Exploration on the Course Construction of Analog Electronic Technology

Li Li and Xia Liu
School of Mechanical and Electrical Engineering, Guangdong University of Science & Technology, Dongguan 523083, Guangdong, China

Abstract—In view of the problems existing in the current teaching of analog electronic technology course, according to the requirements of the new teaching plan, this paper has made extensive and in-depth exploration on the theoretical teaching, practical teaching and textbook construction of analog electronic technology course. Practice has proved that the reform plan is correct, the teaching effect is remarkable and the students are greatly improved. Comprehensive application of electronic technology and innovation capabilities.

Keywords—analog electronic technology, experimental teaching, course construction, engineering practice ability.

I. INTRODUCTION

Analog electronics technology is a compulsory course for all specialties of information science. It is an extremely important bridge connecting public basic courses with professional courses. At present, there is a widespread phenomenon in higher education that attaches great importance to theory but neglects practice, simulation and experiment. In order to strengthen the foundation, broaden the academic horizon, cultivate innovative thinking, vigorously carry out research-based teaching mode, pay attention to the cultivation of students' innovative consciousness, innovative methods and innovative ability, improve students' independent learning ability, vigorously promote extracurricular learning, the course of analog electronic technology has been comprehensively reformed and explored.

II. REVISING THE TEACHING PLAN OF ANALOG ELECTRONIC TECHNOLOGY COURSE

Combining with the development trend of electronic technology, drawing lessons from similar well-known foreign textbooks, referring to the teaching arrangement of analog electronic technology courses in similar universities in China, we formulate a teaching plan that guarantees the foundation, pays attention to practice and embodies advanced teaching concepts.

The content of analog electronics technology course highlights the fundamentality. Analog electronic technology course is a basic course for information specialty. Its teaching goal is to require students to master basic knowledge of electronic circuit theory and to cultivate students' ability to analyze and solve practical problems independently. Mastering solid theoretical foundation knowledge of analog electronic technology course is the basis of cultivating students' innovative ability. For example, in the course of "Fundamentals of Analog Electronics Technology", the establishment of "Micro-Variable Equivalent Circuit" of transistors and the analysis of "High Frequency Equivalent Model" of transistors are still fully reserved.
The course of analog electronic technology emphasizes practicality. The characteristic of analog electronic technology course is its strong practicality. The course content should highlight its application characteristics and the combination of theory and practice. For example, in the course content, we should reduce the content of discrete components appropriately, especially the internal working mechanism, focus on the external characteristics of electronic devices, increase the content of integrated circuits, and strengthen the content of system analysis and practical engineering application cases.

The content of analog electronic technology course highlights the advanced nature. Electronic technology is one of the fastest growing technologies in today's society. New devices, processes and technologies are changing with each passing day. Its teaching content should keep pace with the development of the times.

IIII. REVISION OF ANALOG ELECTRONIC TECHNOLOGY TEXTBOOKS

Textbooks are the carrier of knowledge reflecting teaching content and teaching requirements, the basic tool for teaching, and the important guarantee for improving teaching quality. To cultivate first-class talents with an international perspective, textbooks must be in line with relevant textbooks of well-known international universities and compile textbooks that are suitable for the actual situation of our country and have their own characteristics.

According to the development of similar foreign textbooks at present, the textbooks should emphasize the analysis methods and applications in practical engineering and the cultivation of students' practical working ability; incorporate the methods of using software tools to simulate, analyze and design problems into the textbooks; add new analog integrated devices and analysis methods, such as current mode set, operational amplifier and its application.

The theoretical class hours of analog electronic technology course are gradually decreasing, while more and more new technology, new technology and new devices are available. The main problems in compiling the textbook are to simplify the old content, optimize the textbook structure and pay attention to the subject development. The new revised textbook adopts the following methods: reducing the introduction of the internal working mechanism of discrete components, reducing the analysis of the internal working principle of integrated circuits, strengthening the application content of medium and large scale integrated circuits, increasing the content of functional module method in designing electronic systems, and reducing the method of small scale integrated circuit design.

The integration of tradition and development reflects innovation in the integration. According to the characteristics of strong engineering technology application ability required by information specialty, the textbook should reflect the latest development of electronic technology as far as possible. This textbook incorporates the cultivation of practical engineering application ability into teaching, adds the introduction of new technologies and methods, and cooperates with experimental teaching, so that students can master the analysis and design of electronics. At the same time, the textbook pays attention to the continuation of traditional knowledge, keeps the inertia of content, and makes the textbook more readable. This textbook not only meets the needs of undergraduate teaching, but also facilitates students' self-study. It is also suitable for engineers and technicians to consult materials.

IV. COMPREHENSIVE REFORM OF EXPERIMENTAL TEACHING OF ANALOG ELECTRONIC TECHNOLOGY

One of the greatest characteristics of analog electronic technology course is its strong practicality. Students should not only master the theoretical knowledge of electronic technology, but also improve their application ability through many practical links. Aiming at the problems of
obsolete experimental teaching content, single experimental means, backward experimental equipment and weak expansibility of experimental projects, this paper gradually realizes the international conformity from the aspects of laboratory hardware platform construction, experimental curriculum system, experimental teaching content, experimental teaching methods and means, etc.

To build an international level hardware platform for experimental teaching and cultivate international first-class undergraduates, laboratories must have international level testing instruments and instruments. For example, TI provides the latest microcontroller and analog integrated devices for students to participate in innovative activities such as scientific and technological innovation production, electronic design competitions and so on.

Develop an experimental device to train students' comprehensive quality and innovative ability. At present, most of the traditional "electronic technology experimental devices" have simple functions, single experimental items and poor comprehensiveness, which make it difficult to complete the training of students' design ability and innovation ability. To this end, a comprehensive experimental teaching device for electronic technology has been developed. The experimental platform adopts the idea of fully open design. On this experimental platform, basic experiments, comprehensive experiments and design experiments can be completed, sufficient resources are left for students, students' creative thinking ability can be better stimulated, and students' mastery of the international community can be trained in an all-round way. The ability of the latest technology to design digital systems. The system consists of flexible functional modules, including the minimum system module, CPLD/FPGA module, signal conditioning module, A/D and D/A module, input and output module, signal generation and conversion module, power amplification module, etc. In the teaching of electronic design, first of all, these modules are successfully welded and debugged by students. Then, according to the specific design tasks, the functions of the whole system can be realized by connecting multiple functional modules. The experimental device has powerful function, flexible expansion, compact structure and can be repeatedly disassembled. This completely open teaching device has played a very good role in cultivating students' innovative ability.

Establish a hierarchical experimental teaching system. According to the requirement of analog electronic technology course, the connection between theory course and experiment course is strengthened, the content of experiment teaching is selected, the classic and modern integration is achieved, and the experiment teaching is divided into four levels.

Basic Layer Experiments: This part is the basic experiment that students first enter into the study of electronic technology, including the performance test of common electronic components and integrated circuits, and the measurement of common electronic circuits. The purpose is to deepen students' understanding of the basic theory of electronic technology and cultivate students' interest in electronic technology experiments.

Design Layer Experiment: This level transforms the confirmatory experiment into the design experiment. Teachers will put forward the experimental items and requirements, let students design their own experimental circuit, experimental steps, experimental methods, and finally go to the laboratory for installation, debugging, writing the experimental report. Objective To cultivate students' ability of integrating theory with practice and writing design experiment reports.

Comprehensive design level: This level requires students to use new devices, adopt new design methods and means to design and complete a comprehensive electronic system. Students are required to skillfully use analog electronic technology to design and analyze electronic circuits, in order to cultivate students' comprehensive ability to use electronic technology.

Innovation Research Level: For students with solid theoretical knowledge and strong practical ability, they should be encouraged to participate in electronic design competitions and other innovative activities. Teachers can give comprehensive and strong topics suitable for different professional directions. They can use the topics of previous National University Students' electronic
design competitions as reference for students' free choice. We should adopt an open teaching method to cultivate students' independent scientific research literacy, cultivate students' cooperative spirit, and cultivate students' ability to write scientific and technological papers.

Establish an assessment method based on the whole process monitoring. The examination of experimental courses is much more complicated than that of theoretical courses. We should not only examine the experimental results, but also pay attention to the examination of the experimental process. The basic process of completing an experiment is "experiment preview, experiment design, experiment operation, experiment troubleshooting, experiment result analysis, experiment report writing". Therefore, only by using "whole process" assessment, can students be evaluated fairly and objectively. Requirements for each student's experimental process are recorded, mainly including: student attendance, experimental instrument operation, experimental testing, experimental report writing norms; for more than two people completed the comprehensive experiment, each person adopts the "reply" way to ask questions, inquiry circuit design ideas, the electricity. The problems existing in the road, the problems appearing in the circuit installation and debugging, and the solutions, etc. The theory examination adopts closed-book examination, which mainly examines students' electronic circuit testing methods, the use of common instruments, error analysis and processing, circuit testing theory and technology, etc. The average time scores and examination scores of all the experiments (50% each) were added as the final scores of the students.

VI. CONCLUSION

To sum up, this paper explores and tries every teaching link of analog electronic technology course. Through the implementation in four classes of 2016, the overall effect is remarkable. Students generally reflect that they have increased their interest in learning electronic technology, improved their practical ability, and can master commonly used electronic instruments and master them skillfully. Advanced electronic design methods have improved the enthusiasm of students to participate in all kinds of science and technology competitions, and have achieved excellent results in participating in all levels of science and technology competitions. At present, the biggest problems are how to open the laboratory to students on a large scale and continuously, how to improve the enthusiasm of teachers in teaching, how to establish a more scientific management system, and so on. These problems need to be further studied.

REFERENCES