Curriculum Standard

Curriculum: Structural Drawing Recognition and

Reinforcement Calculation

Major: Engineering Cost

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Structural Drawing Recognition and Reinforcement Calculation Curriculum Standard

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Credit： 5

Class Hour： 88

Major： Engineering Cost

1. Preface

1.1 Characteristics of the course

《structural drawing recognition and reinforcement calculation》 is a professional core course of engineering cost specialty. This course meets the needs of the times of Ideological and political education in Colleges and universities, redesigns the knowledge structure from the task and professional ability, selects the necessary theoretical knowledge points around the completed work tasks, and focuses on cultivating students' professional ability and practical ability. Through the course study, students can comprehensively and systematically master the basic theories and methods of flat structure construction drawing reading and reinforcement quantity calculation, and cultivate the ability of structural drawing reading and reinforcement quantity calculation, so as to meet the needs of subsequent courses and career development. The characteristics of this course are guided by the calculation process of flat method reinforcement, based on national occupation, aiming at comprehensive vocational ability, taking work tasks as the carrier, student-centered and ability-based.

1.2 Design of the course

The integrated arrangement of "teaching, learning and doing" improves the teaching effect and efficiency of the course. The integrated arrangement of "teaching, learning and doing" refers to the close combination of knowledge and skill, knowledge transfer and ability training in each class. Abandon the traditional practice of artificially dividing a course into theoretical part and practical part, and break through the inertial thinking that students can't do without explaining clearly. In curriculum teaching, the most important function of teachers is to organize, drive and guide students to "do", so that students can improve their professional ability, cognition and accumulate knowledge. The connection point of the integrated arrangement of "teaching, learning and doing" is the vocational ability project training.

Design features of this course: firstly, it combines the plane method of structural construction drawing with reinforcement measurement, which is in line with the current situation of popularizing the overall plane representation method of reinforced concrete structural construction

drawing in China, and trains students to master the basic skills required by the project cost personnel of plane method of structural construction drawing, so that the reinforcement measurement can be carried out accurately only on the basis of reading the construction drawing; Secondly, the teaching process takes a set of structural construction drawing plane method reading and reinforcement quantity calculation as the main line, and successively carries out structural plane method reading of different parts and reinforcement measurement of concrete construction. The process of completing the teaching is the process of completing structural plane method reading and reinforcement measurement of a specific project. Each teaching task is relatively independent and coherent. Introduce relevant knowledge at the beginning of each project, and several tasks included are relevant skill training, and the preparatory knowledge necessary for operation is introduced in each task; Learn theory in the project, understand the theory in the skill training task, and integrate the abstract theory into the practical operation task; On the basis of certain theoretical study, students can master the skills and methods of structural plane drawing and reinforcement calculation through more specific and rich practical operation.

This course standard is employment oriented, and the teaching content of this course is determined according to the analysis of job tasks and professional abilities involved in project cost by industry experts and in close combination with the actual project operation needs of enterprises. The teaching activities of this course are divided into several projects according to the working process involved in professional posts, the teaching is organized by the project as the unit, and the specific construction drawings are used as the carrier to draw out relevant professional theoretical knowledge, so that students can deepen the understanding and application of professional knowledge and skills in project practice, and cultivate students' comprehensive professional ability.

2．Objectives of the course

2.1 Overall objectives

Through the study of this course, students can master the work skills of plane method drawing reading and reinforcement calculation required for the professional post of cost controller, that is, they can read the plane method construction drawings of important structural concrete components such as beams, slabs, columns and foundations, accurately calculate the reinforcement quantities of each component according to the measurement rules, so that students have the ability to calculate the plane method reinforcement quantities independently.

2.2 Specific objectives

2.2.1 Knowledge objectives

(1) Be able to understand the flat method rules of structural construction drawings;

(2) Be able to understand the procedure of reinforcement quantity calculation;

(3) Be able to understand the plane method rules of common foundations and the calculation rules of reinforcement quantities;

(4) Be able to understand the flat method rules of columns and the calculation rules of reinforcement quantities;

(5) Be able to understand the plane method rules of beams and the calculation rules of reinforcement quantities;

(6) Be able to understand the flat method rules of slab and the calculation rules of

reinforcement quantities;

(7) Be able to understand the plane method rules of shear wall and the calculation rules of reinforcement quantities;

(8) Be able to understand the plane method rules of joints such as stairs and the calculation rules of reinforcement quantities.

2.2.2 Capability objectives

(1) Be able to read plane construction drawings;

(2) Be able to analyze and summarize the rules of reinforcement quantity calculation;

(3) Be able to read the plane construction drawings of common foundations;

(4) Be able to calculate the reinforcement quantities of common foundations;

(5) Be able to read the plane construction drawings of columns;

(6) Be able to calculate the reinforcement quantities of frame columns;

(7) Be able to read plane construction drawings of beams;

(8) Be able to calculate the reinforcement quantities of frame beams;

(9) Be able to read plane construction drawings of slab;

(10) Be able to calculate the reinforcement quantity of slab;

(11) Be able to read the plane construction drawing of shear wall;

(12) Be able to calculate the reinforcement quantity of shear wall;

(13) Be able to read plane construction drawings of stairs and other nodes;

(14) Be able to calculate the reinforcement quantities of joints such as stairs.

2.2.3 Quality objectives

(1) Establish an honest, responsible and positive learning attitude;

(2) Develop the professional spirit of being hardworking, seeking truth in practice and abiding by discipline and law;

(3) Establish a team consciousness of unity and cooperation and good at communication.

3．Course content and requirements

No.	Teaching task	Course content and teaching requirements	Instructional design
1	Rules and principles of plain reinforcement	(1) Knowledge content and requirements: ① Master the classification and function of construction drawings; ② Master the type, symbol, concrete cover, anchorage length, connection mode, etc. of reinforcement (2) Skill content and requirements: ① Be able to read the symbol information of reinforcement, determine the thickness of protective layer, the value of anchorage length and lap length	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ (2) Practice project Read the construction drawings of the real project and determine each calculation parameter

		(1) Knowledge content and requirements:	(1) Teaching methods
2	Calculation of horizontal reinforcement of column	(1) Knowledge content and requirements: ① Drawing rules of column plane construction drawing; ② Calculation method of column reinforcement quantities; (2) Skill content and requirements: ① Be able to read column plane construction drawings ② Be able to calculate the quantities of column reinforcement	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ (2) Practice project Calculation of column reinforcement quantities of real projects.
3	Calculation of plane reinforcement of beam	(1) Knowledge content and requirements: ① Drawing rules of beam plane construction drawings; ② Calculation method of beam reinforcement quantities; (2) Skill content and requirements: ① Be able to read beam plane construction drawings ② Be able to calculate the quantity of beam reinforcement	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ (2) Practice project Calculation of beam reinforcement quantities of real projects.
4	Calculation of plane reinforcement of slab	(1) Knowledge content and requirements: ① Drawing rules for construction drawings of slab and plane method; ② Calculation method of slab reinforcement quantities; (2) Skill content and requirements: ① Be able to read the plate plane construction drawings ② Be able to calculate the quantity of slab reinforcement	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ (2) Practice project Calculation of slab reinforcement quantities for real projects.
5	Calculation of horizontal reinforcement of foundation	(1) Knowledge content and requirements: ① Drawing rules of foundation plane construction drawings; ② Calculation method of foundation reinforcement quantities; (2) Skill content and requirements: ① Be able to read foundation plane construction drawings ② Be able to calculate the quantities of foundation reinforcement	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ (2) Practice project Calculation of foundation reinforcement quantities of real projects.

		(1) Knowledge content and requirements: ① Drawing rules for plane construction drawings of stairs; ② Calculation method of stair reinforcement quantities; (2) Skill content and requirements: ① Be able to read plane construction drawings of stairs ② Be able to calculate the reinforcement quantities of stairs	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ (2) Practice project Calculation of stair reinforcement quantities for real projects.
6	Calculation of plane reinforcement of stairs		
7	Calculation of plane reinforcement of shear wall	(1) Knowledge content and requirements: ① Drawing rules of plane construction drawing of shear wall; ② Calculation method of reinforcement quantities of shear wall; (2) Skill content and requirements: ① Be able to read the plane construction drawing of shear wall ② Be able to calculate the reinforcement quantities of shear wall	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ (2) Practice project Calculation of reinforcement quantity of shear wall in real project.
8	Class training	(1) Knowledge content and requirements: ① Be familiar with the plane drawing rules of various component structure construction drawings in civil engineering; ② Master the method of plane drawing identification of various component structure construction drawings in civil engineering and the method of reinforcement quantity calculation; (2) Skill content and requirements: ① Have the ability to read the construction drawings of various types of component structures by plane method and calculate the quantities of reinforcement in civil engineering	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ ⑥ Others: (2) Practice project Calculation of reinforcement quantities of real projects

No.	Teaching task	Course content and teaching requirements	Instructional design	Reference class hours
1	Foundation structure drawing identification and reinforcement calculation	(1) Knowledge content and requirements: ① Understand the drawing rules of various types of foundation plane construction drawings in general civil engineering; ② Master the reading method of plane construction drawings of various types of foundations in general civil engineering and the calculation method of reinforcement quantities; (2) Skill content and requirements: ① Have the ability to calculate the quantities of various types of foundation reinforcement in general civil engineering;	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ ⑥ Others: (2) Practice project Calculation of foundation reinforcement quantities of real projects.	10
2	Column structure drawing identification and reinforcement calculation	(1) Knowledge content and requirements: ① Understand the drawing rules of various types of column plane construction drawings in general civil engineering; ② Master the reading method of construction drawings of various types of columns in general civil engineering and the calculation method of reinforcement quantities; (2) Skill content and requirements: ① Have the ability to calculate the quantities of various types of column reinforcement in general civil engineering;	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ ⑥ Others: (2) Practice project Calculation of column reinforcement quantities of real projects.	16

		(1) Knowledge content and requirements: ① Understand the drawing rules of plane construction drawings of various types of beams in general civil engineering; ② Master the reading method of plane construction drawings of various types of beams in general civil engineering and the calculation method of reinforcement quantities; (2) Skill content and requirements: ① Have the ability to calculate the quantities of various types of beam reinforcement in general civil engineering;	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ ⑥ Others: (2) Practice project Calculation of beam reinforcement quantities of real projects.	
3	Beam structure drawing identification and reinforcement calculation			16
4	Plate structure drawing identification and reinforcement calculation	(1) Knowledge content and requirements: ① Understand the drawing rules of various types of slab plane construction drawings in general civil engineering; ② Master the reading method of various types of slab plane construction drawings and the calculation method of reinforcement quantities in general civil engineering; (2) Skill content and requirements: ① Have the ability to calculate the quantities of various types of slab reinforcement in general civil engineering;	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ ⑥ Others: (2) Practice project Calculation of slab reinforcement quantities for real projects.	10

		(1) Knowledge content and requirements: ① Understand the drawing rules of plane construction drawings of various types of concrete walls in general civil engineering; ② Master the reading method of construction drawings of various types of concrete wall plane method and the calculation method of reinforcement quantities in general civil engineering; (2) Skill content and requirements: ① Have the ability to calculate the reinforcement quantities of various types of concrete walls in general civil engineering;	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ ⑥ Others: (2) Practice project Calculation of reinforcement quantities of concrete wall of real project.	
5	Wall structure drawing identification and reinforcement calculation			8
6	Node structure drawing identification and reinforcement calculation	(1) Knowledge content and requirements: ① Understand the drawing rules of plane construction drawings of various types of nodes in general civil engineering; ② Master the reading method of plane construction drawings of various types of joints in general civil engineering and the calculation method of reinforcement quantities; (2) Skill content and requirements: ① Have the ability to calculate the quantities of various types of joint reinforcement in general civil engineering;	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ ⑥ Others: (2) Practice project Calculation of joint reinforcement quantities of real projects.	8

7	Class training	(1) Knowledge content and requirements: ① Be familiar with the plane drawing rules of various component structure construction drawings in general civil engineering; ② Master the method of plane drawing identification of various component structure construction drawings and the calculation method of reinforcement quantities in general civil engineering; (2) Skill content and requirements: ① Have the ability to read the construction drawings of various types of component structures by plane method and calculate the quantities of reinforcement in general civil engineering;	(1) Teaching methods ① Lecture ② Combination of teaching and practice √ ③ Case analysis √ ④ Discuss ⑤ Training √ ⑥ Others: (2) Practice project Calculation of joint reinforcement quantities of real projects.	20
Total class hours				88

4．Implementation recommendations

4.1 Suggestions on textbook selection and compilation

4.1.1 Selection of teaching materials

The selection of teaching materials for the course must be combined with the contents of the course standards, effectively combined with the contents of the professional qualification examination of the industry, and carry out the teaching work on the basis of various actual engineering economic management operation processes. The recommended teaching materials are as follows:

(1) Peng Bo. Basic course of plain reinforcement drawing and calculation. China Construction Industry Press, January 2013.China Construction standards design and Research Institute. Drawing rules and structural details of plane overall representation method of concrete structure construction drawings (16g01-1). China Construction Industry Press, September 2016。

4.1.2 Suggestions on textbook compilation.

(1) The compilation of teaching materials for this course should divide the professional activities into several typical work items, and organize the contents of teaching materials according to the needs of completing the work items and post work procedures, combined with the requirements of vocational level examination. Through the technical and economic analysis of

typical engineering projects, we should introduce the necessary theoretical knowledge, strengthen the operation training, and emphasize the application of theory in the process of practice;

(2) The teaching materials should be illustrated and combined with diagrams, improve students' learning intuition and initiative, and deepen students' understanding and understanding of technical and economic analysis of engineering projects. The description of teaching materials must be concise, accurate and scientific.

(3) The contents of textbooks should reflect the advanced nature, versatility and practicability. We should bring the new norms and technologies of this major into teaching materials in a timely manner, so that the teaching materials can be more close to the professional development and actual needs.

(4) The content of activity design in teaching materials should be specific and operable.

4.1.3 Suggestions on the use of teaching materials and teaching reference materials

The teaching materials are preferred to the national planning teaching materials for Vocational Education in the 12th Five Year Plan, and it is suggested to promote the practice oriented school-based teaching materials.

4.2 Teaching suggestions

(1) Take the work flow of reinforcement calculation as the main line, take the work task as the guidance, and arrange the teaching by linking the major knowledge and skill points with the help of the real project of the enterprise;

(2) Using group teaching method to implement various tasks, pay attention to matching different types of students into groups, and strive to cultivate students' team spirit;

(3) To build a platform for school enterprise participation in classroom teaching, and to use the Internet plus evaluation and display of student learning outcomes, and bring business experts into the teaching platform, and jointly train talents with schools and enterprises.

4.3 Teaching assessment and evaluation suggestions

To implement the process assessment, we should comprehensively assess the students' usual classroom participation, homework completion, especially their performance in practical teaching, record the results, and increase the proportion of daily assessment. So that examination is not only a means to test the learning effect, but also an integral part of students' relearning and training.

Specific assessment and evaluation suggestions are as follows:

Comprehensive score (100%) = chapter test (15%) + homework after class (20%) + attendance check-in (10%) + course interaction (5%) + final test (30%) + Training Score (20%)

4.4 Development and utilization of curriculum resources

(1) Pay attention to the development and application of course training instructions and training materials.

(2) Pay attention to the development and utilization of curriculum resources and modern teaching resources, which are conducive to creating vivid working situations, stimulating students' interest in learning and promoting students' understanding and mastery of knowledge. At the same time, it is suggested to strengthen the development of curriculum resources, establish a database of multimedia curriculum resources, and strive to realize the sharing of Cross School multimedia resources, so as to improve the utilization efficiency of curriculum resources.

(3) Actively develop and make use of network curriculum resources, make full use of network information resources such as e-books, e-journals, databases, digital libraries, educational websites and electronic forums, and change teaching from single media to multiple media; Teaching activities change from one-way transmission of information to two-way exchange; Students' individual learning changes to cooperative learning. At the same time, we should actively create conditions to build a distance teaching platform and expand the interactive space of curriculum resources.

(4) Industry university cooperation develops experimental training course resources, makes full use of typical enterprise resources in the industry, strengthens industry university cooperation, establishes practice and training base, and alternates practice, work and study, so as to meet students' practice and training needs and create opportunities for students' employment.

(5) Establish the specialty and open the training center to enable it to have the functions of on-site teaching, experimental training and vocational skill certification, realize the integration of teaching and training, teaching and training, and teaching and certification, and meet the requirements of students' comprehensive vocational ability training.

4.5 Suggestions on teaching conditions

(1) Pay attention to the construction of situational construction project budget training environment, including the application of hardware scene environment and relevant project case base.

(2) Pay attention to the development and utilization of curriculum resources and modern teaching resources, actively develop and utilize network curriculum resources, stimulate students' interest in learning, make students' learning no longer limited to the classroom, and promote students' understanding and mastery of knowledge.

(3) Industry university cooperation develops training course resources, makes full use of typical enterprise resources in the industry, strengthens industry university cooperation, establishes practice and training base, and alternates practice, work and study, so as to meet students' practice and training needs and create employment opportunities for students.

4.6 Other instructions

The standard middle school hours of this course are reference hours, and the specific implementation can be adjusted according to the actual number of weeks of classes and holidays.