

Research on the Teaching of Circuit Analysis Courses in Higher Vocational School

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Abstract

Fundamentals of circuit analysis is an important professional foundation course for electronics majors, the author has explored from the organization and arrangement of course content, teaching methods and means, assessment methods, experimental teaching and other aspects, and received good results.

Keywords

Circuit Analysis; Course Teaching; Exploration.

1. Introduction

Fundamentals of senior circuit analysis is an important professional foundation course for electronics majors, and it is an introductory course for the study of circuit theory. Students' mastery of the circuit analysis course is directly related to the study of subsequent professional courses, it is the prerequisite and necessary condition for learning electronic professional courses.

The teaching of the traditional circuit analysis course, there are many problems: the teacher's teaching is mainly based on the instillation of subject knowledge, ignoring the value of discovery learning, inquiry learning and action learning for the development of students. Only focusing on the teaching of theoretical knowledge but neglecting the training of hands-on ability, ignoring the acquisition of social experience and the formation of practical ability. Students only passively accept knowledge, the teaching process lacks student participation, and students' motivation to learn is greatly affected. On the other hand, the traditional circuit analysis teaching content of professionalism is very strong, very abstract, and the theoretical analysis of complex, to learn it well, not only need to have a high level of mathematical level, but also must have a good grasp of the physical knowledge, for students in higher vocational education, the use of traditional teaching methods, students not only feel that this course of study is boring, and the difficulty of the students to master. With the development of science and technology, enterprises have higher and higher requirements for employees, who must not only have solid professional ability, but also must have strong methodological ability, social ability and innovative spirit. Based on the above reasons, the reform of higher vocational circuit analysis course is imperative.

2. Integration of Course Content and Construction of the Curriculum System

The objective of higher vocational education is to train high-quality skilled and applied talents at the front line of the enterprise industry. The positions targeted are the mental labor positions in the front line of the enterprise, and the required skills have certain creativity and intelligence. For this reason, the concept of circuit analysis course design is: ability-based, to the degree of adequate, necessary, to the core of comprehensive ability training.

Through the modular teaching integration of circuit analysis, circuit synthesis experiment and multisim course content, in order to ensure that the course "fundamental principles" on the

basis of "practical principles", "practical principles" and "innovative principles". On the basis of ensuring the "fundamental principle" of the course, we focus on the "practical principle", "practical principle" and "innovative principle". Compress the theoretical hours, increase the experimental hours.

In the selection and organisation of the course content, adhere to the main line of the training of comprehensive technical application capabilities, to build three major modules, they are DC circuit module (including the basic laws of circuits and circuit elements, resistance circuit analysis, respectively, 10 hours and 16 hours), AC circuit module (including sinusoidal steady-state circuit analysis, non-sinusoidal periodic circuit analysis, coupled circuits, respectively, 30 hours, 2 hours and 4 hours), dynamic circuit module (including linear dynamic circuit analysis, 6 hours), all the modules to abandon the complexity of the theory of the analysis, in the spirit of the theory of the principle of adequate use.

The experiments are divided into four levels of experimental teaching: basic skills training (18.9%, including the use of instrumentation, determination of volt-ampere characteristics of components, the use of oscilloscopes and signal generators), validation (13.5%, including voltage and potential measurements, Kirchhoff's law, resistance, inductance and capacitance of series circuits), research (51.4%, including superposition theorem simulation and experiments, Davening's theorem simulation and experiments, the study and simulation experiments of three-phase Circuit research and simulation experiments, series resonant circuit research simulation experiments, inductive load power factor improvement simulation experiments), design-type (accounting for 16.2%, including lighting circuit design and production) four levels of experimental teaching system, the gradual progression between the levels, and gradually improve. One of the basic skills training type, verification type, research type experiments are circuit analysis course experiments. In order to cultivate students' design ability, we have set up additional design-type experiments on the basis of the course experiments.

3. To Reform Teaching Methods and Improving Teaching Quality

3.1. Teaching Methods

Teaching is carried out using flexible and varied methods, the core idea of which is to take the students as the main body and the teacher as the guide. The following methods are used in the teaching process.

3.1.1. "Problem-led, Task-driven" Teaching Methodology

Students as the main body, the teacher guides, the teacher puts forward the problem or design a reasonable practical training project, the students take the initiative to participate in the whole teaching process to "guide" the main instead of "filling" the main.

3.1.2. "Heuristic" Teaching Methodology

A. Preset questions to guide students to think and discuss. B. Prepare the content of the project carefully, except for giving students the necessary hints, leave the rest to students to find relevant information, in order to reduce the lecture time, improve the efficiency of teaching and cultivate the learning ability. C. Skillfully design the classroom teaching sessions, end the classroom teaching with questions, extend the learning task beyond the classroom and beyond the campus, learn to preview, review, take good class notes, make a good summary of learning, and teachers design corresponding checking methods.

3.1.3. "Interactive" Teaching Method

In the teaching process, teamwork and communication is an important element, and in classroom teaching, we focus on developing students' ability to formulate solutions to problems. The main measures include the following:

A. Put forward the problem to be solved, give students a certain amount of time to study the problem, and to solve the problem independently to learn the corresponding new knowledge, and to develop students' ability of research and investigative learning.

B. Decompose the problem to be solved and organize student study groups. Each study group to solve the various sub-problems of the problem, the results of the study "brainstorming" type of discussion, to fully mobilize students' learning enthusiasm and collaborative learning ability.

C. Organize learning presentations in which students are asked to give a public presentation or demonstration of their own experience of learning new knowledge, and other students respond positively to the presentation or results.

3.1.4. "Motivation and Encouragement" Teaching Methodology

Encourage students through some of the following ways. A. Excellent works created by students in the process of learning will be announced in class in time. B. Use multimedia teaching software to demonstrate the operation process of students. Seize every opportunity to find students' shining points and praise and encourage them in time.

3.1.5. Experimental Analysis and Discussion Method

After the students get the experimental data, the teacher organizes the students to analyze and discuss together in a timely manner, creating a student-oriented discussion atmosphere, and improving the students' sense of participation and dominance. For example: superposition theorem, Davening theorem, three-phase AC circuits and other teaching can be used in this way.

3.2. Teaching Tools

3.2.1. Combination of Multimedia Courseware and Traditional Board Books

The use of multimedia teaching advantages, the teaching of the physical objects used in the form of pictures to show the complex circuit of the explanation of the form of animation to show, so that the students are immersed in the situation, to achieve twice the result with half the effort.

3.2.2. Combination of Theory and Experiment, Virtual Simulation

For the experiments that the college laboratory has the conditions to do, the teaching starts from the students' experiments first, and the data are obtained through the experiments, and then the students are guided to analyze the experimental data, and then the theorems, laws or conclusions are summarized by the students, and then the theorems, laws or conclusions are applied to the practice, so as to deepen the understanding of the theorems, laws, and finally, the students carry out the simulation experiments by using the multisim software, so as to further consolidate the theoretical knowledge they have learnt. For experiments that are unconditional in the laboratory, students first use multisim software to conduct simulation experiments, and then analyze and draw conclusions, and then apply the conclusions to practice. This not only overcomes the dryness of theoretical teaching, cultivates students' hands-on ability, the ability to analyze problems, the ability to apply electronic simulation software, but also enables students to enhance the perceptual understanding of abstract circuits, and draws in the distance between theory and practice. Experiments from the virtual simulation-based environment and the actual operation of the environment in two aspects of the development of the organic combination of the two, complement each other, broaden the experimental pathway, to achieve the combination of theoretical teaching and experimental teaching, the actual operation of the experiment with the combination of virtual simulation experiments. Integration of experiments, theory, electronic simulation in one, the real teaching and doing in one.

3.2.3. Integration of Classroom Teaching and Online Independent Learning

Online classes are held using the Digital Campus Centre for self-directed learning. Through the teaching webpage, lecture plans are uploaded, course exercises are provided, and tutorial

practice is conducted. On the other hand some experiments that cannot be operated in the laboratory are made available for students to complete online simulation through the construction of teaching web pages.

3.2.4. Combination of Chinese and English

Foreign-funded enterprises not only need employees with solid professional knowledge and strong social ability, but also need them to be proficient in a certain number of professional English vocabulary. In our teaching, we emphasize the English expression of professional vocabulary, and we have opened a professional English learning corner for circuit analysis on the Internet to provide students with learning.

3.3. Assessment Method

To establish a composite, whole process type and diversified assessment system, which consists of six parts, they are learning attitude, classroom learning, homework completion, theory test, electronic simulation design and physical production. The evaluation methods are students' self-assessment, students' mutual assessment, classroom teachers' grading and marking teachers' grading. Attitude to learning using a combination of student self-assessment and teacher evaluation; classroom learning using students to assess each other, the teacher scoring; homework completion using the teacher scoring; theory tests scored by the teacher, the electronic simulation design using a combination of student self-assessment and teacher-teacher scoring; the physical production of the use of students to assess each other, the teacher scoring. Evaluation system: the total evaluation grade consists of three parts, which are 40% of the usual (including 10% learning attitude, 15% classroom learning, 15% homework completion), 30% of the final should know (including theory test), and 30% of the final should be able to (including simulation design, physical production, each accounting for 15%).

4. Reform of Experimental Teaching and Cultivation of Comprehensive Ability

Experiments are divided into four parts, which are basic skills training type, verification type, research type and design type. Control the proportion of validation-type and basic skills training-type experiments (32.4 per cent) and increase the proportion of research-type and design-type experiments (67.6 per cent).

4.1. To reduce the Basic Skills Training-Type, Verification-Type Experiments

Optimise the combination of the original experiments and streamline the experimental content in order to improve the efficiency of experiments. To cultivate students' preliminary scientific research ability as the goal, to master the basic experimental methods as the main line, reorganize the experimental teaching content, and build a new experimental teaching system. Students are required to independently design the experimental programme, independently debug the instrument, and fully complete the experimental content, laying the foundation for moving from experiment to scientific research. This is of great significance to deepen the understanding of theoretical knowledge and cultivate students' practical ability and innovation ability.

4.2. To Increase Research Experiments

In the experimental process, students are required to put forward the basic idea, and teachers discuss with them to improve the programme. Students through reference books, Internet search for information, put forward specific experimental programmes, in this process, exercise the ability of students to independently acquire knowledge and problem-solving ability. In the experiments encountered problems, students are required to propose solutions, and then group discussions, the teacher helps to analyze the reasonableness of these methods, through

the student-oriented, teacher-assisted experimental teaching methods to cultivate the students' ability to analyze the problem and the ability of teamwork and cooperative learning.

4.3. To Increase the Number of Designed Experiments

Design-type experiments are conducive to the cultivation of innovative thinking, some experiments have a variety of programmes, students can freely choose, which is conducive to teaching students according to their aptitude, is conducive to stimulating students to a deeper understanding of the knowledge they have learnt, and is conducive to the development of students' personality. Designed experiments generally involve knowledge of multiple courses, in the process of students access to information, design of experimental programmes, can be a comprehensive application of the knowledge learned, but also to understand and master the knowledge of other related disciplines. This process in itself breeds the cultivation and improvement of creative ability and enables students to exercise their ability to analyze and solve problems.

5. Conclusion

The reform of the circuit analysis course has improved students' enthusiasm for learning, hands-on practical ability, comprehensive application ability, teamwork ability and creativity have been well developed, and the ability of self-inquiry has been significantly improved. Teachers have accumulated rich experience in the course reform, and the quality of teaching has been steadily improved.

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