Appendix B-5: Design of Reinforced Concrete and Masonry Structure Syllabus

Design of Reinforced Concrete and Masonry Structure Syllabus

Course title	Design of reinforced concrete and masonry structure					Course number	9031113060
Applicable specialties	Civil Engineering (Construction Engineering)						
Nature of the course	General education courses☐, subject foundation courses☐ professional core courses (elective ☐ required ☑), independent development courses (required☐ elective ☐), and concentrated practice courses☐						
Unit offering the course							
Total class hours	**75**	credit	2.5	Contact hours	40	Self-study hours	35
Prerequisite courses	Civil engineering materials, Civil engineering drawing						
Textbooks and so on teaching materials	Course materials: He Dongliang, Cao Weijun. Building Science [M]. Xi an: Northwestern Polytechnical University Press, 2021. Wang Haijun, Wei Hua. Building Science [M]. Beijing: Higher Education Press, 2021. Reference materials: Building Design Code, Building Design Fire Code, Standard Atlas of Central and South China						

1. Course Introduction

"Building Science" is an essential foundational course for the architectural engineering direction of Civil Engineering. It is also the only course in Civil Engineering that involves architectural design theory, providing significant guidance for the architectural design section of graduation projects. The primary goal is to help students understand the basic components of general building structures, grasp the fundamental principles of architectural construction, and learn common structural design methods. By integrating practical engineering experience, it aims to adapt students to the application and development of new materials and technologies. The course also cultivates students spatial imagination, reading skills, and necessary drawing abilities, laying a solid foundation for future work in complex building design and structural research. Through this course, students will acquire the essential qualities and capabilities required for research and technical work related to architectural design and construction in civil engineering. This is a practical and applied course that combines knowledge of civil engineering drawing and materials.

2. The graduation requirements supported by this course and the path to achieve them

(1) The graduation requirements that this course can support

number	Graduation requirement indicators	Specific content of graduation requirement indicators
1	Graduation requirements 6.1	Familiar with the standards, policies and laws and regulations related to civil engineering professions and industries
2	Graduation requirement 6.2	Ability to evaluate the impact of civil engineering project design and construction, complex engineering problem solutions on society, health, safety, law and culture
3	Graduation requirements 7.3	Have the awareness of using energy-saving and environmental protection new materials and carrying out green construction

(2) The implementation path of graduation requirements indicators in this course

1. Course objectives

Through the theoretical teaching and cognitive practice of this course, students will have basic knowledge and ability. The specific course objectives are as follows:

Course Objective 1: Master urban planning, surrounding environment, and site requirements in the overall building layout design; understand the design of main and auxiliary rooms and traffic connections in the building floor plan, and conduct architectural floor plan combination design; grasp the determination of building height and number of floors, as well as the combination and utilization of building space; be familiar with the basic principles of architectural composition; understand the research objects and tasks of building construction, the composition of buildings; grasp factors affecting building construction and design principles; master the selection of column grids and positioning axes for single-story industrial buildings and multi-story factory building floor plans, as well as the determination of number of floors and heights; understand the construction components and design requirements of foundations, walls, floors, elevators, roofs, and doors and windows; grasp the setting conditions and requirements for expansion joints, structural treatment at expansion joint locations, and the construction of expansion joint covers; master wall, floor, and ceiling finishing methods; understand the scale design of stairs and the drawing of detailed stair plans; grasp roof drainage design and drawing; master waterproofing construction for basements,

floors, walls, and roofs; develop the ability to analyze, reason, and solve engineering problems.

Course Objective 2: Based on the teaching knowledge of architectural theory, a preliminary BIM design scheme model of a certain building is constructed, and the basic construction process is familiar through modeling operation, so that the design and construction of civil engineering projects can be evaluated, and the solution to complex engineering problems can be evaluated for its impact on society, health, safety, law and culture.

Course Objective 3: Understand the types of building insulation, heat insulation and sound insulation; master the construction design and requirements of building insulation, heat insulation and sound insulation.

2. The corresponding relationship between the course teaching objectives and the graduation requirements indicators

Graduation requirement indicators	Course teaching objectives
Graduation requirements 6.1	Course Objective 1
Graduation requirements 6.2	Course objective 2
Graduation requirement 7.3	Course objective 3

3. Intended learning outcomess and details of teaching links

(1) Intended Learning Outcomes

The intended Learning Outcomes of this course are as follows

blocks of knowledge		knowledge point	Initial level	Degree of requirement	Intended Learning Outcomes	Corresponding curriculum objectives
1	Building design (including civil and industrial building design) and building construction (civil building	Overview of architectural design	L1	L2	1. Be clear about the content, procedures, requirements and basis of architectural design, and master the building module and	Course Objective 1

blocks of knowledge		knowledge point	Initial level	Degree of requirement	Intended Learning Outcomes	Corresponding curriculum objectives
	construction)				modular system	
		Fundamentals of building physical environment	L1	L2	2. Understand the type and degree of influence of meteorological and solar elements	Course Objective 1
		Building plan, elevation and section design	L1	L3	3. Master the technical parameters and concepts of building plan, vertical and sectional design, and apply these parameters to building plan, vertical and sectional design	Course Objective 1
		Industrial building design	L1	L2	4. Master the classification of industrial buildings and the types of lifting and transportation equipment inside the factory, understand the selection of column grid and positioning axis in single-story industrial factories	Course Objective 1
		Overview of building	L1	L3	5. Understand the basic	Course

blocks of knowledge		knowledge point	Initial level	Degree of requirement	Intended Learning Outcomes	Corresponding curriculum objectives
		construction Foundation and substructure Wall construction Floor (ground) construction Roof construction Stairs and elevators Window and door construction movement joint architectural coating Building waterproofing			composition of buildings and illustrate the role of each component in the house	Objective 1
			L1	L3	6. Master the basic concepts and construction forms of foundation and base, and illustrate the treatment methods of foundation with examples	Course Objective 1
			L1	L3	7. Master the detailed construction measures and reinforcement measures of walls, understand the construction points of ring beams, structural columns and other components	Course Objective 1
			L1	L3	8. Master the basic concept and construction composition of floor, understand the construction requirements of balcony and canopy	Course Objective 1

blocks of knowledge	knowledge point	Initial level	Degree of requirement	Intended Learning Outcomes	Corresponding curriculum objectives
		L1	L3	9. Master the roof type and construction points, and be able to flexibly apply roof drainage design in the architectural design stage	Course Objective 1
		L1	**L3**	10. Master the basic composition and detailed construction methods of stairs, be able to design stairs, understand the methods and requirements of steps and ramps	Course Objective 1
		L1	L3	11. Understand the basic concept of doors and Windows, master the common scale and construction requirements of doors and Windows	Course Objective 1
		L1	L2	12. Understand the basic concept of deformation joint, master the types of deformation joint and the setting principles and	Course Objective 1

blocks of knowledge		knowledge point	Initial level	Degree of requirement	Intended Learning Outcomes	Corresponding curriculum objectives
					construction requirements	
			L1	L3	13. Master the construction hierarchy of building finishes, and illustrate the specific practices of wall, floor and floor finishes with examples	Course Objective 1
			L1	L3	14. Master the construction method of moisture-proof and waterproofing in the basement, and be able to reasonably choose the moisture-proof and waterproofing method in the construction stage	Course Objective 1
			L1	L3	15. Master the construction method of roof waterproofing, and be able to reasonably select waterproof materials in the construction stage	Course Objective 1
2	A preliminary BIM design model of a	BIM preliminary design scheme	L2	L3	16. Based on the teaching knowledge of architectural	Course objective 2

blocks of knowledge		knowledge point	Initial level	Degree of requirement	Intended Learning Outcomes	Corresponding curriculum objectives
	building	model			theory, the preliminary BIM design model of a building is constructed, and the architectural scheme model reflects the impact on society, health, safety, law and culture	
3	Building insulation Insulation and sound insulation	Building insulation Building insulation Building sound insulation	L1	L2	17. Master the construction method of building insulation, and be able to reasonably choose building insulation materials in the construction stage	Course objective 3
			L1	L2	18. Master the construction method of building insulation, and be able to reasonably select insulation materials in the construction stage	Course objective 3
			L1	L2	719. Master the construction ethod of building ound insulation, and be able to asonably choose	Course objective 3

blocks of knowledge		knowledge point	Initial level	Degree of requirement	Intended Learning Outcomes	Corresponding curriculum objectives
					ound insulation naterials in the nstruction stage of building	

(2) Course Assessment Rules

content of courses (blocks of knowledge)	Number of teaching hours	Expected Learning Outcomes (ILO)	Implementation link (In class, experiment, etc.)	instructional strategies
Building design (including civil and industrial building design)	30	1. Master architectural design standards 2. Explain the basic of architectural physical environment 3. Understand the content of architectural plan, elevation and section design 4. Master the classification of industrial buildings, master the selection of column grid and positioning axis of single-story industrial buildings	In-class teaching Study outside of class Extracurricular practice Big assignments	lecture Problem-oriented case
Building construction (construction of civil buildings)		5. Understand the basic composition of the house and the role of each part in the house 6. Understand the basic composition of the house and the role of each part in the house 7. Master the basic concepts and	In-class teaching Study outside of class Extracurricular practice Big assignments	lecture Problem-oriented Discussion style case

content of courses (blocks of knowledge)	Number of teaching hours	Expected Learning Outcomes (ILO)	Implementation link (In class, experiment, etc.)	instructional strategies
		construction forms of foundation; be familiar with the treatment methods of foundation 8. Master the detailed construction measures and reinforcement measures of walls, understand the basic concepts, functions and design requirements of walls 9. Master the construction composition of floor and ground, as well as the construction requirements of balcony and canopy 10. Master the roof type, construction composition and specific structural measures of roof drainage design and waterproofing 11. Master the basic composition, detailed construction methods and stair design of stairs, and understand the practice and requirements of steps and ramps 12. Understand the basic concept of doors and Windows,		

content of courses (blocks of knowledge)	Number of teaching hours	Expected Learning Outcomes (ILO)	Implementation link (In class, experiment, etc.)	instructional strategies
		master the common scale and construction requirements of doors and Windows 13.Understand the basic concept of deformation joint, master the types of deformation joint, setting principles and construction requirements 14.Master the construction level and specific practices of building floors, walls, ceilings and other finishes 15.Master the construction method of basement moisture and waterproofing 16.Master the waterproof construction of roof		
A preliminary BIM design model of a building	8	17.Build a preliminary design model of BIM	Big assignments	Problem-oriented Discussion style
Building insulation Insulation and sound insulation	2	18.Master the construction method of building insulation 19.Master the construction method of building insulation 20.Master the construction method	In-class teaching Study outside of class Extracurricular practice	lecture Problem-oriented guidance Discussion style

content of courses (blocks of knowledge)	Number of teaching hours	Expected Learning Outcomes (ILO)	Implementation link (In class, experiment, etc.)	instructional strategies
		of building sound insulation		

4. Course assessment (Assessment Scheme)

(1) Course assessment structure

Examination items		Scale	Requirement
usual performance	Homework	1 0%	Process-based assessment is adopted, and students are evaluated comprehensively according to the automatic records of learning through Learning Pass on resource learning, participation in various online learning activities, classroom performance, etc.
	Test it regularly	1 0%	All knowledge points are mainly objective questions, with question bank, cloud class, learning network and other teaching software to judge the students mastery of knowledge.
	Big assignments	20%	The teaching software is arranged through cloud class and study through online submission. The focus is on assessing students ability in comprehensive analysis and understanding.
final		6 0%	The test uses subjective questions with engineering background to focus on assessing students ability to use their knowledge to comprehensively analyze and deal with problems.
amount to		100 %	

(2) Course assessment details:

Assessment items	primary coverage	
	Knowledge units/points	Ability items
Homework	For all knowledge units, the number of assessment knowledge points shall be no less than 50% of all knowledge points	1. independent learning ability; 2. Industry standard reading and application ability; **3.** Communication skills
Test it regularly	All the knowledge points	This is an objective question, all of which are tested in terms of

Assessment items	primary coverage	
	Knowledge units/points	Ability items
		knowledge
Big assignments	A preliminary BIM design model of a building	Assess students ability to model practical design
Final	Detailed construction measures and reinforcement measures of walls, selection and positioning axis determination of column grid in single-story industrial buildings, calculation and design of stairs, types and setting principles and construction requirements of deformation joints, construction of basement moisture-proofing and waterproofing of roof	The test is conducted by using subjective questions with certain practicality, focusing on assessing students ability to use their knowledge to comprehensively analyze and deal with problems.

5. Tasks undertaken in the cultivation of the ability to solve complex engineering problems

Master the basic theories of architectural design, the composition and fundamental principles of building structures, and use CAD and REVITE software. Possess the ability to model architectural designs and compare design schemes, with an awareness of using energy-saving and environmentally friendly new materials for green construction. Be capable of evaluating the impact of civil engineering project designs and constructions, as well as solutions to complex engineering problems, on society, health, safety, law, and culture.

6. Cultivation and observation of non- "technical ability"

Cultivation of non-technical ability: guide students to learn independently, adopt group assistance learning mode in discussion, and cultivate students team assistance ability and communication ability;

Observation: In the group assignment scoring, set up peer evaluation among students in the same group and peer evaluation between groups, and observe students performance in

collaborative learning.

7. Course ideological and political design

The ideological and political goals of this course are mainly to cultivate students sense of responsibility, a high sense of social responsibility, good professional ethics, and future outstanding engineers with integrity, honesty, craftsmanship, cooperation, and awareness of lifelong learning. The course adheres to three orientations:

(1) Integrate key ideological and political points into typical engineering cases, cutting-edge engineering technologies, the qualities of engineers, and issues arising during construction. Combine patriotism education and revolutionary history education into professional classrooms to positively guide students, enhancing their national pride and sense of honor. Cultivate in students a spirit of hard work, innovation, and craftsmanship for the new era. Special attention should be given to using negative examples from technical fields to inspire students sense of responsibility and awareness of potential crises.

(2) Through after-class Q&A activities in architectural studies and guiding student design competitions, broaden students thinking and horizons, bridge the gap between students and teachers, enhance the appeal and influence of ideological and political education, improve students ideological and political qualities, national sentiment, and sense of responsibility, and guide everyone to actively practice the core socialist values.

(3) Help students to understand the employment situation in advance, strengthen professional guidance and life planning for students through professional learning, and solve problems such as confusion about majors, lack of confidence in majors and lack of ideals and beliefs.

8. Course evaluation and continuous improvement mechanism

(1) Course evaluation

The course evaluation cycle is once per semester.

1. The achievement of teaching objective 1 is evaluated by comprehensive evaluation through regular tests, regular assignments and final tests; the evaluation is based on scoring

method.

2. The achievement of teaching objective 2 is evaluated through major assignment evaluation, using project scoring method.

3. The achievement of teaching objectives 3 is evaluated by comprehensive evaluation through regular tests, regular assignments and final tests, using the scoring method.

(2) Continuous improvement mechanism

(a) Establish a continuous improvement system

① Establish a continuous improvement group for this course;

② The head of the course continuous improvement group is responsible for organizing and supervising the continuous improvement process;

③ Develop continuous improvement measures.

(b) Establish a continuous improvement group for this course

Team leader: person in charge of the course team

Team member: a team member of the course

(c) Continuous improvement method of this course

① Regular grade assessment mechanism: According to the academic situation of each class, teachers in the course group must summarize and collect various indicators of students regular grade assessment every 4 weeks, adjust students status in time, and make corresponding records.

② Final examination assessment mechanism: analyze the final examination paper, count the score of each part of the test, use the statistical results to analyze and study the course as a whole, and improve the students who take the make-up exam and those in the next class.

(d) Continuous improvement measures of this course

① For the regular assessment of grades, measures such as symposiums, discussion groups, the establishment of study groups and individual exchanges with students are adopted to improve.

② For the final examination assessment, unified guidance and other measures are taken for students who take the make-up exam to improve according to the problems in the students

examination and the key content of the course.

Formulator (signature):
Director of department (office) review (signature):
Professional person in charge of review (seal):