**Teaching Quality Standard of Courses**

（2020 Edition）

**China University of Mining and TechnologySchool of Resources and Geosciences**

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[E05411](#_Toc87266099) [Syllabus for《Principles and Applications of Electric and Electromagnetic Exploration》 246](#_Toc87266098)

[M05428/E05416](#_Toc87266101) [Syllabus for《Rock Physics》 247](#_Toc87266100)

[M05406/E05418](#_Toc87266103) [Syllabus for《Well Logging》 248](#_Toc87266102)

[E05415](#_Toc87266105) [Syllabus for《Introduction to Geophysics》 249](#_Toc87266104)

[E05501](#_Toc87266107) [Syllabus for《Earth system science and global change》 251](#_Toc87266106)

[E05502](#_Toc87266109) [Syllabus for《Geological Creativity》 253](#_Toc87266108)

[E05503](#_Toc87266111) [Syllabus for《Modern exploration technology and method》 255](#_Toc87266110)

[E05505](#_Toc87266113) [Syllabus for《Enrichment Mechanism and Law of Geological Resources》 257](#_Toc87266112)

[E05505](#_Toc87266115) [Syllabus for《Geology modelling and simulation》 258](#_Toc87266114)

[E05506](#_Toc87266117) [Syllabus for《Modern geology》 259](#_Toc87266116)

[E05507](#_Toc87266119) [Syllabus for《Geoscience Information Data Analysis》 260](#_Toc87266118)

[E05508](#_Toc87266121) [Syllabus for《Chinese Geology》 261](#_Toc87266120)

[E05509](#_Toc87266123) [Syllabus for《Modern Testing Technology》 262](#_Toc87266122)

[E05510](#_Toc87266125) [Syllabus for《Sedimentary Geology》 264](#_Toc87266124)

[E05511](#_Toc87266127) [Syllabus for《Advanced sedimentary basin analysis》 265](#_Toc87266126)

[E05512](#_Toc87266129) [Syllabus for《Regional tectonic analysis》 266](#_Toc87266128)

[E05513](#_Toc87266131) [Syllabus for《Frontier of Earth Science》 267](#_Toc87266130)

[E05516](#_Toc87266133) [Syllabus for《Structural Geology》 268](#_Toc87266132)

[E05519](#_Toc87266135) [Syllabus for《Crystallography and Mineralogy》 270](#_Toc87266134)

[E05520](#_Toc87266137) [Syllabus for《Crystal Optics and Optical Mineralogy》 272](#_Toc87266136)

[E05521](#_Toc87266139) [Syllabus for《Magmafic and Ｍetamorphic Petrology》 273](#_Toc87266138)

[E05522](#_Toc87266141) [Syllabus for《Sedimentary Petrology》 274](#_Toc87266140)

[E05523](#_Toc87266143) [Syllabus for《Sedimentology and Lithofacies Paleogeography》 275](#_Toc87266142)

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[E05525](#_Toc87266147) [Syllabus for《Geochemistry》 280](#_Toc87266146)

[E05526](#_Toc87266149) [Syllabus for《Modern Testing Technology》 282](#_Toc87266148)

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[E05528](#_Toc87266153) [Syllabus for《Big Data Foundation in Geoscience》 286](#_Toc87266152)

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[I05201](#_Toc87266167) [Syllabus for《engineering geology》 295](#_Toc87266166)

[I05202](#_Toc87266169) [Syllabus for《Engineering geomorphology》 296](#_Toc87266168)

[I05203](#_Toc87266171) [Syllabus for《Drilling engineering》 297](#_Toc87266170)

[I05204](#_Toc87266173) [Syllabus for《Engineering geotechnical》 298](#_Toc87266172)

[I05205](#_Toc87266175) [Syllabus for《Foundation of geological hazards》 299](#_Toc87266174)

[I05301](#_Toc87266177) [Syllabus for《Engineering geomorphology》 300](#_Toc87266176)

[I05401](#_Toc87266179) [Syllabus for《Earthquake Prevention and Disaster Mitigation》 302](#_Toc87266178)

[I05501](#_Toc87266181) [Syllabus for《An Outline of Earth Science》 304](#_Toc87266180)

[I05502](#_Toc87266183) [Syllabus for《Introduction to New Energy》 305](#_Toc87266182)

[I05503](#_Toc87266185) [Syllabus for《Coal Mine Geology》 307](#_Toc87266184)

[P05528](#_Toc87266187) [Syllabus for《Experiment of coal bearing strata and Paleontology》 309](#_Toc87266186)

[P05411](#_Toc87266189) [Syllabus for《Comprehensive ability training for geophysics》 311](#_Toc87266188)

# Syllabus for《An Outline of Earth Science》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M5017M | Course Nature |  |
| Faculty | School of Resources and Geoscience | Semester |  |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

This course mainly talks about the earth's material composition, the earth's sphere structure, earth system science and other related knowledge. The main contents include the physical properties and geological processes of the earth, the outer layer of the earth and its interaction, the material transformation, deformation and displacement of the lithosphere, the dynamic system of the earth, the relationship between human beings and resources and the environment. Through learning, master the necessary basic theories, basic knowledge and basic analysis methods of earth sciences, establish a scientific outlook on the earth, understand the relationship between environment, resources and humans, and establish awareness of resources, geological disasters, and environmental protection, which are the learning and basic qualities of subsequent courses.

2. Course Examination

Course total score = classroom performance × 10% + regular assignment × 20% + final test × 70%.

Writer: Zhenghui Qu

Reviewer: Yinghai Guo, Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Physical Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05106 | Course Nature | Major basic compulsory courses |
| Faculty | School of Resources and Geoscience | Semester | Second Semester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

This course is a required basic course. This course is applicable to the specialties of geological prospecting engineering, geophysics, hydrology and water resources engineering. It mainly covers the knowledge and skills of earth composition, crustal deformation and displacement, and the geological processes which control these geological phenomena. The main contents of the course are about elements, minerals and rocks that composing the earth, various geological processes which control the distribution of material, and the palaeontological stratigraphic record which reflect the process of geo-evolution, geological disasters which are closely related to human living environment. Through the course, students are expected to learn the basic geological concepts, theories and research methods, and set up the scientific viewpoints about earth, resources, environment, and man-land relationship. Common geology focus on the combination of theory and practice, in order to make a great contribution to develop sudents’ scientific thinking, practical ability and comprehensive qualities, and finally lay a good foundation for their further learning.

2. Course Examination

This course assessment adopts a combination of process evaluation and goal evaluation, and the final score of the course is comprehensively determined by the usual results (including attendance and usual performance), homework, experimental results and final exam results. Normal scores account for 10% of the total score, homework scores for 10%, laboratory scores for 20%, and final exam scores for 60%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Yulin Shen

Reviewer: Yinghai Guo, Chongtao Wei

Approver: Zhixin Liu

# Syllabus for《Structural Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05107 | Course Nature | Compulsory basic course for all majors of the same discipline |
| Faculty | School of Resources and Geoscience | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource | 8 |

1. Course Introduction

The course “Structural Geology” is a compulsory basic course for all majors of the same discipline. It is a combination of online and offline teaching courses and the prerequisite course is Physical Geology. This course is applicable to Resource Exploration Engineering, Geology Engineering, Geophysics, Hydrology and Water Resources Engineering, Human Geography and Urban-rural planning majors. It mainly covers the various small and medium-sized geological structures formed by the deformation of the rocks, rock stratum and rock mass in the lithosphere, and studies the geometrical forms, combinations and evolution of these geological structures, and discuss the direction, size, nature and origin of the forces that produce these structures. through this course, students are expected to understand the important position and significance of Tectonic Geology in geological disciplines, grasp the basic concepts, basic knowledge and basic skills of Tectonics, master the idea of Tectonic Geology research, research methods and research content, master the basic skills in reading and analyzing geological data, drawing geological maps, and initially have the ability to engage in structural geological survey and analysis.

The main contents of this Chapter 1 introduction include familiar with the research object and content of tectonic geology; grasp the method and status quo of tectonic geology. Understand the significance of studying the geological structure.

The main contents of this Chapter 2 occurrence of geologic bodies and stratigraphic contact relation include mastering the geological body and its occurrence; tilt rock formation, thickness, outcrop width and outcrop morphology. Understanding the characteristics of upright strata and horizontal strata. Grasping the contact relationship between the strata and its geological significance.

The main contents of this Chapter 3 the mechanical basis of geological structure analysis include mastering the basic concepts of force and stress; stress state analysis and tectonic stress field; rock deformation analysis and factors affecting rock deformation.

The main contents of this Chapter 4 fold include grasp the concept of folds; elements of folds; the classification and combination of folds; the formation mechanism of folds and the factors that affect the folds. Be familiar with the observation and study of folds.

The main contents of this Chapter 5 joint include grasp the concept of joint; joint classification and characteristics; joint staging and matching and joint observation and research.

The main contents of this Chapter 6 fault include master the concept of fault, elements, classification and formation mechanism. Be familiar with the fault effect. The identification mark of the fault and the determination of its relative displacement direction. Be familiar with the observation and study of faults and the characteristics of extensional tectonics, thrust nappe structures, strike-slip faults and gravitational sliding structures.

The main contents of this Chapter 7 magmatic rock structureinclude master the magmatic rock body occurrence, the original structure and contact with the surrounding rock; familiar with the magmatic rock structure observation and research.

The main contents of this Chapter 8 comprehensive analysis of regional tectonicsinclude master the principles and methods of comprehensive analysis of regional tectonics; the basic content of tectonic analysis; the study of regional tectonic development history. Familiar with China's main crustal movement and its characteristics, structural evolution analysis of ideas and content.

2. Course Examination

Course total score = online learning score × 10% + process assessment score × 20% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Li Ming

Reviewer: Jiang Bo

Approver: Liu Zhixin

# Syllabus for《Paleontology and Stratigraphy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05109 | Course Nature | Required basic courses |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1.Course Introduction

Paleontology and stratigraphy is a basic required course; Its prerequisite course is general geology; Suitable for resources exploration engineering, geological engineering, geophysics, hydrology and water resources engineering; This course focuses on the history of the crust and its biosphere, looking for its evolution law, stratigraphic division and correlation, and then guiding the exploration and production of mineral resources. Through the study of this course, the students can master the basic concepts, theories and methods of paleontology, and have the ability to identify and apply key categories of paleontology, so as to lay the foundation for solving the division and correlation of strata, restoring paleogeography, paleoclimate, etc; At the same time, master the modern basic theories and research methods of stratigraphy, explore the experience and changes of the crust and surface in the past geological periods, explore the evolution and development of the earth's surface open system in the geological history period and modern times, and its impact on the biological evolution, sedimentary stratigraphic structure, formation of related mineral resources and environmental evolution, To enable students to have the ability to analyze and solve geological problems.

Main teaching contents are as follow,

1) Introduction (2 class hours)

(1) Basic concepts of Paleontology and stratigraphy;

(2) Evolution history of crust and biosphere;

(3) The contents and methods of Paleontology and stratigraphy;

(4) The frontier issues of Paleontology and stratigraphy.

2) Fundamentals of Paleontology (2 class hours)

(1) The formation conditions and preservation types of fossils;

(2) Classification and nomenclature of Paleontology;

(3) Application of Paleontology

3) protozoa (2 class hours)

(1) The taxonomic position and main characteristics of foraminifera;

(2) The evolution of fusulinidae;

(3) Important fossil representatives.

4) Animal Kingdom (4 class hours)

(1) The taxonomic position and main characteristics of coralline, Brachiopoda, Mollusca, trilobites, graptolites and chordate phyla;

(2) The representative and evolution of important fossils;

(3) An important event in the evolution of the animal kingdom.

5) flora (4 class hours)

(1) Plant classification and classification basis;

(2) Characteristics and representative molecules of lower plants;

(3) The basic characteristics of higher plants, common fossil representatives, geological distribution and ecological characteristics;

(4) Basic knowledge of sporopollen analysis.

6) conodonts and trace fossils (2 class hours)

(1) Conodont basic knowledge and fossil representative;

(2) Basic knowledge of trace fossils and fossil representatives;

7) stratigraphy and history of geological development (4 class hours)

(1) The basic concept of strata and the method of stratigraphic division and correlation;

(2) The main sedimentary types and their identification marks;

(3) Basic knowledge of plate tectonics and tectonic division of China.

8) Precambrian (2 class hours)

(1) The time range, stage division and rock series characteristics of Precambrian;

(2) The geological history of Precambrian and the general situation of Precambrian and regional geology and mineral resources in China;

(3) The Ediacaran geohistory of China.

9) Paleozoic (4 class hours)

(1) Paleozoic division, important categories of biosphere, standard fossils, characteristics of biofacies assemblage and global geological history;

(2) The Paleozoic regional geological characteristics, stratigraphic division, sedimentary characteristics and lithofacies changes in China;

(3) Geological history of Paleozoic regional tectonic units in China.

10) Mesozoic (4 class hours)

(1) The division of Mesozoic, the evolution of biosphere and the characteristics of global geological history;

(2) The development of Mesozoic in China in different stratigraphic divisions, the sedimentary environment, lithofacies changes and the distribution characteristics of climatic zones represented by typical sections.

11) Cenozoic (2 class hours)

(1) Stratigraphic division, biological interface and global geological history of Cenozoic era;

(2) Typical sections, palaeogeographic features and sedimentary types of Paleogene and Neogene in China;

(3) Quaternary characteristics, division of glacial period, sedimentary types and development characteristics of China.

2. Course Examination

1) Assessment method

The assessment of this course adopts the combination of process evaluation and target evaluation, and the final score of the course is determined by the usual performance (including attendance and usual performance), homework and final exam scores. The average score accounts for 20% of the total score, the homework score accounts for 10%, and the final exam score accounts for 70%.

The final score is given according to the 100 point system, and 60 points is considered as passing.

2) Assessment contents and requirements

This course is a closed book examination. The main assessment methods are: final examination, homework, etc. Closed book examination is adopted and the final score is 100 points. The whole process is arranged by the Academic Affairs Office of the school. The examination content should cover the teaching content supporting all the connotation observation points of graduation requirements.

Writer: Fanfan Kong

Reviewer: Biao Quan

Approver: Zhixin Liu

# Syllabus for《Fundamentals of Engineering Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05110 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

《Fundamentals of Engineering Geology》is the main course of geological engineering and Geological Engineering (excellent engineer). It is an elective course of Geophysics and resource exploration engineering. It is an offline teaching course. If necessary, it can be an online and offline mixed teaching course; Its prerequisite courses are general geology, Fundamentals of hydrogeology, soil science and soil mechanics, which are suitable for undergraduates of geological engineering, geophysics and resource exploration engineering. This course mainly introduces the basic theory, engineering geological problems, engineering geological techniques and methods of engineering geology, so that students can understand the engineering geological phenomena, engineering geological conditions and engineering geological problems in human engineering activities, as well as the influence of engineering geological conditions and engineering geological problems on the process of engineering design, construction and operation, To train students to have the ability to analyze and solve engineering geological problems, and to make rational use of engineering geological conditions. Through the study, we can deeply understand the interaction and mutual restriction law between human engineering activities and geological environment, and lay a foundation for future study of professional courses, graduation design and practical work.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Cao Liwen

Reviewer:Yang Weifeng

Approver: Liu Zhixin

# Syllabus for《Principle of reinforced concrete structure》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05201 | Course Nature | Major courses |
| Faculty | School of Resources and Earth Sciences | Semester | fifth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course of reinforced concrete design principle is a basic compulsory course of geological engineering, which is a core course with strong practicality and related to the current norms and regulations. Its prerequisite courses are advanced mathematics, probability theory and mathematical statistics, theoretical mechanics, material mechanics, statically determinate part of structural mechanics, civil engineering materials, etc. It is suitable for non civil engineering majors such as geological engineering. This course mainly introduces the material properties of reinforcement and concrete, the mechanical properties of reinforced concrete axial tension members, axial compression members, flexural members, eccentric compression members, eccentric tension members, calculation methods, reinforcement structure, and the basic requirements of deformation and crack of reinforced concrete members; This course has the characteristics of wide teaching content and strong practicality; Through the study of this course, the students can master the basic theory and knowledge of concrete structure, and provide a solid foundation for continuing to study other professional courses in school and in the engineering field after graduation.

2. Course Examination

This course adopts the assessment method of combining examination with usual assessment.

That is to say, close book examination is conducted at the end of the course, and the examination results account for 70% of the total evaluation results. The homework and attendance results, as usual results, account for 15% of the total results, and the experiment accounts for 15%.

The final score is given according to the 100 point system, and 60 points is considered as passing.

Writer:Yu Qing

Reviewer:Qiao Wei

Approver: Liu Zhixin

# Syllabus for《Geotechnical Engineering Construction》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05205 | Course Nature | Optional major course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Geotechnical engineering construction technology is a theoretical, practical and technical application technology, which involves a wide range and is difficult to construct. It has a close relationship with other disciplines. Geotechnical engineering construction technology plays a very important role in the construction of various projects. In engineering construction, it is often necessary to carry out deep foundation construction and foundation pit support, in order to make senior students of geotechnical engineering, construction engineering, engineering geology and other majors have a preliminary understanding of geotechnical engineering construction technology. Geotechnical engineering construction is a major course for undergraduates majoring in geological engineering. The main purpose of the course is to establish the basic understanding of geotechnical engineering construction for undergraduates majoring in geological engineering, and to train students to understand the process, technology, existing problems and construction management of geotechnical engineering construction; Its prerequisite courses are soil science, soil mechanics and rock mechanics; It is suitable for students majoring in geological engineering. The main contents of the course are: foundation treatment construction, pile foundation construction, underground continuous wall construction, SMW construction, MJS construction, geotechnical anchoring technology construction, underground geotechnical trenchless construction, geotechnical grouting technology construction, geotechnical engineering construction monitoring technology. Through the study of this course, the students have the ability of preliminary geotechnical engineering construction organization design and management. In this course, the pile foundation construction, underground continuous wall construction, rock and soil anchoring construction, trenchless technology are systematically introduced to provide knowledge preparation for students who are going to work.

2. Course Examination

Homework accounts for 30% and closed book examination accounts for 70%

Writer: Wang dangliang

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Foundation and Foundation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05208 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | FifthSemester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Foundation and foundation is a major course for undergraduates majoring in geological engineering. The main purpose of the course is to establish the basic understanding of foundation treatment and foundation design for undergraduates majoring in geological engineering, and to cultivate the ability of design and drawing; Its prerequisite courses are soil science, soil mechanics and rock mechanics; It is suitable for students majoring in geological engineering. This course mainly talks about the design and construction of shallow foundation, pile foundation and foundation treatment. The shallow foundation part focuses on the selection of foundation type, selection of bearing layer, checking calculation of bearing capacity, foundation size and reinforcement design. The pile foundation part focuses on the type and structure of the pile, the bearing capacity and checking calculation of the pile foundation, the design and checking calculation of the pile cap, etc. In the foundation treatment part, the comparison and selection of treatment schemes, the design and calculation of composite foundation, and the detection of bearing capacity of composite foundation are explained; Through the study of this course, the students have the ability to design the foundation and foundation according to the basic requirements of engineering and geotechnical engineering conditions, and to organize and participate in the construction according to the engineering design scheme and requirements.

2. Course Examination

Both the mid-term and final examinations are open book.

Mid term examination results accounted for 30%, and final examination results accounted for 70%.

Writer: Wang dangliang

Reviewer: Yang weifeng

Approver: Liu zhixn

# Syllabus for《Geotechnical engineering monitoring and testing》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05209 | Course Nature | Professional elective courses |
| Faculty | School of Resources and Earth Sciences | Semester | Sixth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Geotechnical engineering monitoring and testing course is a professional elective course for Geological Engineering (including excellent engineers). The purpose of the course is to train students to master the basic principles and methods of geotechnical engineering monitoring and detection and their application in engineering practice, and be familiar with the monitoring scheme design, implementation method and report writing in the process of geotechnical engineering construction. It is a course closely combining theory with practice, so as to improve students' ability of analyzing problems and comprehensive thinking, and increase test skills, The purpose of this paper is to cultivate the students' habit of abiding by the norms, and lay a good foundation for the further study and engineering practice of professional courses in the future.

2. Course Examination

Process assessment accounted for 20% of the total score; The results of homework accounted for 10% of the total; The final examination results accounted for 70% of the total score.

Writer: Piao Chunde

Reviewer: Yu Qing

Approver: Liu Zhixin

# Syllabus for《Drilling Fluid and Engineering Slurry》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05213 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

《Drilling Fluid and Engineering Slurry》 is a major course of geological engineering. It is suitable for geological engineering. For offline teaching courses, if necessary, it can be a mixed online and offline teaching course; The first courses are the foundation of hydromechanics, chemistry, drilling engineering and engineering geology. It is suitable for undergraduate students majoring in geological engineering. This course mainly describes the circulation hydraulic mechanics of drilling fluid, engineering slurry chemistry theory, drilling fluid system, performance adjustment and analysis principle, grouting fluid and grouting fluid technology, design and engineering application. The main contents are as follows: the basic principles of hydromechanics, the theory of slurry rheology and the analysis of seepage in rock and soil during drilling fluid circulation; Theoretical basis of Engineering slurry chemistry; The significance of slurry performance parameters and the measurement method of parameters; The research and evaluation method of drilling fluid system; The principle, technology and circulation system of drilling fluid; The method of drilling fluid performance adjustment and its matching relationship with formation properties and drilling parameters; The technology, design and engineering application of grouting fluid and grouting fluid. Through learning, students should be trained to have the preliminary ability of designing, preparing and adjusting drilling fluid and engineering slurry involved in various engineering activities, and be able to conduct drilling fluid and engineering slurry evaluation research, which will lay a foundation for the future geological engineering major to study professional courses, graduation design and practical work.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Cao Liwen

Reviewer:Yang Weifeng

Approver: Liu Zhixin

# Syllabus for《Trenchless Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05216 | Course Nature | Professional elective courses |
| Faculty | School of Resources and Earth Sciences | Semester | Seventh semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Trenchless engineering course is a professional course of geotechnical drilling and excavation engineering group of geological engineering specialty; Its prerequisite courses are soil science and soil mechanics, rock mechanics and engineering mechanics; It is applicable to the geotechnical drilling and excavation engineering group of geological engineering specialty. This course mainly introduces various fields of trenchless engineering technology, including underground pipeline detection technology, pipeline condition detection and evaluation theory and technology, new pipeline construction technology (including HDD, pipe jacking, micro tunnel, horizontal spiral drilling technology, pipe tamping technology, etc.), pipeline cleaning technology, pipeline replacement technology, pipeline repair technology, and pipes used in trenchless engineering, etc; This course has the characteristics of wide teaching content and strong practicality; Through the study of this course, the students can master the new construction technology of laying, replacing and repairing various underground pipelines under the condition of excavating a small part of the surface by using various geotechnical drilling equipment and technical means, such as guiding and directional drilling, so as to provide a solid foundation for continuing to study other professional courses in school and for continuing to develop in the engineering field after graduation.

2. Course Examination

This course adopts open book examination combined with comprehensive score of experimental teaching.

According to the progress of the course, teachers arrange homework, seminars, classroom tests and other process assessment; Among them, 20% of the total achievements were on special topics and 10% were on ordinary days; Examination results accounted for 70% of the total.

The final score is given according to the 100 point system, and 60 points is considered as passing.

Writer:Yu Qing

Reviewer:Qiao Wei

Approver: Liu Zhixin

# Syllabus for《Prevention and control technology of geological disasters》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05222 | Course Nature | Professional elective courses |
| Faculty | School of Resources and Earth Sciences | Semester | Seventh semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course of geological disaster prevention and control technology is the major course of excellent engineers in geological engineering and the elective course of geological engineering. It is an important professional course of disaster prevention and reduction. Based on the teaching concept of knowledge integrated engineering application and technology practice, this course combines classroom teaching, on-site teaching, video teaching, seminar, engineering case and practice training to carry out classroom, engineering field and video mixed teaching. Its prerequisite courses are general geology, soil mechanics, rock mechanics, engineering geology, hydrogeology, Quaternary geology, etc. This course mainly introduces the definition and main types of geological disasters, the classification of geological disaster prevention and control engineering, the characteristics and risk zoning of geological disasters, the requirements and principles of geological disaster control, the key points of geological disaster prevention and control construction of collapse, landslide, debris flow and ground collapse, the project management, completion acceptance and completion data compilation of geological disaster prevention and control engineering. Through the study of this course, the students can master the basic technology of geological disaster prevention and control, have the ability to engage in the design, construction and construction management of geological disaster prevention and control, and lay a theoretical foundation for the related professional research and production practice after graduation. In the process of teaching, the concept of "green water and green mountains are golden mountains and silver mountains" is transmitted to train students to contribute their technical strength to disaster prevention and mitigation and green, healthy and sustainable development of the motherland.

2. Course Examination

On site teaching assessment accounted for 20% of the total score; 15% of the total results were obtained in ordinary times and seminars; Examination results accounted for 65% of the total score.

Writer:Wu Shenglin

Reviewer:Zhu Shuyun

Approver: Dong Qinghong

# Syllabus for《Geotechnical drilling and excavation engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05223 | Course Nature | Professional practice courses |
| Faculty | School of Resources and Earth Sciences | Semester | fifth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The important basic disciplines of course resources development, urban geological survey and engineering construction of geotechnical drilling and excavation engineering. Guided by the inquiry teaching concept, this course combines classroom teaching, experimental practice, engineering cases, scientific research and training, to enhance students' participation and create a learning environment and atmosphere for students as the main body of the classroom. The course mainly describes the progress of geotechnical drilling engineering, geotechnical excavation engineering and modern engineering construction, geotechnical drilling technology and drilling quality, equipment and tools, drilling flushing, safe drilling, hydrological and well drilling, engineering construction drilling, oil and gas well drilling, directional drilling and urban underground non excavation technology. The first courses are general geology, engineering mechanics, rock mechanics, soil mechanics and soil mechanics; It is suitable for undergraduate students in geology engineering, civil engineering and other majors. Through the study of this course, students can master the basic professional knowledge of geotechnical drilling and excavation engineering, understand the drilling and excavation problems encountered in the construction of the project, and their role and influence on the process of engineering investigation, design, construction and monitoring, and correctly handle and reasonably utilize the natural geological conditions and master the requirements and methods of various geotechnical drilling and excavation technology and equipment. This course focuses on the combination of theory and practice, which lays a good foundation for the further study and engineering practice of the professional courses in the future.

2. Course Examination

This course adopts the assessment method of combining process examination and final examination (closed book).

Process assessment includes attendance and experimental work, accounting for 30% of the total score; The final examination results accounted for 70% of the total score.

The final score is given according to the 100 point system, and 60 points is considered as passing.

Writer: Yang Weifeng

Reviewer: Dong Qinghong

Approver: Liu Zhixin

# Syllabus for《Engineering Geomorphology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05227 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

General teaching objectives: through the study of this course, students should have the basic ability to make use of the relevant knowledge of geomorphology, be able to maintain the idea of dynamic design in the complex process of engineering design and construction, and be familiar with the basic principles of geomorphic processes such as weathering process as the starting point, gravity process leading to flow water leading, wind leading and human activities leading. Through the study of this course, students should be able to use the basic principles of Engineering geomorphology to reasonably analyze and evaluate the geomorphic process of various exogenous forces, and fully consider the interaction between engineering activities and natural geomorphic process. Through the study of this course, students should be able to study and discuss the change process of natural process parameters and engineering activity parameters that need to be considered when carrying out various engineering activities in the process of various complex natural landforms.

The main contents of this chapter 1 include the basic concepts of Engineering geomorphology，the relationship between landform and quaternary system，the landform form and its classification and the stages of geomorphic development.

The main contents of this chapter 2 include weathering types, processes and products, block movement type, mechanism and geomorphic process，the engineering significance of weathering crust and the evaluation of collapse disaster and landslide disaster.

The main contents of this chapter 3 include the types of fluvial processes and their geomorphological processes, the geomorphology and sediment types of sheet flow- gully flow- river flow, the acquisition process of important parameters of debris flow disaster, the relationship between flow action and engineering activities and the evaluation method of seepage deformation.

The main contents of this chapter 4 include aeolian sand and aeolian landform, loess landform and formation process, the relationship between special soil and Engineering in arid area and the evaluation method of loess collapsibility.

The main contents of this chapter 5 include the geomorphic process of karstification, the main engineering significance of Karst and the evaluation method of karst foundation stability.

The main contents of this chapter 6 include the geologic agent and geomorphic processes in cold area and the evaluation and design idea of foundation in seasonal frozen soil area.

The main contents of this chapter 7 include coastal dynamic action and geomorphic process, coastal structure protection methods and the main engineering characteristics of calcareous rock and soil.

The main contents of this chapter 8 include the concept and characteristics of neotectonics and active tectonics, the basic types of tectonic landforms, the relationship between active structures and engineering activities and the method of earthquake impact assessment.

The main contents of this chapter 9 include the direct and indirect landforms of human activities, the evaluation method of goaf and the land subsidence evaluation method.

2. Course Examination

Course total score = process assessment score × 50% + final exam score × 50%.

Process assessment score= homework score × 60% + attendance score × 40%.

Writer: Ju Yuanjiang

Reviewer: Sun Ruhua

Approver: Liu Zhixin

# Syllabus for《Rock mechanics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05228 | Course Nature | Major courses |
| Faculty | School of Resources and Earth Sciences | Semester | fourth semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Rock mass mechanics is a major course of geological engineering. Its prerequisite courses are general geology, engineering mechanics and structural geology; It is suitable for undergraduates majoring in geological engineering. This course is mainly about the engineering properties of rock and rock mass, the theory and application of deformation and failure law of rock mass under the action of stress field. The main contents include: geological and structural characteristics of rock mass, engineering properties of rock mass, deformation and strength of rock mass, constitutive relationship and strength theory of rock / rock mass, evaluation theory and method of engineering rock mass stability, etc. Through the study of this course, the students will be further familiar with the engineering properties of rock and rock mass, understand the rock strength theory and rock deformation and failure characteristics, master the mechanical theory and method of analyzing and evaluating the strength conditions and stability of engineering rock mass, and lay a theoretical foundation for professional research and production practice after graduation.

2. Course Examination

Examination results account for 60% of the total score. Daily work and attendance accounted for 20% of the total score, and the experimental part accounted for 20% of the total score.

Writer:He Hu

Reviewer: Yu Qing

Approver: Liu Zhixin

# Syllabus for《Soil Science and Soil Mechanics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05229 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | FourthSemester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours | 8 | Online Resource | Soil science and soil mechanics, Sui Wanghua, love course website. |

1. Course Introduction

Soil science and soil mechanics is an important basic subject of urban construction and resource development. Guided by the concept of research-oriented teaching, this course combines classroom teaching, experiments, seminars, engineering cases, scientific research and training to carry out online and offline hybrid teaching. The part of soil science mainly studies the engineering properties of soil and its formation and change law, and the part of soil mechanics studies the stress-strain or stress-strain-time relationship, strength and stability of soil under the action of force. The concrete contents include the material composition and physical properties of soil and soil, the permeability of soil and the movement of water in soil, the compressibility and shear resistance of soil, the calculation of stress in soil, the settlement of foundation soil, the bearing capacity of foundation, the stability analysis of soil slope, the calculation of retaining wall pressure, the treatment of foundation, etc. The prerequisite courses are basic geology, probability theory and mathematical statistics, engineering mechanics; It is suitable for undergraduates majoring in geological engineering and civil engineering. Through the study of this course, students can master the basic principles and calculation methods of soil science and soil mechanics, cultivate their ability to solve complex engineering geological problems in production practice, and lay a good foundation for further study and engineering practice of professional courses in the future.

2. Course Examination

Examination scores account for 50% of the total score, homework and report scores account for 40% of the total score, and autonomous learning and discussion account for 10% of the total score.

Writer: Sui wanghua

Reviewer: Yu qing

Approver: Liu zhixin

# Syllabus for 《Coal mine engineering geology and hydrogeology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05230 | Course Nature | Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | Sixth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 10 | Online Resource |  |

1. Course Introduction

The main content of this chapter 2 includes the concept of exploration methods of mine engineering geology and hydrogeological conditions, related basic concepts of geological environment elements, main testing methods, steps and calculation methods of in-situ stress, characteristics of in-situ stress field in coal mine area, basic methods of stress field analysis, and coal mine engineering geological model.

The main content of this chapter 3 includes the concept of the stability analysis and evaluation method of shaft, roadway and underground stope surrounding rock, the basic concept of engineering geological problems of coal mine overburden and floor, the failure and zoning characteristics of coal mine overburden and its test method, the deformation and failure law of coal mine floor and the basic law of mine pressure showing and the prevention and control method of rock burst.

The main content of this chapter 4 includes the concept of the basic concepts of coalfield hydrogeology and water hazards, the basic elements and water filling conditions of coal mine water hazards, the working methods of coal mine hydrogeology, the evaluation methods of all kinds of coal mine water hazards, and the basic prevention and control methods of all kinds of coal mine water hazards.

The main content of this chapter 5 includes the concept of the basic concept and characteristics of open-pit slope, the deformation and failure law of open-pit slope and dump slope, the analysis and evaluation method of open-pit slope stability, the monitoring method of open-pit slope deformation.

The main content of this chapter 6 includes the concept of relevant basic concepts of coal mine environmental geology, environmental geology problems caused by coal mine production and prevention methods, surface and groundwater caused by coal mine production to understand the surface and groundwater environmental protection problems in coal mine area.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Wei Qiao

Reviewer: Qing Yu

Approver: Zhixin Liu

# Syllabus for《Big Data Foundation in Geoscience》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05232 | Course Nature | Optional basic course for all majors of the same discipline |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course is a major basic elective course, which prerequisite course is "Python Programming", applicable to Resource Exploration Engineering, Geological Engineering and other major undergraduates. Big data is widespread in geoscience and is growing exponentially. Under this background, the big data mining of geoscience has been paid more and more attention by geoscientists. This course focuses on the basic concepts of big data in geosciences, the basic tasks of big data mining and the modeling process, data cleaning and pre-processing, the degradation of high-dimensional data, classification and prediction, the processing of graphical data, and the use of Python data analysis libraries. Through the study of this course, students are required to master geoscience data characteristics, data science paradigms and big data technology, and master the latest progress and research frontiers of geotechnical data mining and fusion theory and technology at home and abroad. Students will be proficient in using data analysis and mining modules including NumPy, SciPy, Pandas, GDAL, Matplotlib, Scikit-learn and Scikit-image, and have the ability to discover, analyze and solve problems in the field of geosciences based on the data-driven manner.

The main contents of this chapter 1 include the fourth paradigm of scientific research, geoscience data, the basic tasks of big data mining, the modeling process of big data mining, and commonly used big data modeling tools.

The main contents of this chapter 2 include data cleaning, data integration and fusion, data transformation, data reduction, discrete point detection and Python main data preprocessing function.

The main contents of this chapter 3 include Correlation analysis, canonical correlation analysis, hash algorithm, principal component analysis, factor analysis and Python implementation of various dimensionality reduction algorithms.

The main contents of this chapter 4 include regression analysis, cluster analysis, discriminant analysis, association rule algorithm, recommendation system algorithm and Python implementation of each algorithm.

The main contents of this chapter 5 include computer graphics foundation, digital image processing, image pattern recognition and graphics data processing algorithms.

The main contents of this chapter 6 include infinite stream data and time series mode, infinite stream data feature extraction, time series algorithm, application cases and Python implementation.

The main contents of this chapter 7 include the development history of machine learning, machine learning classification, SVM, decision tree and artificial neural network, deep learning and migration learning, Python implementation of machine learning algorithms.

The main contents of this chapter 8 include Bayesian principle, artificial intelligence and mineral rock identification method based on artificial intelligence.

2. Course Examination

Course total score = regular score× 10% + assignment score × 10% + experiment score × 20% + final exam score × 60%.

Writer: Xi Yantao

Reviewer: WangJilin

Approver: Liu Zhixin

# Syllabus for《Geological Engineering Information System》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05233 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | FifthSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course of geological engineering information system is a combination of theory and practice; The prerequisite courses are computer language programming, general geology, surveying, engineering geomorphology, hydrogeology, engineering geology, geophysics, geotechnical mechanics and drilling engineering; It is suitable for undergraduates of intelligent geological engineering course group of geological engineering specialty. This course mainly describes the characteristics, composition, collection and utilization of geological information in engineering geology and geotechnical drilling related fields; Application requirements and management principles of geological engineering information system; Creativity of geological engineering information model: construction, information query, visualization and utilization; Geological engineering informatization; The correlation and reliability of geological engineering information; Through the study of this course, the students can have the basic concepts of geological engineering information system, the basic knowledge and basic ideas of establishing model and system development, and the knowledge base of analyzing the scientific problems related to geological engineering information system; It has the idea and preliminary ability of geological engineering information construction and innovative utilization; Cultivate the quality of active analysis and timely access to geological engineering information.

2. Course Examination

The course performance consists of classroom performance (10%), extracurricular learning (5%), seminar performance (20%), homework performance (45%) and experiment performance (20%).

Writer: Dong qinghong

Reviewer: Yang weifeng, Xi yantao

Approver: Liu zhixin

# Syllabus for《Engineering Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05234 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 32 | Credit | 2.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Geological engineering is the main course of geological engineering; Its prerequisite courses are general geology and structural geology; It is suitable for geological engineering. This course mainly introduces the engineering properties of rock mass, geological environment of rock mass and soil mass, geological action of groundwater, stability analysis of rock mass and soil mass, geological engineering analysis and reinforcement of rock mass engineering; Through the study of this course, students can understand and master the transformation and utilization of geological bodies, emphasize the controlling role of geological conditions on engineering safety, pay attention to the application of engineering measures on the transformation and reinforcement technology of geological environment, deeply understand the interaction and mutual restriction law between human engineering activities and geological environment, and let students learn to integrate basic geological theory, geological engineering practice and geological environment Mechanical analysis theory and engineering design theory are organically combined to lay a foundation for future practical work.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Sun ruhua

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Detection and control of Geological Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05235 | Course Nature | Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | Sixth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Geological engineering detection and control course is the main course of Geological Engineering (including excellent engineers). The purpose of the course is to train students to master the basic principles and methods of geological engineering detection and control and their application in engineering practice, and to be familiar with the detection scheme design, various detection methods and process control methods in the process of geological engineering construction. It is a course closely combined with theory and Practice, which can improve students' ability of analyzing problems and comprehensive thinking, and increase test skills, The purpose of this paper is to cultivate the students' habit of abiding by the norms, and lay a good foundation for the further study and engineering practice of professional courses in the future.

2. Course Examination

Process assessment accounted for 20% of the total score; The results of homework accounted for 10% of the total; The final examination results accounted for 70% of the total score.

Writer: Piao Chunde

Reviewer: Yu Qing

Approver: Liu Zhixin

# Syllabus for《Intelligent Method and Equipment of Geological Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05236 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | SixthSemester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource | https://www.icourse163.org/course/CDLGDX-1460205161?from=searchPage |

1. Course Introduction

This course is a major course in the field of geological engineering. The prerequisite courses of this course are geological engineering information system, geological engineering and geotechnical drilling engineering; It is suitable for the intelligent geological engineering direction of geological engineering specialty. To meet the needs of economic and social development, we should adhere to moral education, cultivate high-quality application-oriented talents with socialist core values, basic knowledge and application ability of intelligent methods and equipment, and be able to engage in Geological Engineering Specialty Based on information cutting-edge technology. It mainly introduces the connotation, research significance and possible new directions of geo engineering intelligence; Intelligent perception method of engineering geological conditions and engineering conditions; Intelligent evaluation method for evolution process of engineering geological conditions, engineering conditions, economic and environmental conditions, etc; Critical state identification, judgment methods and Countermeasures of engineering conditions and engineering conditions; The structural characteristics of geological engineering intelligent equipment and its creativity.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Dong qinghong

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Fluid Mechanics and Hydraulic Transmission Technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05237 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | FifthSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course of fluid mechanics and hydraulic transmission technology is a combination of theory and practice; Its prerequisite courses are engineering graphics, engineering mechanics, college physics and advanced mathematics; It is suitable for undergraduates of geotechnical drilling and excavation engineering course group of geological engineering specialty. This course mainly introduces the working principle and performance characteristics of the foundation of fluid mechanics, hydraulic circuit, hydraulic transmission components, hydraulic control components and typical components, as well as the working principle and performance characteristics of the hydraulic system of geological engineering machinery; Through the study of this course, the students can master the basic knowledge of fluid mechanics and hydraulic transmission, and have the preliminary ability of creativity and application of geological engineering hydraulic equipment.

2. Course Examination

The course score consists of classroom performance (15%), homework score (65%) and experiment score (20%).

Writer: Dong qinghong

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《geotechnical investigation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05238 | Course Nature | Major courses |
| Faculty | School of Resources and Earth Sciences | Semester | fifth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Geotechnical engineering survey course is the main course of geological engineering and the elective course of civil engineering; This course combines classroom teaching, experiment and on-site teaching, and on-site teaching is carried out in the way of school enterprise combination. Its prerequisite courses are general geology, soil mechanics, rock mechanics, engineering geology, hydrogeology, engineering drilling, basic engineering, etc; It is suitable for geological engineering, civil engineering, road and traffic civil engineering. This course mainly introduces the basic working methods of geotechnical engineering investigation, the division of investigation stages, the requirements of various projects for investigation work, the investigation requirements of adverse geological effects and geological disasters and special geotechnical and groundwater, the compilation of various investigation methods and investigation results reports, etc; Through the study of this course, students can make clear the purpose, tasks and requirements of geotechnical engineering investigation of construction site, correctly select and use geotechnical engineering investigation methods, have strong hands-on ability and ability to analyze and solve problems, have the sense of responsibility to abide by regulations and the spirit of dedication to serve the construction of the motherland.

2. Course Examination

On site teaching examination accounted for 15% of the total score, special discussion accounted for 20% of the total score, and ordinary performance accounted for 10%; Examination results accounted for 55% of the total.

Writer:Wu Shenglin

Reviewer: Yu Qing

Approver: Dong Qinghong

# Syllabus for《Drilling equipment and technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05239 | Course Nature | Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | Sixth semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

This course is the main course for the major of geological engineering. Prerequisite courses: general geology, engineering mechanics, mechanical drawing, etc. The main content of this course is divided into two parts. The first part is the drilling technology, including: cemented carbide drilling technology, diamond drilling technology, percussive rotary drilling technology, reverse circulation drilling technology, core taking technology, technical measures to improve core taking rate and quality, drilling bending mechanism, drilling bending measurement and Prevention. The second part is the drilling equipment, mainly including the working principle, performance parameters and structure analysis of core, water well and engineering drilling rig; Requirements of drilling technology for pumps; Type and working principle of reciprocating pump; Types and basic parameters of drilling tower; The structure of the rig. Through the study of this course, students can systematically master the basic theory, basic knowledge and basic skills of drilling equipment and technology, and lay the necessary professional knowledge foundation for the study of follow-up courses and the future application of drilling engineering.

2. Course Examination

The assessment method of this course is process assessment (30%) + result assessment (70%).

Writer: Zhou Chang

Reviewer: Yu Qing

Approver: Liu Zhixin

# Syllabus for《Geothermic Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05245 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | FifthSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Geothermal geology is the main course of geological engineering; Its prerequisite courses are general geology, structural geology, paleontology and stratigraphy, foundation of engineering geology, foundation of hydrogeology, etc; It is suitable for undergraduates majoring in geological engineering. This course focuses on the formation, evolution and evaluation of geothermal resources. The main contents include: heat and heat transfer in the earth, thermal state of the crust, occurrence law of geothermal resources, distribution and evaluation of geothermal resources, etc. Through the study of this course, students can apply the theories and methods of Geology and geotherm to analyze the formation and distribution of geothermal resources, divide the genetic types of geothermal fields, find out the physical properties and chemical composition of geothermal fluids, determine their industrial value and predict their development prospects, etc., so as to provide scientific basis for economic rational exploration, development and utilization, To cultivate the students' professional ability of applying the basic geological theory, mechanical analysis theory and geothermal engineering design theory to organically combine the comprehensive analysis and evaluation of geothermal resources.

2. Course Examination

Process assessment: 30%

Closing Test Score: 70% (Close Book Test)

Writer: Wang qiqing

Reviewer: Qiao wei

Approver: Liu zhixin

# Syllabus for《Engineering Water Hazards》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05245 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 26 | Credit | 2 |
| Extracurricular hours | 6 | Online Resource |  |

1. Course Introduction

The teaching objective of this course is to enable students to master the basic concepts and types of engineering water damage, and understand the dialectical relationship between engineering and water resources, water environment and water ecology. Master the basic concepts of engineering hydrology, methods of hydrological data acquisition, and have the basic ability of hydrological data collection and hydrological statistics; Capable of analyzing the causes of water damage in surface and shallow engineering, mine engineering, dam engineering and other typical engineering; To understand the basic methods for evaluating the impact of engineering activities on water environment. To guide students to establish the concept of harmonious coexistence and coordinated development between engineering and water resources and water environment, harmonious coexistence between human and nature, sustainable development and ecological civilization construction.

The main content of this chapter 1 is overview of the relationship between engineering and water, which include the present situation of water resources in China and the natural characteristics of water, the relationship between engineering and water, the concept, content and classification of engineering water hazard science.

The main content of this chapter 2 is fundamentals of engineering hydrology, which include the concepts of engineering hydrology, processes of hydrological cycle and runoff formation, knowledge of hydrological data collection, methods of hydrological statistics.

The main content of this chapter 3、4、5 is cause analysis of water damage in surface and shallow engineering, mine engineering, dam engineering and other typical engineering.

The main content of this chapter 6 is impact assessment of engineering activities on water environment, which include the basic knowledge of water environment, surface water environmental impact assessment technology, groundwater environmental impact assessment technology, water environmental protection countermeasures and measures.

The main content of this chapter 7、8、9 is typical water hazards into water conservancy, the impact of typical projects on water resources, engineering activities and water environment harmonious co-existence case analysis

2. Course Examination

Process assessment: 30% (10% for attendance, 10% for project discussion and class problems, 5% for assignments, 5% for outstanding performance)

Closing Test Score: 70% (Open Book Test)

Writer: Qian ziwei

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Numerical calculation of geotechnical engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05241 | Course Nature | Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Numerical calculation of geotechnical engineering is an elective course for geological engineering. Guided by the concept of application-oriented teaching, this course combines classroom teaching with computer experiment simulation, and is an offline teaching course. This course mainly describes the basic principles and methods of geotechnical engineering numerical calculation, and how to use relevant software for engineering geological modeling, result output and analysis, and parameter debugging. The main contents include: introduction of common numerical methods, finite element method for elastic problems, finite element method for elastic-plastic problems, finite difference method and application of numerical simulation software in geotechnical engineering, combined with relevant software to simulate the four common engineering geological problems in class, etc. The prerequisite courses are introduction to mining, foundation of engineering geology, soil science, soil mechanics and rock mechanics; It is suitable for undergraduates majoring in geological engineering and civil engineering. Through the study of this course, the students can master the numerical calculation method of geotechnical engineering, cultivate the ability of how to establish engineering geological numerical model to solve problems in geotechnical engineering in production practice, and lay a good foundation for further study and engineering practice of professional courses in the future.

2. Course Examination

Process assessment accounts for 40% of the total score, and homework accounts for 60% of the total score. Process assessment includes attendance and essay or reading report, attendance accounts for 10% of the total score, and writing related essay or reading report accounts for 30% of the total score.

Writer: Zhu Shuyun

Reviewer: Yu Qing

Approver: Liu Zhixin

# Syllabus for《Geothermal exploration technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05242 | Course Nature | Major courses |
| Faculty | School of Resources and Earth Sciences | Semester | Sixth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Geothermal exploration technology is the main course of geological engineering; The prerequisite courses are geophysics, engineering geology, hydrogeology, geothermal geology and geological engineering; It is suitable for undergraduates majoring in geological engineering. This course focuses on the main technical methods and requirements of geothermal resources exploration. The main contents include: brief introduction of geothermal resources, geothermal surface survey methods, geothermal geochemical exploration technology, geothermal geophysical exploration technology, geothermal remote sensing technology and geothermal drilling technology. Through the study of this course, students can understand and be familiar with the development trend of geothermal resources exploration technology at home and abroad, focus on mastering the exploration methods, principles and technical requirements of geothermal resources, and cultivate students' professional ability of comprehensive analysis and evaluation of geothermal resources by using geothermal resources exploration technology.

2. Course Examination

Examination results account for 70% of the total score, homework, attendance as usual results, accounting for 30% of the total score.

Writer: Wang Qiqing

Reviewer: Yang Weifeng

Approver: Liu Zhixin

# Syllabus for《Geothermal Well Drilling Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05243 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geosciences | Semester | Second Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course is professional courses for geological engineering major.Through study this curriculum,students master the basic theory, basic knowledge and basic skills of well drilling and well completion technology.And these lay a necessary professional knowledge base for the following curriculum study and the future use in the professional work of drilling engineering.This course focuses on the content:the principle and content of well drilling design; rock fragmentation mechanism and technical parameters of drilling technology of drag type bit and rock bit;structure principle and drilling technology of wire-line coring drilling tool；drilling theory and technology of under-balanced drilling；working principle and technology of high pressure jet drilling;design and calculation of hydraulic parameter for high pressure jet drilling；cementing technique，this including well structure design、casing string design and technology measures of improving cementing quality；well completion technique； selection and application of well completion methods.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Li Julong

Reviewer:Yang Weifeng

Approver: Liu Zhixin

# Syllabus for《Introduction to Geological Economic Management of Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05244 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | https://mooc1.chaoxing.com/course/204126526.html |

1. Course Introduction

The course involving engineering, management, economics and other disciplines, is aimed at achieving the purpose of engineering economy by using the method of economics and the concept of management.

This course includes: engineering economic elements, project evaluation, uncertainty analysis, project financial evaluation, project management, network planning, project control, project cost control, project quality control, project safety and environmental management, project completed acceptance et al..

Through studying this course, students will understand and master the analysis method of engineering economics, the basic knowledge of project management, and their senses of economics and control will be improved.

2. Course Examination

Course total score = process assessment score × 40% + final assessment score × 60%.

Writer: Jishan Xu

Reviewer: Qing Yu

Approver: Zhixin Liu

# Syllabus for《Engineering Water Hazards》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05245 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 26 | Credit | 2 |
| Extracurricular hours | 6 | Online Resource |  |

1. Course Introduction

The teaching objective of this course is to enable students to master the basic concepts and types of engineering water damage, and understand the dialectical relationship between engineering and water resources, water environment and water ecology. Master the basic concepts of engineering hydrology, methods of hydrological data acquisition, and have the basic ability of hydrological data collection and hydrological statistics; Capable of analyzing the causes of water damage in surface and shallow engineering, mine engineering, dam engineering and other typical engineering; To understand the basic methods for evaluating the impact of engineering activities on water environment. To guide students to establish the concept of harmonious coexistence and coordinated development between engineering and water resources and water environment, harmonious coexistence between human and nature, sustainable development and ecological civilization construction.

The main content of this chapter 1 is overview of the relationship between engineering and water, which include the present situation of water resources in China and the natural characteristics of water, the relationship between engineering and water, the concept, content and classification of engineering water hazard science.

The main content of this chapter 2 is fundamentals of engineering hydrology, which include the concepts of engineering hydrology, processes of hydrological cycle and runoff formation, knowledge of hydrological data collection, methods of hydrological statistics.

The main content of this chapter 3、4、5 is cause analysis of water damage in surface and shallow engineering, mine engineering, dam engineering and other typical engineering.

The main content of this chapter 6 is impact assessment of engineering activities on water environment, which include the basic knowledge of water environment, surface water environmental impact assessment technology, groundwater environmental impact assessment technology, water environmental protection countermeasures and measures.

The main content of this chapter 7、8、9 is typical water hazards into water conservancy, the impact of typical projects on water resources, engineering activities and water environment harmonious co-existence case analysis

2. Course Examination

Process assessment: 30% (10% for attendance, 10% for project discussion and class problems, 5% for assignments, 5% for outstanding performance)

Closing Test Score: 70% (Open Book Test)

Writer: Qian ziwei

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Slope engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05247 | Course Nature | Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | Sixth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Slope engineering is the main course of geological engineering; Its prerequisite courses are introduction to mining, foundation of engineering geology, soil science, soil mechanics and rock mechanics; It is suitable for geological engineering. This course mainly analyzes and introduces slope engineering problems such as slope, landslide, debris flow, dangerous rock, collapse and bank collapse, and expounds the methods of slope engineering investigation, test, stability analysis and evaluation, treatment and monitoring. The main contents include: introduction of slope engineering, basic theory and stability evaluation of slope treatment, calculation of lateral geotechnical pressure, design and construction of common reinforcement measures, slope engineering monitoring, etc. Through the study of this course, the students can understand and be familiar with the basic theoretical knowledge and methods of slope survey, design, construction and monitoring, cultivate the ability of students to understand slope, analyze and evaluate slope stability, carry out treatment scheme design, and use the knowledge to solve practical engineering problems.

2. Course Examination

The results of classroom tests and homework accounted for 20% of the total; The final examination results accounted for 40% of the total scores; Group engineering design report accounted for 20% of the total score; Group report accounted for 20% of the total score.

Writer: Zhou Chang

Reviewer: Yu Qing

Approver: Liu Zhixin

# Syllabus for《Foundation Pit and Underground Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05248 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | SixthSemester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

"Foundation pit and underground engineering" is the main course of the engineering geology and geotechnical engineering course group of geological engineering specialty, innovation and entrepreneurship course; Its prerequisite courses are soil mechanics, rock mechanics, engineering geology and reinforced concrete structure principle; It is suitable for undergraduates majoring in geological engineering. This course mainly describes the structural structure of foundation pit and underground engineering, surrounding rock classification and determination of surrounding rock pressure, structural design and calculation of underground engineering, design of foundation pit engineering and its supporting structure, groundwater control, current common underground engineering construction methods, disasters during construction and operation and their protection methods, etc; Through the study of this course, students can master the design, construction principles and calculation methods of foundation pit engineering and underground engineering, understand the influencing factors of surrounding rock stability of foundation pit and underground engineering and their relationship with construction methods, and understand the construction technology of underground engineering and foundation pit engineering, To cultivate students' ability to use the basic knowledge to calculate and analyze the structure of Underground Engineering (including foundation pit engineering) and to solve the practical engineering design and construction.

2. Course Examination

Process assessment: 30% (Classroom attendance, classroom study and discussion, homework evaluation and course experiment accounted for 10%, 30%, 20% and 40% of the process assessment results respectively.)

Closing Test Score: 70% (Open Book Test)

Writer: Li xiaoqin

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Groundwater Numerical Modeling》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05301 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 24 | Credit | 2 |
| Experimental hours | 8 | Online Resource |  |

1. Course Introduction

The groundwater numerical modeling course is a high-level optional major course for the major of hydrology and water resources engineering, and it is also one of the special professional courses with geological background for the major of hydrology and water resources engineering in CUMT. Its prerequisite courses are the foundations of hydrogeology, groundwater dynamics.

Through the teaching of this course, students can clearly understand the basic concepts of groundwater numerical modeling, the problem description and application fields of groundwater flow; master the finite difference method and finite element method of groundwater flow; be familiar with the requirements of groundwater numerical modeling data; know the application of differential or finite element software and be familiar with the flow of groundwater numerical modeling through application examples. It will make students have the "prototype to model" transformational thinking, be familiar with groundwater modeling methods and software, will train students to integrate theory with practice, and have the ability to use groundwater numerical modeling tools to solve practical problems such as groundwater migration, groundwater environmental evaluation, and extraction volume prediction.

This course mainly includes groundwater flow problems, the advantages and disadvantages of numerical modeling methods; the finite difference method and finite element method of groundwater flow modeling models; the numerical method of inverse hydrogeological parameters through modeling; make students understand the knowledge of international popular software and related applications in the field of groundwater, be familiar with the latest development trends and prospects of international groundwater numerical modeling.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Qi Yueming

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Watershed hydrological modeling》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05302 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course is an extension course for students major in Hydrology and Water Resources Engineering. Its prerequisite courses include the principle of hydrology and hydrological forecasting. Through course study, students can master the basic principles and modeling techniques of hydrological forecasting methods, including basic theories of runoff generation and concentration, infiltration theory and models, full-storage runoff models, super-permeable runoff models, evapotranspiration models, river flow calculations, The rainfall-runoff model, the establishment of the model structure and the determination and calibration of the parameters in various models, and train students to use the model to solve practical production problems.

This course introduces new methods and techniques for watershed hydrological simulation, and grasps the basic principles and modeling techniques of hydrological simulation. It mainly includes the basic theory of runoff yield and concentration, infiltration theory and model, evapotranspiration model, model of runoff yield and concentration, channel flow routing, generalization of watershed hydrological process, modeling, parameter calibration and validation, etc. The focus is on learning the latest dynamic hydrological simulation, the principle and method of modeling, using hydrological model to solve practical problems, research on hydrological laws, and grasp the advantages and disadvantages of different hydrological models, the applicable conditions and scope of application.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: SONG Xiaomeng

Reviewer: KONG Fanzhe

Approver: LIU Zhixin

# Syllabus for《Water Pollution Prevention and Remediation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05303 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course "Water Pollution Prevention and Remediation" is an extension course for hydrology and water resources majors, whose prerequisite courses are "Water Environment Chemistry", "Fundamentals of Hydrogeology", "Water Environment Monitoring and Protection" and "Water Resources Pollution Control", which is applicable to undergraduate students of hydrology and water resources engineering. The course is mainly about water pollution investigation, evaluation methods and water pollution prevention and remediation techniques, the main contents include: water pollution identification, water pollution investigation, surface water pollution evaluation, river pollution ecological restoration techniques, lake and reservoir pollution ecological restoration techniques, groundwater pollution evaluation, groundwater pollution restoration techniques and other contents. Through the course of study, students master the basic concepts, basic theories and basic methods of water pollution prevention and remediation, familiar with common water pollution evaluation models and water pollution remediation techniques, can use water chemistry, hydrogeology and other professional theoretical knowledge, analysis and proposed surface water and groundwater and other water pollution evaluation and remediation solutions, with the basic ability to engage in water pollution prevention and remediation of scientific research and practice.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yong Liu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Modern Hydrogeology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05304 | Course Nature | Modern Hydrogeology |
| Faculty | School of Resources and Geoscience | Semester | 7th Semester |
| Class Hours | 32 | Credit | 2.0 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course is intended to make the students master the theory, method of modern hydrogeology and its development trend.

The main content include modern theories of hydrogeology and groundwater aquifer medium characteristics, the rule of groundwater movement, groundwater flow numerical simulation theories and methods, hydrogeology exploration techniques, hydrogeochemical circulation and water pollution prevention and control.

The students will know the main content of hydrogeology, its development trend, new technology, new tools and new theory, and have the ability to analyze, research and solve the modern hydrogeology problems.

It also help students clearly understanding the importance of developing modern analytical techniques and the latest groundwater scientific principles to solve related hydrogeological problems and the significance to social and economic development.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer:Sun Yajun, Xu Zhimin

Reviewer: Kong Fanzhe

Approver: Liu Zhixin

# Syllabus for《Modern Hydrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05305 | Course Nature | Expand Knowledge Course |
| Faculty | School of Hydrology | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Modern Hydrology Course is a major compulsory course of the graduate student of hydrology and water resource and that of civil and hydraulic engineering. The advanced courses include hydrogeology and principles of hydrology. The course content includes: The development of hydrology; the theory of hydrologic cycle and the research contents of modern hydrology; The application of "3S” technology, especially GIS and RS in hydrology; Conceptual watershed hydrologic model based on modern technology; Distributed watershed hydrologic model based on physics. By learning the course, students should have the ability to use the modern technology to analysis and simulate the overall process and each sub-process of hydrologic cycle.

By learning the Modern Hydrology Course, students should understand the promoting effect of modern technology on the development of modern hydrology; know very well the research hotspot of modern hydrology; master the modern technology which have been used widely in hydrology; be able to use the modern technology to solve hydrologic problems, especially the modeling problems of hydrologic process; be familiar with the modern simulation systems of hydrology used widely.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: kong fanzhe

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Hydrometry》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05307 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The course is an important component of the hydrological sciences, and it is a special major course for students major in Hydrology and Water Engineering. Its prerequisite course is “Principles in Hydrology”. The contents include as follows: the basic concepts, methods and theories for station setting; the basic information for observation, collection and calculation the hydrologic elements; the methods for dealing with the hydrologic data; the error analysis methods for the hydrologic observation; the automation information for hydrological survey and forecasting, and so on. Through this course, students are expected to grasp the basic concepts, theories and methods to collect the hydrological information and to deal with the hydrological data through this course learning. They can gain basic knowledge of discipline development.

The main contents include as follows: gauges and network, precipitation gauging, water level gauging, discharge measurement, sediment measurement, groundwater monitoring, water quality information collection, discharge data processing and sediment data processing. The main objective of this course are:

* To master the basic concepts and related theories and methods for hydrological information collection, data processing, information transmission, and information release；
* To cultivate the innovation consciousness and scientific literacy for the students；
* To make the students understand the development direction of this discipline and the current situation of hydrological information technology at home and abroad；
* To train the analysis ability to solve the hydrological information problems met in practice。

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: SONG Xiaomeng

Reviewer: KONG Fanzhe

Approver: LIU Zhixin

# Syllabus for《Hydrologic Forecasting》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05308 | Course Nature | Major Compulsory Course |
| Faculty | School of Hydrology | Semester | Fifth Semester |
| Class Hours | 24 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

This course includes runoff generation, watershed confluence, channel discharge routing and flood forecasting, watershed hydrologic model and real time flood forecasts, etc. The runoff generation part introduces analysis of runoff generation mechanism, calculation of evapotranspiration, separation of baseflow in measured stream flow and calculation of excess rainfall, including saturation excess runoff model and infiltration excess runoff model. The watershed confluence part introduces unit hydrograph model, instantaneous unit hydrograph and isochrones of travel time. Channel discharge routing part introduces principle of discharge routing, characteristic river length method, Muskingum method and corresponding water level（discharge） method. The watershed hydrologic model part introduces conceptual watershed hydrologic model, including Xin’anjiang model and Tank model.

The goal of this course is that after learning this course, students should have the ability to develop or choose a hydrologic forecasting proposal under different conditions and carry out the forecasting proposal.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: kong fanzhe

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Water resources evaluation and utilization》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05309 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | Two |
| Extracurricular hours | 8 | Online Resource | https://www.icourse163.org/course/WHU-1002921017?from=searchPage |

1. Course Introduction

Water resources evaluation and utilization is the main major course of hydrology and water resources engineering, and its prerequisite courses are "Groundwater Dynamics" and "Principles of Hydrology". This course mainly describes the calculation method of groundwater resources, the calculation method of the allowable extraction of groundwater, the calculation method of surface water resources, the analysis and processing methods of precipitation, evaporation, and runoff, the calculation method of the usable amount of surface water, and the amount of water resources. The method of determining the amount of repetition, the method of evaluating the quality of water resources, the engineering and ways of water resources development and utilization.

Through the study of this course, master the basic concepts in water resources evaluation, and master the amount of groundwater recharge, discharge, storage, groundwater resources, surface water resources, groundwater extractable use, surface water available, groundwater and surface water Repetitive quantity, total amount of water resources, surface water quality and groundwater quality evaluation methods, master the basic principles of water resources evaluation by analytical method, parameter method and water balance method, and the basic process of water resources evaluation, master the development and utilization of water resources Engineering and approach. Cultivate students' professional ability to evaluate and utilize water resources by collecting, sorting and analyzing hydrological data. Cultivate students' sense of social responsibility and historical mission to save and protect water resources.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Guiming Dong

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Prevention and Control of Mine Water Disasters》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05310 | Course Nature | Prevention and Control of Mine Water Disasters |
| Faculty | School of Resources and Geoscience | Semester | 6th  Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The course is intended to make students know systematically the status of coal mine water disasters in China, and the basic concepts, theories and techniques of prevention and control of mine water disasters. Main content includes the conditions and mechanism of mine water disasters, basic prediction method, the calculation of mine water inflow, prevention and control technologies, comprehensive utilization of mine water.

The students will have correct technical ideas of analyzing and solving the problems of mine water disasters, and the ability to analyze and solve problems comprehensively with the multi-disciplinary knowledge of geology, hydrogeology, geophysical exploration, water environment, hydrochemistry and mining engineering, etc., and the ability of multi-disciplinary intersection and knowledge fusion. The students will be able to use the relevant technology and methods to give a correct technical plan of prevention and control of mine water disasters, and how to use mine water resources.

The course will support students get their ability of self-study and self-improvement, as well as their initial consciousness of innovation, and clearly understand the importance of solving the complex engineering problems and the significance to social and economic development.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer:Sun Yajun, Xu Zhimin

Reviewer: Kong Fanzhe

Approver: Liu Zhixin

# Syllabus for《Reading of classic literature in hydrology (Bilingual)》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05323 | Course Nature | Major Elective Course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course "Reading Classical Literature in Hydrology (Bilingual)" is a bilingual major elective course for the major of Hydrology and Water Resources Engineering. The prerequisite courses are Principles of Hydrology, General Hydrogeology, Groundwater Dynamics, Water Environment Chemistry, etc. It focus on reading classic English literatures on Hydrology. The selected classic literature mainly consists of early original monographs, contemporary standardized test standards and forewords of special issues of international journals, involving well hydraulics, linear graphic method, history of groundwater simulation softwares, environmental geochemistry, etc.

On the basis of reading and analyzing classic literature in hydrology and water resources, the overall goal of this course is to deepen the understanding of professional knowledge and broaden the vision of professional knowledge, as well as to develop students' ability to search, read and analyze original literatures.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Wang Changshen

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Hydraulics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05329 | Course Nature | Compulsory basic course for all majors of the same discipline |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The course is a major course for students major in Hydrology and Water Resources Engineering. Its prerequisite courses include advanced mathematics and physics. Through the study of this course, students can master the basic concepts, theories and calculation skills of hydraulics, so as to lay the necessary hydraulics foundation for the study of subsequent courses. The goal of this course is to cultivate students’ logical reasoning ability, hydraulic calculation ability, innovation consciousness and self-study ability, especially the ability to analyze and solve the engineering practical problems by comprehensively using the learned hydraulics knowledge.

The main contents include as follows: definition and task of hydraulics, hydrostatic features, the basic principles of water flow movement, the theories and methods for conduit flow and open channel flow, the hydraulic methods for the hydraulic structure, subsurface flow movement and solute transport. Upon successful completion students gained basic knowledge of mathematical treatment of physical flow processes, in particular transient flow in open channels and pipes; they can select adequate modelling concepts to solve hydraulic problems, apply and modify simple numerical simulation models, elaborate problem solutions in small teams, and interpret and evaluate simulation results and uncertainties in order to better understand the theory and application of the more widely available simulation models.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: SONG Xiaomeng

Reviewer: KONG Fanzhe

Approver: LIU Zhixin

# Syllabus for《Hydrometeorology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05330 | Course Nature | Compulsory Basic Course for All Majors of the Same Discipline |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course includes classroom learning and extracurricular learning. Through the study of this course, students can deeply understand the importance of hydrometeorology work and its important role in social and economic development. Besides, students can master the contents and abilities of the following aspects: the basic principles、basic theories and basic skills of hydrometeorology, the characteristics of weather systems at different latitudes, the influencing factors of climate formation; Students can analyze the causes of climate anomalies, master the statistical methods of hydrometeorology, and use new technologies such as GIS and remote sensing to solve practical problems in hydrometeorology. Students have the ability to use the basic theories of hydrometeorology to analyze the impact of hydrometeorological elements on social production, early warning and flash flood prevention, and disaster management.

The main teaching content of the class includes:

Chapter 1 introduces the overview of hydrometeorology, research content, research tasks, significance to social and economic development, and a brief history of the subject development.

Chapter 2 includes the characteristics of solar radiation, the adiabatic change process of temperature, the method of judging the stability of the atmosphere, the characteristics of ground radiation and the distribution of temperature.

Chapter 3 includes the concepts of saturated water vapor pressure and humidity, the conditions of water vapor condensation and condensation phenomena in the surface and atmosphere, the principles of artificial precipitation, atmospheric precipitation process, types of precipitation, precipitation elements, precipitation representation methods, and precipitation observation methods.

Chapter 4 includes the expression method of atmospheric pressure, the qualitative explanation of the distribution of pressure with height, the characteristics of pressure field, the characteristics of air force, the form and characteristics of air horizontal movement, and the characteristics of atmospheric circulation.

Chapter 5 includes the concept and formation conditions of air masses, the concept and classification of fronts, the characteristics of extratropical and tropical cyclone weather systems, weather forecasting systems, and hydrological and meteorological disasters.

Chapter 6 includes an overview of the climate system, the impact of land and sea factors and circulation factors on climate, the characterization characteristics of climate change, and the characterization methods of climate anomalies.

Chapter 7 includes hydrometeorological observation methods, hydrometeorological station network construction, basic theories of hydrometeorological statistics and calculations, the relationship between hydrometeorology and ecological environment, hydrometeorological and new technology application cases.

Chapter 8 covers the application of hydrometeorology in production, early warning and flash flood control, and urban management.

The extracurricular teaching content includes:

Chapter 5 includes the causes and characteristics of extratropical anticyclones and tropical cyclones.

Chapter 6 includes the performance characteristics and forecasts of climate anomalies.

The main content of Chapter 7 is to obtain historical hydrometeorological data of a certain river basin and analyze climate change.

The main content of Chapter 8 is to find literature and analyze more applications of hydrometeorology based on case studies.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yanqing Ding

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Conspectus of Water Conservancy Project》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05331 | Course Nature | Compulsory basic course of all  majors of the same discipline |
| Faculty | School of Resources and Geosciences | Semester | Forth Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Through learning of this course, students are expected to understand the current situation of the development of water conservancy project construction in China, to master the characteristics of the reservoir water level and capacity, to be familiar with hydraulic engineering grades and types, to master the [structuralcomposition](javascript:;)s, working principles and application conditions of water retaining projects, flood discharge projects and [waterconveyanceproject](javascript:;)s, to know the construction method of [keywatercontrolproject](javascript:;)s, to master the professional basic knowledge related to water conservancy project performance, site selection, design, construction and operation, and have abilities required by the design, construction and operation of water conservancy project.

During the study, students should realize the impacts of water conservancy projects on the social and natural environment in the process of site selection, design, construction and operation, be aware of the related ethical issues of water conservancy projects, and make clear the professional ethics and responsibilities of water conservancy engineers, so as to become technical talents with both professional basic knowledge and professional ethics.

The main contents of this chapter 1 includes characteristics and problems of water resources in China, [engineeringmeasures](javascript:;) for flood control and soil and water conservation, and the development history and construction status of water conservancy in China.

The main contents of this chapter 2 includes characteristic water levels and capacities of the reservoir, types of hydropower stations, characteristics of hydraulic structures, grades of water conservancy projects and hydraulic structures.

The main contents of this chapter 3 includes development histories, working principles, structure composition, application conditions, and foundation treatment methods of gravity dam, arch dam and earth-rock dam.

The main contents of this chapter 4 includes the working principle, structure composition and application conditions of the drainage buildings

The main contents of this chapter 5 includes classifications and working principle of water intake and delivery structures.

The main contents of this chapter 6 includes river diversion methods and influence during construction types, and applicable conditions of diversion buildings.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Hang Yuan

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《General Hydrogeology A》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05332 | Course Nature | Compulsory basic course for all majors of the same discipline |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource | https://www.icourse163.org/spoc/course/CUMT-1206705809 |

1. Course Introduction

General hydrogeology A is a major course of Hydrology and Water Resources Engineering, and its prerequisite course is general geology. The course explains the origins of groundwater, the feature of groundwater medium, the existence form of groundwater in media, features of groundwater flow, aquifer, aquiclude and groundwater system, the chemical composition of groundwater and its formation, recharge, runoff, discharge and regime feature of groundwater. The features of different types groundwater, groundwater utilization and its environmental impact, and so on. Through the study of this course, students will grasp the basic theory in hydrogeology, including the origin, formation, occurrence, movement conditions, features and vary with time of quality and quantity, classification and its features of groundwater, understand the relationship between groundwater and environment, understand the features of groundwater resources and water resources management preliminary, lay a foundation for further study of hydrogeology.

Through the study of the courses, master the basic knowledge and concepts in hydrogeology, understand the basic laws of groundwater science.； possess the ability to analyze the formation, occurrence and transport rule of groundwater preliminary, possess the ability to analyze the chemical property, regime and budget of groundwater preliminary； understand the features of water resources and the relationship between water resources and environment, cultivate students excellent quality of love for nature and cherish water resources；Build the basic concepts of hydrogeology, understand the framework of hydrogeology knowledge, lay the foundation for other courses of hydrology in the future.

2. Course Examination

Course total score = process assessment score × 40% + final exam score ×60%.

Writer: Jinpeng Xu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Groundwater Dynamics A》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05333 | Course Nature | Optional basic course for all majors of the same discipline |
| Faculty | School of Resources and Geosciences | Semester | Semester 5 |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

Groundwater is the world’s largest freshwater source, but sound and sustainable exploitation remains a challenge, and so modeling has become an essential tool for groundwater resources management and often also of environmental engineering. The course introduces about modeling method of groundwater flow and is intended to serve students and practitioners by bridging the gap between basic hydrogeology and groundwater modeling. This work contributes to a better understanding of groundwater flow theory and provides a greater and more realistic insight into what groundwater models can do and how they should be applied in practice.

The course consists of 7 chapters. Chapter 1 introduces the basic concepts of groundwater movement and Darcy's law. Chapter 2 introduces the groundwater flow equations, initial and boundary conditions. Chapter 3 introduces one-dimensional groundwater flow problems. Chapter 4 introduces the Dupuit formula of well-flow. Chapter 5 introduces 5 typical unsteady well-flow models in infinite aquifer. Chapter 6 introduces methods of hydrogeological parameters of aquifers obtained with pumping tests. Chapter 7 introduces well flow problems under complex hydrogeological conditions.

Through the study of this course, students can use these theories to analyze hydrogeological problems, establish corresponding mathematical models and quantitatively evaluate groundwater, and be able to apply the learned theories to the analysis and expression of complex hydrogeological engineering problems.

Pre-requisites：Hydrogeology Fundamentals A(M05332) and Hydraulics (M05329).

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

The process assessment consists of homework, seminars, and lab report. The final exam is an open-book exam.

Writer: Guoyong Yang

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Principle of Hydrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05334 | Course Nature | Main major course |
| Faculty | School of Resource and Geosciences | Semester | Fourth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The course has the characteristics of high specificity, strict logic and wide application. Through the study of this course, students can understand the research objects, research contents and research approaches of hydrology, understand the relationship between hydrology and related disciplines, master the basic concepts and methods of hydrology, so as to lay the necessary foundation for the study of subsequent hydrology and water resources.The goal of this course is to develop students' ability to analyze and solve problems, and to conduct in-depth analysis of hydrological problems in specific basins or regions, so as to solve hydrological problems in production and scientific research, especially in complex engineering problems.

The main contents of this chapter 1 include the basic characteristics of the research methods and hydrological phenomena, the research objects and methods of hydrology, the development process and its classification system.

The main content of this chapter 2 includes the equation of water balance and the scale of hydrological cycle,precipitation characteristics,regional average precipitation,factors affecting the spatial and temporal distribution of precipitation,the types and characteristics of soil water,energy state of soil water,infiltration phenomenon and its physical process,influencing factors of infiltration,the physical mechanism of evaporation, the factors affecting evaporation and the calculation of evaporation,runoff process.

The main content of this chapter 3 includes the structure of vadose zone, water dynamics and its redistribution effect on rainfall,the physical mechanism of runoff generation and the basic runoff generation mode,Houghton's runoff theory and modern slope hydrology runoff theory,plant interception and hollowing process.

The main content of this chapter 4 includes Saint Venant's equations,the motion,types and characteristics of flood waves,principle and equation of tank storage,law of flood movement in river course, the basic principle of flood calculation method,law of dry and receding water.

The main content of this chapter 5 includes the calculation of the total runoff of full storage and runoff,calculation of hyperosmotic runoff,the variation of runoff area and its description,analysis and determination of runoff yield models in different basins.

The main content of this chapter 6 includes the composition of the discharge of the outlet section,the meaning and application of line of equal flow and unit hydrograph,catchment confluence principle,classification and problems of catchment confluence models.

The main content of this chapter 7 includes glaciers,river ice regime,snowmelt runoff.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Zhu Kui

Reviewer: Kong Fanzhe

Approver: Liu Zhixin

# Syllabus for《Water Environmental Chemistry》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05335 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course of "Water Environment Chemistry" is the Main major course of hydrology and water resources engineering majors, whose prerequisite courses are "University Chemistry" and "Fundamentals of Hydrogeology", applicable to undergraduate students of water resources and geology majors. The course is mainly about the basic principles of water chemistry of natural water and the water chemistry characteristics of various natural water bodies. The main contents include: the structure and nature of water, the composition and classification of natural water, water pollution and its main pollutants, the role of chemical equilibrium of natural water, the interface chemical processes in the water environment, the migration and transformation of chemical substances in the water environment, and the research methods of water environment chemistry. Through the study of the course, students master the basic theory of water environment chemistry, familiar with the characteristics of natural water body water chemistry, understand the common water environment chemical problems, can use the professional theory of water chemistry, analysis and solution of hydrological investigation, hydrogeological exploration, water environmental protection and water pollution prevention and control of the main water chemistry problems, master the research methods of water environment chemistry, for the future to engage in water conservancy, environment, resources, geology This course will lay a solid foundation for future work in the fields of water resources, environment, resources, geology, etc.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yong Liu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Special Hydrogeology Course》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05336 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Through the study of this course, students can master the working principle, common equipment and application conditions of hydrogeological exploration techniques and methods, such as hydrogeological surveying and mapping, hydrogeological geophysical exploration, hydrogeological drilling, hydrogeological experiment and hydrogeological dynamic equilibrium monitoring, understand the basic methods and application conditions of geothermal exploration. Students can be trained and get abilities to choose appropriate methods of hydrogeological exploration and arrange workload according to different types of hydrogeological problems in the principle of technical, economic and reasonable, be equipped with the initial ability to analyze, study and solve practical hydrogeological problems, and obtain engineering consciousness and standardization consciousness.

The main content of this chapter 1 includes the division of stages of hydrogeological exploration and the basic requirements for each stage, methods and workload of hydrogeological exploration.

The main content of this chapter 2 includes the purposes, tasks and working procedures of hydrogeological mapping, basic contents and requirements of hydrogeological surveying and mapping.

The main content of this chapter 3 includes the basic principles of hydrogeological geophysical exploration, the basic content of hydrogeological geophysical exploration.

The main content of this chapter 4 includes objectives and tasks of hydrogeological drilling, simple hydrogeological observation, structure design of hydrogeological boreholes, technical requirements for hydrogeological drilling.

The main content of this chapter 5 includes tasks and types of pumping tests, technical requirements of pumping test and borehole layout, pumping test equipment and tool, site work and data collection of pumping test, principles and methods of water discharge test, connection test, water [pump-in](javascript:;) test and water injection test.

The main content of this chapter 6 includes factors and equilibria of groundwater dynamics, characteristics of common groundwater dynamic genetic types, determination of groundwater equilibrium elements, study method of groundwater dynamic equilibrium.

The main content of this chapter 7 includes methods for the exploration of underground hot water resources and evaluation of geothermal resources.

The main content of this chapter 8 includes the types of hydrogeological maps, the compilation and content of the text manual of hydrogeological reports.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Hang Yuan

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Hydrologic Statistics and Hydrologic Calculation》

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| --- | --- | --- | --- |
| Course Code | M05337 | Course Nature | Major Compulsory Course |
| Faculty | School of Hydrology | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

This course includes hydrological statistics, calculation of design yearly runoff and design flood calculation by runoff data and storm data. In the hydrological statistics part, the curriculum introduces the basic concept of probability, random variables and probability distribution and the calculation methods of hydrological frequency, among which the method and steps of P-III curve are introduced. In the yearly design runoff calculation part, the calculation with different data available conditions are introduced, including long-term measured runoff data, short- term measured runoff data and calculation with no measured runoff. Design flood calculation by runoff data part introduces analysis and processing of flood data, calculation method of flood peak discharge, flood discharge and design flood process. Design flood calculation by storm data part introduces design areal precipitation and the flood design process according to design areal precipitation.

The goal of this course is that after learning this course, students should have the ability to calculate the design yearly runoff and the design flood under different data conditions

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: kong fanzhe

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Water Environment Monitoring and Protection》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05338 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource | http://www.icourse163.org/course/ZZU-1207210802 |

1. Course Introduction

The main contents of this course include water environment monitoring content and methods, water pollution load analysis and prediction, water environment evolution principles, water environment simulation and prediction mathematical models, water environment quality evaluation, water environmental protection planning and management, etc.

Through this course, familiarize with the main tasks and content of water environment monitoring and protection, understand the important meaning and role of water environment monitoring and protection, master the basic theories and methods of water environment monitoring and protection, and form a systematic theoretical and technical system in water resources monitoring, protection, planning and management.

Enable students to establish awareness of water environmental protection and sustainable social development, and cultivate students’ ability to apply the principles of natural science to investigate, explain and solve complex engineering problems in hydrology, water resources, and groundwater science.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Bo Liu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Specialty English》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05339 | Course Nature | Specialty English |
| Faculty | Hydrology and Water Resources Engineering | Semester | 7 th Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Through the study of this course, students can master the basic English skills necessary for their major, including certain technical terms, basic professional expressions and professional English idioms; improve their reading ability to read, analyze and translate professional documents more skillfully in English; improve their professional writing ability, master the method of writing simple English papers correctly, and write more standardized English abstracts; At the same time, improve English listening, adapt to the needs of other scientific and technological communication activities, and truly achieve the goal of effective oral and written information exchange in English.

This course mainly includes English vocabulary and expressions (including surface water and groundwater), reading, analysis and translation of English literature; Through the study of this course, the students' English proficiency and the ability to learn the relevant knowledge of hydrology and water resources engineering are improved, so that the students' ability of listening, speaking, reading, writing and translating can be improved.

2. Course Examination

The evaluation model is the combination of process assessment and final exam.

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Zhang Xinxia

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Ecohydrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05340 | Course Nature | Optional major course |
| Faculty | School of Resources and Earth Sciences | Semester | Seventh Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

“Ecohydrology” is a major course, and its prerequisite courses include “Principles of hydrology”, “Water environment chemistry” and “Water environment monitoring and protection”. This course mainly includes the basic principles of eco-hydrology, the research methods of eco-hydrology and different types of eco-hydrological systems. In the basic principles of eco-hydrology, the theory of optimal control, soil-vegetation-atmosphere water-heat coupling, energy-water coupling balance of ecosystem, carbon-nitrogen-water coupling cycle of ecosystem, watershed water system and eco-hydrological management are introduced. The research methods of eco-hydrology are focused on process observation, including ecological process observation, hydrological process observation, coupled process observation, and application of isotope method and remote sensing in process observation. Different types of eco-hydrological systems are introduced, including land vegetation eco-hydrology, water area eco-hydrological process, environmental eco-hydrology and urban eco-hydrology, and the key problems in the process of eco-hydrology, environmental eco-hydrology and basin eco-hydrology are emphasized. Through the study of this course, students can master the basic theory, methods and skills of eco-hydrology, and have the ability to analyze and deal with the comprehensive problems of eco-hydrology.

The main teaching content of the class includes:

Chapter 1 introduces the concept of eco-hydrology and its significance for social and economic development，and the development of eco-hydrology，and understand the main research content and subject characteristics of eco-hydrology in detail.

Chapter 2 includes the basic theory of eco-hydrology, energy-water coupling balance and carbon-nitrogen-water coupling cycle.

Chapter 3 includes the ecological process observation, hydrological process observation and coupling process observation in ecological hydrology; also introduces the method and application of stable isotope analysis and the application of remote sensing technology in ecological hydrology.

Chapter 4 includes the process of precipitation redistribution and the characteristics of soil hydrological process, also and the process and characteristics of plant water use, the main factors and mechanism of plant transpiration and the hydraulic process of plant.

Chapter 5 includes the impact of hydrological processes on the structure of aquatic biological communities and the impact of hydrological factors and multi-factor interactions on the ecological energy of waters; also learns how aquatic communities affeced by hydraulic conditions, the coastal and coastal ecological and hydrological processes and the wetland ecological hydrology process.

Chapter 6 introduces the influence of land degradation, soil erosion and mountain disasters on eco-hydrology, the eco-hydrological process of karst environment and the interaction between water environment change and eco-hydrology.

Chapter 7 includes the characteristics of urban eco-hydrology and urban green space hydrology and storm flood management, to understand urban heat island effect and its eco-hydrological regulation.

Chapter 8 includes to master the process of eco-hydrology, to understand the influence of human activities on the process of eco-hydrology, to master the coupling simulation of eco-water system and to understand the regulation and integrated management of eco-hydrology.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Yanqing Ding

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Professional Regulations andEngineering Ethics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05341 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Through the study of this course, students can understand the concept of water law and the historical evolution of water law in China, understand the basic laws related to the development and utilization of water resources, such as the law on soil and water conservation, the law on flood prevention and control, and the law on the prevention and control of water pollution, basic regulations relating to the management of water resources, river courses and water conservancy projects, water resources administrations, and prevention and control of mine water disasters. Students can realize and understand the engineering ethics issues involved in the practice of water resources engineering, analyze and demonstrate the common ethical problems in water conservancy projects, such as the allocation of water resources, the risk of water conservancy projects, the maintenance of river health and life, and the migration of water conservancy projects. At the same time, students can gain the basic ability to carry out water activities according to law, be cultivated their awareness of engineering ethics and sense of responsibility, and to be technical talents with professional knowledge of laws and regulations and engineering ethics.

The first chapter is divided into nine parts, mainly about water laws and regulations, include summary of water law, the law on soil and water conservation, the law on flood prevention and control, and the law on the prevention and control of water pollution, basic regulations relating to the management of water resources, river courses and water conservancy projects, water resources administrations, and prevention and control of mine water disasters.

The second chapter is divided into seven parts, mainly about ethics of hydraulic engineering，include overview of engineering ethics, ethical problems in hydraulic engineering, allocation of water resources, risks of water conservancy projects, maintenance of river health and life, migration of water conservancy projects, and the role of the hydraulic engineer.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Hang Yuan

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Economy of Water Conservancy Project》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05342 | Course Nature | Main major course |
| Faculty | School of Resource and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course has the characteristics of high specificity, strict logic and wide application. Through the study of this course, the students can master the main technical indexes of water conservancy projects, the time value and calculation formula of funds, the method of engineering economic analysis, the investment allocation of water conservancy projects, and the economic evaluation of water conservancy construction projects.The goal of this course is to cultivate students' ability to analyze and deal with water cases, to evaluate the economic effects of water conservancy projects and to select water conservancy projects.

The main contents of this chapter 1 includes content of water conservancy project economic analysis, the basic methods and basic criteria of evaluation,the construction procedure and content of water conservancy construction project, the general situation of water conservancy project economy development and its significance.

The main contents of this chapter 2 includes various methods of shadow price measurement ,basic concepts of major inputs and specific inputs.

The main contents of this chapter 3 includes the calculation of the loan interest during the construction period and part of the operation period,the concept of various assets.

The main contents of this chapter 4 includes the drawing of capital flow chart, the selection method of calculation base year, the determination method of economic life and calculation analysis period, the characteristics and application conditions of the basic calculation formula, the concept of the time value of capital.

The main contents of this chapter 5 includes the project economic analysis of the relevant methods, the main static economic analysis method and dynamic economic analysis method, the project scheme.

The main contents of this chapter 6 includes the basic methods and main indexes of national economic evaluation, the purpose and task of economic evaluation, uncertainty analysis and risk analysis.

The main contents of this chapter 7 includes the method of social evaluation of water conservancy construction projects, the content of social evaluation of water conservancy construction projects, the index system of social evaluation of water conservancy construction projects, the purpose and task of social evaluation.

The main contents of this chapter 8 includes the various investment cost allocation methods of water conservancy projects, the investment structure of water conservancy projects, the purpose and practical significance of investment allocation.

The main content of this chapter 9 includes the calculation method of the economic benefit of the comprehensive utilization of various departments.

2. Course Examination

Course total score = process assessment score × (30%~40% )+ final exam score × (60%~70%).

Writer: Zhu Kui

Reviewer: Kong Fanzhe

Approver: Liu Zhixin

# Syllabus for《Environmental Hydrogeology》

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| --- | --- | --- | --- |
| Course Code | M05343 | Course Nature | Environmental Hydrogeology |
| Faculty | Hydrology and Water Resources Engineering | Semester | 6th Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course “Environmental Hydrogeology” is an elective course for hydrology and water resources engineering; Its prerequisite course is General Hydrogeology and Underground Water Dynamics; through this course, students are expected to understand the relationship between the primary hydrogeological environment and endemic diseases; the geochemical effects of contaminant migration; pollution status and mechanism of major pollutants; mathematical model of contaminant transport in groundwater; environmental hydrogeological problems of waste disposal; environmental hydrogeology survey, environmental status assessment, impact assessment and water quality prediction methods, protection and management of groundwater resources

Through this course, students can clearly understand the importance of environmental hydrogeology and its significance for social and economic sustainable development; understand the overall knowledge structure of environmental hydrogeology, understand the migration and influencing factors of elements in the primary environment, understand the relationship between hydrogeological zones and endemic diseases; train students' ability to identify various pollutants in groundwater system in secondary environment, master pollutant pollution mechanism; be familiar with the prevention and control measures of various pollutants in groundwater; master the law of pollutant migration in groundwater; establish pollutant transport model and carry out pollution prediction; master various research methods of environmental hydrogeology; To cultivate students' basic ability to analyze and judge water pollution cases by using the basic knowledge, and to achieve the training goal of the graduates' knowledge structure requirements and the ability to solve engineering problems.

2. Course Examination

The evaluation model is the combination of process assessment and final exam.

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Zhang Xinxia

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Flood Protection and Disaster Mitigation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05344 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course is an optional primary course for students major in Hydrology and Water Resources Engineering. Through the study of this course, students can master the basic concepts, theories, and methods for flood protection and disaster mitigation. The objective is to make the students master the basic principles of flood prevention and disaster mitigation, understand the main measures in disaster prevention and reduction, master flood risk analysis and impact assessment methods, and know the flood control planning and disaster emergency management. The aim is also to train students’ ability to solve the practice problems related to their respective professions in flood prevention and disaster mitigation.

This course focuses on the flood disaster and disaster prevention and mitigation, including the features and driving factors for the flood disasters, the basic methods and measures for disaster prevention and mitigation, the flood disaster risk analysis, flood control planning and flood impact assessment, and so on. The emphasis will be put on practical value in the risk analysis, flood impact assessment and flood control planning.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: SONG Xiaomeng

Reviewer: KONG Fanzhe

Approver: LIU Zhixin

# Syllabus for《Advances in Groundwater Science （Englisk）》

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| --- | --- | --- | --- |
| Course Code | M05345 | Course Nature | Major Elective Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Advances in Groundwater Science (English) is an elective course for majors in hydrology and water resources. Its prerequisite courses are General Hydrogeology A, Groundwater Dynamics A, and Specialized Hydrogeology. Chapters 1 and 2 of the course are general descriptions, mainly introducing the connotation, knowledge structure, methodological system and interdisciplinary development characteristics of groundwater science. Chapters 3~5 are sub-chapters, introducing the hot issues of groundwater related to environment, new energy development and climate change respectively.

The course is expected to widen students’ perspectives and inspire more interest in Groundwater Science. The use of original English materials, English teaching and classroom seminars will also help enhance the ability to search, read and comprehend professional English literatures.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Wang Changshen

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Computation of Water Conservancy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05346 | Course Nature | Optional major course |
| Faculty | School of Resource and Geosciences | Semester | Sixth Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

This course is to make students understand the overall knowledge structure of hydraulic calculations, correctly understand and grasp planning of water resources and hydrological water conservancy calculation aspects of basic concept, basic principle and basic methods, especially in the reservoir hydropower station as the center of runoff regulation, flood control regulation, water power calculation, reservoir parameter design of hydropower stations, the basic knowledge of the reservoir scheduling, The ability to study the solutions to complex engineering problems in the development and utilization of hydrology and water resources, project management and decision-making methods, as well as the impact of solutions on society, environment and sustainable development, and acquire the research ability to engage in water conservancy professional technology.

The main contents of this chapter 1 includes the concept and significance of runoff regulation, the tasks and basic contents of water conservancy calculation, the characteristics of water resources and its rational utilization methods.

The main contents of this chapter 2 includes the design standard and design guarantee rate of the reservoir, the characteristic curve of the reservoir, the water level and the storage capacity of the reservoir, the water loss of the reservoir and the inundation of the reservoir, the water demand characteristics and requirements of the various water departments of the national economy.

The main contents of this chapter 3 includes calculation principle and basic method of runoff regulation, calculation method of different reservoir benefit regulation, classification of runoff regulation.

The main contents of this chapter 4 includes calculation methods of water leveling depth, guaranteed output and annual average electric energy of hydropower stations, calculation of water energy of different hydropower stations, basic equations and methods of water energy calculation, power system and its capacity composition, calculation of water energy for irrigation station.

The main contents of this chapter 5 includes principle and method of reservoir flood regulation calculation, flood control calculation of reservoirs without sluice spillway and with sluice spillway, reservoir inflow flood and design inflow flood calculation, reservoir dam break flood calculation.

The main contents of this chapter 6 includes flood resistance capacity of reservoir and comprehensive utilization of reservoir operation, reservoir flood control operation map and favorable Scheduling Chart, the preparation of reservoir flood control and favorable control plan.

The main contents of this chapter 7 includes the principle and method of reservoir characteristic capacity and profit adjustment calculation, the difference between the calculation method of excluding water loss and counting water loss in annual regulation reservoir, the simulation calculation method of reservoir profit calculation.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Zhu Kui

Reviewer: Kong Fanzhe

Approver: Liu Zhixin

# Syllabus for《Water resources planning and management》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05347 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 8 | Online Resource | http://www.wrpm-cumt.com/ |

1. Course Introduction

Water resources planning and management is optional major course for hydrology and water resources engineering majors, and it is also one of the special professional courses with geological background for hydrology and water resources engineering majors in CUMT. The prerequisite courses are basic hydrogeology, groundwater dynamics, water resources evaluation and utilization.

Through the study of this course, students will have a clear understanding of the basic concepts, basic features and composition of water resources systems; be familiar with the basic concepts, classifications and principles, methods and content of water resources planning and management; familiar with the content and technical methods of water supply and demand analysis ; Master the analysis methods of water resources system and water resources planning model analysis; analyze and understand the working process of water resources system planning and water resources management decision-making from examples. With the systematic thinking of "four water transformation", the comprehensive ability of integrating theory with practice, and carrying out water resources system planning and management, helping to solve practical problems encountered in production, life and scientific research practice.

The content of this course mainly includes basic knowledge of water resources planning and management, water supply and demand analysis, water resources system analysis, water resources planning model, water resource management model and case analysis, etc. The basic knowledge part includes the basic concepts, classifications, principles and methods of water resources planning and management; the water supply and demand analysis part focuses on the regional water resources available supply, demand types and balance analysis methods. The water resources system analysis part focuses on the relationship between groundwater resources system, surface water resources system composition and water resources. Water resources planning model introduces several commonly used water resources planning models, such as target planning model, dynamic planning model, linear programming model, etc. The water resources management model introduces commonly used centralized parameter models, distributed parameter models, coupling of simulation models and optimization models, etc., and introduces engineering examples.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Qi Yueming

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Mordern Water Quality Testing Technolgy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05348 | Course Nature | Major Elective Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Modern water quality testing technology is a professional elective course for hydrology and water resources engineering majors, and the prerequisite courses are "Fundamentals of Hydrogeology" and "Water Environment Chemistry". It mainly covers an overview of modern water testing technology, anion and cation testing, organic analysis, hydrological isotope testing, in situ online monitoring and data processing. (1) Modern water testing technology introduces the national and industry water quality standards and regulatory water test specifications; (2) Anion and Canion testing instructs the mechanism and methods of ion chromatography and inductively coupled plasma spectroscopy; (3) Organic composition analysis will briefly illustrate the typical spectrophotometer and gas/liquid chromatography technology; (4) Hydrological isotope testing is mainly to show how the stable isotopes of hydrogen and oxygen are measured by the Mass spectrometer (MAT253); (5) In situ online monitoring introduces the status of online monitoring technology, design and application; (6) Data processing focus on how to analyzed the precision, accuracy and correctness of the water quality test.

The course is aimed to enrich students’ knowledge on modern water quality testing technology, particularly on their principles, procedure and applicability, so that students could have the basic skills and capability related to water quality testing.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Wang Changshen

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Programming in Hydrology and Water Resources》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05349 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | Semester 6 |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

In scientific research or engineering design, computer programming has become an indispensable auxiliary tool, and Python has attracted much attention due to its concise code and its friendliness to Scientific Computing. This course deals with the application of Python language in scientific computation. The course is an introductory course, it explains programming methods for specific problems, be able to write simple programs for solving linear equations, data fitting, function extremes, numerical integration, statistical analysis, etc., overcomes students' unfamiliarity and fear of computer programming, and enables students to give analysis ideas for complex engineering problems.

The content includes the scientific computing environment Anaconda and its components; the use of NumPy, SciPy, Matplotlib and other scientific computing packets; scientific computing knowledge such as linear algebra operations, least squares fitting, function extremes, numerical integration, statistical analysis, etc.

2. Course Examination

Course total score = Comprehensive training test score × 100%.

Teachers can score according to the workload of group members.

Writer: Guoyong Yang

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Groundwater Detection and Monitoring Technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05350 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource | - |

1. Course Introduction

The course of 《Groundwater Detection and Monitoring Technology》 is an optional course for the major of hydrology and water resources engineering. Its prerequisite courses include 《Basic Hydrogeology》 and 《Special Hydrogeology》. This course mainly introduces the new methods and technologies of groundwater detection and monitoring, including: new technologies of groundwater geophysical exploration, new technologies of groundwater geochemical exploration, new technologies of groundwater test, comprehensive application of various detection technologies, theoretical basis of groundwater monitoring, technologies and applications of groundwater monitoring.

The course requires students to master the basic principles, application conditions and application scope of various groundwater detection and monitoring technologies, focusing on how to use various new technologies to accurately and effectively detect and monitor the groundwater quality, occurrence law and change law of water quantity, so as to solve the problems of groundwater resource exploration and evaluation, groundwater pollution and treatment, groundwater quality and water quality control This paper discusses the related engineering problems of mine water disaster prevention and control. Through the study of this course, the students can comprehensively master the basic methods, principles, techniques and basic skills of groundwater monitoring, and have the ability to engage in groundwater monitoring.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Zhimin XU

Reviewer: Fanzhe KONG

Approver: Zhixin LIU

# Syllabus for《Water Resources Pollution Control》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05352 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course "Water Resources Pollution Control" is an optional major course for hydrology and water resources engineering; its prerequisite courses are "Water Environment Chemistry", "Water Environment Monitoring and Protection", "Modern Water Quality Testing Technology"; applicable to hydrology and water resources engineering undergraduate. This course mainly describes the basic principles and main processes of wastewater resource treatment, the main contents include water pollution and self-purification, sewage physical treatment, sewage chemical treatment, sewage biological treatment principles, sewage biological treatment and ecological treatment technology, sewage treatment physical and chemical treatment and sludge treatment and disposal; through this course, students will be familiar with the basic concepts of water pollution and self-purification of water body pollution, understand common wastewater recycling technologies, and be proficient in the main physics, chemistry and biological treatment processes of sewage treatment the basic principles and process flow, and familiar with domestic and foreign sewage treatment technology and its development trend, can use the basic theory of wastewater resource technology, analyze and solve related problems such as sewage treatment process design and planning in water environment and aquatic ecological engineering, mastering the main research methods of water pollution control will lay a good foundation for continuing to study courses related to water environmental pollution and work in water conservancy, environment, hydrogeology, and other related industries.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yong Liu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Dynamics of Seismic Waves》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05402 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of resource and earth science | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course “Dynamics of Seismic Waves” is a major course of geophysics; the Basic goals of this course are to make students to master the basic concepts, basic theories and methods of seismic wave mechanics; to cultivate students' ability to analyze the laws of different types of seismic wave propagation; to have the ability to solve problems encountered in engineering practice and scientific research; to make students rich in the scientific spirit of innovation and exploration, and to establish correct socialist values and patriotism.

Its prerequisite course is Multivariable calculus, linear algebra, and physics; This course is applicable to the geophysical majors. It mainly covers Tensor Analysis, stress and strain, the solutions of seismic wave equations, and the reflection and refraction of harmonic plane waves at interfaces between different types of elastic media; through this course, students are expected to know a little about the tensor analysis, understand the seismic wave equations and their solutions, and master the propagation rules of the seismic waves including the P-wave, S-wave and surface wave, which is helpful to the further learning.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Yang Lei

Reviewer: PAN Dongming

Approver: LIU zhixin

# Syllabus for《Well Logging》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05406/E05418 | Course Nature | Major courses |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource | http://mooc1.chaoxing.com/course/93532757.html |

1. Course Introduction

Geophysical logging is the main course of Geophysics. Its prerequisite courses are seismic wave dynamics, geophysical field theory and seismic exploration principle and application. It is applicable to geophysics, geological engineering and resource exploration engineering. This course mainly introduces the methods and principles of electrical logging (ordinary apparent resistivity logging, lateraling and electrochemical logging), nuclear logging (natural gamma logging, density logging, lithological density logging, etc.), and acoustic logging (sonic velocity logging, acoustic amplitude logging, etc.),and a brief introduction to mine explosion-proof logging methods.. This course will teach the influencing factors, correction methods, interpretation methods and applications of the three basic logging methods. Through the study of this course, students can understand the status and role of geophysical logging in coal field geological exploration, master the basic theory, basic principles and working methods of various logging methods, familiar with the geological problems, application conditions and geological effects solved by various logging methods.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Dong Shouhua

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Mine Geophysical Exploration》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05408 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 6 | Online Resource |  |

1. Course Introduction

The Mine Geophysical Exploration is the main major course of geophysics. Its prerequisite courses are Principles of Seismic Exploration, Principle of Electrical Exploration, and Mine Geology. It is applicable to the students majored in geophysics. This course mainly covers the geophysical characteristics of coal strata rocks, full-space electromagnetic field theory, full-space seismic wave theory foundation, mine radio wave perspective method, mine direct current method exploration, mine geological radar exploration, channel wave seismic exploration, mine seismic exploration, and others mine geophysical prospecting method, and its application in actual engineering, as well as the mine geophysical prospecting technology in coal mine dynamic disaster monitoring, coal mine water prevention early warning and monitoring. This course enables the students to master the principles, technical characteristics and application conditions of commonly used geophysical prospecting methods under mine geological conditions, and understand the ability and characteristics of various methods to solve geological problems in coal mine safety production; grasp the geological problems encountered in the production process of coal mines and their corresponding geophysical characteristics, master the technical characteristics and application conditions of common mine geophysical exploration methods, master the data processing and interpretation techniques of common geophysical methods, understand the ability and limitations of mine geophysical methods to solve geological problems in coal mine production, and train students to analyze and solve problems.

**2. Course Examination**

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: 刘树才、刘志新

Reviewer:

Approver:

# Syllabus for《Applied Geophysical Prospecting Instruments and Equipment》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05414 | Course Nature | Professional elective course |
| Faculty | School of Resources and Geosciences | Semester | The Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource | None |

1. Course Introduction

Applied Geophysical Prospecting Instruments and Equipment is an elective course for geophysics. Its prerequisite courses are the Principles of Seismic Exploration, the Principles of Electrical Exploration, Geophysical Logging. This course mainly introduces signal measurement techniques, seismic instruments and systems, electrical instruments and systems,electromagnetic instruments, gravity and magnetic instruments, logging instruments, etc. Meanwhile, it focuses on explaining the seismic instruments, high-density electrical instruments, transient electromagnetic instruments, geological radar instruments and so on. Through in-class explanation and outdoor experiments, students can learn the background and development trends of current geophysical instruments, understand the basic principles, composition and performance of typical geophysical instruments, and master the instrument operation methods and data interpretation methods.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Wang Bo, Liu Jing

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Well Logging data processing and interpretation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05415 | Course Nature | Professional elective course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Well Logging data processing and interpretation is an elective course for geophysics. Its prerequisite courses are digital signal analysis and data processing and geophysical logging. This course is suitable for geophysics and geological engineering.This course mainly introduces the current situation of coal field geophysical logging data processing and interpretation at home and abroad, logging data preprocessing, logging curve layering and lithology (coal quality) analysis, logging data rock mechanics analysis, logging curve comparison mathematical principle and implementation process, common coalfield logging data processing and interpretation process on computer. Through the study of this course, students can understand the status and role of geophysical logging data processing in geophysical logging, master the basic theory, basic principle and logging digital interpretation method of common logging data processing methods, and understand the geological problems, application conditions and geological effects solved by various logging methods.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: HuangYaping

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Digital Image Processing》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code |  | Course Nature | Minor course |
| Faculty | School of Resources and Earth Sciences | Semester | The second semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course “Digital Image Processing” is a professional elective course for Geophysics; Its prerequisite course is Higher mathematics, Linear algebra or Computer science and technology foundation. This course is suitable for geophysics, geological Engineering, Geo-information and processing, remote sensing and other majors related to Image processing and application. The course focuses on the basic knowledge of Digital Image Processing and its common methods. Through this course, students are expected to master the basic principles of Digital Image Processing and the Image enhancement processing technology, so that students have a certain understanding of Image restoration and reconstruction. Training students to write the corresponding procedures and apply software, and make them have a basic understanding of image coding and picture segmentation.

Through the study of the course, students understand the basic methods and applications of Digital Image Processing and the application of Geology. The course will make the students have a deep understanding of Digital Image Processing and master the basic methods of image transformation. Students are expected to master the space domain method for image enhancement and understand Image restoration and image reconstruction methods. so that students have a certain understanding of the basic knowledge about the segmentation of image coding and be able to open the image and do simple processing in high-level language. The principle part of the algorithm of image processing software commonly used in domestic and abroad is also needed to understand. Students can use image processing software or high-level language for some actual image processing, and then achieve the training objectives of graduates' knowledge structure and strong practical ability.

2. Course Examination

Course total score = Regular attendance scores × 20% + Homework and class performance × 20%+ final exam score × 60%.

Writer: YongZhong Xu

Reviewer: DongMing Pan

Approver: \*\*\*

# Syllabus for《Earthquake Prevention and Disaster Mitigation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05421 | Course Nature | Earthquake Prevention and Disaster Mitigation |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | \ | Online Resource | \ |

1. Course Introduction

Earthquake disaster prevention and mitigation is a optional major course for all undergraduates, which is suitable for all undergraduates. This course teaches the splendid seismic culture of ancient China through the design of ancient seismic buildings. Combined with the basic theory of seismic wave propagation, this paper introduces the personal feelings and the damage to the building when the earthquake occurs, and then introduces the scientists use the seismic wave of ' lighting the lights inside the earth ' to discover the inner circle structure of the earth. The development history of plate tectonic theory of macroscopic mechanism of earthquake origin and Wilson ' s ' hot spot theory ' are introduced. The mechanism of the Wenchuan earthquake and the formation of the Hawaiian Islands was expounded, and the possibility of earthquakes in Xuzhou was analyzed. The earthquake monitoring and forecasting system, earthquake precursor phenomena, fire and tsunami disasters in China are introduced. In the part of earthquake prevention and disaster reduction, this paper first introduces the methods of earthquake prevention and disaster reduction in different places when earthquakes occur, and focuses on the concept of ' rescue triangle area ' and the places that are easy to form ' triangle area ' in real life. Students can master the self-help and mutual rescue measures and means of the golden rescue time after the earthquake and secondary disasters, especially before the arrival of professional rescue teams, through thematic activities such as escape skills knowledge explanation, classroom escape drills and cardiopulmonary resuscitation. Secondly, through the film "San Andreas", the students will experience the feeling of being in the actual situation when an earthquake occurs and understand the hazards of earthquakes and the methods and measures of earthquake prevention and mitigation, and deepen their understanding and mastery of the knowledge taught in class. Through this course, students will learn about the glorious earthquake culture of China in ancient times, master the basic knowledge of earthquakes, causes of earthquakes, earthquake forecasting, and basic skills and methods of earthquake prevention and mitigation, self-rescue and self-help, enhance students' awareness of disaster prevention and mitigation, and minimize the damage of earthquake disasters to human society.

Chapter 1 Introduction. The main contents include seismology and research content, human understanding of earthquakes, a brief history of seismology development, combined with famous earthquakes in human history, such as the Huaxian earthquake, Haicheng earthquake, Tangshan earthquake, Wenchuan earthquake, the Great Indonesia earthquake, and the Fukushima nuclear power plant leak in the East Japan earthquake. Analyze the significant effects of earthquakes on human society.

Chapter 2 Propagation of Seismic Waves. The main contents include seismic waves and their classification, the propagation law of seismic waves, various seismic phases and seismic travel time table.

Chapter 3 Causes of Earthquakes.The main contents include three hypotheses of earthquake genesis, continental drift theory, submarine spreading theory and plate tectonics theory, analysis of the cause of Wenchuan earthquake and analysis of the possibility of Xuzhou earthquake.

Chapter 4 Earthquake Monitoring and Forecasting. The main contents include the content, development history and methods of earthquake forecasting, earthquake precursors, earthquake monitoring and the current status of domestic and international research on earthquake forecasting.

Chapter 5 Earthquake Hazards. The content includes types of earthquake hazards, focusing on secondary hazards such as fires, tsunamis, and mudslides, as well as the losses caused by various hazards to human society, the mechanisms of formation, precursor phenomena, and ways of escape.

Chapter 6 Earthquake Disaster Prevention and Mitigation. Focuses on the basic knowledge of earthquake disaster prevention and mitigation in various environments, self-help and mutual rescue methods, escape methods and precautions in the escape process. This chapter includes two topics: the first classroom environment earthquake escape drills. The second CPR method operation method.

Chapter 7 Excellent Earthquake Film Appreciation and Review. Watch the excellent foreign earthquake film "Doomsday Collapse" to let students visualize the scenes and escape skills and methods when an earthquake occurs. Review the course content, assign the examination content, and explain the requirements and precautions for writing the final paper.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Deng Shuaiqi

Reviewer: Pan Dongming

Approver: Shen Jian

# Syllabus for《Digital Signal Analysis and Data Processing》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05417 | Course Nature | Digital Signal Analysis and Data Processing |
| Faculty | School of Resources And Geosciences | Semester | The fourth semester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours | 6 | Online Resource |  |

1. Course Introduction

“Digital signal analysis and data processing” is a main course for the major of geophysics; Its prerequisite courses are advanced mathematics, linear algebra and mathematical physical equation; It is suitable for undergraduates majoring in geophysics. This course mainly introduces the principles and algorithms of geophysical signal analysis and processing, including the basic knowledge and sampling theorem of continuous signal processing, representation of discrete signal and system, Z-transform, discrete Fourier transform (DFT) and Fast Fourier transform (FFT), digital spectrum analysis, short-time Fourier transform (SFT), wavelet transform (CWT), the design and application of Hilbert transform and digital filteretc; Through the study of this course, the students will have basic knowledge in geophysical signal processing and its application. This course helps to cultivate studentsthe ability to analyze and solve practical problems, enable them to correctly process, analyze and interpret experimental data, and obtain reasonable and effective conclusions through comprehensive interpretation and apply them to engineering practice; It is a good theoretical foundation for the further study of random signal analysis and nonlinear geophysical data processing.

The main contents of this chapter 1 include the concept of continuous signal, analog signal, discrete signal and digital signal.

The main content of this chapter 2 includes the concept of Z transform, inverse Z transform, and its relationship with Fourier transform;.

The main content of this chapter 3 includes the Fourier transform, four forms of Fourier transform, Hilbert transform, Radon transform, discrete Fourier transform and its fast algorithm.

The main content of this chapter 4 includes the application of discrete Fourier transform to analyze the spectrum of continuous signal.

The main content of this chapter 5 includes the concept of wavelet transform and the application of time-frequency analysis and wavelet transform in geological exploration data processing.

The main content of this chapter 6 includes the linear phase filter, F-K filter, and the application of FIR filter.

The main content of this chapter 7 includes the correlation function, linear convolution.

1. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Qi Xuemei,Hu Yong

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Geophysical Field Theory》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05427 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The Exploration Electromagnetic Field Theory is a core specialty course of geophysics, and is applicable to the students majored in geophysics. Its prerequisite courses are Advanced Mathematics and College physics. This course mainly covers the basic concepts of field theory, electrostatic field theory, the establishment of stable electric field in conductive medium, the distribution of stable electric field, the propagation of plane electromagnetic wave, polarization of plane electromagnetic wave, reflection of plane electromagnetic wave on conductor surface, characteristics of electromagnetic wave, electric dipole and magnetic dipole, symmetric period of time radiation field and directional radiation. This course enables the students to build a systematic and deep understanding of the theory of electromagnetic field in underground conductive media, and lay a good theoretical foundation for learning the specialty courses of Electrical Prospecting, Mine Geophysical Exploration and Geophysical Well Logging.

Based on the knowledge of the basic physical parameters and the basic laws of electromagnetic field learned in college physics course (electromagnetics), this course guides the students to derive the basic concepts & basic laws of electrostatic field, and the basic theory of time varifying magnetic field. These help the students to establish the whole concept of electromagnetic field and electromagnetic wave, thoroughly master the basic theory of mathematics and physics, and help to cultivate the students' ability to use the general laws to analyze and solve specific problems. When teaching the contents of each chapter, the teaching contents and geophysical exploration methods are properly combined, especially the last two classes are dedicated to explain the relevance of geophysical exploration methods and the teaching contents, stimulating the students to use electromagnetic theory to solve practical engineering problems, and cultivating their scientific thinking, innovation consciousness and strong practical ability.

The main contents of this chapter 1 include the concept of the field, direction derivative and gradient of scalar field, flux and divergence of vector field, circulation and curl of vector field.

The main contents of this chapter 2 include the charge distribution of the charged body, the law of the change in the dielectric interface, electrostatic field energy. And the concept of volume charge density and surface charge density, charge distribution characteristics of conductor in electrostatic field and polarization characteristics of dielectric.

The main contents of this chapter 3 include flat interface electric image method and electric image method concept, field distribution electric image.

The main contents of this chapter 4 include the continuity equation of current, using the static electricity analogy to study the stable current electric field and the process and its essence of stable electric field in inhomogeneous conductive medium, using the charge analysis method to study the stable electric field distribution.

The main contents of this chapter 5 include the difference between the stable field and the time varying field and time varying electromagnetic Maxwell equations, the stability of the electric field and the eddy current field, the difference between steady current and displacement current, harmonic electromagnetic field energy density.

The main contents of this chapter 6 include the concept of plane electromagnetic wave, plane electromagnetic wave propagation in conductive medium, the properties of plane electromagnetic wave in conductive medium, the relationship of phase velocity in ideal medium and the propagation of plane electromagnetic wave in perfect conductor, the relationship of phase velocity in conductive medium, the polarization form and characteristics of plane electromagnetic wave, Helmholtz equation in the earth, the emission and refraction of the monochromatic electromagnetic wave in the media interface, the relationship between linear polarizer, earth resistivity and wave impedance in the earth, full reflection, fresnel formula, dielectric interface transmitted wave and incident wave energy change and wave guide electromagnetic wave as well as plane electromagnetic wave reflection in conductor, TE and TM wave, cut-off frequency of waveguide.

The main contents of this chapter 7 include scalar potential and vector potential, tatsuo equation and its solution in time variation magnetic field and characteristics of far field of electric dipole and magnetic dipole radiation, symmetrical oscillator radiation field and its directionality and directional radiation of antenna array.

The main contents of this chapter 8 include the application of stable electric field, the radiation field of electric dipole and magnetic dipole and electromagnetic wave of conductive medium.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Yu Jingcun

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Rock Physics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05428/E05416 | Course Nature | Major basic compulsory courses |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Rock Physics is a basic elective course for majors in geophysics. This course mainly teaches the basic knowledge and basic concepts of rock, rock density, magnetism, electricity, acoustics, heat and the relationship between rock physical parameters.Through course teaching, the aim is to enable students to grasp the relationship and laws between the physical parameters of rock and rock structure and composition, be familiar with the influence of lithology, porosity, fracture, fluid type and saturation on stable current field, electromagnetic wave field and seismic wave field in rock,and their reflection in the geophysical observation data. Understand some basic methods of obtaining rock physical properties and application of rock physical parameters. Students are trained to analyze, calculate and summarize the practical problems in the field of Geophysics, and put forward preliminary solutions, so as to lay a solid theoretical foundation for learning subsequent geophysical related courses andfurther obtaining related knowledge.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: HuangYaping

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Principles of Intelligent Computing》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05429 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Geoscience | Semester | 4th Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

In this course students will learn how to design mathematical models for the numerical solution of geophysical problems. The course will provide numerical techniques for basic mathematical processes involving discretization and their analysis, different types of errors associated with numerical methods，basic data fitting problems such as interpolation and approximation including splines and least squares data fitting, numerical differentiation and integration, numerical methods for the solution of linear and nonlinear systems and their intelligent Implementation . The goal is to work through geophysical examples where the mathematical tools are useful. A key goal is to introduce the mathematical language and style of thinking. Students will acquire the skills to program different numerical methods relevant for solving geophysical problems.

2. Course Examination

Course total score = process assessment score × 50% + final exam score × 50%.

Writer: Yue lei

Reviewer: \*\*\*

Approver: \*\*\*

# Syllabus for《Principles and Applications of Seismic Exploration》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05430 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 64 | Credit | 4 |
| Extracurricular hours | 16 | Online Resource | https://www.icourse163.org/course/YANGTZEU-1003150001 |

1. Course Introduction

The course has the characteristics of high abstraction, strict logic, and wide application. Through the study of this course, students can master the basic concepts, theories, and calculation skills of seismic waves propagation, field survey, seismic velocity, seismic interpretation, and 3D seismic method. The goal of this course is to cultivate students' abstract generalization ability, logical reasoning ability, spatial imagination ability, and self-study ability, especially the ability to analyze and solve practical problems by comprehensively using the learned seismic knowledge.

The main contents of this chapter 1 include the introductions of the conventional geological survey, the traditional geophysical survey, and the historical review of the seismic survey.

The main contents of this chapter 2 include the concept of geometrical seismology, the principles of seismic propagation, the T-D curves of reflection wave, and the T-D curves of refraction wave.

The main contents of this chapter 3 include the design of field layout, the conditions of seismic generation and receiver, the weathered layer and static correction, and the multi-fold survey technology.

The main contents of this chapter 4 include the influence factors of seismic velocity, the concepts of different seismic velocities, and the influence of seismic velocity on the seismic section.

The main contents of this chapter 5 include the definition of seismic resolution, the lateral and vertical seismic resolution, and the principle and classification of seismic migration.

The main contents of this chapter 6 include the main contents of structural interpretation, the fault interpretation, and the drawing technology of the plan view map.

The main contents of this chapter 7 include the applications of seismic velocity and seismic amplitude.

The main contents of this chapter 8 include the link and difference between 2D seismic survey, and 3D seismic survey, and the field survey technology of 3D seismic exploration.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Tongjun Chen

Reviewer: Dongming Pan

Approver: Jian Shen

# Syllabus for《Principles and Applications of Electric and Electromagnetic Exploration》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05431 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 64 | Credit | 4 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The Principles and Applications of Electric and Electromagnetic Exploration are the main major courses. Its prerequisite courses are Advanced Mathematics, College Physics, General Geology, and Geophysical Field Theory. It is applicable to the students majored in geophysics. This course mainly covers the electromagnetic properties of rock and ore, the field source properties of natural and artificial geoelectric fields, the temporal and spatial distribution of electric and electromagnetic fields under uniform and non-uniform geoelectric conditions, the working principle, data processing and data interpretation method of direct current sounding, electrical profile and high-density resistivity; the working principle and data processing interpretation method of the induced polarization, natural electric field, charging method, and magnetotelluric sounding, controllable source audio magnetotelluric sounding, transient electromagnetic sounding. This course enables the students to master the basic theory, detection method technology, data interpretation and application of commonly used electromagnetic geophysical methods, familiar with the application prerequisites and conditions of various methods, cultivate students to be able to use the basic principles of electromagnetic geophysical methods to solve practical problems in terms of resource exploration, engineering and environment and other specific problems, such as program design, data processing and interpretation.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: 姜志海、刘志新

Reviewer: \*\*\*

Approver: \*\*\*

# Syllabus for《Seismic exploration data processing》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05433 | Course Nature | Major Course |
| Faculty | School of Resource and Geosciences | Semester | Sixth Semester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours | 12 | Online Resource | https://mooc1.chaoxing.com/course/216822648.html |

1. Course Introduction

The course “Seismic exploration data processing” is an optional major course for the undergraduates majored in geophysics; Its prerequisite courses include advanced mathematics, linear algebra, collage physics, probability theory and mathematical statistics, programming, mathematical physics equation, seismic wave dynamics, geophysical signal processing foundation, seismic exploration principle; This course is applicable to the geophysics major. It mainly covers the basic methods, principles and specific algorithms for routine processing of seismic data, including pre-processing of seismic data, deconvolution, velocity analysis, normal moveout correction and static correction, horizontal stacking and migration; through this course, students are expected to deeply understand the purpose and significance of seismic data processing, familiar with the basic data processing flow, understand the difficulties and development trend of seismic data processing, master the algorithm principle in the main modules widely used in current domestic and international seismic data processing field, and can write their own simple processing procedures, have the ability to carry out a simple practical seismic data processing.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Hu Mingshun

Reviewer: Pan Dongming

Approver: Dong Qinghong

# Syllabus for《Engineering and Environmental Geophysical Exploration》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05409 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The Engineering and Environmental Geophysical Exploration is the main course of geophysics. The prerequisite courses are General Geology, Seismic Exploration Principles, Electrical Exploration Principles, and Gravity and Magnetic Exploration. It is applicable to the students majored in geophysics, hydrology and water resources engineering, and geology engineering, resource exploration engineering and others. The course adopts an interspersed bilingual teaching method, mainly covering the principles of engineering and environmental geophysical methods, the selection basis of geophysical technology methods in engineering surveys and environmental monitoring, the design of geophysical survey technology schemes, data processing and data interpretation methods, new methods and new Technology and future development trends, etc. This course enables the students to build a preliminary understanding of the application of geophysics in the field of engineering and environment, and understand the application status, technological frontiers and development trends of engineering and environmental geophysics at home and abroad, and master the methods and technologies of engineering and environmental geophysics, familiar with English professional vocabulary, lay a good foundation for future course internships, advanced studies, and related work in engineering and environmental industries.

**2. Course Examination**

Course total score = process assessment score × 50% + final exam score × 50%.

Writer: 姜志海

Reviewer:

Approver:

# Syllabus for《Processing and interpretation of gravity and magnetic prospecting data》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05417 | Course Nature | Professional Elective Courses |
| Faculty | School of resources and Earth Sciences | Semester | sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 4 | Online Resource |  |

1. Course Introduction

This course is suitable for undergraduates major in geophysics. The course is a professional elective course with professional knowledge and skills, which has strong theoretical and practical. Its prerequisite courses include Advanced mathematics, College physics, Computer, Geology, Introduction to geophysics, Gravity prospecting and Magnetic prospecting, etc. The course mainly teaches forward and inversion simulation method of gravity and magnetic anomalies, special anomaly data processing method, frequency domain anomaly data processing method, anomaly analysis and interpretation method, presentation and drawing method of result map, etc. Studying this course, students will be trained to analyze and solve practical geological problems, so that they can acquire the basic theory, basic data processing method and interpretation technology of gravity prospecting and magnetic prospecting, and understand the new technology and development trend of gravity and magnetic anomaly data processing, It lays a good foundation for the study and application of geophysics technology in related majors.

Based on the professional knowledge of gravity prospecting and magnetic prospecting, through the study of this course, students can consolidate and deepen the impression and understanding of the theoretical knowledge learned in gravity prospecting and magnetic prospecting, and enhance their practical ability. At the same time, they can carry out the drawing skills training of the professional result map, so that students can complete the whole work from the work purpose, work area design, data acquisition, data preprocessing, routine processing, some special processing, professional mapping, preliminary geological interpretation and report writing. We should firmly grasp the basic characteristics of geological body model and actual gravity anomalies and magnetic anomalies, cultivate students' ability to analyze and solve problems, and lay a foundation for the field data acquisition, data processing and interpretation of gravity prospecting and magnetic prospecting in the future. At the same time, the new technology and development trend of gravity and magnetic data processing and interpretation are understood.

The main contents of this chapter 1 includes gravity prospecting principle and conventional data processing, magnetic prospecting principle and conventional data processing and new technology and development trend of data processing of gravity and magnetic anomaly.

The main contents of this chapter 2 includes forward modeling and inversion of gravity anomaly and forward modeling and inversion of magnetic anomaly.

The main content of this chapter 3 includes processing and conversion of gravity anomaly and processing and conversion of magnetic anomaly.

The main content of this chapter 4 includes separation and enhancement of gravity anomaly and separation and enhancement of magnetic anomaly.

The main content of this chapter 5 includes extraction method of fault structure information.

The main content of this chapter 6 includes new methods for delineation of geological body boundary.

The main content of this chapter 7 includes interpretation method and application of gravity anomaly and interpretation method and application of magnetic anomaly.

2. Course Examination

Final assessment = Write a book report or a practice report.

Writer: Jia Yuge

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Principle and application of gravity and magnetic prospecting》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05432 | Course Nature | Professional core Courses |
| Faculty | School of resources and Earth Sciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1．Course Introduction

The course is a professional core course of Geophysics, which is suitable for undergraduate students of geophysics. This course is of the characteristics of professional knowledge and professional skills, which has strong theoretical and practical characteristics. The prerequisite courses include advanced mathematics, University Physics, Computer, geology and Introduction to Geophysics, etc. The course mainly teaches the basic knowledge of gravity field and gravity prospecting principle, data processing, interpretation and application, and teaches basic knowledge of geomagnetic field and magnetic prospecting principle, data processing, interpretation and application. Through this course study, students are trained to master the basic theories, basic analysis methods and basic skills in the two geophysical prospecting methods, namely gravity exploration and magnetic exploration, understand the new technologies and development trends of gravity prospecting and magnetic prospecting, and have the ability to apply gravity prospecting and magnetic prospecting to analyze and solve practical geological problems, It will lay a good foundation for the follow-up course study and the application of geophysics technology in related majors.

Studying this course, students are required to understand and master the basic knowledge and principle of gravity prospecting method, the design principle and use of gravimeter, the field work method, the data processing method, the data interpretation method and the ability to solve practical geological and engineering problems, as well as the new technology and development trend of gravity prospecting. Studying this course, students are required to understand and master the basic knowledge and principle of magnetic prospecting method, the design principle and use of magnetometer, the field work method, the data processing method, the data interpretation method and the ability to solve practical geological and engineering problems, as well as the new technology and development trend of magnetic prospecting. To cultivate students' ability to comprehensively solve complex geological problems by using the professional knowledge of gravity prospecting and magnetic prospecting, and lay a solid professional foundation for geophysical related scientific research and engineering project management.

The main contents of this chapter 1 includes the nature and characteristics of the course and New technology and development trend of gravity prospecting and magnetic prospecting industry.

The main contents of this chapter 2 includes gravity field and related basic concepts, principle of gravity prospecting and the essence of gravity anomaly.

The main content of this chapter 3 includes Classification of gravimeter and design principle of gravimeter.

The main content of this chapter 4 includes field work method of gravity prospecting and preliminary arrangement of data.

The main content of this chapter 5 includes calculation of gravity anomalies of several simple regular bodies, calculation of gravity anomaly for complex shape abnormal body and gravity anomaly inversion.

The main content of this chapter 6 includes gravity anomaly data processing: smooth processing, anomaly separation, analytic continuation and high-order derivative, etc.

The main content of this chapter 7 includes interpretation method and application of gravity anomaly.

The main contents of this chapter 8 includes geomagnetic field, magnetic field and related basic concepts, principle of magnetic prospecting and the essence of magnetic anomaly.

The main content of this chapter 9 includes Classification of magnetometer and design principle of magnetometer.

The main content of this chapter 10 includes field work method of magnetic prospecting and preliminary arrangement of data.

The main content of this chapter 11 includes calculation of magnetic anomalies of several simple regular bodies, calculation of magnetic anomaly for complex shape abnormal body and gravity anomaly inversion.

The main content of this chapter 12 includes magnetic anomaly data processing: data gridding, smooth processing, anomaly separation, analytic continuation, high-order derivative, reduction to the pole of magnetic anomaly, and frequency domain processing of potential field data, etc.

The main content of this chapter 13 includes interpretation method and application of gravity anomaly.

2．Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Jia Yuge

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Processing and Interpretation of Electrical Prospecting Data》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05434 | Course Nature | Professional elective course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | 0 |

1. Course Introduction

Processing and interpretation of electrical prospecting data is an elective course for geophysics. Its prerequisite courses are electromagnetic field theory, digital signal analysis and electrical prospecting principle. This course is suitable for geophysics students.This course mainly introduces forward and inversion theory of electrical prospecting, algorithm design, and use of the plotting software. Through the study of this course, students can understand the principles and techniques for resistivity data processing, master the basic processing methods of measured data, and understand the typical computer program and theoretical function used in the processing and interpretation of electrical prospecting data.

2. Course Examination

Course total score = process assessment score × 40% + final assessment score × 60%.

Writer: Yang Haiyan

Reviewer: Su Benyu

Approver: Liu Zhixin

# Syllabus for《Engineering Surface Wave Exploration Technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05436 | Course Nature | Optional Major Course |
| Faculty | School of Resource and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course "Engineering Surface Wave Exploration Technology" is a professional elective course for geophysics majors. The prerequisite courses include advanced mathematics, linear algebra, collage physics, probability theory and mathematical statistics, programming, mathematical physics equation, seismic wave dynamics, geophysical signal processing foundation, seismic exploration principle and seismic data processing. Through the study of this course, students will be able to master the current widely used surface wave exploration methods, data processing and interpretation theories, deeply understand the scope of application of surface waves, and carry out real surface wave exploration data processing and interpretation. Main contents are principles of surface wave exploration, surface wave data processing, surface wave exploration data interpretation and application of surface wave exploration.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Hu Mingshun

Reviewer: Pan Dongming

Approver: Dong Qinghong

# Syllabus for《Ground penetrating radar detection technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05437 | Course Nature | Major Elective Courses |
| Faculty | School of Geoscience | Semester | 7th Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course will provide a comprehensive background in this popular geophysical technique that is regularly applied in environmental investigations. The student will gain competency in the electromagnetic theory and methodology behind the technique and obtain a unique ‘hands on learning’ experience using the GPR instruments. This ‘hands on’ experience will allow the student to gain confidence in the data acquisition methods in the field and common processing techniques used to interpret GPR datasets.

2. Course Examination

Course total score = process assessment score × 50% + final exam score × 50%.

Writer: Yue lei

Reviewer: \*\*\*

Approver: \*\*\*

# Syllabus for《Machine Learning》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code |  | Course Nature | Minor course |
| Faculty | School of Resources and Earth Sciences | Semester | The second semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course “Machine Learning” is a professional elective course for Geophysics and is an important branch of computer science; Its prerequisite course is Higher mathematics, Linear algebra or Computer science and technology foundation. This course is suitable for geophysics, resources exploration, information and processing and other majors related to intelligent information processing and application. The course focuses on the basic knowledge of Machine Learning and its common methods. Through this course, students are expected to master the basic principles of Machine Learning and the classification of machine learning, so that students have a certain understanding of Common methods of machine learning. Training students to write the corresponding procedures and apply software, and make them have a basic understanding of Geoscience information fusion and Geoscience information cluster analysis.

Through the study of the course, students understand the basic methods and applications of machine learning and the application of Geology. The course will make the students have a deep understanding of machine learning and master the basic knowledge of the development history and classification of machine learning. Students are expected to understand some classic and commonly used machine learning methods and be able to do a simple process of one method in a high-level language. The principle part of the algorithm of machine learning software commonly used in domestic and abroad is also needed to understand. Students can use machine learning software or high-level language for some actual machine learning, and then achieve the training objectives of graduates' knowledge structure and strong practical ability.

2. Course Examination

Course total score = Regular attendance scores × 20% + Homework and class performance × 20%+ Course Report Examination × 60%.

Writer: YongZhong Xu

Reviewer: DongMing Pan

Approver: \*\*\*

# Syllabus for《Dynamics of Seismic Waves》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05402 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of resource and earth science and | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course “Dynamics of Seismic Waves” is a major course of geophysics; Its prerequisite course is Multivariable calculus, linear algebra, and physics; This course is applicable to the geophysical majors. It mainly covers Tensor Analysis, stress and strain, the solutions of seismic wave equations, and the reflection and refraction of harmonic plane waves at interfaces between different types of elastic media; through this course, students are expected to know a little about the tensor analysis, understand the seismic wave equations and their solutions, and master the propagation rules of the seismic waves including the P-wave, S-wave and surface wave, which is helpful to the further learning.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 40%.

Writer: Yang Lei

Reviewer: PAN Dongming

Approver: LIU zhixin

# Syllabus for《Paleontology and Stratigraphy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05504 | Course Nature | Required basic courses |
| Faculty | School of Resources and Geosciences | Semester | 4 |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource | www.icourses.cn/sCourse/course\_3297.html  www.icourse163.org/course/CUG-1461094175 |

一Course Introduction

Paleontology and stratigraphy is a basic required course; Its prerequisite course is general geology; Suitable for resources exploration engineering, geological engineering, geophysics, hydrology and water resources engineering; This course focuses on the history of the crust and its biosphere, looking for its evolution law, stratigraphic division and correlation, and then guiding the exploration and production of mineral resources. Through the study of this course, the students can master the basic concepts, theories and methods of paleontology, and have the ability to identify and apply key categories of paleontology, so as to lay the foundation for solving the division and correlation of strata, restoring paleogeography, paleoclimate, etc; At the same time, master the modern basic theories and research methods of stratigraphy, explore the experience and changes of the crust and surface in the past geological periods, explore the evolution and development of the earth's surface open system in the geological history period and modern times, and its impact on the biological evolution, sedimentary stratigraphic structure, formation of related mineral resources and environmental evolution, To enable students to have the ability to analyze and solve geological problems.

（一）Curriculum objectives and graduation requirements

1. General teaching objectives

The teaching objective of this course is to make students understand and master the related concepts of Paleontology and stratigraphy, familiar with the basic theories of modern Paleontology and stratigraphy, preliminarily master the basic skills of stratigraphy research methods, division and comparison of geological age, understand the evolution history of crust and biosphere, and understand the basic laws of biological evolution, It will lay a foundation for the exploration and production of mineral resources and the restoration of paleogeography, paleoenvironment and paleoclimate.

2.Teaching Objectives

Combined with the knowledge system of Paleontology and Stratigraphy and the graduation requirements for students, four curriculum objectives are set to support different observation points of graduation requirements (Table 1).

1）Course objective 1: understand and master the related concepts of Paleontology and stratigraphy, be familiar with the basic theories of modern Paleontology and stratigraphy, preliminarily master the basic skills of stratigraphy research methods, geological age division and correlation, understand the evolution history of the crust and the biosphere, and understand the basic laws of biological evolution（ Support the professional graduation requirements (1-3).

2）Objective 2: through the study of this course, students can understand and master the scientific thinking mode of Paleontology and stratigraphy, and establish a correct outlook on the development of earth history (supporting the graduation requirements of this major 7-3).

3）Objective 3: through the study of this course, students can have the ability of teamwork and lay a foundation for the future work in geology and related fields (supporting the graduation requirements of this major 9-1).

4）Objective 4:In the course of teaching, through the introduction of typical examples and other methods, we can stimulate students' enthusiasm for patriotism, school love and specialty love, and cultivate socialist builders and successors with all-round development of morality, intelligence, sports, beauty and labor. We should have a correct understanding of professional characteristics, build up professional self-confidence, and establish a modern earth science consciousness of protecting biology and environment. So as to make students understand the national energy security, have a deeper understanding of the school and professional characteristics, have a better vision of the professional prospects, and encourage students to meet the follow-up professional courses in a more positive and enthusiastic state (curriculum ideological and political teaching objectives, support the professional graduation requirements of 7-3, 9-1).

Table 1 corresponding relationship between curriculum objectives and connotation observation points of graduation requirements

|  |  |
| --- | --- |
| Course objectives | Connotation observation points of graduation requirements |
| objectives 1 | 1-3: master the basic ideas and methods to solve the engineering problems of coal based fossil energy minerals by using the engineering foundation and professional knowledge, and have the ability to comprehensively apply the learned knowledge to solve complex engineering problems. |
| objectives 2 | 7-3: be able to think about the sustainability of resource exploration engineering practice from the perspective of environmental protection and sustainable development, and evaluate the damage and hidden danger that resource exploration may cause to human and environment. |
| objectives 3 | 9-1: understand the relationship between the individual and the team and the significance of teamwork, and be able to complete their own tasks in a multidisciplinary team. |
| objectives 4 | 7-3: be able to think about the sustainability of resource exploration engineering practice from the perspective of environmental protection and sustainable development, and evaluate the damage and hidden danger that resource exploration may cause to human and environment.  9-1: understand the relationship between the individual and the team and the significance of teamwork, and be able to complete their own tasks in a multidisciplinary team. |

（二）Course content, requirements and class hour allocation

一） Main teaching contents

1 Introduction (2 class hours)

1) Teaching objectives

Master the basic concepts, research contents and research methods related to Paleobiology and stratigraphy, understand the evolution history and branch of the crust and biosphere, and be familiar with the frontier problems of Paleobiology and Stratigraphy (supporting Curriculum Objectives 1 and 4).

2) Teaching content

(1) Basic concepts of Paleontology and stratigraphy（ 2) Evolution history of crust and biosphere（ 3) The contents and methods of Paleontology and stratigraphy（ 4) The frontier issues of Paleontology and stratigraphy.

3) Key points and difficulties

The research content, research methods, development history and branch of subjects, curriculum structure system and learning method of Paleontology and stratigraphy.

4) Teaching methods

(1) Teaching method and case method are adopted.

2. Fundamentals of Paleontology (2 class hours)

1) Teaching objectives

Understand the formation conditions and preservation types of fossils, the classification and nomenclature of paleontology, and be familiar with the application of Paleontology (support course objective 1).

2) Teaching content

(1) The formation conditions and preservation types of fossils（ 2) Classification and nomenclature of Paleontology（ 3) Application of Paleontology

3) Key points and difficulties

(1) The types of fossil preservation（ 2) Binomial method

4) Teaching methods

(1) Teaching method and case method are adopted;

3 protozoa (2 class hours)

1) Teaching objectives

Understand the characteristics of protozoa, master the taxonomic location, main characteristics, evolution process and important fossils of foraminifera (support course goal 1).

2) Teaching content

(1) The taxonomic position and main characteristics of foraminifera;

(2) The evolution of fusulinidae;

(3) Important fossil representatives.

3) Key points and difficulties

Evolutionary characteristics and important fossil representatives of fusulinidae

4) Teaching methods

(1) Teaching method and case method are adopted;

4 Animal Kingdom (4 class hours)

1) Teaching objectives

Master the taxonomic position, main characteristics, fossil representation and evolutionary process of coralline, Brachiopoda, Mollusca, trilobite, graptolite and chordate, and be familiar with important events in the evolution of Animal Kingdom (support course objective 1).

2) Teaching content

(1) The taxonomic position and main characteristics of coralline, Brachiopoda, Mollusca, trilobites, graptolites and chordate phyla;

(2) The representative and evolution of important fossils;

(3) An important event in the evolution of the animal kingdom.

3) Key points and difficulties

Representative and evolution of important fossils

4) Teaching methods

(1) Teaching method and case method are adopted;

5 flora (4 class hours)

1) Teaching objectives

To understand the classification and basis of plants and the characteristics and representative molecules of lower plants; Familiar with the basic characteristics of higher plants, grasp the classification and main identification characteristics of pteridophytes and gymnosperms, familiar with the representative of common important fossils, geological history distribution and ecological characteristics; Understand the basic knowledge of sporopollen analysis (support course objective 1).

2) Teaching content

(1) Plant classification and classification basis;

(2) Characteristics and representative molecules of lower plants;

(3) The basic characteristics of higher plants, common fossil representatives, geological distribution and ecological characteristics;

(4) Basic knowledge of sporopollen analysis.

3) Key points and difficulties

Basic characteristics of higher plants, common fossil representatives, geological distribution and ecological characteristics

4) Teaching methods

(1) Teaching method and case method are adopted;

6 conodonts and trace fossils (2 class hours)

1) Teaching objectives

Understand the basic knowledge of conodonts and trace fossils, and be familiar with their common fossil types (support course objective 1).

2) Teaching content

(1) Conodont basic knowledge and fossil representative;

(2) Basic knowledge of trace fossils and fossil representatives;

3) Key points and difficulties

Fossil representation and application of conodonts and trace fossils

4) Teaching methods

(1) Teaching method and case method are adopted;

7 stratigraphy and history of geological development (4 class hours)

1) Teaching objectives

Master the basic concepts and theories of strata; Be familiar with the method of stratigraphic division and correlation; Understand the relationship between various stratigraphic unit systems. Understand the basic principle of facies analysis, master the main sedimentary types and their identification marks, and be familiar with the analysis methods and identification marks of paleogeography and paleoclimate. Master the principles and methods of historical tectonic analysis, understand the basic knowledge of plate tectonics, and be familiar with China's tectonic zoning (support course objective 1).

2) Teaching content

(1) The basic concept of strata and the method of stratigraphic division and correlation;

(2) The main sedimentary types and their identification marks;

(3) Basic knowledge of plate tectonics and tectonic division of China.

3) Key points and difficulties

Be familiar with the method of stratigraphic division and correlation; Understand the basic principle of facies analysis, master the main sedimentary types and their identification marks, and be familiar with the analysis methods and identification marks of paleogeography and paleoclimate. Master the principles and methods of historical structure analysis.

4) Teaching methods

(1) Teaching method and case method are adopted;

8 Precambrian (2 class hours)

1) Teaching objectives

Be familiar with the time range, stage division and rock series characteristics of Precambrian, understand the geological history of Precambrian and the general situation of regional geology and mineral resources of China, and master the geological history of Ediacaran in China (support course objective 1).

2) Teaching content

(1) The time range, stage division and rock series characteristics of Precambrian（ 2) The geological history of Precambrian and the general situation of Precambrian and regional geology and mineral resources in China（ 3) The Ediacaran geohistory of China.

3) Key points and difficulties

Precambrian Geological History, Precambrian and regional geology and mineral resources in China

4) Teaching methods

(1) Teaching method and case method are adopted;

9 Paleozoic (4 class hours)

1) Teaching objectives

To master the division of Paleozoic, important categories of biosphere, standard fossils, characteristics of biofacies Association and global geological history. To master the regional geological characteristics, stratigraphic division, sedimentary characteristics and lithofacies changes of Paleozoic in China. Master the geological history of Paleozoic regional tectonic units in China, master the performance of Caledonian and Hercynian movements, and be familiar with the distribution characteristics of major Paleozoic mineral resources (supporting course objectives 1 and 2).

2) Teaching content

(1) Paleozoic division, important categories of biosphere, standard fossils, characteristics of biofacies assemblage and global geological history（ 2) The Paleozoic regional geological characteristics, stratigraphic division, sedimentary characteristics and lithofacies changes in China（ 3) Geological history of Paleozoic regional tectonic units in China.

3) Key points and difficulties

Regional geological characteristics, stratigraphic division, sedimentary characteristics and lithofacies changes of Paleozoic in China

4) Teaching methods

(1) Teaching method and case method are adopted;

10 Mesozoic (4 class hours)

1) Teaching objectives

Master the division of Mesozoic, the evolution of biosphere and the characteristics of global geological history, master the development of Mesozoic in different stratigraphic divisions of China, and the distribution characteristics of sedimentary environment, lithofacies change and climate zone represented by typical sections. Master the main performance and influence of Indosinian movement and Yanshan movement in China. Be familiar with the distribution characteristics of Mesozoic mineral resources (support course objective 1).

2) Teaching content

(1) The division of Mesozoic, the evolution of biosphere and the characteristics of global geological history（ 2) The development of Mesozoic in China in different stratigraphic divisions, the sedimentary environment, lithofacies changes and the distribution characteristics of climatic zones represented by typical sections.

3) Key points and difficulties

The development of Mesozoic in China in different stratigraphic divisions, the sedimentary environment, lithofacies changes and the distribution characteristics of climatic zones represented by typical sections

4) Teaching methods

(1) Teaching method and case method are adopted;

11 Cenozoic (2 class hours)

1) Teaching objectives

Master the stratigraphic division, biological interface appearance and global geological history characteristics of Cenozoic, and be familiar with the typical sections, paleogeographic characteristics and sedimentary types of Paleogene and Neogene in China. To understand the Quaternary characteristics, glacial division, sedimentary types and development characteristics of China. Familiar with the Cenozoic crustal movement in China, the main mineral resources and distribution（ Support course objective 1).

2) Teaching content

(1) Stratigraphic division, biological interface and global geological history of Cenozoic era（ 2) Typical sections, palaeogeographic features and sedimentary types of Paleogene and Neogene in China（ 3) Quaternary characteristics, division of glacial period, sedimentary types and development characteristics of China.

3) Key points and difficulties

Quaternary characteristics, division of glacial period, sedimentary types and development characteristics of China.

4) Teaching methods

(1) Teaching method and case method are adopted.

2. Course Examination

（1） Assessment method

The assessment of this course adopts the combination of process evaluation and target evaluation, and the final score of the course is determined by the usual performance (including attendance and usual performance), homework and final exam scores. The average score accounts for 20% of the total score, the homework score accounts for 10%, and the final exam score accounts for 70%.

The final score is given according to the 100 point system, and 60 points is considered as passing.

2） Assessment contents and requirements

This course is a closed book examination. The main assessment methods are: final examination, homework, etc. Closed book examination is adopted and the final score is 100 points. The whole process is arranged by the Academic Affairs Office of the school. The examination content should cover the teaching content supporting all the connotation observation points of graduation requirements.

Writer: Fanfan Kong

Reviewer: Biao Quan、Zhuangfu Li

Approver: Zhixin Liu

# Syllabus for《Geochemistry》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05506 | Course Nature | Major Core Courses |
| Faculty | School of School of Resources and Earth Sciences | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

Geochemistry is the core course of resource exploration engineering. The prerequisite courses are college chemistry and general geology; Applicable to resources exploration engineering, geological engineering and other science and engineering undergraduates. This course mainly describes the abundance, distribution and distribution characteristics of elements and isotopes in geochemical systems, the combination rules and occurrence forms of elements, the migration and transformation of elements in common geochemical systems, the basic theories of geochemical evolution of elements (isotopes) and the basic working methods of geochemistry. And organic geochemistry, environmental geochemistry related basic theories and skills. Through the study of this course, students can understand the research content of geochemistry, learn the basic theories and methods of geochemistry, and use the basic theories of geochemistry to solve complex engineering problems such as geology, resources and energy. In order to adapt to the development of geoscience under the new situation and the national needs for geochemical talents in other fields related to national economy, such as resources, energy and environment.

The main contents of this chapter 1 include the geochemistry and related basic concepts, research contents and methods of geochemistry, brief history of geochemistry development and branches of disciplines, methodology and methodology of geochemistry.

The main content of this chapter 2 includes the basic concepts of element abundance, distribution law of elements in the solar system, structure and chemical composition of the earth, abundance and distribution characteristics of elements in the crust.

The main content of this chapter 3 includesthe geochemical affinity and its classification of elements, isoforms, crystal field stability and its control on the behavior of transition metal elements, micro-controlling factors of element binding law, geochemical classification of elements and its occurrence forms.

The main content of this chapter 4 includesthe related theories of element geochemical migration, types of water-rock chemical interaction and its influencing factors, and case analysis of water-rock chemical interaction.

The main content of this chapter 5 includesthe fundamental theory of trace element geochemistry, quantitative model of trace element distribution and evolution during magmatism, rare earth element geochemistry and trace element tracer significance.

The main content of this chapter 6 includesthe isotope related concepts and causes of variation of isotopic composition in nature, isotope chronology, stable isotope geochemistry.

The main content of this chapter 7 includesthe related concepts of organic geochemistry, biological cycling of organic matter and elements in nature, organic geochemistry of combustible deposits, transformation of organic matter and influencing factors.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Wang Aikuan

Reviewer: Wang Wenfeng

Approver: Liu Zhixin

# Syllabus for《Organic Petrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05507 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | None | Online Resource | None |

1. Course Introduction

Organic Petrology is a compulsory course of resource exploration, and it is a discipline that studies the petrological properties, geological causes and their applications of sedimentary organic matter in the formation. Its prerequisite courses are Biology and Paleontology, Mineralogy and Petrology, Coal Chemistry, Geochemistry, Ore Geology and Energy Geology or Coal Geology. The subjects of this course mainly include aggregated organic matter (such as coal, oil shale, asphalt, etc.) and dispersed organic matter (organic matter dispersed in other rocks). Its petrological characteristics mainly include petrographic components, abundance and evolution. Through the study of these three aspects, the necessary geological information about the genesis of sedimentary organic matter and its geological products can be obtained, which is instructive for coal resources exploration, oil and gas exploration and other related mineral exploration. At the same time, the application of basic theories and methods of organic petrology can help solve some practical problems in coal processing and utilization, environmental protection, archaeological and other fields. Through the study of this course, students will initially grasp the basic theories of organic rock science, basic knowledge and basic skills for future research and application to lay the necessary foundation.

2. Course Examination

Course total score = process assessment score × 50% + final exam score × 50%.

Writer: Jian Shen

Yilin Chen

Reviewer: Xuehai Fu

Approver: Zhixin Liu

# Syllabus for《Log Geological Interpretation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05513 | Course Nature |  |
| Faculty | School of Resources and Geoscience | Semester |  |
| Class Hours | 16 | Credit | 1.0 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

This course mainly talks about the Log Geological Interpretation. The main contents include present situation of geological energy logging geological interpretation at home and abroad, well logging data pretreatment, well logging curve stratification and lithology analysis, rock mechanics analysis of well logging data, mathematical principle and realization process of well logging curve correlation. Through learning, the students should master the necessary basic theories, basic knowledge and basic analysis methods of earth sciences, which are the learning and basic qualities of subsequent courses.

2. Course Examination

Course total score = classroom performance (10%) + regular assignment (20%) + final test (70%), and is given in five levels finally.

Writer: Junlong Zhao, Qian Wang

Reviewer: Jilin Wang

Approver: Zhixin Liu

# Syllabus for《Paleontology and Stratigraphy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05517 | Course Nature | Minor courses |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1.Course Introduction

Paleontology and stratigraphy is a minor course; It’s prerequisite course is general geology; Suitable for resources exploration engineering, geological engineering, geophysics, hydrology and water resources engineering; This course focuses on the history of the crust and its biosphere, looking for its evolution law, stratigraphic division and correlation, and then guiding the exploration and production of mineral resources. Through the study of this course, the students can master the basic concepts, theories and methods of paleontology, and have the ability to identify and apply key categories of paleontology, so as to lay the foundation for solving the division and correlation of strata, restoring paleogeography, paleoclimate, etc; At the same time, master the modern basic theories and research methods of stratigraphy, explore the experience and changes of the crust and surface in the past geological periods, explore the evolution and development of the earth's surface open system in the geological history period and modern times, and its impact on the biological evolution, sedimentary stratigraphic structure, formation of related mineral resources and environmental evolution, To enable students to have the ability to analyze and solve geological problems.

Main teaching contents are as follow,

1) Introduction (2 class hours)

(1) Basic concepts of Paleontology and stratigraphy;

(2) Evolution history of crust and biosphere;

(3) The contents and methods of Paleontology and stratigraphy;

(4) The frontier issues of Paleontology and stratigraphy.

2) Fundamentals of Paleontology (2 class hours)

(1) The formation conditions and preservation types of fossils;

(2) Classification and nomenclature of Paleontology;

(3) Application of Paleontology

3) protozoa (2 class hours)

(1) The taxonomic position and main characteristics of foraminifera;

(2) The evolution of fusulinidae;

(3) Important fossil representatives.

4) Animal Kingdom (4 class hours)

(1) The taxonomic position and main characteristics of coralline, Brachiopoda, Mollusca, trilobites, graptolites and chordate phyla;

(2) The representative and evolution of important fossils;

(3) An important event in the evolution of the animal kingdom.

5) flora (4 class hours)

(1) Plant classification and classification basis;

(2) Characteristics and representative molecules of lower plants;

(3) The basic characteristics of higher plants, common fossil representatives, geological distribution and ecological characteristics;

(4) Basic knowledge of sporopollen analysis.

6) conodonts and trace fossils (2 class hours)

(1) Conodont basic knowledge and fossil representative;

(2) Basic knowledge of trace fossils and fossil representatives;

7) stratigraphy and history of geological development (4 class hours)

(1) The basic concept of strata and the method of stratigraphic division and correlation;

(2) The main sedimentary types and their identification marks;

(3) Basic knowledge of plate tectonics and tectonic division of China.

8) Precambrian (2 class hours)

(1) The time range, stage division and rock series characteristics of Precambrian;

(2) The geological history of Precambrian and the general situation of Precambrian and regional geology and mineral resources in China;

(3) The Ediacaran geohistory of China.

9) Paleozoic (4 class hours)

(1) Paleozoic division, important categories of biosphere, standard fossils, characteristics of biofacies assemblage and global geological history;

(2) The Paleozoic regional geological characteristics, stratigraphic division, sedimentary characteristics and lithofacies changes in China;

(3) Geological history of Paleozoic regional tectonic units in China.

10) Mesozoic (4 class hours)

(1) The division of Mesozoic, the evolution of biosphere and the characteristics of global geological history;

(2) The development of Mesozoic in China in different stratigraphic divisions, the sedimentary environment, lithofacies changes and the distribution characteristics of climatic zones represented by typical sections.

11) Cenozoic (2 class hours)

(1) Stratigraphic division, biological interface and global geological history of Cenozoic era;

(2) Typical sections, palaeogeographic features and sedimentary types of Paleogene and Neogene in China;

(3) Quaternary characteristics, division of glacial period, sedimentary types and development characteristics of China.

2. Course Examination

1) Assessment method

The assessment of this course adopts the combination of process evaluation and target evaluation, and the final score of the course is determined by the usual performance (including attendance and usual performance), homework and final exam scores. The average score accounts for 20% of the total score, the homework score accounts for 10%, and the final exam score accounts for 70%.

The final score is given according to the 100 point system, and 60 points is considered as passing.

2) Assessment contents and requirements

This course is a closed book examination. The main assessment methods are: final examination, homework, etc. Closed book examination is adopted and the final score is 100 points. The whole process is arranged by the Academic Affairs Office of the school. The examination content should cover the teaching content supporting all the connotation observation points of graduation requirements.

Writer: Fanfan Kong

Reviewer: Biao Quan

Approver: Zhixin Liu

# Syllabus for《Energy geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05526 | Course Nature | Major Professional Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource | - |

1. Course Introduction

This course deeply integrates the professional basic knowledge of traditional coal geology, petroleum geology and natural gas geology to form a new undergraduate professional knowledge structure and system of energy geology. Through the study of this course, students will be able to master the relevant knowledge of the origin of fossil energy minerals, the basic properties of fossil energy minerals and the geological carrier of fossil energy. to understand the distribution law of fossil energy minerals, evaluation methods, exploration and development trends at home and abroad and related principles and policies of fossil energy exploration engineering, and to establish a relatively complete and systematic basic knowledge system of fossil energy geology. Lay the foundation for the course study of resource exploration and comprehensive evaluation methods. The basic theory, analysis and testing means and technical methods related to fossil energy can be used to solve complex geological and engineering problems in the process of fossil energy exploration and development.

The course includes the following four parts: the origin of fossil energy minerals, the basic properties of fossil energy minerals, the geological carriers of fossil energy minerals and the distribution and evaluation of fossil energy minerals.

The main contents of this chapter 1 include the basic concept and classification of energy, the trend of energy supply and demand and future solutions, fossil energy and energy geology, the main contents of this course and its relationship with other disciplines.

The main contents of this chapter 2 include the source of sedimentary organic matter, the formation of sedimentary organic matter, the material composition of modern sedimentary organic matter, the accumulation and distribution of sedimentary organic matter.

The main contents of this chapter 3 include the macroscopic sedimentary characteristics of sedimentary organic matter, the micropetrological characteristics of sedimentary organic matter, and the petrological research methods of sedimentary organic matter.

The main contents of this chapter 4 include the electromagnetic properties of sedimentary organic matter, the mechanical properties of sedimentary organic matter, the spatial structure properties of sedimentary organic matter, the surface physical and chemical properties of sedimentary organic matter, and the diffusion and percolation properties of sedimentary organic matter.

The main contents of this chapter 5 include the types of elements and organic compounds in sedimentary organic matter, the chemical composition of aggregated organic matter, the chemical composition of dispersed organic matter and kerogen, the chemical composition of crude oil, and the chemical composition of natural gas. Advanced examples within the energy industry.

The main contents of this chapter 6 include the evolution stages and signs of sedimentary organic matter, the evolution products of sedimentary organic matter, the geological-geochemical mechanism of the evolution of sedimentary organic matter, and the types of evolution of sedimentary organic matter.

The main contents of this chapter 7 include the basic characteristics of sedimentary basins, the types of sedimentary basins, energy basins and their basic characteristics, sedimentary filling characteristics and processes of the basin.

The main contents of this chapter 8 include the pore-fracture system of the energy geological carrier, the fluid saturation of the energy geological carrier, the diffusivity and permeability of the energy geological carrier, and the surface physical and chemical properties of the energy geological carrier. fluid pressure of energy geological carrier.

The main contents of this chapter 9 include coal (reservoir) and its roof and floor strata, clastic reservoir and its development characteristics, shale (mudstone) reservoir and its development characteristics, carbonate reservoir and its development characteristics, caprock and source-reservoir-cap assemblage.

The main contents of this chapter 10 include coal bed and its basic types, coal quality and coal classification, oil and gas reservoirs and their basic types.

The main contents of this chapter 11 include the mode and type of basin transformation, the geological unit of fossil energy mineral accumulation, the law of regional accumulation and distribution of fossil energy in China, the characteristics and evaluation theory of fossil energy mineral resources.

2. Course Examination

The examination of this course consists of three parts: peacetime performance, extracurricular homework and final examination. the scoring standard is 100%, which is comprehensively evaluated according to proportion. Among them: normal grades (attendance + classroom performance + classroom notes + classroom tests) account for 30%, extracurricular homework scores account for 20% (popular science / science fiction papers, or oil and gas migration / development of animation, or professional essays / book reports, etc., can be substituted for each other, animation time is not less than 1 minute, papers / reading reports are required to be no less than 3000 words, references are not less than 10), and the final open-book exam scores account for 50%.

The final score is given on a percentile basis, with 60 as a pass.

Writer: Caifang Wu

Reviewer: Xuehai Fu

Approver: Zhixin Liu

# Syllabus for《Foudations of Mineralogy and Petrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05545 | Course Nature | Optional major Course |
| Faculty | School of Resoueces and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

This course is an elective course for the major of hydrology and water resources engineering. Through the study and experiment of this course, students can master the basic theory and knowledge of mineral petrology and the basic skills of identifying and describing minerals in the field. This course focuses on cultivating students practical ability, and requires students to master the identification characteristics of common minerals and rocks, including mineral compositions, structure and naming of rocks, so as to lay a solid foundation for the study of subsequent courses.

The main contents of this chapter 1 include the basic concepts of crystal optics and optical mineralogy, the research contents and methods of crystal optics.

The main content of this chapter 2-5includes the chemical composition and internal structure of minerals, the form of minerals, the physical properties of minerals and the classification and naming of minerals.

The main content of this chapter 6 includesthe mineralogical properties and identification characteristics of common metallic minerals and nonmetallic minerals, focusing on the properties and identification characteristics of silicate minerals.

The main content of this chapter 7-9 includesthe basic characteristics of magmatic rocks, the main types of magmatic rocks, and the genesis of magmatic rocks.

The main content of this chapter 10-12 includesthe formation process and characteristics of sedimentary rocks, terrigenous clastic rocks and endogenous sedimentary rocks.

The main content of this chapter 13、14 includesthe basic concepts of metamorphism, metamorphic rocks and the types of metamorphic rocks.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Xiaoli Zhang

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Drilling Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05554 | Course Nature | Optional basic course for all majors of the same discipline |
| Faculty | School of resources &Geosciences | Semester | 6 |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course "Drilling Engineering" is an optional basic course for all majors of the same discipline for undergraduates majoring in science and engineering such as resource exploration engineering and geological engineering. This course is 32 hours, it focuses on the traditional drilling technology, strengthens the knowledge system of the latest drilling equipment and technology systems at home and abroad, and introduces the frontiers of the application and development of drilling technology in different fields. It not only deepens the understanding of traditional and mature drilling theories, but also integrates the development of advanced theories and the latest technology in related fields. In terms of teaching content, the drilling engineering content is reorganized and integrated, and theory is combined with practice. The curriculum focuses on basic, systematic, complete and practical, and injects modern scientific research results, which is convenient for guided teaching and students' self-study. Through the study of this course, students will be able to fully grasp the drilling engineering technology, basic knowledge and basic skills, and lay the necessary professional knowledge foundation for the follow-up course study and future application and engaging in the professional drilling engineering work. Initially have the ability to discover, analyze and solve problems. It is conducive for students to have a comprehensive understanding of drilling technology and its social production applications and technical intersections, thereby stimulating professional innovative thinking. The main content of this course is the composition of drilling equipment, drilling pipes and common tools, cemented carbide, diamond drilling and percussion rotary drilling technology, rock core technology, drilling bending measurement and prevention, hydrological and water well drilling and progress Technology, pile foundation construction technology such as bored piles and high-pressure jet grouting piles.

Chapter 1 Introduction

The content includes the main content of drilling work, drilling technical and economic indicators.

Chapter 2 Core Drilling Equipment and Drilling Tools

The content includes core drilling equipment and drilling tools; reasonable use of drill string.

Chapter 3 Drilling Method

The content includes cemented carbide drilling, diamond drilling, percussion rotary drilling working principle and drilling regulations.

Chapter 4 Rock Mine Core Taken

The content includes the basic requirements of rock core; single-layer and double-layer core tube core drilling technology.

Chapter 5 Drilling and Bending

The content includes the mechanism of borehole bending, borehole bending measurement and prevention technology.

Chapter 6 Hydrological and Water Well Drilling and Well Formation Technology

The content includes hydrological and water well drilling structure design, drilling technology, and water well formation technology.

Chapter 7 Pile Foundation Construction Technology

The content includes the construction technology of bored piles and the construction technology of high pressure jet grouting piles.

2. Course Examination

This course assessment adopts a combination of process evaluation and goal evaluation, and the final grade of the course is comprehensively determined by various aspects such as classroom study discussion and after-class feedback performance (30%) + course examination (70%).

1. Process assessment (30%)

Classroom learning feedback, homework assessment, periodic testing, etc.

2. Result test (70%)

Exam (closed book)

Writer: Xiaohong Xia

Reviewer: Aikuan Wang

Approver: Zhixin Liu

# Syllabus for《Coal bearing strata and Paleontology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05555 | Course Nature | Major elective course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource |  |

1.Course Introduction

Paleontology of coal bearing strata is a major basic elective course; Its prerequisite courses are general geology, paleontology and stratigraphy; It is suitable for the major of resource exploration engineering; This course is mainly about coal bearing strata and paleontology, looking for the formation and evolution of coal bearing strata, dividing and comparing coal bearing strata, and guiding the exploration and production of coal and related resources. Through the study of this course, the students can master the basic concepts, basic theories and basic methods of paleontology of coal bearing strata, have the ability to identify and apply the key paleontological categories of coal bearing strata, and master the typical section characteristics of coal bearing strata in each geological history period in order to solve the Division and correlation of coal bearing strata, and understand the influence of important tectonic movements on the paleogeography and paleogeography of coal accumulation period Paleotectonic framework and paleoclimate; At the same time, master the application of coal bearing strata paleontology, so that students have the ability to analyze and solve geological problems.

1） Main teaching contents

1 Introduction (2 class hours)

(1) Basic concept of coal measures（ 2) The research contents and methods of paleontology of coal bearing strata（ 3) Paleontological application of coal bearing strata.

2. Temporal distribution of coal resources (2 class hours)

(1) Coal seams formed by higher plants（ 2) The metamorphic degree of coal seams formed in different periods.

3. Preservation types of fossils in coal measures and coal seams (2 class hours)

(1) Animal and plant fossils in coal bearing strata and their stratigraphic division and correlation significance;

(2) Conservation types of fossil plants in coal bearing strata and coal seams in China.

4. Flora of coal bearing strata (4 class hours)

(1) The evolutionary stage of plants;

(2) Coal forming flora in coal accumulation stage;

(3) The representative, ecological characteristics and coal accumulation of common plant fossils in coal accumulation period.

5 plant residues in coal (4 class hours)

(1) Coal core;

(2) Analysis of sporopollen and sporopollen facies;

6 characteristics of coal bearing formations in China (2 class hours)

(1) Characteristics of coal bearing formations in China;

(2) Analysis of fossil communities in coal bearing strata;

(3) The sedimentary environment of coal accumulation period is related to Korean American characteristics.

2. Course Examination

1） Assessment method

The assessment of this course adopts the combination of process evaluation and target evaluation, and the final score of the course is determined by the usual performance (including attendance and usual performance), homework and final exam scores. The average score accounts for 20% of the total score, the homework score accounts for 10%, and the final exam score accounts for 70%.The final score is given according to the 100 point system, and 60 points is considered as passing.

（2） Assessment contents and requirements

This course is a closed book examination. The main assessment methods are: final examination, homework, etc. Closed book examination is adopted and the final score is 100 points. The whole process is arranged by the Academic Affairs Office of the school. The examination content should cover the teaching content supporting all the connotation observation points of graduation requirements.

Writer: Biao Quan、Fanfan Kong

Reviewer: Jilin Wang

Approver: Zhixin Liu

# Syllabus for《Crystallography and Mineralogy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05556 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course includes two parts: crystallography and mineralogy.The crystallography part introduces the basic properties of crystals, the law of crystal symmetry, the classification of crystal symmetry, and the basic theories of crystal chemistry.The mineralogy part introduces the chemical composition, morphology, physical properties,classification and naming of minerals, as well as the mineralogical properties, identification characteristics, genesis and main uses of common minerals.Through the study of this course, students will systematically master the basic theories, knowledge and skills of crystallography and mineralogy. grasp the causes of mineral forms and physical properties of minerals by the analysis of crystal structure,and master the reaserching methods of mineralogy,and improve analytical ability and research ability of geological science theory.

The main contents of this chapter 1 include the definition of crystal, the general rule of space lattice structure, the difference between crystalline, amorphous and Quasicrystal Materials; The basic properties of crystal; Bravue's law, cossel's theory, spiral growth theory, conservation law of surface angle and its significance;

The main contents of this chapter 2include the characteristics of crystal symmetry, the concepts and operation methods of symmetry plane, symmetry axis, symmetry center and rotation extension axis, the law of symmetry and the combination law of symmetry elements, the common symmetry types, and the system of crystal classification according to symmetry; Fourteen kinds of space grids;

The main contents of this chapter 3include the concept and derivation method of simplex, classification of simplex, 47 kinds of geometric simplex, focusing on 20 kinds of common simplex; The concept of geometric simplex, crystalline simplex and polymorph; The steps and methods of analyzing simplex from aggregation.

The main contents of this chapter 4include the law of integers, the concept of Michaelis symbol and simplex symbol on crystal surface; The principle of crystal orientation, the method of crystal orientation and the characteristics of crystal constant of each crystal system; The shape number of the most common simplex; Crystal band, crystal band law and crystal edge symbol.

The main contents of this chapter 5include the similarities and differences between actual crystal and ideal crystal, the influencing factors of actual crystal morphology, parallel intergrowth, the concept of bicrystal, bicrystal axis, bicrystal plane, bicrystal joint surface, bicrystal type, bicrystal law and bicrystal identification method; The formation mode of bicrystal. A preliminary understanding of the common types of twinning in minerals.

The main contents of this chapter 6include ion type of elements, chemical composition, chemical formula and crystal chemical formula of minerals, isomorphism and isomorphism, colloidal minerals and their composition, occurrence form of water in minerals; The principle of spherical compact packing of crystal structure and coordination polyhedron, crystal bond type and lattice type and their influence on mineral structure and properties, crystal field theory, crystal order.

The main contents of this chapter 7include the research significance of mineral morphology, crystal habit of mineral monomer, morphology of mineral aggregate, genesis and influencing factors of various mineral morphology.

The main contents of this chapter 8include the optical properties of minerals, i.e. the color, streak color, luster and transparency of minerals and their relationship; The mechanical properties of minerals include cleavage, cleavage and fracture, hardness, elasticity and flexibility, brittleness and toughness; Other physical properties of minerals, such as specific gravity, magnetism, luminescence, electrical properties, thermal properties, etc; Based on the crystal structure, the physical properties of minerals and their relationships are explained.

The main contents of this chapter 9include the chemical composition of the earth's crust, the geological process of forming minerals, the paragenetic Association of minerals and the associated minerals reflect some phenomena of mineral genesis and typomorphic characteristics of minerals;

The main contents of this chapter 10include the naming principle of minerals and the classification of crystal chemistry of minerals;

The main contents of this chapter 11include the crystal chemistry, physical properties and genesis of natural metal and natural nonmetal (diamond, graphite and natural sulfur) sulfides; Representative sulfide minerals; The crystal chemical and physical properties of oxides and hydroxides and their origin; Typical oxide and hydroxide minerals.

The main contents of this chapter 12include the chemical composition, crystal chemical characteristics, physical properties, genesis and classification of oxygen-containing salts, crystal structure types of silicates and their relationship with physical properties of minerals, structure and analysis methods of clay minerals in layered silicates; The crystal structure and physical properties of carbonate and sulfate; Physical properties of other oxygen-containing salts; It is a representative mineral containing oxygen.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Process assessment is composed of attendance, classroom performance and homework performance, in which attendance and classroom performance accounted for 10% and homework performance accounted for 20%.

The result examination (70%) was closed book examination.

Writer: JinHongbo

Reviewer: Shen Yulin

Approver: Liu Zhixin

# Syllabus for《Crystal Optics and Optical Mineralogy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05557 | Course Nature | Major Main Courses |
| Faculty | School of Resoueces and Geosciences | Semester | Third Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The main contents of this course are principles of crystal optics, the optical properties of crystals under three polarizing systems, and the systematic identification of transparent mineral under polarizing microscope. After studying of this course, the basic theory of crystal optics，trial method of polarizing microscope and measurement methods of crystal optical properties under single polarization, orthogonal polarization and cone polarization systems will be learned by students.

The main contents of this chapter 1 include the basic concepts of crystal optics and optical mineralogy, and the research contents and methods of crystal optics.

The main content of this chapter 2 includes the the structure and composition of polarized light microscope, single polarized light device and characteristics;Crystallization behavior and section morphology of minerals, cleavage of minerals, measurement of cleavage Angle;Color, polychromatism, and absorbability of minerals;Mineral projections and refractive index.

The main content of this chapter 3 includesthe entry and debugging method of the orthogonal polarized optical system.Interference of white polarized light;Complementary colour rules and the use of complementary colour devices;Observation and determination of optical properties of crystals under orthogonal polarizer.

The main content of this chapter 4 includesthe contents and methods of systematic identification of mineral flakes.Optical properties of common rock-forming minerals.

2. Course Examination

Course total score = process assessment score × 20% + final exam score × 80%.

Writer: Xiaoli Zhang

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Magmafic and Ｍetamorphic Petrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05558 | Course Nature | Main major course |
| Faculty | School of Resources and Environmental Sciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Through the study of this course, students can be familiar with the basic theory of petrology. Master the classification and naming methods of magmatic rocks and metamorphic rocks, systematically identify the mineral composition, microstructure and structure of common rocks and be able to name them accurately; Basic knowledge of the genesis of magmatic rocks and metamorphic rocks and the methods of extracting relevant geological genetic information from rock slices; To develop students' theoretical analysis ability and problem-solving ability in related fields.

Combined with relevant course systems and graduation requirements for students, three course objectives are set to support different graduation requirements indicator points respectively .

Objective 1: To master the mineral composition, structure and structure, occurrence, classification and nomenclature of magmatic rocks and metamorphic rocks. To master the identification methods and skills of magmatic rocks and metamorphic rocks. (Graduation Requirements 1-3)

Objective 2: To master the petrogenesis of magmatic rocks and metamorphic rocks and the methods of extracting relevant geological genetic information from the corresponding rock slices. (Graduation Requirements 2-1)

Objective 3: to understand new research methods and new advances in petrological content. Cultivate students' theoretical analysis ability and application research ability, and have innovative consciousness and ability. Cultivate students' ability to engage in scientific research and work in resource exploration, engineering geology, mine geology and related fields. (Graduation requirement 4)

Objective 4: To cultivate students' professional awareness of resources and environmental protection; Have a clear understanding of the sustainable development strategy of resources (energy), and establish a strong sense of responsibility for The Times. (Ideological and political objectives of the course)

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Xiaojuan Yao

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Sedimentary Petrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05559 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | None |

1. Course Introduction

The course has the characteristics of highpracticality, comprehensiveness, and intersection. Through the study of this course, students can master the basic theories and knowledge of sedimentary petrology, graspthe ability of theoretical analysis and application in geological field, strengthen the consciousness of subject innovation, and cultivate the ability of independent learning and lifelong learning. The goal of this course is to lead students to get more professional knowledge and skills, and adapt to the development of present geosciences.

The main contents of this chapter 1 include the source, transport, sedimentation and diagenesis of sediments; the classification and nomenclature of sedimentary rocks.

The main contents of this chapter 2 include the color, chemical and mineral composition,texture, and structure (sedimentary structure) of sedimentary rocks.

The main contents of this chapter 3 include the general characteristics of coarse-grained clastic rocks (conglomerates, breccias, and mictites), the classification and nomenclature of coarse-grained clastic rocks based on textural, compositional and genetic characteristics, and the common types of coarse-grained clastic rocks; the general characteristics of sandstones, the classification and nomenclature of sandstones based on textural and compositional characteristics, and the main types of sandstones; the general characteristics, classification and nomenclature of siltstones and argillaceous rocks.

The main contents of this chapter 4 include thegeneral characteristics, basic classification and nomenclature of carbonate rocks; the general characteristics of limestones, the classification and nomenclature of limestones based on mineral component and texture, and the genetic mechanism of limestones; the general characteristics, classification and nomenclature, main types and genetic mechanism of dolomites; the general characteristics, classification and nomenclature, main types and genesis of siliceous rocks; the general characteristics and genetic mechanism of other authigenic sedimentary rocks (such as evaporitic, phosphorous, aluminous, and ferric rocks), coal, oil shale, and petroleum.

The main contents of this chapter 5 include the key points, methods and means of field observation of sedimentary rocks; the key points, methods and means of laboratory research on sedimentary rocks.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Zhuangfu Li

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Sedimentology and Lithofacies Paleogeography》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05560 | Course Nature | Major courses |
| Faculty | School of Resources and Geoscience | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

It mainly covers the recent research progress and development trend for sedimentology, sedimentary facies symbol , all kinds of sedimentary facies and sedimentation, controlling factors of sedimentary and reconstruction and analysis on paleogeography; through this course, students are expected to master the fundamental theories and elementary knowledge for sedimentary environment , sedimentary facies, sedimentary models; preliminary grasping the distinction for primary symbols of sedimentary facies , common sedimentary types and characteristics for energy basins; building the views of time and space for sedimentary system distribution, preliminary mastering fundamental methods and skills for analysis on sedimentary facies and paleogeography reconstruction, knowing that recent research progress and development trend of sedimentology.

2. Course Examination

This course adopts a combination of process assessment and final exam. The final grades of the course are comprehensively determined by the usual results (including attendance and usual performance), homework, classroom seminars, and final exam results. Normal grades account for 10% of the total grade, homework grades for 10%, classroom seminars for 20%, and final exams for 60%. Teachers can also adjust the proportion of each part of the assessment content, but the proportion of the final exam is not less than 40%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Yulin Shen

Reviewer: Yinghai Guo

Approver: Zhixin Liu

Course Code：M05561

# Teaching Quality Standards of Exploration and Evaluation of Mineral Resources

Total Periods: 32 Credits: 2

The course of mineral resources exploration and evaluation is the main course; It is suitable for resource exploration engineering. This course mainly introduces the technical means of geological exploration of mineral resources, the division of exploration stages, the objectives and requirements of each stage, the division of exploration types, engineering layout and construction management, the calculation and evaluation of resource reserves, the technical and economic evaluation of mines, the knowledge and technology of resource management and mining right evaluation and management. And can use the basic theory to solve complex engineering problems such as mineral exploration, in order to adapt to the new situation of deep prospecting, hidden mineral exploration technical requirements, training related fields of mineral resources exploration and evaluation of talent needs.

1. Course Objectives

General teaching objectives: through the study of this course, students will be familiar with the relevant specifications and regulations, better master the basic theory of mineral resources occurrence and distribution and the geological exploration technical means of related mineral resources, and focus on solving practical engineering problems, especially engineering layout and construction management, reserves calculation and mine technical and economic evaluation, And can flexibly use basic theories and methods to solve complex engineering problems such as mineral exploration.

Course objective 1: master the basic concepts, basic knowledge, basic theories and basic research methods of mineral resources exploration and evaluation（ Supporting the graduation requirements of this major (1-3)

Course objective 2: according to the different minerals and stages of exploration, be able to correctly use different technical means and sequence; according to the different minerals and stages of exploration, be able to master the layout methods and methods of exploration engineering, construction management, reserves calculation and evaluation, and be able to master geological logging, exploration design, reserves calculation and geological report preparation.Supporting the graduation requirements of this major (6-1)

Course objective 3: to be able to master the methods of economic and technical evaluation of mineral deposits, mineral resources exploration management, reserves management, mineral resources laws and regulations, data collection management and information system establishment. Understand the rights and obligations of exploration right holders, the daily work procedures of application and approval, and the evaluation methods and contents of mining rights.Supporting the graduation requirements of this major (11-2)

Teaching objective 4: integrate the professional quality education of energy security and the importance of resources in the national economy into the curriculum, cultivate students to establish a correct world outlook and values, establish their sense of social responsibility and sense of responsibility, educate students to be realistic and pragmatic, forge ahead, and make their own contributions to China's resource exploration and sustainable development. Curriculum (ideological and political teaching objectives.

2. Course content, requirements and period distribution

Main course content (If there is only this section available in Part II, please delete the number designation“1”.)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Chapter | Content and requirements | Period | Remarks |
| 1 | Chapter 1  Coal resources / reserves and mining technical conditions | To master classification and classification of coal reserves  To master comprehensive evaluation of geological, hydrological and engineering conditions of mining and other beneficial minerals | 2 |  |
| 2 | Chapter 2  Division of geological exploration procedures and stages | To master exploration procedures, requirements for exploration and engineering reserves at different stages. Reserves / resources estimation | 3 |  |
| 3 | Chapter 3  Technical means of mineral prospecting and exploration | To master the methods and requirements of remote sensing geological survey, geological mapping, Mountain Engineering, drilling, geophysical exploration and well logging | 2 | Class assignment: 0.5  After the class: 1.5 |
| 4 | Chapter 4  Preliminary investigation | To master objectives, tasks and requirements | 1 |  |
| 5 | Chapter 5  Investigation and exploration | To mater the purposes, tasks and requirements of the phase, the basic principles, forms and methods of the project layout, the classification and division of the reserves, the purpose, technical requirements and methods of sampling requirements. | 4 | Class assignment: 1  After the class: 2 |
| 6 | Chapter 6  Technical and economic evaluation of coal bed | To master working procedure; feasibility study of mineral exploration  To get familiar with the evaluation indicators and methods; can calculate the internal rate of return and other parameters. | 2 | Class assignment: 0.5  After the class: 2 |
| 7 | Chapter 7  Mineral resources management | To master laws and regulations on mineral administration; mining right management; mining right evaluation method. | 4 |  |
| 8 | Chapter 8  The construction and management of geological logging in exploration engineering | To master exploration project management; the original geological logging exploration project, such as the form and the preparation method of the bottom contour. | 4 | Class assignment: 0.5  After the class: 2 |
| 9 | Chapter 9  Geological conditions of ore deposits | To master the purpose and task of prospecting, geological conditions, such as magmatic rock, lithology and other conditions | 2 |  |
| 10 | Chapter 10  Ore deposit prospecting and information | To master distribution law of time; spatial distribution law. | 2 |  |
| 11 | Chapter 11  Technical means of metal deposit exploration | To master gravel prospecting method;  To master placer prospecting method;  To master geochemical prospecting method;  To master gravel prospecting method;  To master comprehensive prospecting method; | 2 |  |
| 12 | Chapter 12  Overview of unconventional oil and gas exploration | To know about the basic methods of shale gas exploration;  To know about the basic methods of CBM exploration; | 2 |  |
| 13 | Review |  | 2 |  |
| Total | |  | 32 |  |

3. Curriculum ideological and Political Design

1. The introduction part guides students to correctly understand the development and research status of deep prospecting in China, and adds positive energy topics in the teaching process to enhance students' understanding of China's resource security and enhance their sense of responsibility.

2. Professional quality education runs through the whole process of the course, teaching students to abide by professional ethics and have professional ethics in the explanation of professional knowledge and skills.

3. In the chapter of introduction, guide students to pay attention to the current situation of energy development and utilization in China, and cultivate students' sense of mission of environmental protection.

4. Teaching staff

Course leader: Teacher with doctor degree. A/Professor or Professor.

Team members: The teachers should be lecturer.

5. Teaching materials and references

Coal geological exploration and evaluation

Mineral deposit prospecting technique

6. Teaching organization

1. Teaching ideas

This course is a main course, involving coal geology and exploration, metal and nonmetal, unconventional natural gas exploration. It introduces the exploration technology and engineering layout principle, reserves and economic and technical evaluation to students. The main content should follow the "modern" and "system" principle. It will meet the needs of different mineral exploration geological exploration unit.

2. Teaching strategies

This course emphasizes practicality and openness. The curriculum content closely combined with production practice. Teachers should have six months to one year of geological exploration work experience or participated in geological exploration and scientific research activities.

3. Teaching methods

This course adopts the teaching method of classroom teaching, classroom discussion and video teaching. In the teaching, raises the question, how solves the question the method to carry on the teaching; at the same time, in the classroom, gives full play to the student initiative, carries on the discussion, the question and so on the way. In order to improve teaching effect.

4. Teaching venues and facilities

The classroom teaching needs the multimedia classroom, the future may carry on the three dimensional simulation animation, carries on the teaching activity.

5. Teaching services

The teacher will give discussion in the classroom and provide answering service to students to assign homework. Homework should be combined with the progress of the course work should be carried out; as far as possible all the homework correcting, and timely comments. The important contents of the classroom assignment or homework, as usual scores included in the total score.

7. Course assessment

The course adopts the combination of process assessment and final open book examination, and the score is composed of usual score (30%) and final exam score (70%). The final examination questions mainly include brief answer, calculation, reading and drawing comprehensive analysis, which correspond to the achievement of each course goal (Table 5).

8. Notes

1) The teaching quality standard of this course is also applicable to other undergraduate majors of non resource exploration engineering.

2) The change of teaching quality standard of this course should be proposed by the person in charge of the course and discussed and approved by the department meeting organized by the person in charge of the major.

3) After the end of the course or the main content of the course, the course design will be arranged for one week.

Made by: Wu Li & Chao-Yong Wang

Examined by: Xiao-Zhi Zhou

Approved by: Zhi-Xin Liu

# Syllabus for《Energy geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05563 | Course Nature | Major Professional Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource | - |

1. Course Introduction

This course deeply integrates the professional basic knowledge of traditional coal geology, petroleum geology and natural gas geology to form a new undergraduate professional knowledge structure and system of energy geology. Through the study of this course, students will be able to master the relevant knowledge of the origin of fossil energy minerals, the basic properties of fossil energy minerals and the geological carrier of fossil energy. to understand the distribution law of fossil energy minerals, evaluation methods, exploration and development trends at home and abroad and related principles and policies of fossil energy exploration engineering, and to establish a relatively complete and systematic basic knowledge system of fossil energy geology. Lay the foundation for the course study of resource exploration and comprehensive evaluation methods. The basic theory, analysis and testing means and technical methods related to fossil energy can be used to solve complex geological and engineering problems in the process of fossil energy exploration and development.

The course includes the following four parts: the origin of fossil energy minerals, the basic properties of fossil energy minerals, the geological carriers of fossil energy minerals and the distribution and evaluation of fossil energy minerals.

The main contents of this chapter 1 include the basic concept and classification of energy, the trend of energy supply and demand and future solutions, fossil energy and energy geology, the main contents of this course and its relationship with other disciplines.

The main contents of this chapter 2 include the source of sedimentary organic matter, the formation of sedimentary organic matter, the material composition of modern sedimentary organic matter, the accumulation and distribution of sedimentary organic matter.

The main contents of this chapter 3 include the macroscopic sedimentary characteristics of sedimentary organic matter, the micropetrological characteristics of sedimentary organic matter, and the petrological research methods of sedimentary organic matter.

The main contents of this chapter 4 include the electromagnetic properties of sedimentary organic matter, the mechanical properties of sedimentary organic matter, the spatial structure properties of sedimentary organic matter, the surface physical and chemical properties of sedimentary organic matter, and the diffusion and percolation properties of sedimentary organic matter.

The main contents of this chapter 5 include the types of elements and organic compounds in sedimentary organic matter, the chemical composition of aggregated organic matter, the chemical composition of dispersed organic matter and kerogen, the chemical composition of crude oil, and the chemical composition of natural gas. Advanced examples within the energy industry.

The main contents of this chapter 6 include the evolution stages and signs of sedimentary organic matter, the evolution products of sedimentary organic matter, the geological-geochemical mechanism of the evolution of sedimentary organic matter, and the types of evolution of sedimentary organic matter.

The main contents of this chapter 7 include the basic characteristics of sedimentary basins, the types of sedimentary basins, energy basins and their basic characteristics, sedimentary filling characteristics and processes of the basin.

The main contents of this chapter 8 include the pore-fracture system of the energy geological carrier, the fluid saturation of the energy geological carrier, the diffusivity and permeability of the energy geological carrier, and the surface physical and chemical properties of the energy geological carrier. fluid pressure of energy geological carrier.

The main contents of this chapter 9 include coal (reservoir) and its roof and floor strata, clastic reservoir and its development characteristics, shale (mudstone) reservoir and its development characteristics, carbonate reservoir and its development characteristics, caprock and source-reservoir-cap assemblage.

The main contents of this chapter 10 include coal bed and its basic types, coal quality and coal classification, oil and gas reservoirs and their basic types.

The main contents of this chapter 11 include the mode and type of basin transformation, the geological unit of fossil energy mineral accumulation, the law of regional accumulation and distribution of fossil energy in China, the characteristics and evaluation theory of fossil energy mineral resources.

2. Course Examination

The examination of this course consists of three parts: peacetime performance, extracurricular homework and final examination. the scoring standard is 100%, which is comprehensively evaluated according to proportion. Among them: normal grades (attendance + classroom performance + classroom notes + classroom tests) account for 30%, extracurricular homework scores account for 20% (popular science / science fiction papers, or oil and gas migration / development of animation, or professional essays / book reports, etc., can be substituted for each other, animation time is not less than 1 minute, papers / reading reports are required to be no less than 3000 words, references are not less than 10), and the final open-book exam scores account for 50%.

The final score is given on a percentile basis, with 60 as a pass.

Writer: Caifang Wu

Reviewer: Xuehai Fu

Approver: Zhixin Liu

# Syllabus for《Regional Geology and Tectonics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05564 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course “Regional geology and tectonics” is a comprehensive geological course. Its prerequisite courses are Structural Geology, Mineralogy and Petrology and Stratigraphical Paleontology. This course is applicable to the major of resource exploration and engineering. Through the study of this course, students are expected to master the basic theory and research methods of Regional Geology and Tectonics, to broaden students' ideas and vision, to cultivate students' ability to use the knowledge of related disciplines, and to analyze and explain the geological problems of regional structure and regional geological evolution history. The goal of this course is to cultivate students' abstract generalization ability, logical reasoning ability, spatial imagination ability and self-study ability, especially the ability to analyze and solve practical problems by comprehensively using the learned knowledge.

This course includes the traditional tectonics theory represented by geosyncline and platform theory, the modern tectonic theory represented by plate tectonic theory, the basic and up-to-date approaches to study the tectonics, the frontier researches and the hot topics of the tectonics, and the tectonic evolution history and characteristics of China.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Wang Ruirui, Ju Wei

Reviewer: Wang Jiyao

Approver: Liu Zhixin

# Syllabus for《Ore Deposit Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05565 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course has the characteristics of strong practicality and comprehensiveness. Through the study of this course, students can master the basic concepts, knowledge and theories of ore deposit geology, be familiar with the research methods of ore deposit geology, be able to use these knowledge and methods to summarize the geological characteristics of ore deposit, such as the shape and occurrence of ore body, ore fabric and grade, and analyze the formation conditions of magmatic rock, geological structure and stratum lithology, so as to lay the foundation for mineral exploration and design. Understand the natural and social attributes of mineral resources, be familiar with the current situation of mineral resources in China and world wide, establish a correct concept of mineral resources, and cultivate students' sense of responsibility and mission. Recognize the dialectical relationship between the development and utilization of mineral resources and environmental protection, and establish the concept of "green mining".

The course consists of three parts.

The main contents of part1 includes the research object, research contents,research methods, history and trend of ore deposit geology.

The main content of part 2 includes the basic concepts and basic theory of ore deposit geology, such as the shape and occurrence of ore body, the structure and structure of ore, the grade and grade of ore, the basic theory of mineralization and the classification of ore deposits.

The main content of part 3 includesthe basic characteristics, formation conditions, mineralization and typical deposit examples of different genetic types of deposits.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%. The process assessment consists of attendance rate, classroom questioning and in class test. Classroom attendance rate is mainly achieved through the "check-in" function of the learning link or rain classroom platform; Classroom questions are randomly asked according to students' attendance; The in class test is carried out in the course of class through the learning or rain classroom platform. The final exam score accounts for 60% of the total score.

Writer: Lijun Jiang

Reviewer: Chongtao Wei

Approver: Zhixin Liu

# Syllabus for《Digital Geology B》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05566 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | The Sixth Semester |
| Class Hours | 16 | Credit | 1.0 |
| Extracurricular hours | 0 | Online Resource | 0 |

1. Course Introduction

Through the study of this course, the students can master the basic theories and methods of digital geology and the application of digital geology methods in Geosciences, and further cultivate their logical thinking ability and the ability of quantitative analysis of geological data by applying the theories and methods of digital geology.

The main contents of this course include: common data multivariate statistical methods, such as regression analysis (including univariate linear regression analysis, multivariate linear regression analysis and stepwise regression analysis), trend surface analysis, cluster analysis, discriminant analysis (including two types of discriminant analysis methods, multi types of discriminant analysis methods and stepwise discriminant analysis methods), optimal segmentation methods of orderly samples, and principles and applications of other digital geological methods.

2. Course Examination

Course total score = process assessment score × 20% + final exam score × 80%.

Writer: Chen Yuhua

Reviewer: WangJilin

Approver: Liu Zhixin

# Syllabus for《Mine geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05567 | Course Nature | Major courses |
| Faculty | School of resources and Earth Sciences | Semester |  |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The objective of teaching: through the study of this course, students can master the application of geological theories or principles in mine production and the relevant geological professional skills required by mine production, be familiar with the basic working methods of mine geology, and understand the development status and trend of mine geology. It can comprehensively use the principles and methods related to mine geology to solve the scientific and geological engineering technical problems encountered in the mine life cycle, including mine geological exploration, mine production and mine closure. It can identify, analyze, evaluate and solve the impact of coal based fossil energy exploration engineering practice on society and environment, so as to achieve the knowledge integration of the major for graduates It is the training goal of the construction requirements and the ability to solve complex problems.

The main teaching contents are as follows.

Table 1 Main teaching contents

| Serial number | Chapter | Contents and requirements | Class hours | remarks |
| --- | --- | --- | --- | --- |
| 1 | Introduction | Know well: The significance, purpose and task of mine geological research, the stage division, research status and development direction of mine geological work. | 1 |  |
| 2 | Common production geological problems | Master: The theoretical principle and analysis method of production geological problems such as mine structure, coal thickness change, magma intrusion, karst collapse column, etc. | 6 |  |
| 3 | Coal mine safety geology | Master: The theoretical principle and analysis method of safety geological problems such as gas, coal spontaneous combustion, coal dust, ground temperature, etc. | 4 |  |
| 4 | Tunnel engineering geology | Master: The engineering geological characteristics of surrounding rock, the analysis and evaluation of surrounding rock stability.  Know well: The dynamic geological phenomenon of the mine. | 2 |  |
| 5 | Coal mine environmental geology | Master: Coal mine environmental geology research content, coal mine environmental pollution type and its harm.  Know well: Coal mine environmental monitoring and quality evaluation method, coal mine ground collapse disaster principle and control measures. | 2 |  |
| 6 | Mine geological mapping | Master: The drawing methods of common mine geological maps, such as geological section map, contour map of coal seam floor, geological map of horizontal section, cross line of broken coal, etc. | 6 | The class hours of experiment is 8 |
| 7 | Geological exploration and logging | Master: The basic methods of geological logging, geological data sorting and roadway section mapping are introduced.  Know well: The types and technical means of mine geological exploration. | 2 |  |
| 8 | Resource / reserve management | Master: Coal resources / reserves classification standard, mine reserves management and "three quantity" management mode. | 1 |  |
| Total | |  | 24 |  |

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Wang Jilin

Reviewer: Jiang Bo

Approver: Liu Zhixin

# Syllabus for《Mine Geological Environment and Remediation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05569 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course of mine geological environment and remediation is the main major course of resource exploration engineering; Its prerequisite courses are general geology, structural geology, hydrogeology and engineering geology. It is suitable for undergraduates majoring in resource exploration engineering, geological engineering, mining engineering and environmental engineering. This course mainly introduces the related concepts, research contents and methods of mine geological environment, the causes, types, hazards and main characteristics of mine environmental geological problems, and the methods and treatment measures of mine environmental geological dynamic monitoring and protection. Through the study of this course, students can understand the causes of mine environmental geological problems, master the methods of mine environmental geological evaluation, dynamic monitoring, protection and governance, and cultivate the ability of students to use the knowledge to compile mine environmental geological maps and analyze practical problems, so as to lay a solid foundation for future mineral resources development and mine geological environmental protection.

The main contents of this chapter 1 includes the concept and problems of mine environment and mine geological environment; the research content and thinking of mine environmental geology.

The main contents of this chapter 2includes the general situation of mineral resources and the present situation of development and utilization in China; the main mining methods of solid mines; environmental impact of mining.

The main contents of this chapter 3includes the classification and harm of mine environmental geological problems, and the leading factors of mine environmental geological problems; the main characteristics of mine environmental geological problems, monitoring and evaluation methods of mine environmental geological problems.

The main contents of this chapter 4includes the zoning method of mine environmental problems remediation, the laws and regulations of mine environmental remediation; the engineering measures of mine environmental geological problems remediation, mine geological environment protection countermeasures.

The main contents of this chapter 5includes the types, distribution and utilization potential of abandoned mines in China; methods, problems and key technologies of utilization of abandoned mines.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Zhou Xiaozhi

Reviewer: Wang Wenfeng

Approver: Liu Zhixin

# Syllabus for《Fluid mechanics in porous medium》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05570 | Course Nature | Professional elective courses |
| Faculty | School of Resource and Geosciences | Semester | First Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource | None |

Course Introduction

Fluid mechanics in porous medium is a major course for studying fluid flow principle in the porous medium. The objective of this course is to provide the understanding of the oil, gas, and water transportation characteristics and also grasp the method to establish the fundamental equations of fluid seepage. At last, the students will have the ability to use the fluid mechanics in porous medium to establish the mathematical equations to solve the kinds of seepage problems.

Course Examination

The evaluation mode of the course combines the process examination (40%) and the final examination test (60%). Teachers can adjust the proportion of each part of the assessment content. The final score is given according to the percentage system and 60 points means pass. Closed-book exam.

Writer: Hao Shuqing

Reviewer: Wu Caifang, Zhou Xiaozhi

Approver: Liu Zhixin

# Syllabus for《Introduction to New Energy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05571 | Course Nature | Main major course |
| Faculty | School of Resources and Geoscienc | Semester | 5 |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 0 | Online Resource | Sustainable Energy, MIT network open course |

1. Course Introduction

Through this course, students can understand new development of energy area, cultivate understanding and development interest of new energy system, grasp basic knowledge of new energy, know international and domestic possession of resources and utilization status, deepen development, transformation, and basic utilization methods of these energy. Students can also deeply understand the basic concept of sustainable development and energy development trend, focus on shale gas, tight sandstone gas and other reservoir characteristics and evaluation methods; and grasp the location characteristics and the basic principle of water, nuclear, ocean, solar energy. This course is bilingual education, and it can make students understand new development tendency of international new energy area and lay the foundation for opening the international vision.

The main contents of this chapter 1 include new energy and related basic concepts, the current energy development trend both in China and world, the newest tendency of new energy technology and the course content system and research methods.

The main contents of this chapter 2 include the basic concepts of shale gas, shale gas resource and distribution, shale gas resource evaluation content and process, the development process, and the development course and status of shale gas exploration and development.

The main contents of this chapter 3 include the basic concepts of tight sandstone gas and coal measure gas, tight sandstone gas and coal measure gas resources and distribution, the basic characteristics and resource evaluation contents of tight sandstone gas and coal measure gas and the development, and the utilization status of tight sandstone gas and coal measure gas.

The main contents of this chapter 4include the basic concepts of natural gas hydrate, natural gas hydrate resource and distribution and the formation cause of natural gas hydrate.

The main contents of this chapter 5include the present situation and prospect of solar energy utilization, the utilization mode, basic theory and site selection of solar energy, and the storage technology of solar energy.

The main contents of this chapter 6include the basic concepts and present situation of wind energy utilization, the formation of wind and the influence factors of wind strength, the wind energy utilization, and the fan power generation.

The main contents of this chapter 7 include the basic concepts and the utilization of hydro energy in China, the power generation principle, operation mode and type of hydropower station, and the characteristic of site selection for hydro energy utilization.

The main contents of this chapter 8 include the basic concepts of marine energy and its utilization in China, the utilization of marine energy, the national marine strategy, and the characteristic of site selection for marine energy.

The main contents of this chapter 9 include the basic concepts and the development and utilization status of geothermal energy, the source and distribution characteristics of geothermal energy, the utilization of geothermal energy, and geothermal types and characteristics.

The main contents of this chapter 10 include the basic concepts of nuclear energy, the development of nuclear energy in China and world, the main uses, classification and composition of nuclear reactors, and the production and treatment of nuclear waste.

The main contents of this chapter 11 include the basic concepts and the development and utilization status of hydrogen energy, the chemical and physical properties of hydrogen and hydrogen industrial preparation and store methods.

The main contents of this chapter 12 include the concepts of biomass energy, utilization status,potential and trend of biomass energy, and the main utilization ways of biomass energy.

The main contents of review and discussion include carrying out class report discussion, each group report speech, class discussion and teacher comments.

2. Course Examination

Course total score = usual performance (including attendance and performance) × 10% + homework × 10% + class discussion × 20% + final exam score × 60%.

Writer: Shangbin Chen

Reviewer: Shuxun Sang

Approver: Zhixin Liu

# Syllabus for《Unconventional Natural Gas Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05572 | Course Nature | Major Courses |
| Faculty | School of Resources and Geosciences | Semester | 6th Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | - | Online Resource | - |

1. Course Introduction

Unconventional Natural Gas Geology is the main course of Resource Exploration Engineering. The preparatory courses are General Geology, Fundamentals of Sedimentology, Structural Geology, Hydrogeology, Geochemistry, Geophysical exploration.

This course mainly focuses on coalbed methane（CBM）, taking into account tight sandstone gas and shale gas. The main contents of the lecture include: basic concepts of unconventional natural gas, physical characteristics of CBM reservoirs, CBM reservoir fluid systems, CBM storage Gas-bearing properties, CBM exploration evaluation technology, basic CBM development geological theory, tight sandstone gas and shale gas reservoir physical properties, enrichment laws and resource evaluation technologies, etc.

Through the study of this course, students can use these theories and methods to solve related geological problems in unconventional natural gas exploration and development.

2. Course Examination

This course adopts a combination of process assessment and final examination.

The final examination is a closed-book examination. The process assessment is composed of homework and class attendance accounting for 30% of the total score, and the final exam accounts for 70% of the total score.

Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Zhaobiao Yang

Reviewer: Caifang Wu

Approver: Zhixin Liu

# Syllabus for《Basic Geothermics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05573 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geoscienc | Semester | 6 |
| Class Hours | 16 | Credit | 1.0 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Through this course, students can master the basic theoretical knowledge and research methods of geothermology, and understand the heating factors, characteristics, types and distribution of geothermal resources in major oil and gas bearing basins in China. Students can also master the basic methods and techniques of geothermal resources exploration and evaluation, enrich their basic knowledge of geothermal resources exploration theory, and increase their ability to analyze problems.

The main contents of this chapter 1 include the development history of geothermal science, the present situation and trend of geothermal resources development and utilization at home and abroad.

The main contents of this chapter 2 include the basic concepts of geothermics, the basic mode of heat transfer, and the basic parameters of rock thermophysical properties.

The main contents of this chapter 3 include geotemperature measurement of sedimentary basin, earth heat flow measurement and analysis of heating factors.

The main contents of this chapter 4include the deep geothermal study of sedimentary basin and the thermal structure of lithosphere.

The main contents of this chapter 5include the distribution characteristics of geothermal resources, hydrothermal resources and geothermal resources of dry hot rock.

The main contents of this chapter 6include the geothermal temperature scale,andgeothermal resources exploration and evaluation methods.

The main contents of this chapter 7 include the application of medium and low temperature geothermal resources, and the application of high temperature geothermal resources.

2. Course Examination

Course total score = usual performance (including attendance and performance) × 10% + homework × 20% + final exam score × 70%.

Writer: Chen Shangbin

Reviewer: Wang Jilin

Approver: Liu Zhixin

# Syllabus for《Unconventional energy exploitation project》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05574 | Course Nature | Major Courses |
| Faculty | School of Resources and Geosciences | Semester | 6th Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | - | Online Resource | - |

1. Course Introduction

Unconventional Energy Mining Engineering is the main course of Resource Exploration Engineering. The preparatory courses are General Geology, Fundamentals of Sedimentology, Structural Geology, Coal Bearing Gas Geology, and Energy Geology.

This course covers the main classification, basic characteristics, mainstream exploration techniques and development processes of unconventional energy sources. Main contents include: the type of unconventional energy, development potential and distribution characteristics, history, current situation and prospect of exploration and development at home and abroad, seismic recognition and comprehensive prediction for unconventional energy, geophysical well logging evaluation method, geochemical prospecting, unconventional energy development plan, the well pattern optimization, reservoir simulation and evaluation technology, drilling and well completion and reservoir capacity renovation and mining process, the typical instance of unconventional resources exploration and development at home and abroad.

It could help students understand and preliminarily master the process and mainstream technology of unconventional energy exploration and development. It is helpful to analyze practical engineering problems. This course can lay a good foundation for further study of resources exploration and development related courses in the future.

2. Course Examination

This course adopts a combination of process assessment and final examination.

According to the course schedule, teachers arrange class seminars, in-class tests and other process assessment. Sminar, attendance and in-class test, and final exam account for 30%, 10% and 60% of the final grade of the course, respectively. Teachers can also adjust the proportion of each part’s grade, but the proportion of the final examination should not be less than 60%.

Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Huazhou Huang, Xiaozhi Zhou

Reviewer: Caifang Wu

Approver: Zhixin Liu

# Syllabus for《Geomorpho1ogy and Quaternary Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05575 | Course Nature | Geomorpho1ogy and Quaternary Geology |
| Faculty | School of Resources and Earth Sciences | Semester | 5th Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course “Geomorphology and Quaternary Geology” is an elective course for the major of resource prospecting engineering. Its prerequisite course is the “General Geology”. This course is applicable to the major of resource prospecting engineering. It mainly covers: (1) the contents, scientific significance and basic questions of the Geomorpho1ogy and Quaternary Geology; (2) the continental geomorphology types, basic features, forming process and mechanism; (3) the features, methods, division, climate changes and sea level variations in the Quaternary Geology; (4) the division and geological events in the China Quaternary. Through this course, students are expected to know well about the surface configuration, the change and development of sediment, main geological hazards, the features of sediment formed in different dynamic process, and have the ability of judging the engineering geology and hydrogeololgy features.

The main teaching contents are as follows.

Table 1 Main teaching contents

| Serial number | Chapter | Contents and requirements | Class hours | remarks |
| --- | --- | --- | --- | --- |
| 1 | Introduction | The research contents of geomorphology and Quaternary geology, the relationship between geomorphology and Quaternary Geology and other disciplines, the role and significance of geomorphology and Quaternary Geology in national economic construction, the development history of geomorphology and Quaternary geology, etc. | 2 |  |
| 2 | Basic problems of geomorphology and Quaternary Geology | Understand the basic elements of geomorphology; Understand the physical basis and dynamic causes of geomorphic formation, understand the distribution characteristics of geomorphology and its relationship with climate, fully understand the concept of "geomorphic process", and understand the development and theory of geomorphology. Understanding quaternary as an important feature of a special geological age and understanding the basic stage of climate fluctuation; Understand paleontological and sediment markers of Quaternary climate change, and understand the relationship between human development history and climate change; Understand the international quaternary division plan. | 4 |  |
| 3 | Main land geomorphic types | This paper mainly introduces the basic characteristics, main types and formation process of slope landforms, flowing water landforms, aeolian and loess landforms, karst landforms, glacial permafrost landforms, ocean and lake deposits, etc. from the perspective of dynamic geology, this paper introduces the Quaternary geological significance of various geomorphic types of sediments, and understands the utilization of different geomorphic characteristics, geological conditions and sedimentary environment It is a basic method to study paleoclimate with different geomorphic and sediment characteristics. | 16 |  |
| 4 | Quaternary Geology | This paper mainly introduces the characteristics and research methods of the Quaternary, the division method of the Quaternary strata, the problem of the lower limit of the Quaternary, the climate change and sea level rise and fall of the Quaternary, the main quaternary stratigraphic divisions in China, and the main geological events of the Quaternary in China. | 10 |  |
| 合计 | |  | 32 |  |

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Wang Jiyao

Reviewer: Wang Jilin

Approver: Liu Zhixin

# Syllabus for《Environmental Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05576 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resource and Geosciences | Semester | Second Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | None | Online Resource | None |

1. Course Introduction

The aim of this course is to enable students to grasp the basic principles, research content and working methods of environmental geology. Moreover, the purpose of this course is enable students to understand the influence of supply and demand of various geological resources and their development and utilization to geological environment, the geological disaster damage to the human environment, the interaction and influence between human environment and geological environment, the relationship of supergene geochemical environment and human health.

The main contents of this chapter 1 include the concepts, research contents, research methods, relations with other disciplines, brief history of development.

The main contents of this chapter 2 include the connotations and basic characteristics of geological environment, environmental geological action, several frontier issues of environmental geology research.

The main contents of this chapter 3 include land resources and land environment problems, the impact of land use on geological environment, land resources protection and sustainable development.

The main contents of this chapter 4 include water resources and geological environment problems, water pollution, the impact of water resources development on geological environment, water resources protection and sustainable utilization.

The main contents of this chapter 5 include mineral resources and their characteristics, mineral resources development and geological environment, mine geological environment governance, water resources protection and sustainable utilization.

The main contents of this chapter 6 include engineering activities and geological environment, urbanization and geological environment, agricultural activities and geological environment, artificial waste disposal and geological environment.

The main contents of this chapter 7 include primary environmental geochemical anomalies and human health, the impact of environmental pollution on human health.

The main contents of this chapter 8 include environmental geology survey, environmental geology evaluation.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Piaopiao Duan

Reviewer: Wenfeng Wang

Approver: Zhixin Liu

# Syllabus for《Disaster Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05577 | Course Nature | Main major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1.Course Introduction

This course is a main major course of Resources Prospecting Engineering; the pre-sessional courses include General Geology, structural Geology, Geochemistry, and Environmental Geology; it is suitable for undergraduates major in Resources Prospecting Engineering and Geological Engineering.

This course mainly introduces theory system and research method of disaster geology, including basic conception, types and distribution of disaster geology, assessment of disasters and benefit evaluation of disaster reduction, as well as countermeasure of reducing disasters. Through the study of the course, students are able to understandsystematically the disaster theory and research methods, and types,distribution characteristics, as well as [occurrence mechanism](http://www.baidu.com/link?url=dPXi1YBCjGmsmduZwFInsxAUKevunaxpgQOBM4afypYIGvjJ5YVzMDrQylSKxncA) of the geologydisasters under the influence of nature force and human activities, making the students capable of resolving the complex engineering problems in coal resources prospecting, based on the basic theory of disaster geology; cultivate students’ high degree of safety awareness, environmental protection awareness and sustainable development concepts, understand and evaluate the impact of resource exploration engineering practices on the environment and sustainable development, and realize the coordinated development of engineering, environment and so-ciety.

2.Course Examination

Course total score=class performance×20%+homework×10%+final exam score×70%.

Writer: Jingjing Liu

Reviewer: Aikuan Wang

Approver: Zhixin Liu

# Syllabus for《Modern Testing Technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05578 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course “Modern Testing Technology” is a main major course of resource exploration engineering professional.Its prerequisite course is physics and physical chemistry.This course is applicable to resource exploration engineering, geological engineering, chemical engineering, environmental engineering majors. It mainly covers large physical analysis instrument testing principle, instrument and the application of key components, instruments and use these large physics analysis instrument of material physical properties, physical and chemical properties test of main experimental technology and testing methods.This course will make students understand and master the analysis method of main analysis instrument principle and information provided by the physical, chemical, understand the basic theory of main analysis instruments, main technical principle, instrument structure, main application technology and development direction. Through this course, not only the necessary theoretical and experimental basis for professional learning, but also can cultivate students in daily life and practice how to make use of modern analytical techniques to analyze and solve the problem of theoretical or practical ability, cultivate students modern scientific research ability.

Through learning of this course, make students understand the research content and the development of modern testing technology, understand the basic principle of testing technology; understand the analysis principle of chromatographic analysis technology and experimental technology; understand and grasp the commonly used element analysis method and its test principle and test technology; master the commonly used mineral (phase) principle and experimental analysis method of test and analysis technology; understand the principle of testing technology of commonly used compounds structure analysis and the experiment technology; understand and familiar with the commonly used basic principle and application of electron microscopic analysis method. Enrich and extend students’ knowledge structure through the course to adapt to the need of modern test and analysis work.

The main content of this chapter 1 is familiar with the modern testing technology research content and the development process.

The main content of this chapter 2 includesthe analysis principle, instrument structure and main parts of the XRD and its application field.

The main content of this chapter 3 includesthe analysis principle, instrument structure and main parts of X-ray fluorescence spectroscopy (XRF) and its application field.

The main content of this chapter 4 includes the principle, instrument structure and main parts of scanning electron microscope (SEM) analysis technology and the transmission electron microscopy (TEM) analysis technology.

The main content of this chapter 5 includesthe analysis principle, instrument structure and main parts of Infrared spectral analysis technology and Raman spectrum analysis technology.

The main content of this chapter 6includes chromatographic analysis technology principle and its basic theory, instrument structure and main parts.

The main content of this chapter 7 includesthe analysis principle, instrument structure and main parts of Mass spectrometry technology (MS) and its application field.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Fengjuan Lan

Reviewer: Wenfeng Wang

Approver: Zhixin Liu

# Syllabus for《Remote Sensing of Environment and Resources》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05579 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course is an overview of the basic principle of remote sensing technology and application. Through the study of this course, students can master the physical basis of remote sensing, remote sensing platform, the image characteristics, the processing of remote sensing digital image, remote sensing mapping, geological principles and methods of deciphering from remote sensing image, geographical remote sensing, geological remote sensing, remote sensing prospecting and the mine environmental remote sensing and so on. The goal of this course is to have a good foundation to continue learning resource exploration engineering courses related to the environmental geology and the earth information science and technology professional direction for the future.

The main contents of this chapter 1 include theconcept of remote sensing, remote sensing classification and system, introduction to remote sensing and the history of remote sensing.

The main content of this chapter 2 includes the concept of radiation, solar radiation, thermal radiation, microwave radiation and scattering, and the radiation effects, including the interactions with the atmosphere and interactions with the earth’s surface.

The main content of this chapter 3 includesthe remote sensing platforms and sensors.

The main content of this chapter 4 includesthe remote sensing digital image processing, atmospheric correction, geometric correction image enhancement and remote sensing cartography.

The main content of this chapter 5 includesthe principle of visual interpretation of remote sensing image and method and procedure of visual interpretation.

The main content of this chapter 6 includesthe remote sensing of environmental resources, such as landform remote sensing, soil remote sensing, vegetation remote sensing, water resources and water environment remote sensing, land resources remote sensing, geological remote sensing.

The main content of this chapter 7 includesthe the basic theory of remote sensing of mineral resources and mine environment and the principle and method of image interpretation.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Ci Hui

Reviewer: WangJilin

Approver: Liu Zhixin

# Syllabus for《Investigation and Evaluation of Environmental Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05580 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Investigation and Evaluation of Environmental Geology is the main course of resource exploration engineering. Its prerequisite courses are general geology, hydrogeology foundation, engineering geology foundation and environmental geology. It is suitable for undergraduates majoring in resource exploration engineering, geological engineering and environmental engineering. This course mainly describes the main contents, working methods, procedures and steps of mine and urban environmental geological survey, the process, methods and relevant laws and regulations of mine and urban environmental geological assessment. Through the study of this course, the students can understand the contents and methods of environmental geological survey, have the basic ability to carry out mine and urban environmental geological survey and evaluation by using multiple information, and lay a solid foundation for mineral resources exploration and development, mine environment restoration and urban environmental survey and evaluation in the future.

The main contents of this chapter 1 includes the concept of mining and urban geological environment and environmental geological problems; the content and thinking of environmental geological survey and evaluation.

The main contents of this chapter 2includes the general situation of China's mineral resources and the current situation of development and utilization, and the causes of mine environmental geological problems; objectives and contents of mine environmental geological survey, laws, regulations and normative documents of mine environmental geological survey; technical methods of mine environmental geological survey.

The main contents of this chapter 3includes the purpose and principle of mine environmental geological evaluation; index system and evaluation method of mine environmental geology evaluation; the content and method of mine environment development trend prediction.

The main contents of this chapter 4includes the current situation and trend of urban development in China, the causes of urban environmental geological problems; objectives and contents of urban environmental geological survey, laws, regulations and normative documents of urban environmental geological survey; technical methods of mine environmental geological survey.

The main contents of this chapter 5includes the purpose and principle of urban environmental geological assessment; index system and evaluation method of urban environmental geology evaluation; the content and method of urban environmental development trend prediction.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Zhou Xiaozhi

Reviewer: Wang Wenfeng

Approver: Liu Zhixin

# Syllabus for《Digital Geology A》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05581 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2.0 |
| Extracurricular hours | 0 | Online Resource | 0 |

1. Course Introduction

Through the study of this course, the students can master the basic theories and methods of digital geology and the application of digital geology methods in Geosciences, and further cultivate their logical thinking ability and the ability of quantitative analysis of geological data by applying the theories and methods of digital geology.

The main contents of this course include: common data multivariate statistical methods, such as regression analysis (including univariate linear regression analysis, multivariate linear regression analysis and stepwise regression analysis), trend surface analysis, cluster analysis, discriminant analysis (including two types of discriminant analysis methods, multi types of discriminant analysis methods and stepwise discriminant analysis methods), optimal segmentation methods of orderly samples, and principles and applications of other digital geological methods.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yang Yongguo

Reviewer: WangJilin

Approver: Liu Zhixin

# Syllabus for《Geographic Information System》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05582 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course is a professional backbone course for resource exploration engineering, geological engineering, geophysics and hydrological and water resource engineering. Geographic Information System (GIS) is a new marginal discipline integrating computer science, geosciences, surveying and mapping, remote sensing, environmental science, space science, information science, management science, etc. This course focuses on the basic concepts of GIS, the mathematical basis of geospatial science, spatial data models, spatial data structure, spatial data organization and management, spatial data acquisition and processing, spatial data query and measurement, basic spatial analysis, digital terrain analysis, spatial statistical analysis, geographical information visualization and its basic applications in geoscience and related disciplines, emphasizing the understanding of GIS theory, technology and application and related software operation skills. To enable students to master the basic skills of GIS-based mapping, spatial analysis and spatial statistical methods, to train students to solve spatial problems, and to have the comprehensive practical ability to solve complex Geological problems using GIS technology.

The main contents of this chapter 1 include the basic concept of GIS, the composition and function of GIS, the relationship between GIS and other disciplines and GIS applications.

The main contents of this chapter 2 include the concept of the earth spheroid, the spatial coordinate system and elevation System, the concept and classification of map projection and commonly used projection systems, projection transformation and map framing.

The main contents of this chapter 3 include conceptual model and logical model of spatial data, spatial data and spatial relationship, raster and vector data structure and vector-raster integrated data structure.

The main contents of this chapter 4 include classification and coding of spatial entities, collection and editing of spatial data, processing of spatial data and analysis and control of spatial data quality.

The main contents of this chapter 5 include spatial data organization and spatial database, the spatial data index, spatial metadata and spatial database on Geodatabase.

The main contents of this chapter 6 include spatial query and measurement, buffer analysis, raster data analysis, spatial overlay analysis, network analysis and digital terrain model (DTM) and digital terrain analysis (DTA).

The main contents of this chapter 7 include visual representation of spatial data, thematic mapping method, multi-scale features and automatic synthesis of spatial data and three-dimensional landscape simulation and dynamic performance.

2. Course Examination

Course total score = regular score × 10% + assignment score × 10% + experiment score × 20% + final exam score × 60%.

Writer: Xi Yantao

Reviewer: WangJilin

Approver: LiuZhixin

# Syllabus for《Resource Information System Design and Application》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05583 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course “Resource Information System Design and Application” is a professional backbone course; It’s prerequisite courses are geographic information system, geoscience database technology, geoscience programming and other courses; This course is applicable to Resources Exploration Engineering. It mainly covers the principle and application of resource information system design, design process and data standards, programming language and development tools, system architecture and software engineering, and through the application examples to guide students to build and complete the network of resource information system design and implementation; through this course, students are expected to understand the theory and method of resource information system design and application, master a variety of resource information system design and development tools and programming language, skilled use of geographic information system software development and implementation of resource information system software and applications. By taking this course, students will not only hold the programming language and development tools. But explore the usage of software to implement the function of resource information system as well. They will learn how to apply those resource information system design and development technologies in resources exploration engineering.

The main contents of this chapter 1 include the introduction to the course syllabus and introduction of course contents.

The main content of this chapter 2 includes the concept of geographic information, spatial data processing and analysis, and the current challenges and future directions.

The main content of this chapter 3 includesthe history of resource information system, components of a resource information system, resource features representation.

The main content of this chapter 4 includesthe concept and process of project and workgroup, communicating in the workgroup, designing an investigation, project management and project documents.

The main content of this chapter 5 includesthe concept and process of requirement of spatial data management, spatial information management, object-oriented database construction, and network database.

The main content of this chapter 6 includesthe concept and process of deploy the data server, resource network database construction, online mapping, resource information visualization representation.

The main content of this chapter 7 includesthe concept and process of big data, cloud computing, wireless sensors network, and visualization

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Yang Hui

Reviewer: Wang Jilin

Approver: Liu Zhixin

# Syllabus for《GeoscienceProgramming》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05584 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 0 | Online Resource | 0 |

1. Course Introduction

This course is for undergraduates in resource exploration engineering. It mainly cultivates students' ability to design geoscience problem solutions by using computer language. Based on modern programming technology, the course adopts case teaching to teach the principles and methods of computer programming for common basic problems of Geosciences by using Microsoft. Net framework and C# advanced programming language. The main teaching contents include: .Net framework and C# language foundation, component programming and implementation, case analysis of geoscience program, etc. Through the study of advanced program language, case analysis and programming practice, students can develop applications for data management, statistical analysis, mathematical calculation, visual expression, algorithm design and other needs in geoscience problems. The course aims at cultivating professional talents for informatization and intelligence of resource exploration, as well as the laying down the foundation for further research.

The main content of this course is consist of five chapters and two programming practices.

Chapter 1 is the introduction to advances of programming frameworks, languages.

Chapter 2 gives the fundamentals of programming language of C# about the data types, programming rules and control sentences.

The main content of chapter 3 includes the basic programming skills such as method and parameter, object oriented, class and struct, especially the debug skills.

The main content of chapter 4 is visual C# programming, which giving the principles of WinForms commonly used controls, file read and write, GDI+ and component programming.

The practice 1 is the C# fundamental programming experiment, mainly consists of concepts usage of namespace, arrays, methods, class etc.

The practice 2 is a comprehensive exercise about visual WinForms and object oriented programming.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: ChenYuhua;Luo Jinhui

Reviewer: Wang Jilin

Approver: Liu Zhixin

# Syllabus for《Gemstone Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05585 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

Course Introduction

The course has the characteristics of strong comprehensiveness. Through the study of this course, students can master the basic concepts andknowledge of gems and jades, master basic characteristics and evaluation criteria of gems and jades, such as diamond, ruby, sapphirebe, jadeite, hetian jade. Be able to use these knowledge to valuate the quality of gems and jades. Be familiar with the resources and genesis of gems and jades, such as diamond, ruby, sapphirebe, jadeite, Hetian jade.

The course consists of three parts.

The main contents of part1 includes thebasic concepts andknowledge of gems and jades, such as classification, naming of gems and jades.

The main content of part 2 includes the basic characteristics, evaluation criteria, distribution and genesis of gems, such as diamond, ruby, sapphirebe, etc.

The main content of part 3 includesthe basic characteristics, evaluation criteria, distribution and genesis of jades, such as jadeite, hetian jade, etc.

2. Course Examination

Course total score = process assessment score × 40% + final essay × 60%. The process assessment consists of attendance rate, classroom questioning and in class test. Classroom attendance rate is mainly achieved through the "check-in" function of the learning link or rain classroom platform; Classroom questions are randomly asked according to students' attendance; The in class test is carried out in the course of class through the learning or rain classroom platform. The final essay accounts for 60% of the total score. Students can choose any kind of gem or jade (non teaching content can be selected), discuss the basic characteristics, authenticity identification, quality evaluation, resource distribution, cause type, cultural connotation of the gem (or jade), print (or handwritten) and submit it. The number of words should not be less than 3000, and should be arranged according to the format of Journal of China University of mining and technology. The number of references should not be less than three.

Writer: Lijun Jiang

Reviewer: Xizozhi Zhou

Approver: Zhixin Liu

# Syllabus for《Tourism Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05586 | Course Nature | Professional Elective Course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource | None |

1. Course Introduction

The course has the characteristics of high practicality, sociality, comprehensiveness, and intersection. Through the study of this course, students can master the basic theories and concepts of tourism geology, understand the relationship between geology and tourism sciences, grasp the ability to excavate tourism resources in geological relics, and establish a scientific view of the earth, resource, environment, and man-earth relationship. The goal of this course is to lead students to adapt to the development of present geosciences and national economy.

The main contents of this chapter 1 include the basic connotation, nature and concepts of tourism geology, the general research contents of tourism geology, the development history, present situation and trend of tourism geology.

The main contents of this chapter 2 include the basic types and corresponding characteristics of tourism geological resources, the tourism value of all kinds of tourism geological resources.

The main contents of this chapter 3 include the concepts of geological processes, the classification of geological processes (internal and external geological processes) and their related characteristics, the genesis, evolution and development of various tourism geological resources related to the internal force geological processes, the formation, evolution and development of various tourism geological resources related to external geological forces.

The main contents of this chapter 4 include the formation mechanism of various tourism geological resources related to engineering geology, and the role and influence of engineering geology in tourism development and design.

The main contents of this chapter 5 include theformation mechanism of various tourism geological resources related to environmental geology/disaster geology, the role and influence of environmental geology/disaster geology in tourism development and design, the view of earth, resource, environment and the relationship between man and earth in the new era.

The main contents of this chapter 6 include thebasic types, spatial and temporal distribution and controlling factors of China's tourism geological resources,examples of typical tourism geological resources in China and their corresponding landscape formation.

The main contents of this chapter 7 include the basic theories and methods of survey and evaluation of tourism geological resources, the basic theories and methods of exploitation, protection and sustainable utilization of tourism geological resources.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Lu Lu

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Coal Mine Gas Preventionand Control》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05587 | Course Nature | Major Elective Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 16 | Credit | 6th |
| Extracurricular hours | - | Online Resource | - |

Course Introduction

" Coal Mine Gas Prevention and Control " is a 16-class professional elective course which mainly focuses on the basic theory application and process parameter design of mine gas ground drainage. The preparatory courses are structural geology and coal measure gas geology. It is suitable for majors such as resource exploration engineering.

This course mainly introduces in situ coalbed methane drainage technology, mining area pressure relief gas drainage bysurfacewells, goaf gas drainage by surface well, underground gas drainage technology. In situ CBM extraction technology includes CBM development geological selection, development well type selection and well pattern layout, drilling and completion technology, logging, well logging, well testing technology, reservoir hydraulic fracturing mechanism and fracturing technology, drainage and production basic theory and drainage technology. The drainage technology of relief gas surface well in mining area includes four aspects: well location and well body design technology, well hole stability theory, drilling and completion technology, drainage and transportation technology. The technology of gas extraction in goaf includes resource evaluation, well location and body design, drilling and completion technology, extraction and transportation technology, etc. The underground gas drainage technology includes four aspects: gas basic parameter test, gas drainage ability evaluation, typical underground gas extraction technology, extraction principle, design and construction, etc.

It can help students master the theories and technologies related to mine gas drainage, and cultivate the ability of process design related to mine gas drainage.

2. Course Examination

The total score of the assessment is 100 points, in which the usual performance (such as attendance, classroom questions, etc.) accounts for 20%, the powerpoint report assessment accounts for 30%, and the final assessment (in the form of open or closed exam) accounts for 50%.

Writer: Huazhou Huang

Reviewer: Caifang Wu

Approver: Zhixin Liu

# Syllabus for《Economics of Mineral Resources》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05588 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geoscienc | Semester | 6 |
| Class Hours | 32 | Credit | 2.0 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The main contents of economics of mineral resources include regional distribution, situation, policy, development strategy of mineral resources，market trade and price tendency of mineral products， economical evaluation and overall arrangement of regional mineral resources， industrial state of mineral resources，using benefit and protect of mineral resources etc. It is its purpose to serve for reasonable use and macro-economic policy decision of mineral resources, so as to increase comprehensively economical and social benefit of mineral exploration.

Economics of mineral resources, which belongs to economics category, mainly concern applied economics including branch economics. Teaching aim of the course is to make students understand the basic knowledge, principle and method of economics of mineral resources, fully recognize the attribute, feature, classification, distribution and national economic meaning of mineral resources, understand international and domestic general situation of mineral resources, master the methods of situation analysis, economy policy decision of mineral resources. The students can know the basic contents and interrelated policy of mineral resources law and regulation, train their economy view and thought way, broaden their knowledge field, lay foundation for training composite person of understand economy and management.

2. Course Examination

Course total score = usual performance (including attendance and performance) ×8% + homework × 42% + final exam score × 50%.

Writer: Chen Shangbin

Reviewer: Zhou Xiaozhi

Approver: Liu Zhixin

# Syllabus for《Spatial Analysis and Modeling》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05589 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 16 | Credit | 1.0 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course “Spatial Analysis and Modeling” is a professional backbone course; Its prerequisite courses are Geographic Information System and other courses; This course is applicable to Resources Exploration Engineering. It mainly covers the spatial analysis and modeling, spatial data mining and intelligent spatial analysis, and through the application examples to guide students to learn and master the basic theory and algorithms, spatial analysis and expression transformation analysis, basic spatial analysis, spatial statistical analysis, digital terrain and visual analysis, spatial data mining and intelligent spatial analysis; Through this course, students are expected to use geographic information system software for spatial analysis to solve the geographical problems, understand the theory and method of spatial analysis and modeling, master the GIS basic spatial analysis functions. By taking this course, students will not only hold the programming language and development tools. But explore the usage of basic functions of spatial analysis software as well. They will learn how to apply spatial analysis techniques to solve practical geography problems.

The main contents of this chapter 1 include the concept of spatial analysis and modeling, s spatial analysis, and the concept of geographic modeling.

The main content of this chapter 2 includes the concept of spatial entities and data structures, the Earth and map projection, and the definition and framework of coordinate system and time system.

The main content of this chapter 3 includesthe differential measurement scale, the geometry and shape measurements, the spatial distribution metrics, spatial data format conversion, space measurement scale conversion and the spatial geographic coordinate system conversion.

The main content of this chapter 4 includesthe concept and process of overlay analysis, buffer analysis, network analysis, raster analysis.

The main content of this chapter 5 includesthe concept and process of overlay analysis, buffer analysis, network analysis, raster analysis. theoretical basis for spatial statistical analysis, deterministic interpolation Act, Statistical interpolation method, exploratory spatial data analysis and spatial regression analysis.

The main content of this chapter 6 includesthe concept and process of digital terrain model, 3D basic terrain analysis, visualization analysis, and 3D landscape analysis.

The main content of this chapter 7 includesthe concept and process of basic information on spatial data mining, spatial clustering, association analysis, classification and forecasting, exceptional analysis.

The main content of this chapter 8 includesthe concept and process of neural network model, fuzzy logic model, genetic algorithms, cellular automata model, fractal analysis, wavelet analysis.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Yang Hui

Reviewer: WangJilin

Approver: Liu Zhixin

# Syllabus for《Scientific Writing》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05590 | Course Nature | Professional Elective Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 8 | Credit | 0.5 |
| Extracurricular hours | 0 | Online Resource | None |

1. Course Introduction

The course has the characteristics of high practicality, comprehensiveness, and intersection. Through the study of this course, students can master the basic knowledge of paper writing, including the classification of scientific papers, the characteristics of various types of scientific papers and writing skills, and relevant technical methods (topic selection method, literature retrieval method, data processing method, etc.). The goal of this course is to lead students to master the writing methods and norms of various types of scientific papers, establish academic moral consciousness, academic legal consciousness and academic quality consciousness, and lay a certain foundation for their future work in production and scientific research.

The main contents of this chapter 1 include the categories and main characteristics of scientific papers, the basic principles of scientific paper writing, the academic ethics, laws and qualities of scientific paper writing, as well as the function of scientific papers.

The main contents of this chapter 2 include the purpose and function of journal paperwriting, the basic structure of the journal paper (title, signature, abstract, key words, introduction, main body, conclusion, acknowledgement, references, etc.), the hierarchy and logical connection among various parts of the journal paper, as well as the content setting and writing methods of each part of the journal paper.

The main contents of this chapter 3 include the purpose and function of dissertation writing, the basic structure of the dissertation (title, signature, abstract, key words, introduction, body, conclusion, acknowledgement, references, etc.), as well as the content setting and writing methods of each part.

The main contents of this chapter 4 include the purpose and function of research report writing,types of common research reports in the geological field, and the structure, content and writing norms of various research reports.

The main contents of this chapter 5 include the common types of scientific research topics and selection methods, the common literature types and retrieval approaches, tools, steps and methods, the data statistic, analysis and processing methods.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Chongtao Wei

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Geological Data Acquisition & Processing》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05591 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course “Geological Data Acquisition & Processing” is resource exploration engineering courses for school of Resources and Geosciences; Its prerequisite course is basic computer courses; This course is applicable for acquisition, processing, storage and analysis of geological data. It mainly covers data sources and characters, basic acquisition and processing of geological data, the theory and basic method of spatial raster and vector data acquisition and processing, data edition, data changing, spatial database, spatial statistics, data interpolation, data visualization; through this course, students are expected to know the characters of geological data and deal with the geological data using suitable method.

This course would make students master the whole knowledge structure of geological data and understand the basic principles and methods of geological data characteristics, establishment, storage, other related work of data and the frontier and the development trend of data processing.

Moreover, this course would use some data processing software (GIS, MATLAB, SURFER), which

can provide strong support for the solving problems.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Chen Yuhua; Ci Hui

Reviewer: Wang Jilin

Approver: Liu Zhixin

# Syllabus for《Geo-data Mining and Machine learning》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05592 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource | 0 |

1.Course Introduction

"Geo-data Mining and Machine learning" is an optional course for undergraduates of resource exploration engineering. This course trains students to extract hidden geological information from huge amount of data using computer language.Hidden information will be extracted by approaches such as statistics, online analysis, information retrieval and machine learning. This course involves theories and approaches of data mining and machine learning, case study of geo-data mining etc. Students will acquire skills to use multiple approaches to extract hidden information from mass data by learning this course. This course aims at training professional talents for informatization of resource exploration and laying the foundation for further research of assessment of mineral resource and prospectivity modeling.

The main contents of this chapter 1 include the concept, function and application field of data mining technology.

The main content of this chapter 2 includes the relationship between statistics and data mining,implementation of pandas based on Python.

The main content of this chapter 3 includesthe basic concepts of machine learning,the concrete process of realizing machine learning scheme

The main content of this chapter 4 includes the concept of classification in data mining, understanding probability model, Bayesian classification, space vector model, etc.

The main content of this chapter 5 includes the concept of regression analysis; Understand the algorithm model and implementation of linear regression, ridge regression, Lasso model and logistic regression mode.

The main content of this chapter 6 includes the basic concept of unsupervised learning in data mining; Understand partition clustering, hierarchical clustering, K-means algorithm, HIERCHICAL clustering algorithm and dimension reduction.

2.Course Examination

Course total score = usual performance score× 15%+assessment score × 15% + final exam score × 70%.

Writer: Zhou Rongfu; Hu Xunyu

Reviewer: Wang Jilin

Approver: Liu Zhixin

# Syllabus for《Reservoir Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05595 | Course Nature | Optional Major Course |
| Faculty | School of resources and geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

This course is a discipline to study the characteristics of rock types, formation conditions, depositional environment, distribution rules, and oil and gas storage performance of oil and gas reservoirs. Through the study of this course, students can understand the construction, diagenetic evolution and structural transformation of oil and gas reservoirs, as well as the macroscopic distribution characteristics of oil and gas reservoirs and the characteristics of reservoir parameters, and train students to use their knowledge to evaluate the quality of oil and gas reservoirs. The ability to scientifically formulate oil and gas exploration plans. Through the study of the content of this course, students will be able to master the basic concepts, basic theories and basic research methods of oil and gas reservoir evaluation, and be able to use basic theories of reservoir geology to solve complex engineering problems such as geology, resources, and energy. This course focuses on the combination of theory and practice, which plays an important role in cultivating students' scientific thinking, enhancing practical skills, improving students' overall quality, and laying the foundation for the follow-up courses.

The teaching objective of this course is based on the content of the course, so that students can understand and master the relevant concepts of oil and gas reservoir evaluation, be familiar with the basic theories of reservoir geology, understand the construction, diagenetic evolution and structural transformation of oil and gas reservoirs, and The macroscopic distribution characteristics and reservoir parameter characteristics of oil and gas reservoirs. To enable students to master the scientific thinking mode of reservoir geology, cultivate technical talents with core socialist values and adapt to the needs of social, economic, and scientific and technological development in the new era, and establish a correct outlook on the earth, which will help in the future in geology and related fields The work carried out lays the foundation.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yang Wang

Reviewer: Shangbin Chen

Approver: Zhixin Liu

# Syllabus for《Geological Computer Mapping》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05596 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geoscience | Semester | 6th Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course is a professional elective course; Its prerequisite courses are general geology and structural geology; It is suitable for the major of resource exploration engineering; This course mainly introduces the basic knowledge of geological map, understanding of different types of mine map, the introduction and drawing principle of computer geological mapping, the application of AutoCAD in geological mapping, and drawing examples combined with geological maps. Through the study of this course, students can understand the basic knowledge and common types of geological maps, the basic concepts and theories of computer geological mapping, the basic drawing and editing commands of AutoCAD, be familiar with the basic principles and skills of AutoCAD drawing geological maps, and understand the common software and application methods of geological aided drawing, To enable students to master the process, methods and skills of computer drawing common geological maps. This course plays an important role in cultivating students' scientific thinking, enhancing their practical ability, improving their comprehensive quality, and laying a foundation for learning follow-up courses.

The main contents of this chapter 1 include the development process of computer geological mapping, the types and characteristics of geological maps required by different regulations, the types of basic elements of geological maps, compilation principles, and the general requirements of compiling geological maps.

The main contents of this chapter 2 include the main contents and graphic elements reflected in the geological maps such as the histogram, profile, floor contour map, the compilation process of the histogram, the compilation method of the geological profile, and the compilation method of the floor contour map.

The main contents of this chapter 3 include the basic concept, installation and operation interface of AutoCAD, the file type and file management function of AutoCAD, the basic drawing commands and using skills of AutoCAD, the auxiliary drawing tools and using methods of AutoCAD.

The main contents of this chapter 4 include the method and skill of inserting base map into AutoCAD, the method of layer setting in AutoCAD, the method and skill of filling, text marking and dimension marking in AutoCAD, the method and skill of drawing comprehensive column chart in AutoCAD, the method and skill of drawing geological section map in AutoCAD, and the method and skill of drawing floor contour map in AutoCAD, Using Excel to assist drawing skills, scale setting methods and skills.

The main contents of this chapter 5 include the interface and main functions of MAPGIS and buffer software, and the application scope of different software in geological mapping.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: WangRan

Reviewer: WangJilin

Approver: LiuZhixin

# Syllabus for《Introduction to Engineering Ethics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code |  | Course Nature | Elective course |
| Faculty | School of resources &Geosciences | Semester | 7 |
| Class Hours | 8 | Credit | 0.5 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course "Introduction to Engineering Ethics" is an elective course for engineering undergraduate majors. This course is 8 hours, suitable for undergraduates majoring in science and engineering such as resource exploration engineering and geological engineering. Mainly taught by offline classrooms. Aiming at the ethical issues in the field of geological engineering, discussing the thinking quality, professional training and social responsibility of geological engineers, so that students can understand the professional social responsibility, understand the social risks of the use of professional technology, and understand the efforts of professional technology in solving and avoiding risks. And results, understand professional and technical problems and social expectations; understand and master the basic norms of engineering ethics, cultivate students' ethical awareness and professionalism, and further enhance the ability to solve complex ethical issues in geological engineering practice.

Part 1

An overview of engineering ethics. Understand the definition of ethics, the concepts and norms of engineering ethics; the principles and decision-making of engineering ethics; be familiar with the concepts and history of engineering ethics.

Part 2

Internal and external social responsibilities in engineering. Master the professional characteristics, purpose and professional quality of engineers; public safety, health and welfare; understand the virtues and work ethics of engineers; engineers and the environment.

Part 3

Obstacles and challenges to the behavior of engineers in charge. Master the professional code of conduct for engineers; be familiar with the macro and micro environments that affect engineers' decision-making; understand the differences and challenges of world culture

Part 4

Earthscienceengineering practice, social responsibility. Grasp the engineering characteristics and development influence of the earth system; humanistic collision and consideration in engineering decision-making;

Understand the speculative examples of resource exploration engineering and geological engineering ethical problems.

2. Course Examination

This course assessment adopts a combination of process evaluation and goal evaluation, and the final grade of the course is comprehensively determined by various aspects such as usual grades (including attendance and usual performance), homework and final inspection grades. Normal scores account for 20% of the total score, homework scores account for 20%, and final assessments account for 60%.

The final score is given in a five-level system, with a passing level of 3 and a full mark for level 5.

Writer: Xiaohong Xia

Reviewer: Aikuan Wang

Approver: Zhixin Liu

# Syllabus for《Modern Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05598 | Course Nature | Basic practice course for all majors of the same discipline |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The course of Modern Geology is a basic practice course for all majors of the same discipline for undergraduates majoring in mining engineering and safety engineering. This course mainly covers the following two parts: 1. Modern geology, including basic concepts and research methods of geology, overview of the earth and geological processes, minerals and rocks, stratigraphy, paleontology and geological history, structural geology, and new advances in geology; 2. Coal mine geology, including coal seam and coal measures, mine geological work, Mine Hydrology and environmental geology, geology, new energy exploration and development geology, abandoned mine investigation, evaluation and work. Through the study of this course, the students can understand and initially master the geological knowledge related to coal mine construction, production, mine environmental protection and reuse, and cultivate their ability to read and use various geological data, so as to serve the design and production stages of coal mine.

The main contents of this chapter 1 includes the relationship between geology and mining engineering, safety engineering and so on; the concept of geology, research content and research methods.

The main contents of this chapter 2includes basic knowledge of the earth, familiar with the main physical properties of the earth, master the earth's stratospheric structure and geological process.

The main contents of this chapter 3includes the main physical properties of minerals, common rock forming mineral macroscopic identification methods, the formation and characteristics of magmatic rocks and sedimentary rocks, the formation and characteristics of metamorphic rocks.

The main contents of this chapter 4includes the brief history of earth development and paleontological evolution, stratigraphic division and determination method of geological age, stratigraphic system and geological age.

The main contents of this chapter 5includes classification and characteristics of fold structure and fault structure.

The main contents of this chapter 6includes coal accumulating conditions and coal forming process, material composition, properties and classification of coal, coal seams, coal bearing rock series and coalfields, coal accumulating period and coal accumulating area in China.

The main contents of this chapter 7includes coal mine geological work and common geological problems, principles and main tasks of coal mine geological work, familiar with the classification standard of coal mine geological types, common geological problems in coal mine construction and production.

The main contents of this chapter 8includes basic knowledge of groundwater and water filling conditions of mine, hydrogeological observation and water control measures of mine, causes and evaluation methods of mine environmental geological problems.

The main contents of this chapter 9includes geological new energy types, exploration and development theory and technical methods; The content of abandoned mine survey and the way of reuse, the current geological exploration and development of new energy and the distribution of abandoned mines in China.

The main contents of this chapter 10includes the development direction and research hotspot of geology, the geological theory and new technology related to coal mine geology.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Wang Jiyao, Wang Jilin, Zhou Xiaozhi

Reviewer: Wang Aikuan

Approver: Liu Zhixin

# Syllabus for《Reservoir Description》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05599 | Course Nature | Optional major course |
| Faculty | School of Resources and Earth Sciences | Semester | Fifth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource | null |

1. Course Introduction

Reservoir description is an optional major course for resource exploration engineering majors. The preparatory courses are general geology, mineral petrology, paleobiography, tectonic geology, geochemistry, etc. It is suitable for science and engineering majors such as resource exploration engineering.

The main contents of this chapter 1 include the basic concepts related to reservoir description, the research objectives and tasks of reservoir description, the brief history of development, the methods, techniques and development trends of reservoir description.

The main content of this chapter 2 includes the research significance of reservoir sedimentary facies and stratigraphic correlation, the classification of sedimentary facies, the analysis technology of sedimentary facies, the analysis process of sedimentary facies, stratigraphic correlation

The main content of this chapter 3 includes the main research contents of reservoir structure description include common fracture modes, research methods and processes of structure description, genetic types of fractures and calculation of fracture porosity.

The main content of this chapter 4includes rservoir concept and type, reservoir diagenesis and pore development, pore type and structure characterization, reservoir heterogeneity and sensitivity, reservoir comprehensive evaluation.

The main content of this chapter 5includes basic concepts related to fluid in oil and gas reservoir, determination method of fluid interface, fluid properties, concepts related to oil, gas and water pressure system, fluid unit characteristics

The main content of this chapter 6includes regional reservoir description, lateral reservoir prediction, reservoir parameter prediction, key well analysis, reservoir parameter interpretation.

The main content of this chapter 7includes calculation of oil and gas reservoir reserves and dynamic description of oil and gas reservoir;Reservoir evaluation parameters, reservoir evaluation criteria and expression, reservoir evaluation steps, reservoir quantitative evaluation methods, and reservoir evaluation examples.

2. Course Examination

Course total score = assignment× 30% + extracurricular discussion× 10% +final exam score × 60%.

Writer: He Jinxian

Reviewer: Fu Xuehai

Approver: Liu Zhixin

# Syllabus for《An Outline of Earth Science》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05599 | Course Nature | General education course |
| Faculty | School of Resources and Geoscience | Semester | Second semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

This course mainly talks about the earth's material composition, the earth's sphere structure, earth system science and other related knowledge. The main contents include the physical properties and geological processes of the earth, the outer layer of the earth and its interaction, the material transformation, deformation and displacement of the lithosphere, the dynamic system of the earth, the relationship between human beings and resources and the environment. Through learning, master the necessary basic theories, basic knowledge and basic analysis methods of earth sciences, establish a scientific outlook on the earth, understand the relationship between environment, resources and humans, and establish awareness of resources, geological disasters, and environmental protection, which are the learning and basic qualities of subsequent courses.

2. Course Examination

The course assessment adopts the method of combining process evaluation and objective evaluation, and the final course score is determined by the usual score (including attendance, homework) and the final exam score. The usual score accounts for 30% of the total score, and the final exam is in the form of course paper, which accounts for 70% of the total score. Final grades are given on a five-level system (Excellent, Good, Intermediate, Pass, Fail).

Writer: Aikuan Wang

Reviewer: Yinghai Guo, Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Modern geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05600 | Course Nature | Extension Course |
| Faculty | School of resources and geosciences | Semester | Seventh Semester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The basic part of this course mainly teaches related knowledge and skills such as the composition of the earth's material, the deformation and displacement of the earth's crust, the history of earth evolution, the evolution of paleontology and plants, and the geological effects that control these geological phenomena. The main content includes the elements, minerals and rocks that make up the earth's materials, various geological functions and characteristics that control the spatial distribution of these materials, stratigraphic paleontological records reflecting the evolution of the earth, and geological disasters that are closely related to the human living environment. Through the study of the content of this course, students will have a preliminary grasp of the basic concepts, basic theories and basic research methods of geology, establish a scientific view of the earth, resources and environment, and the relationship between man and land, and be able to use the basic theories of modern geology to solve geological, Complex engineering issues such as resources and energy. This course focuses on the combination of theory and practice, which plays an important role in cultivating students' scientific thinking, enhancing practical skills, improving students' overall quality, and laying the foundation for the follow-up courses.

The teaching goal of this course is the subject of the course content, so that students can understand and master the related concepts of geology, be familiar with the basic theories of modern geology, have a preliminary grasp of the research methods of geology, the basic skills of observation and description of geological phenomena, and understand the evolution of the earth Process, understand the future development direction of earth science. To enable students to master the scientific way of thinking in geology, cultivate technical talents with core socialist values and adapt to the needs of the social economy and scientific and technological development in the new era, and establish a correct outlook on the earth. This course laid the foundation for future work in geology and related fields.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Caifang WU

Reviewer: Shangbin Chen

Approver: Zhixin Liu

# Syllabus for《Introduction of geo-information science》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05700 | Course Nature | Compulsory basic course for all majors of the same discipline |
| Faculty | School of Resources and Earth Sciences | Semester | Third semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course of introduction of geo-information science is a major basic compulsory course, which is suitable for undergraduates majoring in geo-information science and technology. The course focuses on the theories, methods, techniques and applications of various kinds of information in the earth system, including the formation mechanism of the information of the elements in the Earth’s layers, the morphological structure of different spatial scales and the evolution process of different time scales, the formation mechanism and transmission process of information of different elements, and the relationship between information flow and material flow and energy flow, standardization, normalization and information sharing of earth information. Through the study of this course, the students can master the basic theory, basic knowledge and modern information technology of geo-information science, and train their ability to use information scientifically to solve complex geoscience problems in production practice, for the follow-up professional courses to continue learning and engineering practice to lay a good foundation.

2. Course Examination

The final score of the course is comprehensively determined by the usual results (including usual performance and homework) and final exam results. Normal scores account for 10% of the total score, homework scores for 20%, and final exam scores for 70%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Wang Ran

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Principles and applications of remote sensing》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05701 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | Fifth semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course of principles and applications of remote sensing is a main course for the major of geo-information science and technology. The course is a comprehensive course which outlines the basic principles, methods and applications of remote sensing technology, this paper mainly deals with the physical basis of remote sensing, the remote sensing platform and its image characteristics, the reflection spectrum characteristics of typical land objects (vegetation, soil, water, rock, etc.) , remote sensing digital image processing, remote sensing mapping, the principles and methods of remote sensing image interpretation, and various remote sensing applications. Through the study of this course, the students have a preliminary understanding of the applied theory, applied technology and the knowledge system of image recognition and geo-interpretation needed in the process of remote sensing in geoscience, in addition, we also know the technical frontier and development trend of remote sensing of geography, Geology, mineral exploration and mine environment, which will lay a good foundation for further study of the courses of geo-information science and technology.

2. Course Examination

This course assessment adopts a combination of process evaluation and goal evaluation, and the final score of the course is comprehensively determined by the usual results (including attendance and usual performance), homework, experimental results and final exam results. Normal scores account for 10% of the total score, homework scores for 10%, laboratory scores for 20%, and final exam scores for 60%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Ci Hui

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Geological Data Acquisition & Processing A》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05702 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

“Geological Data Acquisition & Processing A” is a course for the major of Geo-information science and technology of school of Resources and Geosciences and basic computer courses are prerequisite courses. This course is applicable for acquisition, processing, storage and analysis of geological data. It mainly covers data sources and characters, basic acquisition and processing of geological data, the characters and processing method of statistics and spatial data, geological storage, geological data integration and mining, data visualization. Through this course, students are expected to deal with complex geological problems by the characters of geological data and suitable methods.

This course would provide students with the whole knowledge structure of geological data and the basic principles and methods of geological data characteristics, establishment, storage, other related work of data and the frontier data processing methods.

Moreover, this course would use some data processing software (GIS, MATLAB, SURFER), which can provide strong support for solving complex problems.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Chen Yuhua; Ci Hui

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Data Structures and Programming》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05703 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Forth Semester |
| Class Hours | 32 | Credit | 2.0 |
| Extracurricular hours | 8 | Online Resource | 0 |

1. Course Introduction

Data Structures and Programming is the main course for the major of Geo-information Science and Technology, and the prerequisite course is Python Programming. The course is mainly about data structure, programming principles and development application examples in C# advanced programming language, and the main lectures include: C# language foundation, data structure foundation, visual programming, component programming, database access technology, geoscience program case analysis, etc. Through the combination of theoretical lectures and case studies, combined with practical exercises of programming development, students will develop the scientific thinking ability of using computer programming to solve geological problems, as well as the ability to design and develop applications for practical problems such as data management, statistical analysis, mathematical calculation, visualization, algorithm design, etc., so as to meet the requirements of future geological information technology jobs and They will also be able to design and develop applications for practical problems such as data management, statistical analysis, mathematical computation, visualization and algorithm design.

The main content of this course is consist of chapters and two programming practices.

Chapter 1 is the introduction to the mainstream methods and cutting-edge technologies of programming, the concepts and roles of data structures, and the significance of the course to the profession

Chapter 2 is about the C# programming foundations and the Visual Studio usage, code debugging.

Chapter 3 includes data structures foundations, such as arrays, sequences, stacks, etc.

Chapter 4 is object oriented programming in C#.

Chapter 5 is visual programming, which giving the principles of WinForms commonly used controls, file read and write, GDI+ and component programming.

Chapter 6 gives some practical examples to show how to design and implement the algorithms or solutions to deal with the realistic problems.

2. Course Examination

Course total score = extracurricular learning score × 10% + class attendance 10% + homework × 20% + final exam score × 60%.

Writer: Luo Jinhui

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Spatial Analysis and Modeling》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05704 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2.0 |
| Extracurricular hours | 8 | Online Resource | 0 |

1. Course Introduction

Spatial Analysis and Modeling is a major course, whose prerequisite courses are Geographic Information System, Geological Data Acquisition and Processing, applicable to the major of Earth Information Science and Technology. The course is mainly about the foundation of spatial analysis and modeling, spatial measurement and expression transformation, spatial geometric relationship analysis, spatial statistical analysis, terrain visualization analysis, spatial data mining, spatial intelligent computing, and the skills of using related knowledge for spatial analysis to solve earth science problems. Through the course, students will master the skills of spatial analysis and geographic modeling using GIS software, so that students from related disciplines can deepen their understanding of the basic knowledge and functions of spatial analysis, and develop the ability to apply the learned spatial analysis skills to solve practical geographic problems, and lay a good foundation for using spatial analysis in the fields of geographic information science and technology. This course focuses on the combination of theory and practice, which plays an important role in cultivating students' scientific thinking about space and time, enhancing their practical and hands-on abilities, improving their overall quality, and laying the foundation for learning subsequent courses.

2. Course Examination

Course total score = class attendance 20% + homework × 20% + final exam score × 60%.

Writer: Yang Hui

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Geological modeling and Numerical simulation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05705 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geoscience | Semester | Sixth semester |
| Class Hours | 24 | Credit | 2.0 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

This course mainly talks about the theories, workflow and case studies about geological modeling, numerical simulation and other related knowledge. The main contents include introduction of geological modeling software, pre-processes of data from multiple sources, basic workflow of 3D geological modeling, applications of geological models, introduction of numerical simulation of ore-forming processes and simulation software, basic workflow of numerical simulation of ore-forming processes and explanation of numerical results. Through learning, students will master the necessary basic theories, basic knowledge and basic workflow of 3D geological modeling and numerical simulation, building foundation for postgraduate courses and scientific research.

2. Course Examination

Course total score = classroom performance × 10% + regular assignment × 10% + experiments × 40% + final test × 40%.

Writer: Luo Jinhui, Hu Xunyu

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Cartography and Geological Mapping》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05706 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geoscience | Semester | 5 |
| Class Hours | 24 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course “Cartography and Geological Mapping” is a compulsory course; Its prerequisite course is Physical Geology; This course is applicable to Geo-information Science and Technology  majors. It mainly covers basic knowledge of Cartography, understanding of different geological maps, introduction to geological computer mapping, and application of AutoCAD in geological mapping; through this course, students are expected to know about the basic knowledge of Cartography and geological map, basic concept of geological computer mapping, the basic theory and application of AutoCAD in geological mapping, and another softwares in geological mapping.

Through this course, the students are expected to fully understand the basic knowledge of Cartography and geological computer mapping, to know the different types of geological maps, to master the mapping method and skill for different types of geological maps, to master and apply AutoCAD to draw geological maps. In addition, through the experiment, the students are expected to own the ability in applying AutoCAD to draw different geological maps.

2. Course Examination

The closed book exam should be hold. The score of final exam accounts for 65% of total score. The experiment accounts for 20% of total score. Usual performance accounts for 15% of total score.

Writer: Zhou Rongfu

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Geological Data Mining》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05707 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | 0 |

1.Course Introduction

Geographical Data Mining is the main course for earth information science and technology major, mainly cultivates students' ability to extract hidden deep geographic information from large amounts of geological data using computer language. The course achieves the purpose of extracting deep geological information through statistics, online analysis and processing, information retrieval, and machine learning. The main teaching content includes the theory and methods of geographic data mining, geographic data mining case analysis, etc. After learning from geological learning data mining and learning methods and examples, students will master the ability to extract deep information in massive geological data according to many methods. This will lay the foundation for global information science and technology training professionals, and for students to engage in geoscience data mining research.

2.Course Examination

Course total score = usual performance score×20%+assessment score × 20% + final exam score × 60%.

Writer: Chen Yuhua

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《GIS Design and Application》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05708 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | 0 |

1.Course Introduction

GIS Design and Application (Bilingual) is a major bilingual teaching course, whose prerequisite courses are Geographic Information System, Geographic Data Acquisition and Processing and Geographic Programming, applicable to the majors of Geographic Information Science and Technology and Resource Exploration Engineering. The course focuses on GIS design principles and application areas, design process and data standards, programming languages and development tools, system architecture and software engineering, and guides students to build and complete network-based GIS design and implementation through application examples. This course focuses on training students to understand the theory and methods of GIS design and application, to master various GIS design and development tools and programming languages, to be able to use GIS software development and implement GIS software and applications, to enhance students' ability to communicate in English, so as to train students to apply their knowledge of GIS design and development to solve practical resource and environmental problems. Students will be able to use GIS software development and implement GIS software and applications, and enhance their ability to communicate in English..

2.Course Examination

Course total score = practice experiment score×20%+ assessment score × 20% + final exam score × 60%.

Writer: Yang Hui

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Foundation of Environmental Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05709 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | Forth semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course of foundation of environmental geology is an elective course for undergraduates majoring in geo-information Science and technology. Its prerequisite is an introduction to general geology, structural geology, and geoinformatics. This course mainly deals with the basic concept, evolution principle of geological environmental system and its internal relation with geological environmental problems, understanding the influence of the development and utilization of various geological resources on geological environment, and combining with practical work needs, this paper analyzes the concepts, harms, causes, Formation Mechanism and prevention and control countermeasures of common geological environmental problems in China, and through the study of this course, enables students to master the basic principles, research contents and working methods of environmental geology, to understand the influence of various environmental geological problems on human society, economy and human health by studying the main geological environmental problems in China. To cultivate the students’ability to apply the basic principles of environmental geology to solve the environmental problems of complex geosciences in production practice, and to lay a good foundation for the following professional courses and engineering practice.

2. Course Examination

The final score of the course is comprehensively determined by the usual results (including usual performance and homework) and final exam results. Normal scores account for 10% of the total score, homework scores for 20%, and final exam scores for 70%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Wang Ran

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Geo-information Visualization》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05710 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

Geo-information visualization is a professional selection course. Its first courses are geographical information system geo-programming and other courses; It is suitable for the major of geo-information science and technology and can also be used as an elective course for undergraduates and postgraduates of other majors related to geo-science. This course mainly tells the basic theory of geo-3d visualization. Through this course, students can master the basic principles, methods and technologies of geo-visualization, understand the commonly used 3D modeling and graphics development tools, and acquire the methods and skills of geo-landscape simulation 3d geo-modeling visualization and interactive analysis. This course adopts the teaching method of combining theory with practice. The experiment in the course cultivates students' practical skills, enables students to create geological model and conduct three-dimensional space analysis by relevant software, and lays the necessary theoretical and practical foundation for practical engineering application and development.

2. Course Examination

Course total score = process assessment score × 20% + final exam score × 80%.

Writer: Chen Yuhua

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Digital Terrain Model and Application》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05711 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Digital elevation model is the core data in geographic database and the basis of terrain analysis. It is widely used in surveying and mapping, remote sensing, resources, environment, urban planning, agriculture and forestry, disasters and other fields. According to the training requirements of applied talents, the course teaching mainly emphasizes the cultivation of students' practical ability. On the basis of systematically introducing the basic concepts of DEM, data organization and management of DEM, DEM data acquisition methods, DEM establishment and processing, DEM visual expression and other basic theories and key technologies, from the aspects of slope terrain factor extraction, feature terrain element extraction This paper expounds the basic theories and methods of DEM digital terrain analysis from four different aspects: topographic statistical analysis and geoscience model analysis, and promotes theoretical teaching with experimental practice.

2. Course Examination

Course total score = regular score × 40% + final exam score × 60%.

Writer: Zhang Qianfeng

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Remote Sensing Development Technology and Application》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05712 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course "Remote Sensing Development Technology and Application" is a professional elective course, and its prerequisite courses are "Python Program Design", "Geographic Information System" and "Remote Sensing Principle and Application", which is suitable for undergraduates majoring in Geo-information science and technology. Satellite remote sensing is a new space information science, which can obtain continuous surface and near-surface information in space by macro, dynamic and fast means. It plays an increasingly important role in many fields such as resource investigation, mineral exploration, meteorology and climate, and is of great significance to social economy and scientific research. This course mainly describes remote sensing development and application technology based on open source technology and big data cloud platform, including remote sensing data processing and analysis of open source libraries such as GDAL, Matplotlib, Scikit-Learn and Scikit-Image, as well as comprehensive application of remote sensing big data cloud platform. Through the study of this course, students are required to master the basic skills and algorithms of remote sensing development, master the latest research progress of remote sensing development technology at home and abroad, have the ability to use relevant open source libraries and cloud platforms for large-scale and long-term remote sensing analysis and application, and cultivate the ability of students to solve complex geoscience problems. It will lay a good foundation for the further study and application of professional courses. Through this course, students will be able to achieve the following objectives:

To master the basic concept, basic knowledge and basic theory of remote sensing development technology, and understand the application status and development prospect of remote sensing development technology in the field of geoscience.

To master the basic operation of open source library and cloud platform in the field of application and remote sensing development, be able to carry out comprehensive research on scientific and applied technical issues in the field of geoscience by comprehensive use of relevant technologies and platforms, and have the ability to acquire, preprocess, excavate, analyze and further explain geological phenomena of remote sensing images.

To be able to express, demonstrate, deal with, simulate, predict and evaluate geo-complex engineering problems by using comprehensive development technology, and to improve the comprehensive ability of analyzing and solving application

2. Course Examination

Course total score = regular score × 10% + assignment score × 10% + experiment score × 20% + final exam score × 60%.

Writer: Xi Yantao

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Mine Environmental Assessment and Disaster Monitoring》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05713 | Course Nature | Professional Elective Course |
| Faculty | School of Resources and Earth Sciences | Semester | Fifth semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course of mine environmental assessment and disaster monitoring is an elective course for undergraduates majoring in geo-information science and technology. Its prerequisite is an introduction to general geology, structural geology, and geoinformatics. This course mainly deals with the related concepts, research contents and methods of mine geological environment, the causes, types, hazards and main characteristics of mine geological problems, dynamic monitoring and protection methods and control measures of mine environmental geology. Through the study of this course, students can master the causes and incentives of various geological problems in the process of mine development, and master the methods of mine environmental geology evaluation, dynamic monitoring, protection and treatment, to train students to use their knowledge to solve environmental problems in mines, it will lay a good foundation for the study of geological hazards, environmental geology and the work in the departments of land, environmental protection and Engineering Construction and planning.

2. Course Examination

The final score of the course is comprehensively determined by the usual results (including usual performance and homework) and final exam results. Normal scores account for 10% of the total score, homework scores for 20%, and final exam scores for 70%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Wang Ran

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Mineral Resource Assessment and Prospectivity Modeling》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05714 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Geoscience | Semester | Sixth semester |
| Class Hours | 16 | Credit | 1.0 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

This course mainly talks about the history, theories, usage of mineral resource assessment and concept, theories, workflow and case studies about prospectivity modeling and other related knowledge. The main contents include introduction of mineral resource assessment, pre-processes of data from multiple sources, basic workflow of mineral resource assessment, introduction of prospectivity modeling and related approaches, basic workflow of prospectivity modeling and 3D prospectivity modeling. Through learning, students will master the necessary basic theories, basic knowledge and basic workflow of 3D geological modeling and prospectivity modeling, building foundation for postgraduate courses and research on earth science.

2. Course Examination

Course total score = classroom performance × 10% + regular assignment × 20% + final test × 70%.

Writer: Hu Xunyu

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Geological Database》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05715 | Course Nature | Optional Major Course |
| Faculty | School of Resources and Earth Sciences | Semester | Fifth semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course of geological database is an elective course for the major of geo-information science and technology, and its prerequisite courses are geographic information system, remote sensing principle and application, and geo-data acquisition and processing. It is suitable for undergraduates majoring in geo-information science and technology. This course mainly deals with the basic concepts related to geological database, the evolution process of spatial data management, the research contents and the development trend of geological database, computer representation of geospatial phenomena, storage and management technology of database and data model database, management of spatial data in relational database, standard language SQL of relational database, network spatial database, 3D database, massive spatial database, temporal spatial database and geological database system design. Through the study of this course, the students can have a comprehensive understanding of the storage and management techniques of various spatial data, train the students in the design skills of geological database, and be able to design geo-science database system reasonably. The spatial database of basic geoscience is established by software, which lays a foundation for the design of geoscience application system and its database in the future.

2. Course Examination

This course assessment adopts a combination of process evaluation and goal evaluation, and the final score of the course is comprehensively determined by the usual results (including attendance and usual performance), homework, experimental results and final exam results. Normal scores account for 10% of the total score, homework scores for 10%, laboratory scores for 20%, and final exam scores for 60%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Ci Hui

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Geographic Information System C》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05716 | Course Nature | Compulsory basic course for all majors of the same discipline |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course is a professional backbone course for earth Information Science and technology. Geographic Information System (GIS) is a new marginal discipline integrating computer science, geosciences, surveying and mapping, remote sensing, environmental science, space science, information science, management science, etc. This course focuses on the basic concepts of GIS, the mathematical basis of geospatial science, spatial data models, spatial data structure, spatial data organization and management, spatial data acquisition and processing, spatial data query and measurement, basic spatial analysis, digital terrain analysis, spatial statistical analysis, geographical information visualization and its basic applications in geoscience and related disciplines, emphasizing the understanding of GIS theory, technology and application and related software operation skills. To enable students to master the basic skills of GIS-based mapping, spatial analysis and spatial statistical methods, to train students to solve spatial problems, and to have the comprehensive practical ability to solve complex Geological problems using GIS technology.

The main contents of this chapter 1 include the basic concept of GIS, the composition and function of GIS, the relationship between GIS and other disciplines and GIS applications.

The main contents of this chapter 2 include the concept of the earth spheroid, the spatial coordinate system and elevation System, the concept and classification of map projection and commonly used projection systems, projection transformation and map framing.

The main contents of this chapter 3 include conceptual model and logical model of spatial data, spatial data and spatial relationship, raster and vector data structure and vector-raster integrated data structure.

The main contents of this chapter 4 include classification and coding of spatial entities, collection and editing of spatial data, processing of spatial data and analysis and control of spatial data quality.

The main contents of this chapter 5 include spatial data organization and spatial database, the spatial data index, spatial metadata and spatial database on Geodatabase.

The main contents of this chapter 6 include spatial query and measurement, buffer analysis, raster data analysis, spatial overlay analysis, network analysis and digital terrain model (DTM) and digital terrain analysis (DTA).

The main contents of this chapter 7 include visual representation of spatial data, thematic mapping method, multi-scale features and automatic synthesis of spatial data and three-dimensional landscape simulation and dynamic performance.

2. Course Examination

Course total score = regular score × 10% + assignment score × 30% + final exam score × 60%.

Writer: Zhang Qianfeng

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Geological Philosophy & Engineering Ethics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05201 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | https://mooc1.chaoxing.com/course/205200145.html |

1. Course Introduction

The course has 32 class hours, which is composed of online learning and classroom teaching, accounting for 16 class hours each. Among them, the online part mainly involves the general knowledge content of Engineering Ethics, including the basic concepts, the general elements (such as responsibility, value, interest, etc.), and the other related ethical issues in engineering. This part mainly focuses on MOOC learning.

The offline part mainly focuses on the ethical issues in the field of Geological Engineering. It involves the development history, the theoretical framework and philosophical basis of geology, the thinking and worth of geologists, the professional training, the social responsibility of geological engineers, and the ethical issues in the construction, transformation and shaping of geological bodies. Through the study, students can understand and master the basic norms of Engineering Ethics, cultivate their ethical awareness and literacy, and further improve their ability to solve complex ethical problems in geological engineering practice.

2. Course Examination

Course total score = process assessment score × 20% + online learning score × 20% + final assessment × 60%.

Writer: Jishan Xu

Reviewer: Qing Yu

Approver: Zhixin Liu

# Syllabus for《Geological Engineering Simulation Technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05202 | Course Nature | Extension course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 10 | Online Resource |  |

1. Course Introduction

The course of geological engineering simulation technology is a professional development course through undergraduate and postgraduate; Its prerequisite courses are engineering graphics, engineering mechanics, foundation of engineering geology, foundation of hydrogeology, and rock mechanics, soil science and soil mechanics or geological engineering; It is suitable for undergraduates majoring in geological engineering and those who plan to study for master's degree in geological engineering. This course mainly introduces the physical simulation method and numerical simulation method of geological engineering process, boundary condition simulation technology and physical mechanics phenomenon analysis method, etc; Through the study of this course, students can master the method of using modern computer, advanced loading and monitoring instruments of geotechnical and engineering geology to obtain the core physical and mechanical mechanism and evolution law of geological engineering, form the preliminary ability of designing, analyzing and calculating schemes, and inspire innovative thinking mode of solving engineering problems through simulation technology.

2. Course Examination

The assessment method is examination, the process assessment accounts for 100%, and the results are evaluated according to the five level system.

The course score consists of classroom performance (10%), homework score (60%) and experiment score (30%).

Writer: Dong qinghong

Reviewer: Zhu shuyun

Approver: Liu zhixin

# Syllabus for《Advanced Geotechnical Mechanics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05203 | Course Nature | Extension course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | Soil science and soil mechanics, Sui Wanghua, love course website. |

1. Course Introduction

This course mainly describes the mechanical properties of engineering rock and soil and various geological factors affecting its mechanical properties, and further studies the engineering properties of engineering rock and soil, as well as the mechanical behavior, deformation and failure law, strength theory and engineering application under different stress states. It is required to master the engineering properties of engineering rock and soil, the main constitutive model and its engineering application, the deformation calculation theory of rock and soil, the strength theory and failure criterion of rock and soil, the stability analysis of rock and soil, be able to analyze the stress field, seepage field and deformation field of rock and soil engineering, and have the ability to analyze and solve the problems of rock and soil engineering, Understand the related research hotspots and engineering difficulties of this discipline. The prerequisite courses are soil science and soil mechanics, rock mechanics, engineering geology, engineering mechanics, elastic mechanics, plastic mechanics, etc; This course is suitable for undergraduates majoring in geological engineering and civil engineering. Through the study of this course, the students' ability to solve complex engineering geological problems by using more in-depth knowledge and ability of geotechnical mechanics will be cultivated, which will provide the support of basic mechanical theory for the evaluation and reinforcement of geotechnical stability of various engineering construction and mining engineering.

2. Course Examination

The results of homework and in class tests accounted for 30% of the total; The final examination results accounted for 40% of the total scores, and the autonomous learning and discussion part accounted for 20% of the total scores; Small papers account for 10% of the total score.

Writer: He hu

Reviewer: Yu qing

Approver: Liu zhixin

# Syllabus for《Principles of Engineering Geological Analysis》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05204 | Course Nature | Professional Development Courses |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

《Principle of Engineering Geological Analysis》 is a professional development course for geological engineering and Geological Engineering (excellent engineer). It is an offline teaching course. If necessary, it can be an online and offline mixed teaching course; Its prerequisite courses are engineering geology foundation, hydrogeology foundation, rock mechanics, soil science and soil mechanics, which are suitable for geological engineering undergraduates. This course mainly deals with the engineering geological problems related to the stability of rock (soil), the regional stability and the groundwater seepage. The main contents include: analysis of main engineering geological problems and engineering geological process involved in the design, construction and operation of main types of engineering activities, conditions, laws and prediction of engineering problems, as well as protection treatment methods, etc. Through the study of this course, students can understand and be familiar with the development trend of the relationship between domestic and foreign related engineering activities and geological environment, deeply understand the importance and necessity of engineering geological problems, engineering geological analysis and the interaction between geological environment, and learn to study and analyze the main engineering geological problems combined with specific engineering practice, To determine the prevention measures of adverse engineering geological conditions and the evolution law of engineering practice in geological environment. Through the study, we can deeply understand the interaction and mutual restriction between the engineering geological environment elements, evolution and human engineering activities, so as to lay the foundation for the expansion of professional courses, graduation design and practical work.

2. Course Examination

Course total score = process assessment score × 100% .

Writer: Cao Liwen

Reviewer:Yang Weifeng

Approver: Liu Zhixin

# Syllabus for《Intelligent Drilling Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05205 | Course Nature | Extension course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Intelligent drilling and excavation engineering course is an important basic subject of resource development, urban geological survey and engineering construction. Guided by the concept of inquiry teaching, this course organically combines classroom teaching, experimental practice, engineering cases, scientific research and training to enhance students' participation and create a learning environment and atmosphere in which students are the main body of the classroom. The course mainly introduces the progress of geotechnical drilling engineering and excavation engineering, modern engineering construction, geotechnical drilling technology and quality, equipment and tools, drilling flushing, safe drilling, hydrology and well drilling, engineering construction drilling, oil and gas well drilling, directional drilling and urban underground trenchless technology, etc. The prerequisite courses are general geology, engineering mechanics, rock mechanics, soil science and soil mechanics; It is suitable for undergraduates majoring in geological engineering and civil engineering. Through the study of this course, students can master the basic professional knowledge related to geotechnical drilling and excavation engineering, understand the drilling and excavation problems often encountered in engineering construction, as well as its role and influence on the process of engineering survey, design, construction and monitoring, correctly handle and reasonably use the natural geological conditions, and master the requirements and methods of various geotechnical drilling and excavation technologies and equipment. This course focuses on the combination of theory and practice, which can cultivate students' engineering technology concept, enhance practical ability, and cultivate students' ability to solve drilling problems under complex geological conditions in production practice, so as to lay a good foundation for further study and engineering practice of professional courses in the future.

2. Course Examination

Process assessment: 30% (Process assessment includes attendance and laboratory work)

Closing Test Score: 70% (Closed Book Test)

Writer: Dong qinghong

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Geological Engineering Drawing Training》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05207 | Course Nature | Extension course |
| Faculty | School of Resources and Earth Sciences | Semester | SeventhSemester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Geological engineering drawing training is an expanding course; The main purpose of the course is to establish the basic understanding of geological engineering and basic design, and cultivate the ability of design and mapping; Its prerequisite courses are engineering drawing, geotechnical engineering investigation, foundation and foundation, engineering geology foundation; It is suitable for students majoring in geological engineering. Through the study of this course, the students can fully understand the basic knowledge of geological map drawing. At the same time, according to the characteristics of software courses which require higher practical operation, the computer experiment course is set up, and the students are arranged to operate on the computer at the right time, so as to further consolidate the classroom teaching effect and improve the students' practical operation ability, It will lay a foundation for further study of computer aided drawing in the future. Master the drawing methods and skills of different types of geological maps, be able to use AutoCAD software to draw different types of geological maps, and finally enable students to independently use the basic principles and skills of AutoCAD to draw all kinds of geological maps, so as to achieve the training goal of the graduates' knowledge structure requirements of their major, and meet the needs of future jobs or research.

2. Course Examination

The results were evaluated by the combination of process examination (30%) and end of class examination (70%). Grades are given on a five point scale.

Writer: Dong qinghong

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Coal mine engineering geology and hydrogeology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05210 | Course Nature | Development course |
| Faculty | School of Resources and Earth Sciences | Semester | sixth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular Hours | 16 | Online Resource |  |

1. Course Introduction

The main content of this chapter 2 includes the concept of exploration methods of mine engineering geology and hydrogeological conditions, related basic concepts of geological environment elements, main testing methods, steps and calculation methods of in-situ stress, characteristics of in-situ stress field in coal mine area, basic methods of stress field analysis, and coal mine engineering geological model.

The main content of this chapter 3 includes the concept of the stability analysis and evaluation method of shaft, roadway and underground stope surrounding rock, the basic concept of engineering geological problems of coal mine overburden and floor, the failure and zoning characteristics of coal mine overburden and its test method, the deformation and failure law of coal mine floor and the basic law of mine pressure showing and the prevention and control method of rock burst.

The main content of this chapter 4 includes the concept of the basic concepts of coalfield hydrogeology and water hazards, the basic elements and water filling conditions of coal mine water hazards, the working methods of coal mine hydrogeology, the evaluation methods of all kinds of coal mine water hazards, and the basic prevention and control methods of all kinds of coal mine water hazards.

The main content of this chapter 5 includes the concept of the basic concept and characteristics of open-pit slope, the deformation and failure law of open-pit slope and dump slope, the analysis and evaluation method of open-pit slope stability, the monitoring method of open-pit slope deformation.

The main content of this chapter 6 includes the concept of relevant basic concepts of coal mine environmental geology, environmental geology problems caused by coal mine production and prevention methods, surface and groundwater caused by coal mine production to understand the surface and groundwater environmental protection problems in coal mine area.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Wei Qiao

Reviewer: Qing Yu

Approver: Zhixin Liu

# Syllabus for《engineering geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05212 | Course Nature | Extension course |
| Faculty | School of Resources and Earth Sciences | Semester | EighthSemester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

Through the study of this course, students should first understand the research object and basic engineering types of geological engineering, be familiar with the meaning of geological engineering site and its main research content, master the engineering geological properties and geological environment of rock and soil mass, understand the content and exploration method of geological survey, and understand the theory of stability analysis mechanics of rock and soil mass. Master the analysis methods of major geological engineering problems and rock mass engineering reinforcement methods, have the preliminary ability to comprehensively use the geological engineering knowledge to carry out engineering design work, let the students master the dialectical thought of "theory comes from practice, and apply theory to practice". At the same time, cultivate students' ability to find and solve problems, cultivate students' perseverance and asdiligence spirit, so as to achieve the training objectives of geological engineering major for graduates' requirements on knowledge structure and ability to solve complex engineering problems.

The main content of this chapter 1 includes the formation and development of geoengineering, the object and basic engineering types of geoengineering research, the research methods of geoengineering and the relationship between geoengineering and engineering geology.

The main content of this chapter 2includes he structure of rock mass and classification of engineering rock mass, types and characteristics of in-situ stress field, characteristics of groundwater seepage field and characteristics and rules of geothermal field.

The main content of this chapter 3includes groundwater geological engineering function, groundwater exploration method, foundation pit dewatering method and applicable conditions and underground drainage engineering measures.

The main content of this chapter 4，5and6includes Geological survey and exploration, rock and soil stability analysis mechanics and geological engineering analysis.

The main content of this chapter 7and8includes Rock and soil anchorage engineering and anti - slide pile and retaining wall engineering.

2. Course Examination

Process assessment: 40% (Mid-term exams, essay assignments, and seminar results)

Closing Test Score: 60%

Writer: Cao liwen

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Prediction and prevention of geological disasters》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05213 | Course Nature | Development course |
| Faculty | School of Resources and Earth Sciences | Semester | fifth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular Hours | 16 | Online Resource |  |

1. Course Introduction

The course of geological disaster prediction and prevention is an important professional course of disaster prevention and reduction, which is a professional expansion course for outstanding engineers of geological engineering and an elective course for geological engineering. Based on the teaching concept of knowledge integrated engineering application and technology practice, this course combines classroom teaching, on-site teaching, video teaching, seminar, engineering case and practice training to carry out classroom, engineering field and video mixed teaching. Its prerequisite courses are general geology, soil mechanics, rock mechanics, engineering geology, hydrogeology, Quaternary geology, etc. This course mainly introduces the definition and main types of geological disasters, the classification of geological disaster prevention and control engineering, the characteristics and risk zoning of geological disasters, the requirements and principles of geological disaster control, the key points of geological disaster prevention and control construction of collapse, landslide, debris flow and ground collapse, the project management, completion acceptance and completion data compilation of geological disaster prevention and control engineering. Through the study of this course, the students can master the basic technology of geological disaster prevention and control, have the ability to engage in the design, construction and construction management of geological disaster prevention and control, and lay a theoretical foundation for the related professional research and production practice after graduation. In the process of teaching, the concept of "green water and green mountains are golden mountains and silver mountains" is transmitted to train students to contribute their technical strength to disaster prevention and mitigation and green, healthy and sustainable development of the motherland.

2. Course Examination

Teaching assessment accounted for 20% of the total score; 15% of the total results were obtained in ordinary times and seminars; Examination results accounted for 65% of the total score.

Writer: Wu Shenglin

Reviewer: Zhu shuyun

Approver: Dong Qinghong

# Syllabus for《Geological modeling training》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05217 | Course Nature | Extension course |
| Faculty | School of Resources and Earth Sciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular Hours | 0 | Online Resource |  |

1. Course Introduction

Through this course, test and research of geological engineering process, law and mechanism of the physical simulation and numerical simulation method, to make the students familiar with the earth dynamic geological phenomenon, human engineering, geological environment evolution of rock stress state and natural boundary condition simulation technology, excavation supporting process and mechanism of simulation technology, the fluid-structure interaction and infiltration process simulation technology, Rock and soil structure and evolution simulation technology, physical model and numerical model design, pre and post treatment technology, etc. Able to use physical simulation and numerical simulation methods to analyze typical geological engineering problems, identify the key physical and mechanical mechanisms of rock and soil deformation, seepage and failure, predict the stability and evolution trend of typical geological engineering, develop some geological engineering process simulation analysis programs and put forward expected conclusions; Cultivate the systematic view and evolution view of geological engineering, and establish the rigorous work style of seeking truth from facts.

The main content of this chapter 1 and 2includes Geological engineering problems and geological models and discrete element numerical methods.

The main content of this chapter 3 and 4includes Finite element method and physical simulation method.

The main content of this chapter 5 and 6 includes Multi-field and multi-phase coupling analysis and geological engineering simulation scheme and device design.

2. Course Examination

Process assessment: 100% (10% for Classroom performance, 60% for Job performance, 5% for assignments, 30% for The experimental results).

Classroom performance includes attendance and answering questions, 10%; Assignments will include a research report, 40%, and a seminar report, 20%; Experimental results include 1 numerical simulation test, 15%, and 1 physical simulation test, 15%.

Writer: Dong qinghong

Reviewer: Zhu shuyun

Approver: Liu zhixin

# Syllabus for《Drilling engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05219 | Course Nature | Optional transdisciplinary course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

Drilling and Excavation Engineering is an important basic subject of resource development, urban geological investigation and engineering construction. The course mainly introduces the progress of geotechnical drilling engineering and geotechnical excavation engineering, modern engineering construction, geotechnical drilling and excavation technology and drilling quality, equipment and tools, drilling washing, safe drilling, hydrology and well drilling, engineering construction drilling, oil and gas well drilling, directional drilling and urban underground trenchless technology, etc. The prerequisites are General Geology, Engineering Mechanics, Rock Mechanics, Soil Mechanics and Soil Mechanics. It is suitable for undergraduates majoring in geological engineering, civil engineering, etc. Through learning of this course, make the students master the basic professional knowledge of drilling and digging engineering, understand the engineering construction, drilling and digging problems, as well as the engineering survey, design, construction and monitoring process of the role and impact, and can correct and rational utilization of natural geological conditions, to various kinds of rock and soil drilling and digging technology and equipment requirements and methods. This course attaches great importance to the combination of theory and practice, which is conducive to cultivating students' engineering technology concept, enhancing practical and hands-on ability, and cultivating students' ability to solve drilling and excavation problems under complex geological conditions in production practice, thus laying a good foundation for the continuing study of professional courses and engineering practice in the future.

The main content of this chapter 1 includes The present situation and development of drilling and excavating engineering construction technology, the application scope of drilling and excavating, the development of construction equipment, the influence of geotechnical engineering properties on drilling and excavating, and the drillability and classification of rock.

The main content of this chapter 2, 3 and 4 includes Core drilling technology, hydrogeology and well drilling and pile foundation engineering construction technology.

The main content of this chapter 5 , 6 and 7 includes Directional drilling and trenchless technology, oil and gas well drilling and rock and soil excavation engineering.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yang weifeng

Reviewer: Dong qinghong

Approver: Liu zhixin

# Syllabus for《Engineering geotechnical》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05220 | Course Nature | Optional transdisciplinary course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

After learning the basic knowledge and ability of rock and soil mechanics, master the advanced knowledge of rock and soil constitutive model, strength theory, consolidation theory, rock and soil mass dynamics, rock and soil mass hydraulics, etc., have the preliminary ability to use rock and soil mechanics to solve complex engineering geological problems, and understand the international frontier progress of rock and soil mechanics.

The main content of this chapter 1 includes Constitutive model of rock and soil mass.

The main content of this chapter 2, 3 and 4 includes Strength theory of rock and soil, consolidation theory of soil and foundation deformation calculation and hydraulic properties of rock and soil.

The main content of this chapter 5 , 6 and 7 includes Dynamic properties of rock and soil mass, analysis of rock and soil engineering problems under complex conditions and development of modern rock and soil mechanics.

2. Course Examination

Course total score =Small paper score × 10% + Autonomous learning score ×20% + process assessment score × 30% + final exam score × 40%.

Writer: Yang weifeng

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Foundation of geological hazards》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05221 | Course Nature | Optional transdisciplinary course |
| Faculty | School of Resources and Earth Sciences | Semester | sixth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular Hours | 0 | Online Resource |  |

1. Course Introduction

The basic course of geological disaster is an interdisciplinary elective course, which is an important professional course of disaster prevention and mitigation. Based on the teaching concept of knowledge integrated engineering application and technology practice, this course combines classroom teaching, on-site teaching, video teaching, seminar, engineering case and practice training to carry out classroom, engineering field and video mixed teaching. Its prerequisite courses are general geology, soil mechanics, rock mechanics, engineering geology, hydrogeology, Quaternary geology, etc. This course mainly introduces the definition and main types of geological disasters, the classification of geological disaster prevention and control engineering, the characteristics and risk zoning of geological disasters, the requirements and principles of geological disaster control, the key points of geological disaster prevention and control construction of collapse, landslide, debris flow and ground collapse, the project management, completion acceptance and completion data compilation of geological disaster prevention and control engineering. Through the study of this course, the students can master the basic technology of geological disaster prevention and control, have the ability to engage in the design, construction and construction management of geological disaster prevention and control, and lay a theoretical foundation for the related professional research and production practice after graduation. In the process of teaching, the concept of "green water and green mountains are golden mountains and silver mountains" is transmitted to train students to contribute their technical strength to disaster prevention and mitigation and green, healthy and sustainable development of the motherland.

**2. Course Examination**

The examination accounted for 20% of the total score; 15% of the total results were obtained in ordinary times and seminars; Examination results accounted for 65% of the total score.

Writer: Wu Shenglin

Reviewer: Zhu shuyun

Approver: Dong Qinghong

# Syllabus for《Fundamentals of Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05222 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

Through learning of this course, students should be the basic grasp the meaning of engineering geology and its main research content, the connotation of the engineering geological conditions and engineering geological problems, rock mass structure and engineering geological properties, special engineering geological properties of soil, rock and soil body occurrence of geological environment and its research methods, the basic principle of regional stability analysis, slope deformation failure mechanism and stability evaluation method, The engineering geological analysis method of the stability and seepage deformation of the surrounding rock of underground engineering has the ability to comprehensively use the engineering geological knowledge, analyze the engineering geological conditions and refine the engineering geological problems. Cultivate students' ability to love the beautiful rivers and mountains of the motherland and devote themselves to the basic engineering construction of the motherland. Cultivate students' preliminary ability to engage in the basic operation and design of the actual engineering geology work. To achieve the professional geological engineering, geological engineering (excellent engineer), geophysics, resource exploration engineering graduates knowledge structure requirements and the ability to solve complex engineering problems requirements of the training objectives.

The main content of this chapter 1 includes The meaning of engineering geology, the task of engineering geology, the development history of engineering geology, the basic theory, characteristics and development trend of contemporary engineering geology, engineering geological conditions, engineering geological problems and engineering geological research methods.

The main content of this chapter 2, 3 and 4 includes Geotechnical engineering geology properties and rock mass structure engineering geology research, active fault and earthquake engineering geology research and slope stability engineering geology research.

The main content of this chapter 5 and 6 includes Engineering geology research of karst and seepage deformation and engineering geology analysis of surrounding rock stability in underground engineering.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Cao liwen

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Engineering Geology and Hydrological Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05223 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Forth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 16 | Online Resource | https://www.icourse163.org/course/CUMT-1003753007 |

1. Course Introduction

The course of engineering geology and hydrogeology is suitable for undergraduates majoring in civil engineering and mining.

The course adopts the "Online + offline" mixed teaching mode, mainly explaining the geological knowledge related to engineering construction, including minerals and rocks, strata and geological structure, geological action of water, engineering properties of rocks and special soil, adverse geological phenomena and prevention, underground engineering geological problems, foundation engineering geological problems, slope engineering geological problems, engineering geological exploration, etc.

Through the study of this course, students can master the basic principles of engineering geology and hydrogeology, be familiar with the common geological phenomena in engineering construction, analyze and solve the complex geological problems in the process of engineering survey, design and construction by using professional theory, understand the impact of engineering activities on geological environment, and master the basic means, methods and methods of engineering geology and hydrogeology Implementation principle.

2. Course Examination

Course total score = process assessment score × 20% + online learning score × 20% + final exam score × 60%.

Writer: Jishan Xu

Reviewer: Qing Yu

Approver: Zhixin Liu

# Syllabus for《Geotechnical Mechanics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05224 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 56 | Credit | 3.5 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

After learning the basic knowledge and ability of rock and soil mechanics, master the advanced knowledge of rock and soil constitutive model, strength theory, consolidation theory, rock and soil mass dynamics, rock and soil mass hydraulics, etc., have the preliminary ability to use rock and soil mechanics to solve complex engineering geological problems, and understand the international frontier progress of rock and soil mechanics.

The main content of this chapter 1 includes Constitutive model.

The main content of this chapter 2, 3 and 4 includes Strength theory of rock and soil, consolidation theory of soil and foundation deformation calculation and hydraulic properties of rock and soil.

The main content of this chapter 5 ,6,and 7 includes Dynamic properties of rock and soil mass, analysis of rock and soil engineering problems under complex conditions and development of modern rock and soil mechanics.

2. Course Examination

Course total score =Small paper score × 10% +Autonomous learning score × 20% + process assessment score × 30% + final exam score × 40%.

Writer: Yang weifeng

Reviewer: Yu qing

Approver: Liu zhixin

# Syllabus for《Foundation and foundation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05225 | Course Nature | Professional development courses |
| Faculty | School of Resources and Earth Sciences | Semester | fifth semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular Hours | 6 | Online Resource |  |

1. Course Introduction

Foundation and foundation is a professional development course for undergraduates majoring in geological engineering. The main purpose of the course is to establish the basic understanding of foundation treatment and foundation design for undergraduates majoring in geological engineering, and cultivate the ability of design and drawing; Its prerequisite courses are soil science, soil mechanics and rock mechanics; It is suitable for students majoring in geological engineering. This course mainly talks about the design and construction of shallow foundation, pile foundation and foundation treatment. The shallow foundation part focuses on the selection of foundation type, selection of bearing layer, checking calculation of bearing capacity, foundation size and reinforcement design. The pile foundation part focuses on the type and structure of the pile, the bearing capacity and checking calculation of the pile foundation, the design and checking calculation of the pile cap, etc. In the foundation treatment part, the comparison and selection of treatment schemes, the design and calculation of composite foundation, and the detection of bearing capacity of composite foundation are explained; Through the study of this course, the students have the ability to design the foundation and foundation according to the basic requirements of engineering and geotechnical engineering conditions, and to organize and participate in the construction according to the engineering design scheme and requirements.

2. Course Examination

Mid term examination results accounted for 30%, and final examination results accounted for 70%.

Writer: Wang Dangliang

Reviewer: Yang Weifeng

Approver: Liu Zhixin

# Syllabus for《Geotechnical engineering construction》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05226 | Course Nature | Development courses |
| Faculty | School of Resources and Earth Sciences | Semester | fifth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular Hours | 0 | Online Resource |  |

1. Course Introduction

Geotechnical engineering construction technology is a theoretical, practical and technical application technology, which involves a wide range and is difficult to construct. It has a close relationship with other disciplines. Geotechnical engineering construction technology plays a very important role in the construction of various projects. In engineering construction, it is often necessary to carry out deep foundation construction and foundation pit support, in order to make senior students of geotechnical engineering, construction engineering, engineering geology and other majors have a preliminary understanding of geotechnical engineering construction technology. Geotechnical engineering construction is a major course for undergraduates majoring in geological engineering. The main purpose of the course is to establish the basic understanding of geotechnical engineering construction for undergraduates majoring in geological engineering, and to train students to understand the process, technology, existing problems and construction management of geotechnical engineering construction; Its prerequisite courses are soil science, soil mechanics and rock mechanics; It is suitable for students majoring in geological engineering. The main contents of the course are: foundation treatment construction, pile foundation construction, underground continuous wall construction, SMW construction, MJS construction, geotechnical anchoring technology construction, underground geotechnical trenchless construction, geotechnical grouting technology construction, geotechnical engineering construction monitoring technology. Through the study of this course, the students have the ability of preliminary geotechnical engineering construction organization design and management. In this course, the pile foundation construction, underground continuous wall construction, rock and soil anchoring construction, trenchless technology are systematically introduced to provide knowledge preparation for students who are going to work.

2. Course Examination

30% for homework and 70% for examination.

Writer: Wang Dangliang

Reviewer: Yang Weifeng

Approver: Liu Zhixin

# Syllabus for《Intelligent Method and Equipment of Geological Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05227 | Course Nature | Main major course |
| Faculty | School of Resources and Earth Sciences | Semester | SixthSemester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource | https://www.icourse163.org/course/CDLGDX-1460205161?from=searchPage |

1. Course Introduction

This course is a major course in the field of geological engineering. The prerequisite courses of this course are geological engineering information system, geological engineering and geotechnical drilling engineering; It is suitable for the intelligent geological engineering direction of geological engineering specialty. To meet the needs of economic and social development, we should adhere to moral education, cultivate high-quality application-oriented talents with socialist core values, basic knowledge and application ability of intelligent methods and equipment, and be able to engage in Geological Engineering Specialty Based on information cutting-edge technology. It mainly introduces the connotation, research significance and possible new directions of geo engineering intelligence; Intelligent perception method of engineering geological conditions and engineering conditions; Intelligent evaluation method for evolution process of engineering geological conditions, engineering conditions, economic and environmental conditions, etc; Critical state identification, judgment methods and Countermeasures of engineering conditions and engineering conditions; The structural characteristics of geological engineering intelligent equipment and its creativity.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Dong qinghong

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Foundation pit and underground engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05228 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

Through learning this course, make students understand and master relevant basic knowledge of the foundation pit and underground engineering, understand the basic principle of foundation pit and the overall design of the underground engineering and design method, understand the judgment of surrounding rock stability analysis method, familiar with surrounding rock classification method, grasp the characteristics of surrounding rock stress and its calculation method, understand the basic methods of lining structure calculation, Have the basic ability of design and calculation of foundation pit and underground structure, be able to clarify the construction process and application conditions of drilling and blasting method, New Austrian method, tunnel boring machine, shield method and immersed pipe method, be familiar with the common disasters of foundation pit and underground engineering, understand the disaster protection and treatment engineering measures, through learning and training, Possess professional standards and practical ability of design and construction related to foundation pit and underground engineering activities.

The main content of this chapter 1 includes The basic concept of foundation pit and underground engineering, the function and classification of foundation pit and underground engineering, and the brief development of foundation pit and underground engineering.

The main content of this chapter 2, 3 and 4 includes Underground engineering geological environment and surrounding rock classification, underground engineering structure and underground engineering support structure design calculation method.

The main content of this chapter 5 ,6,and 7 includes Foundation pit supporting structure, foundation pit supporting design method and foundation pit groundwater control.

The main content of this chapter 8 and 9 includes Construction method of foundation pit and underground engineering and disaster and protection of foundation pit and underground engineering.

Content of experiment arrangement inclues The section design and calculation of the foundation pit supporting structure and the whole design and calculation of the foundation pit supporting structure.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Li xiaoqin

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Geological Engineering (graduation project)“》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05229 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Eighth Semester |
| Class Weeks | 12 | Credit | 5 |
| Extracurricular Weeks | 0 | Online Resource |  |

1. Course Introduction

Comprehensive training students to use what they have learned the basic theory, basic knowledge and basic skills, and further develop the students' innovation ability, ability to research, retrieval and reading the data of survey, analyze and demonstrate the project plan, calculation and design capability, test the ability of research and analysis, computer application ability, the ability of engineering drawings, The ability to write technical documents and engage in scientific research, etc., to achieve the requirements of the geological engineering major for the graduates' knowledge structure and the ability to solve complex engineering problems.

According to the graduation design the arrangement of the steering group, students have to complete the graduation design (paper), is the student according to the actual data according to the provisions of this outline design content, combined with practical engineering or scientific research projects, through specialized scientific research, the last write conform to the requirements of the specification and the project of graduation design (paper) or in theory there is a certain views of graduation thesis.

Text part:

The description of graduation project (thesis) should include the following contents:

The title

Graduation project (thesis) assignment book, evaluation book, etc

directory

Abstract (500~1000 words, including key words)

English abstract (translation of Chinese abstract, including key words)

The body of the

The appendix

reference

Professional foreign language literature and its translation

The appendix:

The specification of graduation project (thesis) should include the necessary drawings and test data, etc.

2. Course Examination

Graduation design (thesis) according to excellent, good, medium, pass, fail five grades or a percentage system for grading. On a five-point scale, a score of 90 or above is considered excellent. A score of 80 to 89 is good, 70 to 79 is moderate, 60 to 69 is passing, and 60 or less is failing.

The final evaluation of students' graduation project (thesis) results shall be determined by a meeting of defense leaders convened by the department and submitted to the school for approval.

Writer: Sun ruhua

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Groundwater Numerical Modeling》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05301 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 24 | Credit | 2 |
| Experimental hours | 8 | Online Resource |  |

1. Course Introduction

The groundwater numerical modeling course is an extension course for the major of hydrology and water resources engineering, and it is also one of the special professional courses with geological background for the major of hydrology and water resources engineering in CUMT. Its prerequisite courses are the foundations of hydrogeology, groundwater dynamics.

Through the teaching of this course, students can clearly understand the basic concepts of groundwater numerical modeling, the problem description and application fields of groundwater flow; master the finite difference method and finite element method of groundwater flow; be familiar with the requirements of groundwater numerical modeling data; know the application of differential or finite element software and be familiar with the flow of groundwater numerical modeling through application examples. It will make students have the "prototype to model" transformational thinking, be familiar with groundwater modeling methods and software, will train students to integrate theory with practice, and have the ability to use groundwater numerical modeling tools to solve practical problems such as groundwater migration, groundwater environmental evaluation, and extraction volume prediction.

This course mainly includes groundwater flow problems, the advantages and disadvantages of numerical modeling methods; the finite difference method and finite element method of groundwater flow modeling models; the numerical method of inverse hydrogeological parameters through modeling; make students understand the knowledge of international popular software and related applications in the field of groundwater, be familiar with the latest development trends and prospects of international groundwater numerical modeling.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Qi Yueming

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Watershed hydrological modeling》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05302 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course is an extension course for students major in Hydrology and Water Resources Engineering. Its prerequisite courses include the principle of hydrology and hydrological forecasting. Through course study, students can master the basic principles and modeling techniques of hydrological forecasting methods, including basic theories of runoff generation and concentration, infiltration theory and models, full-storage runoff models, super-permeable runoff models, evapotranspiration models, river flow calculations, The rainfall-runoff model, the establishment of the model structure and the determination and calibration of the parameters in various models, and train students to use the model to solve practical production problems.

This course introduces new methods and techniques for watershed hydrological simulation, and grasps the basic principles and modeling techniques of hydrological simulation. It mainly includes the basic theory of runoff yield and concentration, infiltration theory and model, evapotranspiration model, model of runoff yield and concentration, channel flow routing, generalization of watershed hydrological process, modeling, parameter calibration and validation, etc. The focus is on learning the latest dynamic hydrological simulation, the principle and method of modeling, using hydrological model to solve practical problems, research on hydrological laws, and grasp the advantages and disadvantages of different hydrological models, the applicable conditions and scope of application.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: SONG Xiaomeng

Reviewer: KONG Fanzhe

Approver: LIU Zhixin

# Syllabus for《Water Pollution Prevention and Remediation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05303 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course "Water Pollution Prevention and Remediation" is an extension course for hydrology and water resources majors, whose prerequisite courses are "Water Environment Chemistry", "Fundamentals of Hydrogeology", "Water Environment Monitoring and Protection" and "Water Resources Pollution Control", which is applicable to undergraduate students of hydrology and water resources engineering. The course is mainly about water pollution investigation, evaluation methods and water pollution prevention and remediation techniques, the main contents include: water pollution identification, water pollution investigation, surface water pollution evaluation, river pollution ecological restoration techniques, lake and reservoir pollution ecological restoration techniques, groundwater pollution evaluation, groundwater pollution restoration techniques and other contents. Through the course of study, students master the basic concepts, basic theories and basic methods of water pollution prevention and remediation, familiar with common water pollution evaluation models and water pollution remediation techniques, can use water chemistry, hydrogeology and other professional theoretical knowledge, analysis and proposed surface water and groundwater and other water pollution evaluation and remediation solutions, with the basic ability to engage in water pollution prevention and remediation of scientific research and practice.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yong Liu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Isotope Hydrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05306 | Course Nature | Extension course |
| Faculty | School of Resources and Earth Sciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Through the study of this course, students can understand the principle and test method of isotopic fractionation, master the characteristics of atmospheric precipitation isotope equation; master the use of isotopes to determine the recharge resource, supply range, and replenishment elevation of groundwater; master the method of use isotopes to determine the age of groundwater; Master the use of isotopes to determine the source of groundwater pollution; master the use of isotopes to predict the temperature of underground thermal reservoirs.

Through the study of this course, students can fully grasp the basic theories, basic methods and basic skills of water isotope, and have the ability to analyze and deal with comprehensive isotope hydrological problems.

The main content of this chapter 1 is to understand the overview of isotopes in the water cycle

The main content of this chapter 2 includes the changes of isotopes in water, the characterization methods of isotopes, and the principle of isotope fractionation.

The main content of this Chapter 3 includes the collection method of isotope samples and the method of isotope testing.

The main content of this Chapter 4 includes the atmospheric precipitation line equation, the changes of atmospheric precipitation isotope and the temporal and spatial distribution characteristics of atmospheric precipitation isotope

The main content of this Chapter 5 is the characteristics of stable isotopes in lakes and the balance of isotopes.

The main content of this Chapter 6 includes the use of isotopes to determine the source, scope, and elevation of groundwater recharge, as well as the use of isotopes to determine the age of groundwater, and the use of isotopes to determine the source of groundwater pollution.

The main content of this Chapter 7 includes the application of environmental isotope in the hydrothermal system and the use of isotope to predict the temperature of underground thermal reservoirs.

2. Course Examination

Course total score = process assessment score × 50% + outcome assessment × 50%.

Writer: Yanqing Ding

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《General Hydrogeology A》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05307 | Course Nature | Minor course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource | https://www.icourse163.org/spoc/course/CUMT-1206705809 |

1. Course Introduction

General hydrogeology A is a major course of Hydrology and Water Resources Engineering, and its prerequisite course is general geology. The course explains the origins of groundwater, the feature of groundwater medium, the existence form of groundwater in media, features of groundwater flow, aquifer, aquiclude and groundwater system, the chemical composition of groundwater and its formation, recharge, runoff, discharge and regime feature of groundwater. The features of different types groundwater, groundwater utilization and its environmental impact, and so on. Through the study of this course, students will grasp the basic theory in hydrogeology, including the origin, formation, occurrence, movement conditions, features and vary with time of quality and quantity, classification and its features of groundwater, understand the relationship between groundwater and environment, understand the features of groundwater resources and water resources management preliminary, lay a foundation for further study of hydrogeology.

Through the study of the courses, master the basic knowledge and concepts in hydrogeology, understand the basic laws of groundwater science.； possess the ability to analyze the formation, occurrence and transport rule of groundwater preliminary, possess the ability to analyze the chemical property, regime and budget of groundwater preliminary； understand the features of water resources and the relationship between water resources and environment, cultivate students excellent quality of love for nature and cherish water resources；Build the basic concepts of hydrogeology, understand the framework of hydrogeology knowledge, lay the foundation for other courses of hydrology in the future.

2. Course Examination

Course total score = process assessment score × 40% + final exam score ×60%.

Writer: Jinpeng Xu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Principle of Hydrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05308 | Course Nature | Extension course |
| Faculty | School of Resource and Geosciences | Semester | Fourth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The course has the characteristics of high specificity, strict logic and wide application. Through the study of this course, students can understand the research objects, research contents and research approaches of hydrology, understand the relationship between hydrology and related disciplines, master the basic concepts and methods of hydrology, so as to lay the necessary foundation for the study of subsequent hydrology and water resources.The goal of this course is to develop students' ability to analyze and solve problems, and to conduct in-depth analysis of hydrological problems in specific basins or regions, so as to solve hydrological problems in production and scientific research, especially in complex engineering problems.

The main contents of this chapter 1 include the basic characteristics of the research methods and hydrological phenomena, the research objects and methods of hydrology, the development process and its classification system.

The main content of this chapter 2 includes the equation of water balance and the scale of hydrological cycle,precipitation characteristics,regional average precipitation,factors affecting the spatial and temporal distribution of precipitation,the types and characteristics of soil water,energy state of soil water,infiltration phenomenon and its physical process,influencing factors of infiltration,the physical mechanism of evaporation, the factors affecting evaporation and the calculation of evaporation,runoff process.

The main content of this chapter 3 includes the structure of vadose zone, water dynamics and its redistribution effect on rainfall,the physical mechanism of runoff generation and the basic runoff generation mode,Houghton's runoff theory and modern slope hydrology runoff theory,plant interception and hollowing process.

The main content of this chapter 4 includes Saint Venant's equations,the motion,types and characteristics of flood waves,principle and equation of tank storage,law of flood movement in river course, the basic principle of flood calculation method,law of dry and receding water.

The main content of this chapter 5 includes the calculation of the total runoff of full storage and runoff,calculation of hyperosmotic runoff,the variation of runoff area and its description,analysis and determination of runoff yield models in different basins.

The main content of this chapter 6 includes the composition of the discharge of the outlet section,the meaning and application of line of equal flow and unit hydrograph,catchment confluence principle,classification and problems of catchment confluence models.

The main content of this chapter 7 includes glaciers,river ice regime,snowmelt runoff.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Zhu Kui

Reviewer: Kong Fanzhe

Approver: Liu Zhixin

# Syllabus for《Water Environmental Chemistry》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05309 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course of "Water Environment Chemistry" is the Extension course of hydrology and water resources engineering majors, whose prerequisite courses are "University Chemistry" and "Fundamentals of Hydrogeology", applicable to undergraduate students of water resources and geology majors. The course is mainly about the basic principles of water chemistry of natural water and the water chemistry characteristics of various natural water bodies. The main contents include: the structure and nature of water, the composition and classification of natural water, water pollution and its main pollutants, the role of chemical equilibrium of natural water, the interface chemical processes in the water environment, the migration and transformation of chemical substances in the water environment, and the research methods of water environment chemistry. Through the study of the course, students master the basic theory of water environment chemistry, familiar with the characteristics of natural water body water chemistry, understand the common water environment chemical problems, can use the professional theory of water chemistry, analysis and solution of hydrological investigation, hydrogeological exploration, water environmental protection and water pollution prevention and control of the main water chemistry problems, master the research methods of water environment chemistry, for the future to engage in water conservancy, environment, resources, geology This course will lay a solid foundation for future work in the fields of water resources, environment, resources, geology, etc.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yong Liu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Physical Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05310 | Course Nature | Extension course |
| Faculty | School of Resources and Geoscience | Semester | Second Semester |
| Class Hours | 48 | Credit | 3 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

This course is a required basic course. This course is applicable to the specialties of geological prospecting engineering, geophysics, hydrology and water resources engineering. It mainly covers the knowledge and skills of earth composition, crustal deformation and displacement, and the geological processes which control these geological phenomena. The main contents of the course are about elements, minerals and rocks that composing the earth, various geological processes which control the distribution of material, and the palaeontological stratigraphic record which reflect the process of geo-evolution, geological disasters which are closely related to human living environment. Through the course, students are expected to learn the basic geological concepts, theories and research methods, and set up the scientific viewpoints about earth, resources, environment, and man-land relationship. Common geology focus on the combination of theory and practice, in order to make a great contribution to develop sudents’ scientific thinking, practical ability and comprehensive qualities, and finally lay a good foundation for their further learning.

2. Course Examination

This course assessment adopts a combination of process evaluation and goal evaluation, and the final score of the course is comprehensively determined by the usual results (including attendance and usual performance), homework, experimental results and final exam results. Normal scores account for 10% of the total score, homework scores for 10%, laboratory scores for 20%, and final exam scores for 60%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Yulin Shen

Reviewer: Yinghai Guo, Chongtao Wei

Approver: Zhixin Liu

# Syllabus for《Hydraulics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05312 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The course is a significant course for the students minor in Hydrology and Water Resources Engineering. Its prerequisite courses include advanced mathematics and physics. Through the study of this course, students can master the basic concepts, theories, and calculation skills of hydraulics to lay the necessary hydraulics foundation for the study of subsequent courses. This course aims to cultivate students’ logical reasoning ability, hydraulic calculation ability, innovation consciousness, and self-study ability, especially to analyze and solve practical engineering problems by comprehensively using the learned hydraulics knowledge.

The main contents include as follows: definition and task of hydraulics, hydrostatic features, the basic principles of water flow movement, the theories and methods for conduit flow and open channel flow, the hydraulic practices for the hydraulic structure, subsurface flow movement and solute transport. Upon successful completion, students gained basic knowledge of mathematical treatment of physical flow processes, particularly transient flow in open channels and pipes. They can select adequate modeling concepts to solve hydraulic problems, apply and modify simple numerical simulation models, elaborate problem solutions in small teams, and interpret and evaluate simulation results and uncertainties to understand better the theory and application of the more widely available simulation models.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: SONG Xiaomeng

Reviewer: KONG Fanzhe

Approver: LIU Zhixin

# Syllabus for《Special Hydrogeology Course》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05313 | Course Nature | Minor course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Through the study of this course, students can master the working principle, common equipment and application conditions of hydrogeological exploration techniques and methods, such as hydrogeological surveying and mapping, hydrogeological geophysical exploration, hydrogeological drilling, hydrogeological experiment and hydrogeological dynamic equilibrium monitoring, understand the basic methods and application conditions of geothermal exploration and hydrogeological exploration of water supply, master the basic methods and related professional knowledge of water supply hydrogeological exploration, such as water supply quality evaluation, calculation and evaluation of groundwater resources, development and management of groundwater.

Students can be trained and get abilities to choose appropriate methods of hydrogeological exploration and arrange workload according to different types of hydrogeological problems in the principle of technical, economic and reasonable, be equipped with the initial ability to analyze, study and solve practical hydrogeological problems, and obtain engineering consciousness and standardization consciousness.

The main content of this chapter 1 includes the division of stages of hydrogeological exploration and the basic requirements for each stage, methods and workload of hydrogeological exploration.

The main content of this chapter 2 includes the purposes, tasks and working procedures of hydrogeological mapping, basic contents and requirements of hydrogeological surveying and mapping.

The main content of this chapter 3 includes the basic principles of hydrogeological geophysical exploration, the basic content of hydrogeological geophysical exploration.

The main content of this chapter 4 includes objectives and tasks of hydrogeological drilling, simple hydrogeological observation, structure design of hydrogeological boreholes, technical requirements for hydrogeological drilling.

The main content of this chapter 5 includes tasks and types of pumping tests, technical requirements of pumping test and borehole layout, pumping test equipment and tool, site work and data collection of pumping test, principles and methods of water discharge test, connection test, water [pump-in](javascript:;) test and water injection test.

The main content of this chapter 6 includes factors and equilibria of groundwater dynamics, characteristics of common groundwater dynamic genetic types, determination of groundwater equilibrium elements, methods of groundwater dynamic equilibrium.

The main content of this chapter 7 includes methods for the exploration of underground hot water resources and evaluation of geothermal resources.

The main content of this chapter 8 includes the types of hydrogeological maps, the compilation and content of the text manual of hydrogeological reports.

The main content of this chapter 9 includes principles and methods for the selection of water supply sources, occurrence law and characteristics of groundwater in common water sources.

The main content of this chapter 10 includes contents and methods of water quality evaluation for drinking water, industrial water, agricultural irrigation water and mineral water.

The main content of this chapter 11 includes concepts of groundwater reserves, calculation methods of allowable groundwater extraction, such as exploitation test method and local compensation drainage method.

The main content of this chapter 12 includes exploitation areas of underground water and structures for [waterintaking](javascript:;) projects, structure design of pipes and wells, methods of underground water exploitation in coal mining, regulations relating to the management and protection of groundwater resources.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Hang Yuan

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Hydrometry》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05314 | Course Nature | Minor course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The course is an important component of the hydrological sciences, and it is also a required course for students who minor in Hydrology and Water Engineering. Its prerequisite course is “Principles in Hydrology”. The contents include as follows: the basic concepts, methods and theories for station setting; the basic information for observation, collection and calculation the hydrologic elements; the methods for dealing with the hydrologic data; the error analysis methods for the hydrologic observation; the automation information for hydrological survey and forecasting, and so on. Through this course, students are expected to grasp the basic concepts, theories and methods to collect the hydrological information and to deal with the hydrological data through this course learning. They can gain basic knowledge of discipline development.

The main contents include as follows: gauges and network, precipitation gauging, water level gauging, discharge measurement, sediment measurement, groundwater monitoring, water quality information collection, discharge data processing and sediment data processing. The main objective of this course are:

To master the basic concepts and related theories and methods for hydrological information collection, data processing, information transmission, and information release；

To cultivate the innovation consciousness and scientific literacy for the students；

To make the students understand the development direction of this discipline and the current situation of hydrological information technology at home and abroad；

To train the analysis ability to solve the hydrological information problems met in practice。

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: SONG Xiaomeng

Reviewer: KONG Fanzhe

Approver: LIU Zhixin

# Syllabus for《Water resources evaluation and utilization》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05316 | Course Nature | Main major course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | Two |
| Extracurricular hours | 8 | Online Resource | https://www.icourse163.org/course/WHU-1002921017?from=searchPage |

1. Course Introduction

Water resources evaluation and utilization is the main major course of hydrology and water resources engineering, and its prerequisite courses are "Groundwater Dynamics" and "Principles of Hydrology". This course mainly describes the calculation method of groundwater resources, the calculation method of the allowable extraction of groundwater, the calculation method of surface water resources, the analysis and processing methods of precipitation, evaporation, and runoff, the calculation method of the usable amount of surface water, and the amount of water resources. The method of determining the amount of repetition, the method of evaluating the quality of water resources, the engineering and ways of water resources development and utilization.

Through the study of this course, master the basic concepts in water resources evaluation, and master the amount of groundwater recharge, discharge, storage, groundwater resources, surface water resources, groundwater extractable use, surface water available, groundwater and surface water Repetitive quantity, total amount of water resources, surface water quality and groundwater quality evaluation methods, master the basic principles of water resources evaluation by analytical method, parameter method and water balance method, and the basic process of water resources evaluation, master the development and utilization of water resources Engineering and approach. Cultivate students' professional ability to evaluate and utilize water resources by collecting, sorting and analyzing hydrological data. Cultivate students' sense of social responsibility and historical mission to save and protect water resources.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Guiming Dong

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Water Environment Monitoring and Protection》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05319 | Course Nature | Minor Course |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource | http://www.icourse163.org/course/ZZU-1207210802 |

1. Course Introduction

The main contents of this course include water environment monitoring content and methods, water pollution load analysis and prediction, water environment evolution principles, water environment simulation and prediction mathematical models, water environment quality evaluation, water environmental protection planning and management, etc.

Through this course, familiarize with the main tasks and content of water environment monitoring and protection, understand the important meaning and role of water environment monitoring and protection, master the basic theories and methods of water environment monitoring and protection, and form a systematic theoretical and technical system in water resources monitoring, protection, planning and management.

Enable students to establish awareness of water environmental protection and sustainable social development, and cultivate students’ ability to apply the principles of natural science to investigate, explain and solve complex engineering problems in hydrology, water resources, and groundwater science.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Bo Liu

Reviewer: Fanzhe Kong

Approver: Zhixin Liu

# Syllabus for《Engineering geology and hydrogeology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05402 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | https://www.icourse163.org/course/CUMT-1003753007 |

1. Course Introduction

The three graduation requirements in the supporting training plan of this course are engineering knowledge (graduation requirement 1.2), problem analysis (graduation requirement 2.3), and environment and sustainable development (graduation requirement 7.2). It enables students to master the professional knowledge related to engineering geology and hydrogeology, master the theoretical methods and engineering means of engineering geology, have the ability to solve complex engineering geology problems, and cultivate the basic quality of promoting the sustainable development of "engineering-environment-society".

The main content of this chapter 1 includes Minerals and rocks.

The main content of this chapter 2, 3 and 4 includes Strata and geological structure, water geology and engineering properties of rocks and special soils.

The main content of this chapter 5 ,6,and 7 includes Bad geological phenomena and prevention, underground engineering geological problems and foundation engineering geological problems.

The main content of this chapter 8 ,9,and 10 includes Foundation engineering geology problems, slope engineering geology problems and engineering geology investigation.

Outside school hours inclues Introduction and overview of the earth surface system, the engineering geological properties of the rock and soil engineering geological properties of engineering geological properties of groundwater, construction of foundation engineering and its geological problems, underground caverns engineering and geological problems of loess embankment engineering geological problems of the three gorges reservoir engineering and its geological problems, across the river in bridge engineering and its geological problems, the permafrost roadbed engineering and its geological problems, Water diversion channel engineering and its geological problems, reclamation engineering and its geological problems, mountain slope sliding flow disaster, urban land subsidence and ground fissure disaster, atmospheric environment engineering geological problems and engineering geological investigation.

Experimental teaching content inclues Identification of mineral and rock specimens and field practice.

2. Course Examination

Course total score = online learning score × 20% + process assessment score × 20% + final exam score × 60%.

Writer: Xu jishan

Reviewer: Yu qing

Approver: Liu zhixin

# Syllabus for《Geophysical Numerical Simulation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05403 | Course Nature | Geophysical Numerical Simulation |
| Faculty | School of Resources And Geosciences | Semester | The seventh semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 6 | Online Resource |  |

1. Course Introduction

"Geophysical Numerical Simulation" is an extended course for the major of geophysics. Its prerequisite courses are advanced mathematics, linear algebra, college physics, geophysical field theory, seismic exploration principles and applications, electrical and electromagnetic exploration principles and applications, gravity and magnetic exploration principles and applications, engineering mathematics, mathematical physics methods, and seismic waves dynamics. This course mainly describes the numerical simulation methods of geophysical field, mainly including the finite difference numerical solutions of electromagnetic equations, acoustic wave equations and elastic wave equations. The course focuses on explaining geophysical parameter models, finite difference meshing methods, optimal selection of difference coefficients, definition of geophysical observation systems, and the characteristics of complex model geophysical fields. The purpose is to enable students to understand geophysical numerical simulation methods, master the characteristics of geophysical data, and be able to apply them to geophysical prospecting.

The main contents of this chapter 1 include the concept of electromagnetic equations, acoustic wave equations, and elastic wave equations.

The main content of this chapter 2 includes the derivation of finite difference formula, selection of difference coefficients, finite difference stability.

The main content of this chapter 3 includes the compiling of acoustic wave equation program, elastic wave equation program, and electromagnetic wave equation program.

The main content of this chapter 4 includes the design of geophysical data acquisition system and design principles of special exploration targets.

1. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Hu Yong

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Geophysical inversion》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | 010021S6 | Course Nature | Optional major courses |
| Faculty | School of Resource and Geosiciences | Semester | The second Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource | http://[www.seg.org](http://www.seg.org) |

1. Course Introduction

Geophysical Inversion is an off-line hybrid course. Its first course is physical geology, seismic exploration principles and electrical exploration. This course is suitable for undergraduate and graduate students of geophysics and other related majors. The course of Geophysical Inversion mainly describes the basic methods and applications of geophysical inversion. The course consists of three parts: the basic principles and methods of geophysical inversion, seismic inversion and electrical exploration inversion. Through the study of this course, students should be able to master the basic principles of the commonly used geophysical inversion methods, understand the current development of the main geophysical inversion at home and abroad, and be familiar with the application conditions. The basic principles and methods of geophysical inversion theory can be applied to solve practical problems in scientific research. To improve students' ability to solve geological problems, to deepen students' understanding and understanding of the essence of professional theory, to promote students' understanding and understanding of the combination of geophysics and related majors, so as to broaden students' professional knowledge.

Through the study of this course, students can understand the basic methods and applications of geophysical inversion. The course consists of three parts: the basic principles and methods of geophysical inversion, seismic inversion and electrical exploration inversion. The course focuses on the basic principles of inversion (what is inversion problem, forward problem, principle of linear inversion method, generalized inversion method, nonlinear inversion problem), seismic inversion method and application conditions. Seismic inversion is based on CSSI、Geostatistical inversion and SMI inversion. This course is a theoretical course, through learning can understand the current situation of the main geophysical inversion at home and abroad, understand the basic principles and methods of geophysical inversion theory; The basic principles and methods of geophysical inversion theory can be used to analyze and solve practical problems in scientific research.

Geophysical inversion methods include inversion of overdetermined problems, inversion of underdetermined problems, inversion of mixed problems, inversion of band constraint problems, nonlinear inversion and other geophysical inversion methods. Examples of geophysical inversion include seismic wave impedance inversion, seismic travel time inversion, seismic pre-stack inversion, geophysical joint inversion, etc. To master the basic methods of linear geophysical inversion, such as overdetermined, underdetermined, mixed and band constrained conditions, to understand the characteristics of the commonly used geophysical inversion methods, such as seismic wave impedance inversion, travel time tomography inversion, seismic pre-stack inversion, geophysical combined inversion and so on.

Objective 1: to understand and master the basic concepts and methods of mathematics and to have the ability to apply them to engineering fundamentals and geophysical expertise;

Objective 2: to design a feasible technical scheme based on the principles of methodology, data acquisition, data processing and comprehensive interpretation of the complex engineering problems in the field of geophysical exploration;

Objective 3: to explore complex engineering problems in geophysical fields, to develop or select appropriate simulation tools to study positive and negative problems of complex problems.

2. Course Examination

Course total score =homework × 20% +attendance ×10% class discussion × 10% + final exam score × 60%.

Writer: Xu Yongzhong

Reviewer: Pan Dongming

Approver:

# Syllabus for《geophysical tomography》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05405 | Course Nature | Major Elective Courses |
| Faculty | School of Geoscience | Semester | 7th Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Computerized tomography is one of the branches of geophysics, used as an aid in geophysical exploration. With this method, detailed pictures of electromagnetic and seismic properties in the regions between pairs of boreholes can be reconstructed. In this course you will learn how to build straight-line ray optics model 、Fresnel model and full wave equation model for energy propagation between boreholes and use this models to reconstruct the image. The course will provide linear and nonlinear techniques in the iterative solution techniques. Students will acquire the skills to program different tomographic methods relevant for solving geophysical problems. A key goal is to improve student’s professional knowledge structure in geophysical inversion.

2. Course Examination

Course total score = process assessment score × 50% + final exam score × 50%.

Writer: Yue lei

Reviewer: \*\*\*

Approver: \*\*\*

# Syllabus for《Mine Safety Geophysics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05406 | Course Nature | Extension Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 6 | Online Resource |  |

1. Course Introduction

The Mine Safety Geophysics is an extended course integrating undergraduate and master degrees in geophysics. Its prerequisite courses are Principles of Seismic Exploration, Principles of Electric and Electromagnetic Exploration. It is applicable to the students majored in geophysics, geological engineering, resource exploration technology and engineering, etc. This course mainly covers the theory of full-space electromagnetic field, full-space seismic wave theory, mine radio wave perspective, mine direct current method exploration, mine geological radar exploration, channel wave seismic exploration, mine seismic exploration, and the application of other mine geophysical exploration methods in mine dynamic disaster forecast and early warning, mine water inrush disaster monitoring and early warning. This course enables the students to understand the main geological disasters in the process of mine construction and production, master the geophysical characteristics of typical geological disasters and the methods and principles of corresponding detection techniques;possess the basic skills of mine disaster geophysical detection scheme design, data processing and interpretation, understand the frontiers of mine safety geophysical technology development, and cultivate students' ability to analyze and solve problems.

**2. Course Examination**

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: 刘树才、刘志新

Reviewer:

Approver:

# Syllabus for《Geophysical exploration methods and techniques of coalbed methane》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05407 | Course Nature | Integrated curriculum group of undergraduate and postgraduate |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

This course introduces and discusses the geophysical exploration methods and techniques of coalbed methane(CBM), including the geophysical basis of CBM reservoir, geophysical response characteristics of CBM enrichment area, as well as the seismic and logging inversion method of CBM reservoir enrichment area resource conditions and mining conditions. The course focuses on the physical basis of CBM reservoir, CBM enrichment area seismic forward modeling and seismic attribute optimization method, geophysical exploration method of coal reservoir fracture, common geophysical information fusion algorithm and application. The purpose of this course is to make students understand the geophysical exploration method of CBM, master the geophysical evaluation methods of CBM reservoir enrichment area resource conditions and mining conditions, and apply them to the exploration of CBM.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: HuangYaping

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Well-ground seismic exploration》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05408 | Course Nature | Extending Major Course |
| Faculty | School of Resource and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course " well-ground seismic exploration" is a professional extension course for the major of geophysics. The prerequisite courses include advanced mathematics, linear algebra, college physics, probability theory and mathematical statistics, programming, mathematical physics equations, seismic wave dynamics, basics of geophysical signal processing, principles of seismic exploration, and data processing of seismic exploration data. Through the study of this course, students can master VSP, RVSP and cross-well seismic exploration methods, data processing and interpretation theories widely used at home and abroad, deeply understand the technical characteristics of well-ground seismic, and conduct actual well-ground seismic exploration data Processing and interpretation. Main contents include the development of well-ground seismic exploration, basic principles, data processing methods, and the application of well-ground seismic exploration.

2. Course Examination

Course total score = process assessment score × 50% + final exam score × 50%.

Writer: Hu Mingshun

Reviewer: Pan Dongming

Approver: Dong Qinghong

# Syllabus for《Urban Geophysics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05409 | Course Nature | Extension Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 10 | Online Resource |  |

1. Course Introduction

The Urban Geophysics is an extended course integrating undergraduate and master degrees in geophysics. Its prerequisite courses are Principles and Application of Seismic Exploration and Principles and Application of Electrical and Electromagnetic Exploration. It is suitable for undergraduates integrating undergraduate and master degree in geophysics, as well as undergraduates majoring in geological engineering, hydrology and water resources engineering, survey technology and engineering. This course mainly covers common engineering geological problems in the process of urban engineering site selection, construction, operation and maintenance, urban underground space development geological disaster geophysical advanced prediction technology, engineering site and road geological disaster geophysical detection technology, underground pipeline geophysical detection technology , pile foundation detection technology, etc. This course enables the students to understand the engineering and environmental problems faced in the process of urban development today, master the basic principles and observation methods of common geophysical methods such as advance detection of geological disasters in urban underground space development, pipeline detection, and pile foundation detection, understand the development trend of urban geophysics and train students to discover, analyze and solve problems.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: \*\*\*

Reviewer: \*\*\*

Approver: \*\*\*

# Syllabus for《Dynamics of Seismic Waves》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05402 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of resource and earth science | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The course “Dynamics of Seismic Waves” is a major course of geophysics; the Basic goals of this course are to make students to master the basic concepts, basic theories and methods of seismic wave mechanics; to cultivate students' ability to analyze the laws of different types of seismic wave propagation; to have the ability to solve problems encountered in engineering practice and scientific research; to make students rich in the scientific spirit of innovation and exploration, and to establish correct socialist values and patriotism.

Its prerequisite course is Multivariable calculus, linear algebra, and physics; This course is applicable to the geophysical majors. It mainly covers Tensor Analysis, stress and strain, the solutions of seismic wave equations, and the reflection and refraction of harmonic plane waves at interfaces between different types of elastic media; through this course, students are expected to know a little about the tensor analysis, understand the seismic wave equations and their solutions, and master the propagation rules of the seismic waves including the P-wave, S-wave and surface wave, which is helpful to the further learning.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Yang Lei

Reviewer: PAN Dongming

Approver: LIU zhixin

# Syllabus for《Principles and Applications of Seismic Exploration》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05410 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 64 | Credit | 4 |
| Extracurricular hours | 16 | Online Resource | https://www.icourse163.org/course/YANGTZEU-1003150001 |

1. Course Introduction

The course has the characteristics of high abstraction, strict logic, and wide application. Through the study of this course, students can master the basic concepts, theories, and calculation skills of seismic waves propagation, field survey, seismic velocity, seismic interpretation, and 3D seismic method. The goal of this course is to cultivate students' abstract generalization ability, logical reasoning ability, spatial imagination ability, and self-study ability, especially the ability to analyze and solve practical problems by comprehensively using the learned seismic knowledge.

The main contents of this chapter 1 include the introductions of the conventional geological survey, the traditional geophysical survey, and the historical review of the seismic survey.

The main contents of this chapter 2 include the concept of geometrical seismology, the principles of seismic propagation, the T-D curves of reflection wave, and the T-D curves of refraction wave.

The main contents of this chapter 3 include the design of field layout, the conditions of seismic generation and receiver, the weathered layer and static correction, and the multi-fold survey technology.

The main contents of this chapter 4 include the influence factors of seismic velocity, the concepts of different seismic velocities, and the influence of seismic velocity on the seismic section.

The main contents of this chapter 5 include the definition of seismic resolution, the lateral and vertical seismic resolution, and the principle and classification of seismic migration.

The main contents of this chapter 6 include the main contents of structural interpretation, the fault interpretation, and the drawing technology of the plan view map.

The main contents of this chapter 7 include the applications of seismic velocity and seismic amplitude.

The main contents of this chapter 8 include the link and difference between 2D seismic survey, and 3D seismic survey, and the field survey technology of 3D seismic exploration.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Tongjun Chen

Reviewer: Dongming Pan

Approver: Jian Shen

# Syllabus for《Principles and Applications of Electric and Electromagnetic Exploration》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05411 | Course Nature | Main Major Course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 64 | Credit | 4 |
| Extracurricular hours | 16 | Online Resource |  |

1. Course Introduction

The Principles and Applications of Electric and Electromagnetic Exploration are the main major courses. Its prerequisite courses are Advanced Mathematics, College Physics, General Geology, and Geophysical Field Theory. It is applicable to the students majored in geophysics. This course mainly covers the electromagnetic properties of rock and ore, the field source properties of natural and artificial geoelectric fields, the temporal and spatial distribution of electric and electromagnetic fields under uniform and non-uniform geoelectric conditions, the working principle, data processing and data interpretation method of direct current sounding, electrical profile and high-density resistivity; the working principle and data processing interpretation method of the induced polarization, natural electric field, charging method, and magnetotelluric sounding, controllable source audio magnetotelluric sounding, transient electromagnetic sounding. This course enables the students to master the basic theory, detection method technology, data interpretation and application of commonly used electromagnetic geophysical methods, familiar with the application prerequisites and conditions of various methods, cultivate students to be able to use the basic principles of electromagnetic geophysical methods to solve practical problems in terms of resource exploration, engineering and environment and other specific problems, such as program design, data processing and interpretation.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: 姜志海、刘志新

Reviewer: \*\*\*

Approver: \*\*\*

# Syllabus for《Rock Physics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05428/E05416 | Course Nature | Major basic compulsory courses |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

Rock Physics is a basic elective course for majors in geophysics. This course mainly teaches the basic knowledge and basic concepts of rock, rock density, magnetism, electricity, acoustics, heat and the relationship between rock physical parameters.Through course teaching, the aim is to enable students to grasp the relationship and laws between the physical parameters of rock and rock structure and composition, be familiar with the influence of lithology, porosity, fracture, fluid type and saturation on stable current field, electromagnetic wave field and seismic wave field in rock,and their reflection in the geophysical observation data. Understand some basic methods of obtaining rock physical properties and application of rock physical parameters. Students are trained to analyze, calculate and summarize the practical problems in the field of Geophysics, and put forward preliminary solutions, so as to lay a solid theoretical foundation for learning subsequent geophysical related courses andfurther obtaining related knowledge.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: HuangYaping

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Well Logging》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | M05406/E05418 | Course Nature | Major courses |
| Faculty | School of Resources and Geosciences | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource | http://mooc1.chaoxing.com/course/93532757.html |

1. Course Introduction

Geophysical logging is the main course of Geophysics. Its prerequisite courses are seismic wave dynamics, geophysical field theory and seismic exploration principle and application. It is applicable to geophysics, geological engineering and resource exploration engineering. This course mainly introduces the methods and principles of electrical logging (ordinary apparent resistivity logging, lateraling and electrochemical logging), nuclear logging (natural gamma logging, density logging, lithological density logging, etc.), and acoustic logging (sonic velocity logging, acoustic amplitude logging, etc.),and a brief introduction to mine explosion-proof logging methods.. This course will teach the influencing factors, correction methods, interpretation methods and applications of the three basic logging methods. Through the study of this course, students can understand the status and role of geophysical logging in coal field geological exploration, master the basic theory, basic principles and working methods of various logging methods, familiar with the geological problems, application conditions and geological effects solved by various logging methods.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Dong Shouhua

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Introduction to Geophysics》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05415 | Course Nature | Professional Basic Elective Courses |
| Faculty | School of resources and Earth Sciences | Semester | Forth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

This course is a professional basic elective course of geophysics major. It is suitable for the undergraduate students of Geophysics and students of Geophysics related majors. This course mainly describes the basic concepts, principles and application fields of Solid Geophysics (Geodynamics, Radioactive age determination, Seismology, Gravity theory, Geomagnetism, Geoelectricity and Geothermics, etc.); Through this course study, students can understand geophysics, the basic principles and application conditions of Geophysics, the fields of application and the problems to be solved. Through introducing the formation and development history of Geophysics, and the achievements and new technologies of Geophysics which have great influence on contemporary Geophysics, students can have a higher background of Geophysics knowledge. To cultivate students' interest in major and macro control ability, and lay a solid theoretical foundation for learning related courses of Geophysics and further obtaining relevant knowledge.

Through the study of this course, students can understand the general knowledge structure of Geophysics, understand the basic principles and basic methods of Geophysics and the applicable fields of different geophysical methods, understand the classification basis of Geophysics, understand the frontier and development trend of Geophysics, and cultivate students with a high background of Geophysics knowledge. It is necessary to lay a good foundation for the cultivation of modern high-level Geoscience and technology talents. For example, students should be trained with observation ability, modeling ability, scientific analysis ability, ability of connecting with reality and independent knowledge access ability, etc., make students have correct research methods and strong enterprising and dedication spirit, and achieve the goal of cultivating the students' dedication to the knowledge structure of the graduates.

The main contents of this chapter 1 includes definition of Geophysics, characteristics of Geophysics, the branches of Geophysics and branch basis, research status of geophysics at home and abroad and trend of geophysics at home and abroad.

The main contents of this chapter 2 includes radioactive decay law, the concept of radioactive series, the mark of radioactivity balance, basic principle of radioactive age determination, and several methods of radioactive age determination.

The main content of this chapter 3 includes Basic concepts related to natural earthquakes, theoretical basis and out propagation principle of seismic wave, near earthquake theory, the basic law of seismic ray propagation in spherically symmetric media and travel time inversion, the source mechanism of natural earthquake, achievements in natural seismology and understanding of the earth's interior.

The main content of this chapter 4 includes gravity field and gravity potential of the earth, normal gravity and gravity anomaly, gravity correction, characteristics of Bouguer anomaly in China, crustal Isostasy and solid earth tide.

The main content of this chapter 5 includes theoretical basis of geomagnetic field, basic knowledge of ferromagnetic, Paleomagnetism and its application.

The main content of this chapter 6 includes rock ore resistivity, definition and classification of geoelectric field, several kinds of natural electric fields and principle and working method of magnetotelluric.

The main content of this chapter 7 includes fundamentals of geothermal Science, heat conduction theory and distribution characteristics of the earth's thermal field.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Jia Yuge

Liu Jing

Reviewer: Pan Dongming

Approver: Liu Zhixin

# Syllabus for《Earth system science and global change》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05501 | Course Nature | Professional development courses |
| Faculty | School of resources and Earth Sciences | Semester |  |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource |  |

1. Course Introduction

The objective of teaching: through the study of this course, students can systematically master the basic theories and basic knowledge of Geoscience. The knowledge system covers the main contents of general geology, and focuses on the master of the knowledge system of Geoscience. Students should be able to understand the earth from the perspective of planets, and then understand the material composition and transformation of the earth, the structure and interaction of the stratosphere, the deformation and displacement of the lithosphere, the history of the earth development and the changes of the earth environment, etc., on this basis, form a new outlook on earth system science, and establish a correct understanding of human and resources and environment, and even human and earth, Not only can students understand the regularity of global change, master a solid geological basis, but also make them realize the importance of ecological environment protection in resource development.

The main teaching contents are as follows.

Table 1 Main teaching contents

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Serial number | Chapter | Contents and requirements | Class hours | remarks |
| 1 | Introduction | Know well: The research object, content and significance of Earth Science, the characteristics and research methods of earth science.  Understand: The connotation of earth system science, earth science and sustainable development of human society. | 1 |  |
| 2 | A brief history of planet Earth | Master: The basic concepts of the universe, galaxy, solar system, stars and planets, the origin of the solar system, the formation of the earth, and isotopic dating. | 1 |  |
| 3 | The material composition of the earth | Master: The elements and their contents in the earth, the concept and types of minerals, the common minerals in nature, the crystal structure of minerals, the concept and main types of rocks. | 4 |  |
| 4 | The structure and interaction of the earth's outer stratosphere | Master: ① The material composition and stratification of the atmosphere, the material transformation of the atmosphere, the atmospheric movement and weather, the causes of climate and its changes; ② the composition of the biosphere, the characteristics, origin and evolution of life, the origin of human beings, the formation of the biosphere, the ecosystem and its balance; ③ The composition of hydrosphere and the characteristics of water, the types, forms and characteristics of water in the earth, and the circulation of water in the earth.  Know well: The interaction among atmosphere, biosphere and hydrosphere. | 6 |  |
| 5 | The inner layer structure and material transformation of the earth | Master: ①The physical properties of the earth, such as density, elasticity, gravity field and geomagnetic field; ② the stratospheric structure of the earth's crust, mantle and core; the concept and characteristics of lithosphere; ③ the concept and basic mechanism of magmatism, metamorphism, diagenesis and mineralization; ④ the mutual transformation of three types of rocks and the interaction of lithosphere. | 6 | The class hours of experiment is 8 |
| 6 | Deformation and displacement of lithosphere | Master: The basic theory of plate tectonics and its understanding process include: the deformation of rocks and geological structure; the displacement of lithosphere and geotectonics; earthquakes.  Understand: The dynamic mechanism of plate tectonics. | 2 |  |
| 7 | System of Earth System Science | Master: The understanding of "the earth is a system"; the strong interaction between the earth's stratospheres; irreversible evolution; homogenization and cataclysm; the time scale and periodicity of the earth's evolution. | 2 |  |
| 8 | The earth's environment and its changes | Master: The relationship between human and resources, the relationship between human development and the earth's environment. | 2 |  |
| Total | |  | 24 |  |

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Wang Jilin

Reviewer: Jiang Bo

Approver: Liu Zhixin

# Syllabus for《Geological Creativity》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05502 | Course Nature | Extension Course |
| Faculty | School of Resources and Earth Geosciences | Semester | Sixth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course of Geological Creativity is an extension course for the major of resource exploration engineering. It can also be selected in the integrated course of undergraduate and postgraduate and the higher-level elective course of the major; Its prerequisite course is general geology; It is suitable for undergraduates majoring in resource exploration engineering and geological engineering. This course focuses on the characteristics, laws, methods and creativity development of creativity and innovation activities in the field of geology. Through the study of this course, students can understand the rules of human creative and innovative activities, master the theories and methods of creative and innovative activities, and effectively promote the development of various geological related innovative activities, so as to meet the needs of Geological Innovative Talents in the development of Geosciences in the new situation and other related fields of national economy such as resources, energy and environment.

The main contents of this chapter 1 includesthe definition, basic problems and research tasks of Geological Creativity, the emergence and development process of Geological Creativity, the definition, basic problems and research tasks, the emergence and development process of Geological Creativity.

The main content of this chapter 2 includes geological innovation consciousness and its conditions, characteristics of geological innovation consciousness, , and how to stimulate geological innovation consciousness.

The main content of this chapter 3 includesthe embodiment of geological innovation ability, the relationship between individual character, external environment and innovation ability; the mode, content and comprehensive evaluation method of geological innovation ability training; the necessity of strengthening and improving geological innovation ability.

The main content of this chapter 4 includesthe concept of geological innovative thinking; how to Cultivate Geological Innovative thinking, the influence of inertial thinking and transcendental thinking on innovation ability.

The main content of this chapter 5 includesthe methods of innovative thinking training, geological theory innovation and geological technology innovation; the influence of communication, discussion and thinking collision on the improvement of innovation ability.

The main content of this chapter 6 includesthe training of innovation ability in geological cognition practice, basic geological comprehensive practice and scientific research training.

The main content of this chapter 7 includesthe development direction and prospect of geological creativity; the relationship between creative ability and the cultivation of geological innovative talents.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Zhou Xiaozhi

Reviewer: Wang Wenfeng

Approver: Liu Zhixin

# Syllabus for《Modern exploration technology and method》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05503 | Course Nature | Development Course |
| Faculty | School of Resources and Geosciences | Semester | 7 |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

"Modern geological exploration technology and method" is an expanded course for the major of resource exploration and geological engineering. The prerequisite courses are structural geology , coal mine geology, hydrogeology, geochemistry, geophysical exploration, mineral resource exploration and evaluation, energy geology, etc. It is suitable for mineral exploration and Geological Engineering Majors engaged in resource exploration engineering and geological engineering Mine disaster exploration and management and related professional direction. The course deeply integrates the traditional coal geology, oil and gas geological exploration and development, and mineral exploration. It can solve practical problems in production.

Through the study of this course, students can master modern geological exploration technology and methods, deep geophysical exploration technology, geochemical exploration technology, remote sensing technology, coal mine surface and underground gas drainage technology, coal mine disaster comprehensive exploration and control technology, establish a relatively complete and comprehensive exploration system, and solve complex geological and engineering problems in the process of exploration and development. To meet the requirements of the graduates' knowledge structure, the ability to solve practical problems, the research on complex engineering problems and the cultivation of the concept of lifelong learning. In the teaching process, the students' strong feelings of home and country and the high quality of lifelong dedication to the energy cause of the motherland are cultivated.

1 Introduction：The students can understand the basic concepts, classification and application conditions of modern energy exploration technologies and methods; Understand the development trend and future solutions of modern technology exploration.

Modern exploration technology: The students can use modern technology and tools to explore complex engineering problems in mineral exploration, and comprehensively use various technical means to solve problems.

Theory and method of deposit exploration : The students can use modern technology and tools to conduct comprehensive research, demonstration, simulation and prediction of complex engineering problems in mineral exploration dominated by metallic or non-metallic deposits, and carry out economic and technical evaluation.

Survey and control of coal mine disasters :The students can understand the types of coal mine geological disasters, correctly decompose problems through information analysis, find different solutions to problems effectively, optimize the best solution based on comprehensive analysis, and obtain effective conclusions.

Oil and gas exploration and evaluation: The students can master the procedures and contents of different exploration stages of oil and gas, and be able to evaluate oil and gas resources.

Unconventional gas exploration technology: The students can master the classification of unconventional oil and gas resources, understand unconventional natural gas resources, unconventional oil and gas accumulation mechanism, occurrence state, distribution law or exploration and development technology, etc.

2 Course Examination

The examination of this course consists of three parts: peacetime performance, extracurricular homework and final examination. the scoring standard is 100%, which is comprehensively evaluated according to proportion. Among them: normal grades (attendance + classroom performance + classroom notes + classroom tests) account for 30%, extracurricular homework scores account for 20% (popular science / science fiction papers, or professional essays / book reports etc., can be substituted for each other, papers / reading reports are required to be no less than 3000 words, references are not less than 10, an the final open-book exam scores account for 50%.

The final score is given on a percentile basis, with 60 as a pass.

Writer: Chaoyong Wang

Reviewer: Xiaozhi Zhou

Approver: Zhixin Liu

# Syllabus for《Enrichment Mechanism and Law of Geological Resources》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05505 | Course Nature | Major Basic Knowledge Course |
| Faculty | School of Resources and Geoscienc | Semester | 1 |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 4 | Online Resource |  |

1. Course Introduction

Through this course, students can establish and cultivate macro and process thinking mode, master the basic knowledge of geological resource enrichment, understand the structure and sedimentary framework of geological resource enrichment. Students can also focus on mastering the enrichment mechanism and law of geological resources such as metal ore, coal, oil, natural gas, shale gas, tight sandstone gas, coal measure gas, and natural gas hydrate, etc. And through the form of bilingual teaching, increase the amount of students' reading, so that students can understand the latest international development trend.

The main contents of this chapter 1 include the development trend of geological resources at home and abroad, main types of geological resources and related concepts, and course content system and research methods.

The main contents of this chapter 2 include structural framework and the distribution of oil and gas bearing basins and coal bearing basins.

The main contents of this chapter 3 include the stratigraphic pattern and sedimentary system, and the distribution of main geological resources.

The main contents of this chapter 4include the enrichment characteristics of main solid mineral resources, and case study on the formation process of typical mineral deposits.

The main contents of this chapter 5include the enrichment characteristics of coal and the main coal bearing basins, the enrichment characteristics of coal measure gas and coalbed methane, and the case analysis of coalbed methane and coalbed methane enrichment.

The main contents of this chapter 6include the oil enrichment characteristics and main oil basins, the natural gas enrichment characteristics and main gas basins, and the analysis of typical oil and gas enrichment cases.

The main contents of this chapter 7 include the enrichment mechanism of shale gas, and the analysis of typical shale gas enrichment cases.

The main contents of this chapter 8 include the enrichment mechanism of tight sandstone gas and gas hydrate, and the analysis of typical tight sandstone gas and gas hydrate enrichment cases.

The main contents of this chapter 9 include each student's report on a certain geological resource according to the designated basin area, and the review and summary of the course knowledge system.

2. Course Examination

Course total score = usual performance (including attendance and performance) × 10%+ class discussion × 30% + closing report × 60%.

Writer: Shangbin Chen

Reviewer: Jian Shen

Approver: Zhixin Liu

# Syllabus for《Geology modelling and simulation》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05505 | Course Nature | Prolongation courses |
| Faculty | School of Resource and Geosciences | Semester | Sixth Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours | 0 | Online Resource | None |

Course Introduction

Geology modelling and simulation is a prolongation course providing the computational solution methods for the complicated partial differential equations to explain the engineering and/or geology problems. The stronger links established between the natural phenomena and mathematical equations will give the more scientific quantization tools to the principles, engineering parameters and yields etc in engineering and/or geology issues.

Course Examination

The evaluation mode of the course combines the process examination (40%) and the final examination test (60%). Teachers can adjust the proportion of each part of the assessment content. The final score is given according to the percentage system and 60 points means pass. Closed-book exam.

Writer: Hao Shuqing

Reviewer: Chen Shangbin, Zhou Xiaozhi

Approver: Liu Zhixin

# Syllabus for《Modern geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05506 | Course Nature | Extension Course |
| Faculty | School of resources and geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The basic part of this course mainly teaches related knowledge and skills such as the composition of the earth's material, the deformation and displacement of the earth's crust, the history of earth evolution, the evolution of paleontology and plants, and the geological effects that control these geological phenomena. The main content includes the elements, minerals and rocks that make up the earth's materials, various geological functions and characteristics that control the spatial distribution of these materials, stratigraphic paleontological records reflecting the evolution of the earth, and geological disasters that are closely related to the human living environment. Through the study of the content of this course, students will have a preliminary grasp of the basic concepts, basic theories and basic research methods of geology, establish a scientific view of the earth, resources and environment, and the relationship between man and land, and be able to use the basic theories of modern geology to solve geological, Complex engineering issues such as resources and energy. This course focuses on the combination of theory and practice, which plays an important role in cultivating students' scientific thinking, enhancing practical skills, improving students' overall quality, and laying the foundation for the follow-up courses.

The teaching goal of this course is the subject of the course content, so that students can understand and master the related concepts of geology, be familiar with the basic theories of modern geology, have a preliminary grasp of the research methods of geology, the basic skills of observation and description of geological phenomena, and understand the evolution of the earth Process, understand the future development direction of earth science. To enable students to master the scientific way of thinking in geology, cultivate technical talents with core socialist values and adapt to the needs of the social economy and scientific and technological development in the new era, and establish a correct outlook on the earth. This course laid the foundation for future work in geology and related fields.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yang Wang

Reviewer: Shangbin Chen

Approver: Zhixin Liu

# Syllabus for《Geoscience Information Data Analysis》

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| Course Code | E05507 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | The Eighth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

《Geoscience Information Data Analysis》is an integrated course of resource exploration engineering of the School of Resources and Geosciences for students to learn and master the comprehensive analysis of geoscience data for specific problems. And this course describes the integration and processing methods and analytical techniques of geoscience data, mainly about the process of geoscience data integration, automatic discovery of useful information, and the conversion of unprocessed information into useful information, data processing forecasting methods, algorithmic program practice and so on.

Through the study of this course, students can master the basic theory, basic methods and the application of geo-information data analysis methods in geosciences, and further cultivate students' ability of logical thinking and quantitative analysis of applying geo-information data analysis of geological data.

2. Course Examination

Course total score = process assessment score × 20% + final exam score × 80%.

Writer: Chen Yuhua

Reviewer: WangJilin

Approver: Liu Zhixin

# Syllabus for《Chinese Geology》

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| --- | --- | --- | --- |
| Course Code | E05508 | Course Nature | Expansion Course |
| Faculty | School of Resources and Geosciences | Semester | 7 |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | - |

1. Course Introduction

The Chinese geology course is a comprehensive course of undergraduate, master and doctoral degree, mainly at the graduate level. The prerequisite courses generally include general geology, mineral deposits and energy geology. This course mainly teaches Chinese geological phenomena and geological features, geomorphological zoning features, the distribution of main mineral resources and some common geological disasters, etc. The main contents include: sedimentary rocks and sedimentary strata, magmatic rocks and magmatic activities, metamorphic rocks and metamorphism, tectonic processes and geological structures, geomorphological zoning and Quaternary geology, distribution of major mineral resources, etc.

Through the study of the content of this course, students will be able to systematically master China’s rich and diverse geological phenomena, geological features, and geomorphological features, and have a preliminary understanding of some of Chinese main mineral resources distribution and some geological disasters that are closely related to our lives, and train students to establish scientific Earth view, resource environment view and man-land relationship view.

2. Course Examination

The assessment of this course adopts an examination method. Students submit reading notes, and grades are assessed according to the quality of the notes, using a 100-point system.

Writer: Zhaobiao Yang

Reviewer: Caifang Wu

Approver: Zhixin Liu

# Syllabus for《Modern Testing Technology》

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| --- | --- | --- | --- |
| Course Code | E05509 | Course Nature | Extension course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course “Modern Testing Technology” is an extension course of resource exploration engineering professional.Its prerequisite course is physics and physical chemistry.This course is applicable to resource exploration engineering, geological engineering, chemical engineering, environmental engineering majors. It mainly covers large physical analysis instrument testing principle, instrument and the application of key components, instruments and use these large physics analysis instrument of material physical properties, physical and chemical properties test of main experimental technology and testing methods.This course will make students understand and master the analysis method of main analysis instrument principle and information provided by the physical, chemical, understand the basic theory of main analysis instruments, main technical principle, instrument structure, main application technology and development direction. Through this course, not only the necessary theoretical and experimental basis for professional learning, but also can cultivate students in daily life and practice how to make use of modern analytical techniques to analyze and solve the problem of theoretical or practical ability, cultivate students modern scientific research ability.

Through learning of this course, make students understand the research content and the development of modern testing technology, understand the basic principle of testing technology; understand the analysis principle of hermal analysis technology and testing technology, understand the analysis principle of chromatographic analysis technology and experimental technology; understand and grasp the commonly used element analysis method and its test principle and test technology; master the commonly used mineral (phase) principle and experimental analysis method of test and analysis technology; understand the principle of testing technology of commonly used compounds structure analysis and the experiment technology; understand and familiar with the commonly used basic principle and application of electron microscopic analysis method. Enrich and extend students’ knowledge structure through the course to adapt to the need of modern test and analysis work.

The main content of this chapter 1 is familiar with the modern testing technology research content and the development process.

The main content of this chapter 2 includes the main thermal analysis technology experiment method and its application.

The main content of this chapter 3 includes chromatographic analysis technology principle and its basic theory, instrument structure and main parts.

The main content of this chapter 4 includes the principle, instrument structure and main parts of scanning electron microscope (SEM) analysis technology and the transmission electron microscopy (TEM) analysis technology.

The main content of this chapter 5 includesthe analysis principle, instrument structure and main parts of Infrared spectral analysis technology and Raman spectrum analysis technology.

The main content of this chapter 6 includesthe analysis principle, instrument structure and main parts of the XRD and its application field.

The main content of this chapter 7 includesthe analysis principle, instrument structure and main parts of X-ray fluorescence spectroscopy (XRF) and its application field.

The main content of this chapter 8 includesthe analysis principle, instrument structure and main parts of X-ray photoelectron spectroscopy (XPS) and its application field.

The main content of this chapter 9 includesthe analysis principle, instrument structure and main parts of Atomic emission / atomic absorption spectrometry (AES/AAS ) and its application field.

The main content of this chapter 10 includesthe analysis principle, instrument structure and main parts of Mass spectrometry technology (MS) and its application field.

The main content of this chapter 11 includesthe analysis principle, instrument structure and main parts of Nuclear magnetic resonance (NMR) and its application field.

The main content of this chapter 12 includesthe Review and Discussion.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Fengjuan Lan

Reviewer: Wenfeng Wang

Approver: Zhixin Liu

# Syllabus for《Sedimentary Geology》

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| --- | --- | --- | --- |
| Course Code | E05510 | Course Nature | Expansion courses |
| Faculty | School of Resources and Geoscience | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The main contents include: current research status, development trend, research significance, sedimentary rock concept, basic characteristics, sedimentary rock formation mechanism, terrigenous clastic rock and carbonate rock structure, main rock types and their characteristics and genesis, Basic theories and basic knowledge of sedimentary geology such as main sedimentary facies models. Through this course, students will master the basic knowledge and basic theories of sedimentary environment, sedimentary facies, and sedimentary models; have a preliminary grasp of the main indicators for distinguishing sedimentary facies, the common sedimentary types of energy basins and their sedimentary characteristics; establish a temporal and spatial view of sedimentary system distribution, preliminary Master the basic methods and basic skills of sedimentary facies analysis and paleogeographic reconstruction, and understand the research status and development trend of sedimentary geology.

2. Course Examination

This course uses a combination of process assessment and final exam.

Teachers arrange daily homework, classroom discussions, laboratory reports and other process assessments according to the course progress; the proportions of daily homework, classroom discussions, laboratory reports and final exams to the final grades of the course are 10%, 10%, 20%, and 60%, respectively . Teachers can also adjust the proportion of each part of the assessment content, but the proportion of the final exam is not less than 40%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Yulin Shen

Reviewer: Yinghai Guo

Approver: Zhixin Liu

# Syllabus for《Advanced sedimentary basin analysis》

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| --- | --- | --- | --- |
| Course Code | E05511 | Course Nature | Extension course |
| Faculty | School of resources and geosciences | Semester | Eighth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The contents of this course are based on the whole basin, and the systematic study of sedimentary filling, tectonic subsidence, burial history, thermal evolution history and mineralization. Meanwhile, the inner relationship of geodynamics and sedimentary, tectonic and magmatic activities of basin evolution, geochemistry and global events should be explored. The course is focusing on the formation of the basin, the nature of the fills, the degree of conversion of the fills during the depositional and sedimentary periods, and the special events of the geodynamic process control and the accumulation of energy and minerals in the basin, etc.

The teaching goal of this course is to enable students to understand the main research progress and development trends of sedimentary basin analysis in recent years, reveal the dynamic process of the entire evolutionary history of sedimentary basins, explore its internal driving forces, and master sedimentary basins. The basin conducts genetic mechanism research and type division methods, and explores the distribution law of the basin's structural lithofacies belt and its relationship with oil and gas, and finally achieves the purpose of guiding oil and gas exploration. This course aims to improve students’ ability to use basin analysis technology to solve geological resource exploration problems, and to further cultivate technical talents with core socialist values that can meet the needs of social, economic and scientific and technological development in the new era, and to establish a correct outlook on the earth for the future Lay the foundation for work carried out in geology and related fields.

2. Course Examination

This course assessment adopts a combination of process evaluation and target evaluation. The final score of the course is comprehensively determined by two aspects: 30% of the usual score (including 10% of attendance and 20% of homework) and 70% of the final exam score. The final exam will be in the form of course essays. The final grades are given on a five-level system (excellent, good, medium, pass, and fail).

Writer: Yanming Zhu

Reviewer: Shangbin Chen

Approver: Zhixin Liu

# Syllabus for《Regional tectonic analysis》

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| --- | --- | --- | --- |
| Course Code | E05512 | Course Nature | Extension course |
| Faculty | School of Resources and Geoscience | Semester | 8 |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course “Regional tectonic analysis” is a comprehensive geological course. Its prerequisite courses are Structural Geology, Mineralogy and Petrology and Stratigraphical Paleontology and so on. This course is applicable to the major of resource exploration and engineering. Through the study of this course, students are expected to master the basic theory and research methods of regional tectonic analysis. The goal of this course is to cultivate students' abstract generalization ability, logical reasoning ability, spatial imagination ability and self-study ability, especially the ability to analyze and solve practical problems by comprehensively using the learned knowledge. This course includes plate tectonic theory, the Mantle plume theory, the basic and state-of-the-art approaches to study the regional tectonics, the frontier researches and the hot topics of the tectonics in China.

2. Course Examination

Course total score = classroom performance (10%) + regular assignment (30%) + final test (60%), and is given in five levels finally.

Writer: Ruirui Wang

Reviewer: Jilin Wang

Approver: Zhixin Liu

# Syllabus for《Frontier of Earth Science》

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| --- | --- | --- | --- |
| Course Code | E05513 | Course Nature | Advanced Optional Course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 8 | Credit | 0.5 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

This course mainly introduces the most advanced theories and methods of earth science to students in English. The main contents include: earth system and global change, earth materials, evolution of life, neotectonism and global environmental change (hazard and environmental geology), geoplanetology, transparent geology, intelligent geology, etc. Based on the course, the students are expected to understand the frontier of earth science, and to expand their international perspectives.

According to the current development of earth science, the course aims to improve students' perception of the interdisciplinary research of geosciences and their ability to grape the frontier information, so as to make a better foundation for their further work.

2. Course Examination

Course total score = process assessment score × 50% + final readingreport × 50%.

Writer: Yuan Dongxun

Reviewer: Shen Jian

Approver: Liu Zhixin

# Syllabus for《Structural Geology》

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| --- | --- | --- | --- |
| Course Code | E05516 | Course Nature | Minor course |
| Faculty | School of Resources and Geoscience | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 8 | Online Resource | 8 |

1. Course Introduction

The course “Structural Geology” is a minor course. It is a combination of online and offline teaching courses and the prerequisite course is Physical Geology. This course is applicable to Resource Exploration Engineering, Geology Engineering, Geophysics, Hydrology and Water Resources Engineering, Human Geography and Urban-rural planning majors. It mainly covers the various small and medium-sized geological structures formed by the deformation of the rocks, rock stratum and rock mass in the lithosphere, and studies the geometrical forms, combinations and evolution of these geological structures, and discuss the direction, size, nature and origin of the forces that produce these structures. through this course, students are expected to understand the important position and significance of Tectonic Geology in geological disciplines, grasp the basic concepts, basic knowledge and basic skills of Tectonics, master the idea of Tectonic Geology research, research methods and research content, master the basic skills in reading and analyzing geological data, drawing geological maps, and initially have the ability to engage in structural geological survey and analysis.

The main contents of this Chapter 1 introduction include familiar with the research object and content of tectonic geology; grasp the method and status quo of tectonic geology. Understand the significance of studying the geological structure.

The main contents of this Chapter 2 occurrence of geologic bodies and stratigraphic contact relation include mastering the geological body and its occurrence; tilt rock formation, thickness, outcrop width and outcrop morphology. Understanding the characteristics of upright strata and horizontal strata. Grasping the contact relationship between the strata and its geological significance.

The main contents of this Chapter 3 the mechanical basis of geological structure analysis include mastering the basic concepts of force and stress; stress state analysis and tectonic stress field; rock deformation analysis and factors affecting rock deformation.

The main contents of this Chapter 4 fold include grasp the concept of folds; elements of folds; the classification and combination of folds; the formation mechanism of folds and the factors that affect the folds. Be familiar with the observation and study of folds.

The main contents of this Chapter 5 joint include grasp the concept of joint; joint classification and characteristics; joint staging and matching and joint observation and research.

The main contents of this Chapter 6 fault include master the concept of fault, elements, classification and formation mechanism. Be familiar with the fault effect. The identification mark of the fault and the determination of its relative displacement direction. Be familiar with the observation and study of faults and the characteristics of extensional tectonics, thrust nappe structures, strike-slip faults and gravitational sliding structures.

The main contents of this Chapter 7 magmatic rock structureinclude master the magmatic rock body occurrence, the original structure and contact with the surrounding rock; familiar with the magmatic rock structure observation and research.

The main contents of this Chapter 8 comprehensive analysis of regional tectonicsinclude master the principles and methods of comprehensive analysis of regional tectonics; the basic content of tectonic analysis; the study of regional tectonic development history. Familiar with China's main crustal movement and its characteristics, structural evolution analysis of ideas and content.

2. Course Examination

Course total score = online learning score × 10% + process assessment score × 20% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Li Ming

Reviewer: Jiang Bo

Approver: Liu Zhixin

# Syllabus for《Crystallography and Mineralogy》

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| --- | --- | --- | --- |
| Course Code | E05519 | Course Nature | Optional general education course |
| Faculty | School of Resources and Geosciences | Semester |  |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course includes two parts: crystallography and mineralogy.The crystallography part introduces the basic properties of crystals, the law of crystal symmetry, the classification of crystal symmetry, and the basic theories of crystal chemistry.The mineralogy part introduces the chemical composition, morphology, physical properties,classification and naming of minerals, as well as the mineralogical properties, identification characteristics, genesis and main uses of common minerals.Through the study of this course, students will systematically master the basic theories, knowledge and skills of crystallography and mineralogy. grasp the causes of mineral forms and physical properties of minerals by the analysis of crystal structure,and master the reaserching methods of mineralogy,and improve analytical ability and research ability of geological science theory.

The main contents of this chapter 1 include the definition of crystal, the general rule of space lattice structure, the difference between crystalline, amorphous and Quasicrystal Materials; The basic properties of crystal; Bravue's law, cossel's theory, spiral growth theory, conservation law of surface angle and its significance;

The main contents of this chapter 2include the characteristics of crystal symmetry, the concepts and operation methods of symmetry plane, symmetry axis, symmetry center and rotation extension axis, the law of symmetry and the combination law of symmetry elements, the common symmetry types, and the system of crystal classification according to symmetry; Fourteen kinds of space grids;

The main contents of this chapter 3include the concept and derivation method of simplex, classification of simplex, 47 kinds of geometric simplex, focusing on 20 kinds of common simplex; The concept of geometric simplex, crystalline simplex and polymorph; The steps and methods of analyzing simplex from aggregation.

The main contents of this chapter 4include the law of integers, the concept of Michaelis symbol and simplex symbol on crystal surface; The principle of crystal orientation, the method of crystal orientation and the characteristics of crystal constant of each crystal system; The shape number of the most common simplex; Crystal band, crystal band law and crystal edge symbol.

The main contents of this chapter 5include the similarities and differences between actual crystal and ideal crystal, the influencing factors of actual crystal morphology, parallel intergrowth, the concept of bicrystal, bicrystal axis, bicrystal plane, bicrystal joint surface, bicrystal type, bicrystal law and bicrystal identification method; The formation mode of bicrystal. A preliminary understanding of the common types of twinning in minerals.

The main contents of this chapter 6include ion type of elements, chemical composition, chemical formula and crystal chemical formula of minerals, isomorphism and isomorphism, colloidal minerals and their composition, occurrence form of water in minerals; The principle of spherical compact packing of crystal structure and coordination polyhedron, crystal bond type and lattice type and their influence on mineral structure and properties, crystal field theory, crystal order.

The main contents of this chapter 7include the research significance of mineral morphology, crystal habit of mineral monomer, morphology of mineral aggregate, genesis and influencing factors of various mineral morphology.

The main contents of this chapter 8include the optical properties of minerals, i.e. the color, streak color, luster and transparency of minerals and their relationship; The mechanical properties of minerals include cleavage, cleavage and fracture, hardness, elasticity and flexibility, brittleness and toughness; Other physical properties of minerals, such as specific gravity, magnetism, luminescence, electrical properties, thermal properties, etc; Based on the crystal structure, the physical properties of minerals and their relationships are explained.

The main contents of this chapter 9include the chemical composition of the earth's crust, the geological process of forming minerals, the paragenetic Association of minerals and the associated minerals reflect some phenomena of mineral genesis and typomorphic characteristics of minerals;

The main contents of this chapter 10include the naming principle of minerals and the classification of crystal chemistry of minerals;

The main contents of this chapter 11include the crystal chemistry, physical properties and genesis of natural metal and natural nonmetal (diamond, graphite and natural sulfur) sulfides; Representative sulfide minerals; The crystal chemical and physical properties of oxides and hydroxides and their origin; Typical oxide and hydroxide minerals.

The main contents of this chapter 12include the chemical composition, crystal chemical characteristics, physical properties, genesis and classification of oxygen-containing salts, crystal structure types of silicates and their relationship with physical properties of minerals, structure and analysis methods of clay minerals in layered silicates; The crystal structure and physical properties of carbonate and sulfate; Physical properties of other oxygen-containing salts; It is a representative mineral containing oxygen.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Process assessment is composed of attendance, classroom performance and homework performance, in which attendance and classroom performance accounted for 10% and homework performance accounted for 20%.

The result examination (70%) was closed book examination.

Writer: JinHongbo

Reviewer: WangJilin

Approver: LiuZhixin

# Syllabus for《Crystal Optics and Optical Mineralogy》

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| --- | --- | --- | --- |
| Course Code | E05520 | Course Nature | Minor Courses |
| Faculty | School of Resoueces and Geosciences | Semester | Third Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The main contents of this course are principles of crystal optics, the optical properties of crystals under three polarizing systems, and the systematic identification of transparent mineral under polarizing microscope. After studying of this course, the basic theory of crystal optics，trial method of polarizing microscope and measurement methods of crystal optical properties under single polarization, orthogonal polarization and cone polarization systems will be learned by students.

The main contents of this chapter 1 include the basic concepts of crystal optics and optical mineralogy, and the research contents and methods of crystal optics.

The main content of this chapter 2 includes the the structure and composition of polarized light microscope, single polarized light device and characteristics;Crystallization behavior and section morphology of minerals, cleavage of minerals, measurement of cleavage Angle;Color, polychromatism, and absorbability of minerals;Mineral projections and refractive index.

The main content of this chapter 3 includesthe entry and debugging method of the orthogonal polarized optical system.Interference of white polarized light;Complementary colour rules and the use of complementary colour devices;Observation and determination of optical properties of crystals under orthogonal polarizer.

The main content of this chapter 4 includesthe contents and methods of systematic identification of mineral flakes.Optical properties of common rock-forming minerals.

2. Course Examination

Course total score = process assessment score × 20% + final exam score × 80%.

Writer: Xiaoli Zhang

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Magmafic and Ｍetamorphic Petrology》

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| --- | --- | --- | --- |
| Course Code | E05521 | Course Nature | Main major course |
| Faculty | School of Resources and Environmental Sciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

This course is suitable for students who minor in resource exploration. Through the study of this course, students can be familiar with the basic theory of petrology. Master the classification and naming methods of magmatic rocks and metamorphic rocks, systematically identify the mineral composition, microstructure and structure of common rocks and be able to name them accurately; Basic knowledge of the genesis of magmatic rocks and metamorphic rocks and the methods of extracting relevant geological genetic information from rock slices; To develop students' theoretical analysis ability and problem-solving ability in related fields.

Combined with relevant course systems and graduation requirements for students, three course objectives are set to support different graduation requirements indicator points respectively .

Objective 1: To master the mineral composition, structure and structure, occurrence, classification and nomenclature of magmatic rocks and metamorphic rocks. To master the identification methods and skills of magmatic rocks and metamorphic rocks. (Graduation Requirements 1-3)

Objective 2: To master the petrogenesis of magmatic rocks and metamorphic rocks and the methods of extracting relevant geological genetic information from the corresponding rock slices. (Graduation Requirements 2-1)

Objective 3: to understand new research methods and new advances in petrological content. Cultivate students' theoretical analysis ability and application research ability, and have innovative consciousness and ability. Cultivate students' ability to engage in scientific research and work in resource exploration, engineering geology, mine geology and related fields. (Graduation requirement 12-1)

Objective 4: To cultivate students' professional awareness of resources and environmental protection; Have a clear understanding of the sustainable development strategy of resources (energy), and establish a strong sense of responsibility for The Times. (Ideological and political objectives of the course)

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Xiaojuan Yao

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Sedimentary Petrology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05522 | Course Nature | Minor major courses |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource | None |

1. Course Introduction

The course has the characteristics of highpracticality, comprehensiveness, and intersection. Through the study of this course, students can master the basic theories and knowledge of sedimentary petrology, graspthe ability of theoretical analysis and application in geological field, strengthen the consciousness of subject innovation, and cultivate the ability of independent learning and lifelong learning. The goal of this course is to lead students to get more professional knowledge and skills, and adapt to the development of present geosciences.

The main contents of this chapter 1 include the source, transport, sedimentation and diagenesis of sediments; the classification and nomenclature of sedimentary rocks.

The main contents of this chapter 2 include the color, chemical and mineral composition,texture, and structure (sedimentary structure) of sedimentary rocks.

The main contents of this chapter 3 include the general characteristics of coarse-grained clastic rocks (conglomerates, breccias, and mictites), the classification and nomenclature of coarse-grained clastic rocks based on textural, compositional and genetic characteristics, and the common types of coarse-grained clastic rocks; the general characteristics of sandstones, the classification and nomenclature of sandstones based on textural and compositional characteristics, and the main types of sandstones; the general characteristics, classification and nomenclature of siltstones and argillaceous rocks

The main contents of this chapter 4 include thegeneral characteristics, basic classification and nomenclature of carbonate rocks; the general characteristics of limestones, the classification and nomenclature of limestones based on mineral component and texture, and the genetic mechanism of limestones; the general characteristics, classification and nomenclature, main types and genetic mechanism of dolomites; the general characteristics, classification and nomenclature, main types and genesis of siliceous rocks; the general characteristics and genetic mechanism of other authigenic sedimentary rocks (such as evaporitic, phosphorous, aluminous, and ferric rocks), coal, oil shale, and petroleum.

The main contents of this chapter 5 include the key points, methods and means of field observation of sedimentary rocks; the key points, methods and means of laboratory research on sedimentary rocks.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Zhuangfu Li

Reviewer: Yulin Shen

Approver: Zhixin Liu

# Syllabus for《Sedimentology and Lithofacies Paleogeography》

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| --- | --- | --- | --- |
| Course Code | E05523 | Course Nature | Major courses |
| Faculty | School of Resources and Geoscience | Semester | Sixth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

It mainly covers the recent research progress and development trend for sedimentology, sedimentary facies symbol , all kinds of sedimentary facies and sedimentation, controlling factors of sedimentary and reconstruction and analysis on paleogeography; through this course, students are expected to master the fundamental theories and elementary knowledge for sedimentary environment , sedimentary facies, sedimentary models; preliminary grasping the distinction for primary symbols of sedimentary facies , common sedimentary types and characteristics for energy basins; building the views of time and space for sedimentary system distribution, preliminary mastering fundamental methods and skills for analysis on sedimentary facies and paleogeography reconstruction, knowing that recent research progress and development trend of sedimentology.

2. Course Examination

This course adopts a combination of process assessment and final exam. The final grades of the course are comprehensively determined by the usual results (including attendance and usual performance), homework, classroom seminars, and final exam results. Normal grades account for 10% of the total grade, homework grades for 10%, classroom seminars for 20%, and final exams for 60%. Teachers can also adjust the proportion of each part of the assessment content, but the proportion of the final exam is not less than 40%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Writer: Yulin Shen

Reviewer: Yinghai Guo

Approver: Zhixin Liu

Course Code：E05524

**Teaching Quality Standards of Exploration and Evaluation of Mineral Resources**

Total Periods: 32 Credits: 2

The course of mineral resources exploration and evaluation is the main course; It is suitable for resource exploration engineering. This course mainly introduces the technical means of geological exploration of mineral resources, the division of exploration stages, the objectives and requirements of each stage, the division of exploration types, engineering layout and construction management, the calculation and evaluation of resource reserves, the technical and economic evaluation of mines, the knowledge and technology of resource management and mining right evaluation and management. And can use the basic theory to solve complex engineering problems such as mineral exploration, in order to adapt to the new situation of deep prospecting, hidden mineral exploration technical requirements, training related fields of mineral resources exploration and evaluation of talent needs.

I. Course Objectives

General teaching objectives: through the study of this course, students will be familiar with the relevant specifications and regulations, better master the basic theory of mineral resources occurrence and distribution and the geological exploration technical means of related mineral resources, and focus on solving practical engineering problems, especially engineering layout and construction management, reserves calculation and mine technical and economic evaluation, And can flexibly use basic theories and methods to solve complex engineering problems such as mineral exploration.

Course objective 1: master the basic concepts, basic knowledge, basic theories and basic research methods of mineral resources exploration and evaluation（ Supporting the graduation requirements of this major (1-3)

Course objective 2: according to the different minerals and stages of exploration, be able to correctly use different technical means and sequence; according to the different minerals and stages of exploration, be able to master the layout methods and methods of exploration engineering, construction management, reserves calculation and evaluation, and be able to master geological logging, exploration design, reserves calculation and geological report preparation.Supporting the graduation requirements of this major (6-1)

Course objective 3: to be able to master the methods of economic and technical evaluation of mineral deposits, mineral resources exploration management, reserves management, mineral resources laws and regulations, data collection management and information system establishment. Understand the rights and obligations of exploration right holders, the daily work procedures of application and approval, and the evaluation methods and contents of mining rights.Supporting the graduation requirements of this major (11-2)

Teaching objective 4: integrate the professional quality education of energy security and the importance of resources in the national economy into the curriculum, cultivate students to establish a correct world outlook and values, establish their sense of social responsibility and sense of responsibility, educate students to be realistic and pragmatic, forge ahead, and make their own contributions to China's resource exploration and sustainable development. Curriculum (ideological and political teaching objectives.

2. Course content, requirements and period distribution

Main course content (If there is only this section available in Part II, please delete the number designation“1”.)

| No. | Chapter | Content and requirements | Period | Remarks |
| --- | --- | --- | --- | --- |
| 1 | Chapter 1  Coal resources / reserves and mining technical conditions | To master classification and classification of coal reserves  To master comprehensive evaluation of geological, hydrological and engineering conditions of mining and other beneficial minerals | 2 |  |
| 2 | Chapter 2  Division of geological exploration procedures and stages | To master exploration procedures, requirements for exploration and engineering reserves at different stages. Reserves / resources estimation | 3 |  |
| 3 | Chapter 3  Technical means of mineral prospecting and exploration | To master the methods and requirements of remote sensing geological survey, geological mapping, Mountain Engineering, drilling, geophysical exploration and well logging | 2 | Class assignment: 0.5  After the class: 1.5 |
| 4 | Chapter 4  Preliminary investigation | To master objectives, tasks and requirements | 1 |  |
| 5 | Chapter 5  Investigation and exploration | To mater the purposes, tasks and requirements of the phase, the basic principles, forms and methods of the project layout, the classification and division of the reserves, the purpose, technical requirements and methods of sampling requirements. | 4 | Class assignment: 1  After the class: 2 |
| 6 | Chapter 6  Technical and economic evaluation of coal bed | To master working procedure; feasibility study of mineral exploration  To get familiar with the evaluation indicators and methods; can calculate the internal rate of return and other parameters. | 2 | Class assignment: 0.5  After the class: 2 |
| 7 | Chapter 7  Mineral resources management | To master laws and regulations on mineral administration; mining right management; mining right evaluation method. | 4 |  |
| 8 | Chapter 8  The construction and management of geological logging in exploration engineering | To master exploration project management; the original geological logging exploration project, such as the form and the preparation method of the bottom contour. | 4 | Class assignment: 0.5  After the class: 2 |
| 9 | Chapter 9  Geological conditions of ore deposits | To master the purpose and task of prospecting, geological conditions, such as magmatic rock, lithology and other conditions | 2 |  |
| 10 | Chapter 10  Ore deposit prospecting and information | To master distribution law of time; spatial distribution law. | 2 |  |
| 11 | Chapter 11  Technical means of metal deposit exploration | To master gravel prospecting method;  To master placer prospecting method;  To master geochemical prospecting method;  To master gravel prospecting method;  To master comprehensive prospecting method; | 2 |  |
| 12 | Chapter 12  Overview of unconventional oil and gas exploration | To know about the basic methods of shale gas exploration;  To know about the basic methods of CBM exploration; | 2 |  |
| 13 | Review |  | 2 |  |
| Total | |  | 32 |  |

3. Curriculum ideological and Political Design

1. The introduction part guides students to correctly understand the development and research status of deep prospecting in China, and adds positive energy topics in the teaching process to enhance students' understanding of China's resource security and enhance their sense of responsibility.

2. Professional quality education runs through the whole process of the course, teaching students to abide by professional ethics and have professional ethics in the explanation of professional knowledge and skills.

3. In the chapter of introduction, guide students to pay attention to the current situation of energy development and utilization in China, and cultivate students' sense of mission of environmental protection.

4. Teaching staff

Course leader: Teacher with doctor degree. A/Professor or Professor.

Team members: The teachers should be lecturer.

5. Teaching materials and references

Coal geological exploration and evaluation

Mineral deposit prospecting technique

6. Teaching organization

1. Teaching ideas

This course is a main course, involving coal geology and exploration, metal and nonmetal, unconventional natural gas exploration. It introduces the exploration technology and engineering layout principle, reserves and economic and technical evaluation to students. The main content should follow the "modern" and "system" principle. It will meet the needs of different mineral exploration geological exploration unit.

2. Teaching strategies

This course emphasizes practicality and openness. The curriculum content closely combined with production practice. Teachers should have six months to one year of geological exploration work experience or participated in geological exploration and scientific research activities.

3. Teaching methods

This course adopts the teaching method of classroom teaching, classroom discussion and video teaching. In the teaching, raises the question, how solves the question the method to carry on the teaching; at the same time, in the classroom, gives full play to the student initiative, carries on the discussion, the question and so on the way. In order to improve teaching effect.

4. Teaching venues and facilities

The classroom teaching needs the multimedia classroom, the future may carry on the three dimensional simulation animation, carries on the teaching activity.

5. Teaching services

The teacher will give discussion in the classroom and provide answering service to students to assign homework. Homework should be combined with the progress of the course work should be carried out; as far as possible all the homework correcting, and timely comments. The important contents of the classroom assignment or homework, as usual scores included in the total score.

7. Course assessment

The course adopts the combination of process assessment and final open book examination, and the score is composed of usual score (30%) and final exam score (70%). The final examination questions mainly include brief answer, calculation, reading and drawing comprehensive analysis, which correspond to the achievement of each course goal (Table 5).

8. Notes

1) The teaching quality standard of this course is also applicable to other undergraduate majors of non resource exploration engineering.

2) The change of teaching quality standard of this course should be proposed by the person in charge of the course and discussed and approved by the department meeting organized by the person in charge of the major.

3) After the end of the course or the main content of the course, the course design will be arranged for one week.

Made by: Wu Li & Chao-Yong Wang

Examined by: Xiao-Zhi Zhou

Approved by: Zhi-Xin Liu

# Syllabus for《Geochemistry》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05525 | Course Nature | Major Core Courses |
| Faculty | School of School of Resources and Earth Sciences | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

Geochemistry is a minor course of resource exploration engineering. The prerequisite courses are college chemistry and general geology; Applicable to resources exploration engineering, geological engineering and other science and engineering undergraduates. This course mainly describes the abundance, distribution and distribution characteristics of elements and isotopes in geochemical systems, the combination rules and occurrence forms of elements, the migration and transformation of elements in common geochemical systems, the basic theories of geochemical evolution of elements (isotopes) and the basic working methods of geochemistry. And organic geochemistry, environmental geochemistry related basic theories and skills. Through the study of this course, students can understand the research content of geochemistry, learn the basic theories and methods of geochemistry, and use the basic theories of geochemistry to solve complex engineering problems such as geology, resources and energy. In order to adapt to the development of geoscience under the new situation and the national needs for geochemical talents in other fields related to national economy, such as resources, energy and environment.

The main contents of this chapter 1 include the geochemistry and related basic concepts, research contents and methods of geochemistry, brief history of geochemistry development and branches of disciplines, methodology and methodology of geochemistry.

The main content of this chapter 2 includes the basic concepts of element abundance, distribution law of elements in the solar system, structure and chemical composition of the earth, abundance and distribution characteristics of elements in the crust.

The main content of this chapter 3 includesthe geochemical affinity and its classification of elements, isoforms, crystal field stability and its control on the behavior of transition metal elements, micro-controlling factors of element binding law, geochemical classification of elements and its occurrence forms.

The main content of this chapter 4 includesthe related theories of element geochemical migration, types of water-rock chemical interaction and its influencing factors, and case analysis of water-rock chemical interaction.

The main content of this chapter 5 includesthe fundamental theory of trace element geochemistry, quantitative model of trace element distribution and evolution during magmatism, rare earth element geochemistry and trace element tracer significance.

The main content of this chapter 6 includesthe isotope related concepts and causes of variation of isotopic composition in nature, isotope chronology, stable isotope geochemistry.

The main content of this chapter 7 includesthe related concepts of organic geochemistry, biological cycling of organic matter and elements in nature, organic geochemistry of combustible deposits, transformation of organic matter and influencing factors.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Wang Aikuan

Reviewer: Wang Wenfeng

Approver: Liu Zhixin

# Syllabus for《Modern Testing Technology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05526 | Course Nature | Optional major course |
| Faculty | School of Resources and Geosciences | Semester | First Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

Through learning of this course, make students understand the research content and the development of modern testing technology, understand the basic principle of testing technology; understand the analysis principle of hermal analysis technology and testing technology, understand the analysis principle of chromatographic analysis technology and experimental technology; understand and grasp the commonly used element analysis method and its test principle and test technology; master the commonly used mineral (phase) principle and experimental analysis method of test and analysis technology; understand the principle of testing technology of commonly used compounds structure analysis and the experiment technology; understand and familiar with the commonly used basic principle and application of electron microscopic analysis method. Enrich and extend students’ knowledge structure through the course to adapt to the need of modern test and analysis work.

| No. | Chapter | | Content and requirements | Period | Remarks |
| --- | --- | --- | --- | --- | --- |
| 1 | Chapter 1 | Introduction | To familiar with the modern testing technology research content and the development process | 2 |  |
| 2 | Chapter 2 | Thermoanalysis technology | To understand the test principle of thermal analysis technology, understand the main thermal analysis technology experiment method and its application | 2 |  |
| 3 | Chapter 3 | Chromatographic analysis technology | To master chromatographic analysis technology principle and basic theory; to master the gas chromatography instrument composition and test method; to understand the high performance liquid chromatography (HPLC) instruments and test methods | 2 | Experiment: 1 |
| 4 | Chapter 4 | The technology of electronic microscopic analysis | To master the principle of scanning electron microscope (SEM) analysis technology; to understand the scanning electron microscope (SEM) instruments and major experiment technology. To master the principle of transmission electron microscopy (TEM) analysis technology; to understand the transmission electron microscopy (TEM) the main composition and experiment technology | 3 | Experiment: 2 |
| 5 | Chapter 5 | Infrared/Raman spectrum analysis technology | To understand the analysis principle of infrared spectral analysis technology; to familiar with testing techniques of infrared spectrum analysis technology; to understand the principle of analysis of Raman spectrum analysis technology; to familiar with Raman spectrum analysis technology of testing technology | 2 |  |
| 6 | Chapter 6 | X-ray diffraction spectroscopy | To master the XRD analysis principle; to understand the XRD instrument structure and main parts;Mastering the XRD application field | 2 |  |
| 7 | Chapter 7 | X-ray fluorescence spectroscopy | To master the XRF analysis principle; to understand the XRF instrument structure and main parts;Mastering the XRF application field | 2 | Experiment: 1 |
| 8 | Chapter 8 | X-ray photoelectron spectroscopy | To master the XPS analysis principle; to understand the XPS instrument structure and main parts;Mastering the XPS application field | 2 |  |
| 9 | Chapter 9 | Atomic emission / atomic absorption spectrometry | To master the AES/AAS analysis principle; to understand the AES/AAS instrument structure and main parts;Mastering the AES/AAS application field | 3 | Experiment: 1 |
| 10 | Chapter 10 | Mass spectrometry technology | To familiar with the basic principle of mass spectrum analysis technology; to understand the working principle of the key components of the mass spectrometer; to be familiar with the main application field of mass spectrometry technology | 2 |  |
| 11 | Chapter 11 | Nuclear magnetic resonance | To master the NMR analysis principle; to understand the NMR instrument structure and main parts | 2 |  |
| 12 | Chapter 12 | Review and Discussion | To understand the overall development trend of modern testing technology; to understand the basis of testing technology choice; to understand the basic method of sample preparation and requirements; to understand the test and analysis the basic steps and requirements | 2 |  |
| Total | | |  | 26 | Experiment: 6 | |

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Fengjuan Lan

Reviewer: Wenfeng Wang

Approver: Zhixin Liu

# Syllabus for《Drilling Engineering》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05527 | Course Nature | Optional basic course for all majors of the same discipline |
| Faculty | School of resources &Geosciences | Semester | 6 |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course "Drilling Engineering" is an optional basic course for all majors of the same discipline for undergraduates majoring in science and engineering such as resource exploration engineering and geological engineering. This course is 32 hours, it focuses on the traditional drilling technology, strengthens the knowledge system of the latest drilling equipment and technology systems at home and abroad, and introduces the frontiers of the application and development of drilling technology in different fields. It not only deepens the understanding of traditional and mature drilling theories, but also integrates the development of advanced theories and the latest technology in related fields. In terms of teaching content, the drilling engineering content is reorganized and integrated, and theory is combined with practice. The curriculum focuses on basic, systematic, complete and practical, and injects modern scientific research results, which is convenient for guided teaching and students' self-study. Through the study of this course, students will be able to fully grasp the drilling engineering technology, basic knowledge and basic skills, and lay the necessary professional knowledge foundation for the follow-up course study and future application and engaging in the professional drilling engineering work. Initially have the ability to discover, analyze and solve problems. It is conducive for students to have a comprehensive understanding of drilling technology and its social production applications and technical intersections, thereby stimulating professional innovative thinking. The main content of this course is the composition of drilling equipment, drilling pipes and common tools, cemented carbide, diamond drilling and percussion rotary drilling technology, rock core technology, drilling bending measurement and prevention, hydrological and water well drilling and progress Technology, pile foundation construction technology such as bored piles and high-pressure jet grouting piles.

Chapter 1 Introduction

The content includes the main content of drilling work, drilling technical and economic indicators.

Chapter 2 Core Drilling Equipment and Drilling Tools

The content includes core drilling equipment and drilling tools; reasonable use of drill string.

Chapter 3 Drilling Method

The content includes cemented carbide drilling, diamond drilling, percussion rotary drilling working principle and drilling regulations.

Chapter 4 Rock Mine Core Taken

The content includes the basic requirements of rock core; single-layer and double-layer core tube core drilling technology.

Chapter 5 Drilling and Bending

The content includes the mechanism of borehole bending, borehole bending measurement and prevention technology.

Chapter 6 Hydrological and Water Well Drilling and Well Formation Technology

The content includes hydrological and water well drilling structure design, drilling technology, and water well formation technology.

Chapter 7 Pile Foundation Construction Technology

The content includes the construction technology of bored piles and the construction technology of high pressure jet grouting piles.

2. Course Examination

This course assessment adopts a combination of process evaluation and goal evaluation, and the final grade of the course is comprehensively determined by various aspects such as classroom study discussion and after-class feedback performance (30%) + course examination (70%).

1. Process assessment (30%)

Classroom learning feedback, homework assessment, periodic testing, etc.

2. Result test (70%)

Exam (closed book)

Writer: Xiaohong Xia

Reviewer: Aikuan Wang

Approver: Zhixin Liu

# Syllabus for《Big Data Foundation in Geoscience》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05528 | Course Nature | Minor Course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course is applicable to undergraduate students with a minor in Resource Exploration Engineering, which prerequisite course is "Python Programming". Big data is widespread in geoscience and is growing exponentially. Under this background, the big data mining of geoscience has been paid more and more attention by geoscientists. This course focuses on the basic concepts of big data in geosciences, the basic tasks of big data mining and the modeling process, data cleaning and pre-processing, the degradation of high-dimensional data, classification and prediction, the processing of graphical data, and the use of Python data analysis libraries. Through the study of this course, students are required to master geoscience data characteristics, data science paradigms and big data technology, and master the latest progress and research frontiers of geotechnical data mining and fusion theory and technology at home and abroad. Students will be proficient in using data analysis and mining modules including NumPy, SciPy, Pandas, GDAL, Matplotlib, Scikit-learn and Scikit-image, and have the ability to discover, analyze and solve problems in the field of geosciences based on the data-driven manner.

The main contents of this chapter 1 include the fourth paradigm of scientific research, geoscience data, the basic tasks of big data mining, the modeling process of big data mining, and commonly used big data modeling tools.

The main contents of this chapter 2 include data cleaning, data integration and fusion, data transformation, data reduction, discrete point detection and Python main data preprocessing function.

The main contents of this chapter 3 include Correlation analysis, canonical correlation analysis, hash algorithm, principal component analysis, factor analysis and Python implementation of various dimensionality reduction algorithms.

The main contents of this chapter 4 include regression analysis, cluster analysis, discriminant analysis, association rule algorithm, recommendation system algorithm and Python implementation of each algorithm.

The main contents of this chapter 5 include computer graphics foundation, digital image processing, image pattern recognition and graphics data processing algorithms.

The main contents of this chapter 6 include infinite stream data and time series mode, infinite stream data feature extraction, time series algorithm, application cases and Python implementation.

The main contents of this chapter 7 include the development history of machine learning, machine learning classification, SVM, decision tree and artificial neural network, deep learning and migration learning, Python implementation of machine learning algorithms.

The main contents of this chapter 8 include Bayesian principle, artificial intelligence and mineral rock identification method based on artificial intelligence.

2. Course Examination

Course total score = regular score × 10% + assignment score × 10% + experiment score × 20% + final exam score × 60%.

Writer: Xi Yantao

Reviewer: Wang Jilin

Approver: Liu Zhixin

# Syllabus for《Graduation project (thesis)》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05529 | Course Nature | Major practice course |
| Faculty | School of resources and Earth Sciences | Semester | 2 |
| Class Hours | 5 weeks | Credit | 5 |
| Extracurricular hours | 5 weeks | Online Resource |  |

1. Course Introduction

Through this practical teaching, students can learn the comprehensive application of professional knowledge and skills in production practice or scientific problems, and get a comprehensive training in most fields of 12 graduation requirements. Through this practical teaching, students should be able to independently consult the literature under the guidance of teachers, summarize and analyze the problems to be solved, put forward effective design schemes or research methods, and give effective solutions to practical production problems or reasonable conclusions to scientific problems through modern tools or means such as experiment, calculation and simulation, To achieve the training goal of the ability to solve complex problems for graduates.

The main teaching contents are as follows.

Table 1 Main teaching contents

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Serial number | Content of courses | Teaching requirements | Class hours  (days) | Remarks |
| 1 | Design and innovation of technical methods to solve complex engineering problems, or refinement of scientific problems | Master the method of literature review, and learn to analyze and refine the existing problems or deficiencies from the existing research results. | 1 |  |
| 2 | Research ideas and technical routes | Around the technological innovation or scientific problems, put forward reasonable research content, and a set of methods for solving scientific problems or technological innovation, the workload of design should be appropriate. | 1 |  |
| 3 | Specific problem solving process | Through experiments or direct collection of data, using statistics, calculation, analysis and other methods to find regularity, and then put forward effective solutions to complex engineering problems or get reasonable conclusions - need specific analysis of specific problems. | 20 |  |
| 4 | Standardization of thesis writing | The writing format of the paper should conform to the standard, the stationery should be logical and organized, and all kinds of drawings must be cleared by computer drawing software. | 1 |  |
| 5 | Professional translation of foreign language documents | According to the school regulations. | 2 |  |
| Total | |  | 25 |  |

2. Course Examination

(1) According to the students' working attitude and independent working ability, theoretical basis and technical methods, the level of achievement and innovation of graduation project (thesis), and the translation of professional foreign literature, the instructor should write a comprehensive evaluation, give the score according to the percentage system, and leave a review record and signature on each review page of the graduation project (thesis) report. The evaluation should clearly agree with the answer Debate.

(2) According to the significance of topic selection, the ability of comprehensive application of knowledge to solve problems, the amount of work, the innovation of graduation design (thesis) and the standardization of writing, the evaluation teacher should give a comprehensive score and sign on the review page of the design (thesis) report according to the percentage system, and the comments should be clear whether he agrees to reply or not.

(3) The final score of graduation project (thesis) is evaluated by the defense committee according to the results of the instructor and the reviewing teacher and the students' defense situation. The final score is evaluated according to the five grades of "excellent", "good", "medium", "pass" and "fail". The score is converted from the hundred point system into five grades: excellent (90 points and above), good (89-80 points) The average score was 79-70, the pass score was 69-60 and the fail score was below 60.

Writer: Wang Jilin

Reviewer: Jiang Bo

Approver: Liu Zhixin

# Syllabus for《Geoscience Knowledge Graph》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05700 | Course Nature | Extension Course |
| Faculty | School of Resources and Geoscience | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

This course mainly talks about the basic concepts, core technology connotation, and application practice methods of geological knowledge graph. The main contents include geological knowledge representation and reasoning, graph database, geological relationship extraction and knowledge graph construction, graph neural network and graph mining analysis, etc. Through learning, students will master the necessary basic theory, basic knowledge and basic analysis methods of geological knowledge graph, understand the new fields of intersection of earth science, information science and data science, establish a scientific view of earth, enhance the geological innovation driven by both data and knowledge, and lay the foundation for the study of subsequent courses and the improvement of geological literacy.

2. Course Examination

Course total score = classroom performance × 10% + regular assignment × 20% + final test × 70%.

Writer: Yan Zhaojin

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Intelligent Mining》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05701 | Course Nature | Extension Course |
| Faculty | School of Resources and Earth Sciences | Semester | Seventh semester |
| Class Hours | 32 | Credit | 2.0 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Intelligent Mining is an extended course for undergraduate students in major of Geo-information and Technology, whose prerequisite courses are "Geographic Information System", "Geological Data Acquisition and Processing" and "Data Structures and Programming", applicable to undergraduate students of Geographic Information Science and Technology, Resource Exploration Engineering and Geological Engineering. The course is mainly about mine digitization, mine informatization, smart production system, smart mine standard, and smart mine demonstration project. This course focuses on training to understand the digitalization and informatization technology of wisdom mine, mastering wisdom mine standard design and development tools and programming language, and being able to skillfully operate and apply wisdom mine software, so as to cultivate students' ability to apply the learned wisdom mine technology to solve practical mine development problems, and lay a good foundation for using wisdom mine technology in the fields of geomatics science and technology.

2. Course Examination

This course assessment adopts a combination of process evaluation and goal evaluation, and the final score of the course is comprehensively determined by the usual results (including attendance and usual performance), homework, experimental results and final exam results. Normal scores account for 10% of the total score, homework scores for 10%, laboratory scores for 20%, and final exam scores for 60%.

The final score is given on a 100-point scale, with 60 points as a passing pass.

Course total score = class attendance and seminar discussion score ×40%+ final exam score × 60%.

Writer: Yang Hui

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Programming Technology of Geographic Information》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05702 | Course Nature | Undergraduate and Postgraduate Integrated Course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The course "Programming Technology of Geographic Information" is an undergraduate and postgraduate integrated course, and its prerequisite courses are "Python Program Design", "Geographic Information System" and "Remote Sensing Principle and Application", which is suitable for undergraduates majoring in Geo-information science and technology. From the perspective of application development, this course introduces the application skills of Python in geographic information processing with the application of open source GIS, taking the processing, analysis and mapping of spatial data as the main line and the geospatial analysis as the background. Using the most classic and common libraries at present, the course illustrates Python and geospatial analysis, geospatial data, geospatial technology, Python geospatial analysis tools, Python and geographic information systems, Python and remote sensing, Python and elevation data, Python and Advanced geospatial modeling, real-time data, comprehensive applications, and powerful GEE remote sensing big data platform, etc. Through this course, students will be able to achieve the following objectives:

To master common packages and basic development processes of geographic information development;

To proficiently use Python and other development languages to develop specialized geographic information processing modules;

To proficiently solve comprehensive problems in professional fields based on GEE geo-big data platform.

2. Course Examination

Course total score = regular score × 10% + assignment score × 30% + final exam score × 60%.

Writer: Xi Yantao

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《3D Geological Simulation and Visualization》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05703 | Course Nature | Extension Course |
| Faculty | School of Resources and Geosciences | Semester | Eighth Semester |
| Class Hours | 16 | Credit | 1 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

3D geological simulation and visualization is an undergraduate and postgraduate course. Its [prerequisite](link:prerequisite) courses are geographical information system geo-programming and other courses. This course is suitable for the major of geo-information science and technology and used as an elective course for undergraduates and postgraduates of other majors related to geo-science. This course mainly tells the basic theory of geo-3d visualization and geological simulation. Through this course, students can master the basic principles, methods and technologies of geo-visualization, understand 3D modeling and graphics development tools, and acquire methods and skills of geo-landscape simulation 3d geo-modeling visualization and interactive analysis. This course adopts teaching method of combining theory with practice. Experiments in the course cultivates students' practical skills, enables students to create geological model and conduct three-dimensional space analysis by relevant software, and lays the necessary theoretical and practical foundation for practical engineering application and development.

2. Course Examination

Course total score = process assessment score × 20% + final exam score × 80%.

Writer:Chen Yuhua,Hu Xunyu

Reviewer:Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《Advanced Visual Programming》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | E05704 | Course Nature | Extension Course |
| Faculty | School of Resources and Geosciences | Semester | Eighth Semester |
| Class Hours | 32 | Credit | 2.0 |
| Extracurricular hours | 0 | Online Resource | 0 |

1. Course Introduction

Advanced Visual Programming is an extension course for the undergraduate students in major of Geo-information Science and Technology, and the prerequisite course is Python Programming, Data Structures and Programming. The course focuses on the application of modern programming technology in geoscience-related issues in C# advanced programming language. The main contents of the course include: object-oriented programming principles, C# visual programming, graphic image processing, data analysis algorithms and visualization, etc. Through the study of this course, students will develop the scientific thinking ability of using computer programming for exploratory problem analysis, be able to carry out algorithm design and implementation, program development and other basic scientific research capabilities, so as to lay the foundation for further scientific research and further study.

This course is based on C# programming language to develop the main course content, so that students are familiar with the methodological process of programming, master the design of professional software, development principles, familiar with the use of computer programming for data processing and management, visualization, statistical analysis, mathematical calculations and other operations of the principles and methods, to design and develop solutions, with the ability to develop computer programs, for further engagement in They will be able to design and develop solutions and have the ability to develop computer programs, which will lay the foundation for further scientific research.

2. Course Examination

Course total score = class attendance and practice × 20% + homework score × 20% + final exam score × 60%.

Writer: Luo Jinhui

Reviewer: Yang Yongguo

Approver: Liu Zhixin

# Syllabus for《engineering geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | I05201 | Course Nature | Optional transdisciplinary course |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 40 | Credit | 2.5 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

Through the study of this course, students should first understand the research object and basic engineering types of geological engineering, be familiar with the meaning of geological engineering site and its main research content, master the engineering geological properties and geological environment of rock and soil mass, understand the content and exploration method of geological survey, and understand the theory of stability analysis mechanics of rock and soil mass. Master the analysis methods of major geological engineering problems and rock mass engineering reinforcement methods, have the preliminary ability to comprehensively use the geological engineering knowledge to carry out engineering design work, let the students master the dialectical thought of "theory comes from practice, and apply theory to practice". At the same time, cultivate students' ability to find and solve problems, cultivate students' perseverance and asdiligence spirit, so as to achieve the training objectives of geological engineering major for graduates' requirements on knowledge structure and ability to solve complex engineering problems.

The main content of this chapter 1 includes The formation and development of geoengineering, the object and basic engineering types of geoengineering research, the research methods of geoengineering and the relationship between geoengineering and engineering geology.

The main content of this chapter 2, 3 and 4 includes Rock mass engineering properties and geological environment, groundwater geological action and drainage engineering and geological investigation and exploration.

The main content of this chapter 5 ,6,and 7 includes Rock and soil stability analysis mechanics, geological engineering analysis and rock and soil anchorage engineering.

The main content of this chapter 8 includes Anti-slide pile and retaining wall engineering.

Content of experiment arrangement inclues Drilling logging and soil collection, standard penetration test and slope engineering deformation and treatment field practice.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Sun ruhua

Reviewer: Yang weifeng

Approver: Liu zhixin

# Syllabus for《Engineering geomorphology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | I05202 | Course Nature | Development courses |
| Faculty | School of Resources and Earth Sciences | Semester | fifth semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular Hours | 0 | Online Resource |  |

1. Course Introduction

Engineering geomorphology is a core course for geological resources and geological engineering. This course is based on in-situ geomorphology and Quaternary geology, and according to the specific characteristics of Geosciences and engineering, the teaching content is improved and adjusted. The course fully considers the demand of Geosciences and engineering majors for the knowledge of geomorphic process and its interaction with engineering activities, and greatly reduces the teaching hours of endogenetic geomorphic process and quaternary global change. The course mainly deals with the geomorphic processes dominated by exogenic forces during the Quaternary period. This paper focuses on the engineering significance of the geomorphic process during the Quaternary period, the formation process of Quaternary sediments and its impact on engineering, the formation process and response of Quaternary geological disasters, the geomorphic process caused by human activities and its relationship with engineering activities. This course is suitable for undergraduates majoring in geological engineering and related Geosciences and engineering, laying a professional foundation for students' follow-up study; Its prerequisite course is general geology or introduction to earth science; Through the study of this course, students can have the ability to comprehensively consider the harmonious relationship between man and land in the process of engineering design and implementation.

2. Course Examination

The results of final examination accounted for 50%, homework 30% and attendance 20%.

Writer: Ju Yuanjiang

Reviewer: Sun Ruhua

Approver: Dong Qinghong

# Syllabus for《Drilling engineering》

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| --- | --- | --- | --- |
| Course Code | I05203 | Course Nature | Optional transdisciplinary course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The basic goal of the course is to equip students with the basic knowledge of geotechnical drilling, excavation technology and equipment and the basic ability of engineering application. The higher-order goal is to guide the spirit of innovation, dedication, practice and craftsman in big country.

The main content of this chapter 1 includes The present situation and development of drilling and excavating engineering construction technology, the application scope of drilling and excavating, the development of construction equipment, the influence of geotechnical engineering properties on drilling and excavating, and the drillability and classification of rock.

The main content of this chapter 2, 3 and 4 includes Core drilling technology, hydrogeology and well drilling and pile foundation engineering construction technology.

The main content of this chapter 5 ,6,and 7 includes Directional drilling and trenchless technology, oil and gas well drilling and rock and soil excavation engineering.

Content of experiment arrangement includes Equipment drilling tool observation, drilling actual drilling, mud preparation and performance test, special drilling fluid configuration experiment and multi-stage reaming deformation experiment of coal and rock.

2. Course Examination

Course total score = process assessment score × 30% + final exam score × 70%.

Writer: Yang weifeng

Reviewer:Dong qinghong

Approver: Liu zhixin

# Syllabus for《Engineering geotechnical》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | I05204 | Course Nature | Optional transdisciplinary course |
| Faculty | School of Resources and Geosciences | Semester | Fifth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

After learning the basic knowledge and ability of rock and soil mechanics, master the advanced knowledge of rock and soil constitutive model, strength theory, consolidation theory, rock and soil mass dynamics, rock and soil mass hydraulics, etc., have the preliminary ability to use rock and soil mechanics to solve complex engineering geological problems, and understand the international frontier progress of rock and soil mechanics

The main content of this chapter 1 includes Constitutive model of rock and soil mass.

The main content of this chapter 2, 3 and 4 includes Strength theory of rock and soil, consolidation theory of soil and foundation deformation calculation and hydraulic properties of rock and soil.

The main content of this chapter 5 ,6,and 7 includes Dynamic properties of rock and soil mass, analysis of rock and soil engineering problems under complex conditions and development of modern rock and soil mechanics.

2. Course Examination

Course total score =Small paper score × 10% +Autonomous learning score × 20% + process assessment score × 30% + final exam score × 40%.

Writer: Yang weifeng

Reviewer:Yu qing

Approver: Liu zhixin

# Syllabus for《Foundation of geological hazards》

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| --- | --- | --- | --- |
| Course Code | I05205 | Course Nature | Interdisciplinary elective courses |
| Faculty | School of Resources and Earth Sciences | Semester | sixth semester |
| Class Hours | 32 | Credit | 4 |
| Extracurricular Hours | 0 | Online Resource |  |

1. Course Introduction

The basic course of geological disaster is an interdisciplinary elective course, which is an important professional course of disaster prevention and mitigation. Based on the teaching concept of knowledge integrated engineering application and technology practice, this course combines classroom teaching, on-site teaching, video teaching, seminar, engineering case and practice training to carry out classroom, engineering field and video mixed teaching. Its prerequisite courses are general geology, soil mechanics, rock mechanics, engineering geology, hydrogeology, Quaternary geology, etc. This course mainly introduces the definition and main types of geological disasters, the classification of geological disaster prevention and control engineering, the characteristics and risk zoning of geological disasters, the requirements and principles of geological disaster control, the key points of geological disaster prevention and control construction of collapse, landslide, debris flow and ground collapse, the project management, completion acceptance and completion data compilation of geological disaster prevention and control engineering. Through the study of this course, the students can master the basic technology of geological disaster prevention and control, have the ability to engage in the design, construction and construction management of geological disaster prevention and control, and lay a theoretical foundation for the related professional research and production practice after graduation. In the process of teaching, the concept of "green water and green mountains are golden mountains and silver mountains" is transmitted to train students to contribute their technical strength to disaster prevention and mitigation and green, healthy and sustainable development of the motherland.

2. Course Examination

The examination accounted for 20% of the total score; 15% of the total results were obtained in ordinary times and seminars; Examination results accounted for 65% of the total score.

Writer: Wu Shenglin

Reviewer: Zhu shuyun

Approver: Dong Qinghong

# Syllabus for《Engineering geomorphology》

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| --- | --- | --- | --- |
| Course Code | I05301 | Course Nature | Optional transdisciplinary course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Through learning this course, students should have the basic ability of using knowledge geomorphology, need to in the process of engineering design and construction of complex, keep the thought of dynamic design, to be familiar with the weathering process as a starting point and gravity process leading to water and wind and human activities, etc. The basic principle of geomorphologic processes. Through the study of this course, students should be able to use the basic principles of engineering geomorphology to reasonably analyze and evaluate the geomorphic processes of various external forces, and fully consider the interaction between engineering activities and natural geomorphic processes. Through the study of this course, students should be able to study and discuss the variation process of natural process parameters and engineering activity parameters that need to be considered when carrying out various engineering activities in various complex natural geomorphological processes.

The main content of this chapter 1 includes The main content of this chapter 1 includes The formation and development of geoengineering, the object and basic engineering types of geoengineering research, the research methods of geoengineering and the relationship between geoengineering and engineering geology.

The main content of this chapter 2, 3 and 4 includes Weathering type, process, product, block movement types, mechanism, geomorphologic processes and engineering significance of weathering crust, and familiar with collapse, landslide disaster evaluation, in the role of water type and geomorphologic processes, sheet flow - ditch stream - river geomorphology and sediment type, debris flow disasters important parameter acquisition process, the relationship between water effect and engineering activities, Evaluation method of seepage deformation, aeolian sand action and aeolian landform, loess landform and its formation process, relationship between special soil and engineering in arid area and evaluation method of loess collapsibility.

The main content of this chapter 5 ,6,and 7 includes Cold and forcing function and landscape process, evaluation and design thought in seasonal frozen subgrade, and geomorphologic processes coastal dynamic actions, coastal structures protection method, calcarenite soil characteristics of main engineering structure concept and characteristics of neotectonic movement and activity, the basic tectonic geomorphic types, structure and engineering activities and the relationship between seismic effect evaluation method.

The main content of this chapter 8 and 9 includes Concepts and characteristics of neotectonics and active tectonics, basic types of tectonic geomorphology, relationship between active tectonics and engineering activities, evaluation methods of earthquake impact, direct and indirect landforms of human activities, goaf evaluation methods and evaluation methods of understanding land subsidence.

2. Course Examination

Course total score =Attendance record score × 20% + Job performance score × 30% + final exam score × 50%.

Writer: Ju yuanjiang

Reviewer: Sun ruhua

Approver: Liu zhixin

# Syllabus for《Earthquake Prevention and Disaster Mitigation》

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| --- | --- | --- | --- |
| Course Code | I05401 | Course Nature | Earthquake Prevention and Disaster Mitigation |
| Faculty | School of Resources and Geosciences | Semester | Seventh Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | \ | Online Resource | \ |

1. Course Introduction

Earthquake disaster prevention and mitigation is a optional major course for all undergraduates, which is suitable for all undergraduates. This course teaches the splendid seismic culture of ancient China through the design of ancient seismic buildings. Combined with the basic theory of seismic wave propagation, this paper introduces the personal feelings and the damage to the building when the earthquake occurs, and then introduces the scientists use the seismic wave of ' lighting the lights inside the earth ' to discover the inner circle structure of the earth. The development history of plate tectonic theory of macroscopic mechanism of earthquake origin and Wilson ' s ' hot spot theory ' are introduced. The mechanism of the Wenchuan earthquake and the formation of the Hawaiian Islands was expounded, and the possibility of earthquakes in Xuzhou was analyzed. The earthquake monitoring and forecasting system, earthquake precursor phenomena, fire and tsunami disasters in China are introduced. In the part of earthquake prevention and disaster reduction, this paper first introduces the methods of earthquake prevention and disaster reduction in different places when earthquakes occur, and focuses on the concept of ' rescue triangle area ' and the places that are easy to form ' triangle area ' in real life. Students can master the self-help and mutual rescue measures and means of the golden rescue time after the earthquake and secondary disasters, especially before the arrival of professional rescue teams, through thematic activities such as escape skills knowledge explanation, classroom escape drills and cardiopulmonary resuscitation. Secondly, through the film "San Andreas", the students will experience the feeling of being in the actual situation when an earthquake occurs and understand the hazards of earthquakes and the methods and measures of earthquake prevention and mitigation, and deepen their understanding and mastery of the knowledge taught in class. Through this course, students will learn about the glorious earthquake culture of China in ancient times, master the basic knowledge of earthquakes, causes of earthquakes, earthquake forecasting, and basic skills and methods of earthquake prevention and mitigation, self-rescue and self-help, enhance students' awareness of disaster prevention and mitigation, and minimize the damage of earthquake disasters to human society.

Chapter 1 Introduction. The main contents include seismology and research content, human understanding of earthquakes, a brief history of seismology development, combined with famous earthquakes in human history, such as the Huaxian earthquake, Haicheng earthquake, Tangshan earthquake, Wenchuan earthquake, the Great Indonesia earthquake, and the Fukushima nuclear power plant leak in the East Japan earthquake. Analyze the significant effects of earthquakes on human society.

Chapter 2 Propagation of Seismic Waves. The main contents include seismic waves and their classification, the propagation law of seismic waves, various seismic phases and seismic travel time table.

Chapter 3 Causes of Earthquakes.The main contents include three hypotheses of earthquake genesis, continental drift theory, submarine spreading theory and plate tectonics theory, analysis of the cause of Wenchuan earthquake and analysis of the possibility of Xuzhou earthquake.

Chapter 4 Earthquake Monitoring and Forecasting. The main contents include the content, development history and methods of earthquake forecasting, earthquake precursors, earthquake monitoring and the current status of domestic and international research on earthquake forecasting.

Chapter 5 Earthquake Hazards. The content includes types of earthquake hazards, focusing on secondary hazards such as fires, tsunamis, and mudslides, as well as the losses caused by various hazards to human society, the mechanisms of formation, precursor phenomena, and ways of escape.

Chapter 6 Earthquake Disaster Prevention and Mitigation. Focuses on the basic knowledge of earthquake disaster prevention and mitigation in various environments, self-help and mutual rescue methods, escape methods and precautions in the escape process. This chapter includes two topics: the first classroom environment earthquake escape drills. The second CPR method operation method.

Chapter 7 Excellent Earthquake Film Appreciation and Review. Watch the excellent foreign earthquake film "Doomsday Collapse" to let students visualize the scenes and escape skills and methods when an earthquake occurs. Review the course content, assign the examination content, and explain the requirements and precautions for writing the final paper.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%.

Writer: Deng Shuaiqi

Reviewer: Pan Dongming

Approver: Shen Jian

# Syllabus for《An Outline of Earth Science》

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| --- | --- | --- | --- |
| Course Code | I05501 | Course Nature |  |
| Faculty | School of Resources and Geoscience | Semester |  |
| Class Hours | 32 | Credit | 2.0 |
| Extracurricular hours | 2 | Online Resource |  |

1. Course Introduction

This course mainly talks about the earth's material composition, the earth's sphere structure, earth system science and other related knowledge. The main contents include the physical properties and geological processes of the earth, the outer layer of the earth and its interaction, the material transformation, deformation and displacement of the lithosphere, the dynamic system of the earth, the relationship between human beings and resources and the environment. Through learning, the students should master the necessary basic theories, basic knowledge and basic analysis methods of earth sciences, establish a scientific outlook on the earth, understand the relationship between environment, resources and humans, and establish awareness of resources, geological disasters, and environmental protection, which are the learning and basic qualities of subsequent courses.

2. Course Examination

Course total score = classroom performance (10%) + regular assignment (20%) + final test (70%), and is given in five levels finally.

Writer: Wei Ju

Reviewer: Jilin Wang

Approver: Zhixin Liu

# Syllabus for《Introduction to New Energy》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | I05502 | Course Nature | Main major course |
| Faculty | School of Resources and Geoscienc | Semester | 5 |
| Class Hours | 24 | Credit | 1.5 |
| Extracurricular hours | 0 | Online Resource | Sustainable Energy, MIT network open course |

1. Course Introduction

Through this course, students can understand new development of energy area, cultivate understanding and development interest of new energy system, grasp basic knowledge of new energy, know international and domestic possession of resources and utilization status, deepen development, transformation, and basic utilization methods of these energy. Students can also deeply understand the basic concept of sustainable development and energy development trend, focus on shale gas, tight sandstone gas and other reservoir characteristics and evaluation methods; and grasp the location characteristics and the basic principle of water, nuclear, ocean, solar energy. This course is bilingual education, and it can make students understand new development tendency of international new energy area and lay the foundation for opening the international vision.

The main contents of this chapter 1 include new energy and related basic concepts, the current energy development trend both in China and world, the newest tendency of new energy technology and the course content system and research methods.

The main contents of this chapter 2 include the basic concepts of shale gas, shale gas resource and distribution, shale gas resource evaluation content and process, the development process, and the development course and status of shale gas exploration and development.

The main contents of this chapter 3 include the basic concepts of tight sandstone gas and coal measure gas, tight sandstone gas and coal measure gas resources and distribution, the basic characteristics and resource evaluation contents of tight sandstone gas and coal measure gas and the development, and the utilization status of tight sandstone gas and coal measure gas.

The main contents of this chapter 4include the basic concepts of natural gas hydrate, natural gas hydrate resource and distribution and the formation cause of natural gas hydrate.

The main contents of this chapter 5include the present situation and prospect of solar energy utilization, the utilization mode, basic theory and site selection of solar energy, and the storage technology of solar energy.

The main contents of this chapter 6include the basic concepts and present situation of wind energy utilization, the formation of wind and the influence factors of wind strength, the wind energy utilization, and the fan power generation.

The main contents of this chapter 7 include the basic concepts and the utilization of hydro energy in China, the power generation principle, operation mode and type of hydropower station, and the characteristic of site selection for hydro energy utilization.

The main contents of this chapter 8 include the basic concepts of marine energy and its utilization in China, the utilization of marine energy, the national marine strategy, and the characteristic of site selection for marine energy.

The main contents of this chapter 9 include the basic concepts and the development and utilization status of geothermal energy, the source and distribution characteristics of geothermal energy, the utilization of geothermal energy, and geothermal types and characteristics.

The main contents of this chapter 10 include the basic concepts of nuclear energy, the development of nuclear energy in China and world, the main uses, classification and composition of nuclear reactors, and the production and treatment of nuclear waste.

The main contents of this chapter 11 include the basic concepts and the development and utilization status of hydrogen energy, the chemical and physical properties of hydrogen and hydrogen industrial preparation and store methods.

The main contents of this chapter 12 include the concepts of biomass energy, utilization status,potential and trend of biomass energy, and the main utilization ways of biomass energy.

The main contents of review and discussion include carrying out class report discussion, each group report speech, class discussion and teacher comments.

2. Course Examination

Course total score = usual performance (including attendance and performance) × 10% + homework × 10% + class discussion × 20% + final exam score × 60%.

Writer: Shangbin Chen

Reviewer: Shuxun Sang

Approver: Zhixin Liu

# Syllabus for《Coal Mine Geology》

|  |  |  |  |
| --- | --- | --- | --- |
| Course Code | I05503 | Course Nature | Optional Transdisciplinary Course |
| Faculty | School of Resources and Geosciences | Semester | Third Semester |
| Class Hours | 32 | Credit | 2 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

The course of coal mine geology is an optional transdisciplinary course for the major of resource exploration engineering. It is suitable for undergraduates majoring in safety engineering and mining engineering. This course mainly covers the following two parts: 1. Basic geology, including basic concepts and research methods of geology, earth overview and geological processes, minerals and rocks, strata, paleontology and geological history, structural geology, coal formation and characteristics, coal seams and coal measures, and coal geological exploration; 2. Coal mine geology, including coal mine geological work, common geological problems in coal mine construction and production, hydrogeology and coal mine water control, coal mine environmental geology, coal mine geological information work. Through the study of this course, students can understand and initially master the geological knowledge related to coal mine infrastructure construction and coal mine production, cultivate students' ability to read and use various geological data, and serve for all stages of coal mine design and production.

The main contents of this chapter 1 includes the relationship between geology and safety engineering, mining engineering and so on; the concept of geology, research content and research methods.

The main contents of this chapter 2includes basic knowledge of the earth, familiar with the main physical properties of the earth, master the earth's stratospheric structure and geological process.

The main contents of this chapter 3includes the main physical properties of minerals, common rock forming mineral macroscopic identification methods, the formation and characteristics of magmatic rocks and sedimentary rocks, the formation and characteristics of metamorphic rocks.

The main contents of this chapter 4includes the brief history of earth development and paleontological evolution, stratigraphic division and determination method of geological age, stratigraphic system and geological age.

The main contents of this chapter 5includes classification and characteristics of fold structure and fault structure.

The main contents of this chapter 6includes coal accumulating conditions and coal forming process, material composition, properties and classification of coal, coal seams, coal bearing rock series and coalfields, coal accumulating period and coal accumulating area in China.

The main contents of this chapter 7includes the purpose, tasks and basic principles of coal geological exploration, the stage division of coal geological exploration, the technical types of coal geological exploration, and the classification of coal resources / reserves.

The main contents of this chapter 8includes coal mine geological work and common geological problems, principles and main tasks of coal mine geological work, familiar with the classification standard of coal mine geological types, common geological problems in coal mine construction and production.

The main contents of this chapter 9includes basic knowledge of underground water and water filling conditions of mine, hydrogeological observation of mine and water control measures of mine.

2. Course Examination

Course total score = process assessment score × 40% + final exam score × 60%. Teachers can also adjust the proportion of each part of the assessment. Final grades are given on a 100-point scale, with a passing score of 60.

Writer: Zhou Xiaozhi

Reviewer: Wang Aikuan

Approver: Liu Zhixin

# Syllabus for《Experiment of coal bearing strata and Paleontology》

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| --- | --- | --- | --- |
| Course Code | P05528 | Course Nature | Major practice course |
| Faculty | School of Resources and Geosciences | Semester | Fourth Semester |
| Class Hours | 16 | Credit | 0.5 |
| Extracurricular hours | 0 | Online Resource |  |

1. Course Introduction

Paleontology experiment of coal bearing strata is a professional practice course of resource exploration engineering, and its prerequisite course is general geology. Based on the basic concepts and methods of Paleontology in coal bearing strata, this course enables students to correctly identify important paleontological fossils in coal bearing strata and analyze the influence of important tectonic movements on paleogeography, paleotectonic pattern and Paleoclimate in coal accumulation period. The purpose of this study is to help students master the methods and processes of fossil identification, the techniques and basic means of fossil analysis, and to deepen their understanding of the paleogeography, paleotectonic pattern and Paleoclimate of coal bearing strata and the influence of tectonic movement on coal accumulation period.

Experiment name Contents and requirements of the experiment：

1. one Identification of important fossils of the genus ichthydae and correlation of coal bearing stratigraphy Contents:

1) to master the characteristics and distribution of the important genera and the time of the flies;

2) To understand the ecological characteristics, time distribution and evolution of the purpose of the fly.

Requirements: 1) be able to observe and identify the methods of the purpose of the flies under the microscope, the main identification characteristics and geographical distribution of the important genera, and to be used for the division and comparison of coal bearing strata; 2) To understand the ecological characteristics and evolution rules of the purpose of the fly, and analyze the coal gathering environment.

2. Identification of important fossils of Brachiopoda and corals and correlation of coal bearing stratigraphy Contents: 1) to master the characteristics and geographical distribution of the main brachiopods; 2) To master the characteristics and age distribution of the important genera of tetrahedral corals and corals; 3) To understand the ecological characteristics, time distribution and evolution of brachiopods and corals.

Requirements: 1) master the methods of observation and identification of brachiopods and corals, the main identification characteristics and geographical distribution of important genera, and use them for the division and comparison of coal bearing strata; 2) To understand the ecological characteristics and evolution rules of brachiopods and corals, and to analyze the coal accumulating environment.

3. Plant group of coal bearing strata in Late Paleozoic Contents: 1) Devonian flora; 2) Carboniferous flora; 3) Permian Flora.

The requirements: 1) to master the characteristics of the late Paleozoic coal bearing strata flora and compare with the same period of the plants in foreign countries; 2) To understand the geographical division and fossil assemblage of Carboniferous Permian in China.

4. Flora of coal bearing strata in Mesozoic Contents: 1) late Triassic flora; 2) Jurassic flora; 3)

Cretaceous flora.

Requirements: 1) to master the characteristics of the flora of coal bearing strata in Mesozoic; 2) To understand the distribution of continental strata and coal seam in Mesozoic in China.

5. Pollen analysis Content: 1) sporopollen analysis; 2) The characteristics and classification of palynosporin organic matter; 3) Sporopollen facies.

Requirements: 1) to master the sporopollen analysis method and the restoration of parent plants; 2) To understand the application of palynopollen in the analysis of sedimentary environment.

6. Analysis of coal nuclear plants Contents: 1) to understand the mineralization type and research methods of coal core; 2) To understand the cause of coal core; 3) Identification of plant organs in coal core.

Requirements: 1) to master the identification method of plant organs in coal core; 2) To understand the ecological characteristics of coal core plants.

7. The characteristics of the late Paleozoic geohistory and coal bearing construction in China Contents: 1) the histogram of coal bearing strata and coal accumulation environment analysis in typical areas of Late Paleozoic in China; 2) Lithofacies paleogeography map and distribution law of coal bearing formation; 3) The features of the late Paleozoic organisms and the standard fossils of coal bearing strata.

Requirements: 1) master the typical profile characteristics of coal bearing strata in the upper Paleozoic in China; 2) To understand the paleostructure, paleogeography and paleobiological conditions of coal bearing formation.

8. The characteristics of the middle and Cenozoic geohistory and coal bearing construction in China Contents: 1) the histogram of coal bearing strata and coal accumulation environment analysis in typical areas of late paleo middle and Cenozoic in China; 2) Lithofacies paleogeography map and distribution law of coal bearing formation; 3) The characteristics of Mesozoic biology and the standard fossil of coal bearing strata.

Requirements: 1) master the typical profile characteristics of coal bearing strata in the middle and Cenozoic in China; 2) To understand the influence of the important tectonic movements of the middle and Cenozoic on the paleogeography, paleotectonic pattern and Paleoclimate in coal accumulating period.

2. Course Examination

The evaluation of students' learning should reflect the process assessment. According to the characteristics of this course, the students' performance should be evaluated comprehensively by their usual performance (attendance rate + Classroom Activity + classroom notes) + the completion of experimental report. The usual performance accounts for 20%, and the completion of experimental report accounts for 80%. The scoring standard is the hundred point system.

Writer: Biao Quan、Fanfan Kong

Reviewer: Jilin Wang

Approver: Zhixin Liu

# Syllabus for《Comprehensive ability training for geophysics 》

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| --- | --- | --- | --- |
| Course Code | P05411 | Course Nature | Practice of Graduation |
| Faculty | School of Resources and Geosciences | Semester | eighth Semester |
| Class Hours | 13 weeks | Credit | 13.0 |
| Extracurricular hours |  | Online Resource |  |

1. Course Introduction

The graduation project (thesis) course is a professional practice course. The main content of this course is that using the basic knowledge and basic theories learned in school to analyze and solve the practical training process of practical problems. Through this training, students can further consolidate and strengthen their mastery of basic knowledge and training of basic skills, strengthen the training of students' multidisciplinary theories, knowledge and skills comprehensive application ability, and strengthen students' sense of innovation, innovative ability and acquisition of new knowledge Ability training, to train students to comprehensively use the knowledge and skills they have learned, to integrate theory with practice, to analyze independently, and to solve practical problems, so that students can get the basic training to engage in scientific research in their own or similar majors. The process of writing graduation design (thesis) is of great significance for cultivating students' preliminary scientific research ability and improving their comprehensive application of knowledge to analyze and solve problems.

2. Course Examination

Evaluation method: an organization of the geophysical system, comprehensive evaluation based on the completion of the students' graduation thesis (design).

Evaluation method: graduation speech report, on-site defense, graduation thesis

Achievement composition: 20% of the graduation speech report, 20% of the field defense and 60% of the graduation thesis, according to the five-level system: excellent, good, medium, pass and fail.

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Writer: Su Benyu

Reviewer: Pan Dongming

Approver: Liu Zhixin