Research on the Curriculum Reform of Electronic Design Comprehensive Training

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Abstract. The electronic design comprehensive training is an important practical course in the electronic engineering majors, which plays a role in cultivating students' comprehensive application knowledge and skills. However, traditional electronic design comprehensive training course has some problems such as boring teaching content, outdated single teaching methods, and absence of practical applications. In order to address these issue, course reform and innovation are introduced for improving practical training.

Keywords: Electronic design comprehensive training; electronic engineering majors; practical applications.

1. Introduction

The course of electronic design comprehensive training is the integrated application of electronic information professional knowledge and skills, which is focusing on students' practice and technology. This course has been widely offered for third year students in second-batch universities. This course integrates all professional courses and is taught in a project-based manner, which is an indispensable course for cultivating students' comprehensive qualities. At the same time, it also lays a solid foundation for the graduation design and employment of students in their senior year. However, in many universities, electronic design comprehensive training courses still use application cases of digital and analog electronics for teaching[1]. The teaching process is relatively dull and boring, and the teaching content is also repetitive learning of previous content, which has not played a role in comprehensive application. More importantly, the course lacks project-based driving and cutting-edge electronic development software integration. In order to improve the effectiveness of electronic design comprehensive training, course reform and innovation are introduced for enhancing practical training. The expectation of curriculum reform is to achieve the following goals. Firstly, students can further understand the manufacturing process and process of general electronic products in industrial view[2]. Secondly, taking advantage of the opportunity Electronic Design Competition[3] and National Undergraduate Electronic Design Contest[4], students are trained to obtain the engineering skills such as basic electronic components plug-ins, debugging fault correction, PCB software development, circuit simulation and virtual instrument application. Thirdly, in the process of independently completing the course design, students can further master the using of theoretical knowledge to solve practical process problems and obtain valuable practical experience. Finally, this course also promotes students' teamwork and communication skills and cultivates their ability to cooperate with others in the future internship work[5].

2. Modularization driving learning

We introduce the concept of modular teaching, which can improve the means of practical teaching and the comprehensive practical teaching system of electronic design. Fig.1 shows the module diagram of electronic design comprehensive training. Based on original teaching mode, We divided the content of the 16 week course into 4 modules. Four modules are set up in the training content, including PCB board design and production, computer simulation, labview learning and

application, and curriculum design. Students must complete 4 modules of practical training. In curriculum design, students can choose the project topic independently and realize all the functions of the project. This teaching model makes students have a sense of achievement and stimulates their interest in learning. In this process, students may encounter a variety of problems, which drives them to actively discuss with classmates or search for solutions on the Internet, so as to cultivate students' ability to find problems, solve problems and self-learning.
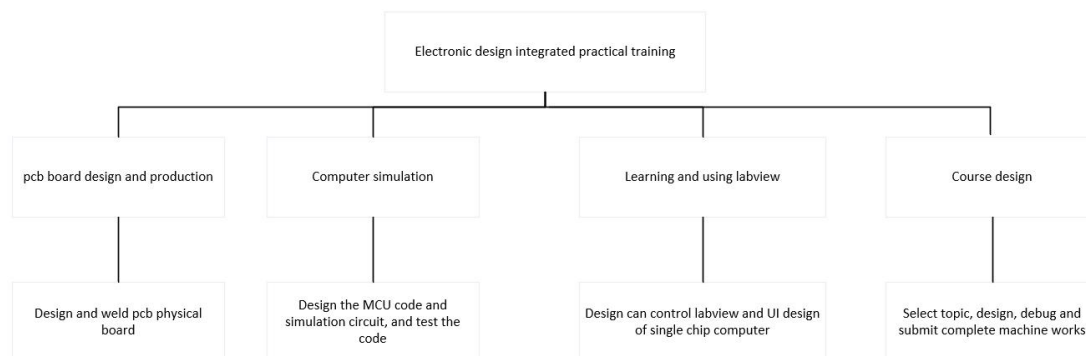

Fig. 1 Integrated training module of electronic design

3. Improve the quality of practical learning through diversified teaching methods

3.1 Adjust practical training content

On the basis of being able to complete the course objectives, some additional teaching requirements are added as bonus items, so that students can be more proficient in the application of labview that is conducive to the practical application in the future. Teachers can guide students to complete basic course objectives such as basic operation and product design after teaching step. If there is no time left in the course, there is no need to complete the task. Starting from the creation of labview project, we gradually teach students to complete product design, physical welding and other contents, which also include the introduction and design of a variety of electronic components and circuit simulation. The design of kitchen alarm system make students more deeply understand the basic process and technology of electronic product design. Based on the completion of the course objectives, we optimize the teaching hours to strengthen the practical operation skills.

Table 1. Distribution of teaching hours

Course Content	Theory teaching/ teaching hours	Practical operation/ teaching hours	Proportion of total teaching hours /%
PCB design	3	6	18.75
Computer simulation	3	6	18.75
Study labview	6	12	37.5
Course design	2	10	25
Sum up	14	34	100

3.2 Integrate diverse teaching methods

Electronic design comprehensive training is a course for students to carry out comprehensive and systematic training after completing the theoretical knowledge learning of professional courses with high quality and special hands-on training content. In the course of electronic design comprehensive

training, students should decompose tasks according to project scheme design, circuit hardware design, software programming and debugging, and system overall testing. Combined with Multisim, Proteus and Altium Designer, students can master the knowledge points of electronic design comprehensive training.

3.3 Improve students' practical ability

The practical section plays an important role in improving students' innovation consciousness and improving students' practical operation level. In this course, teachers demonstrate various possible faults or error situations in the process of practical operation, which can guide students to think independently and improve students' ability to analyze faults. For PCB schematic diagram, labview code implementation results, PCB design and proteus simulation results, teachers should make specific requirements. The final scores are given by the completeness of the course design such as debugging performance, circuit complexity, software architecture, PPT report and teamwork.

4. Explore the innovation mode

The proposed reform direction and innovative teaching mode has be reflected in the following aspects:

Firstly, placing the practice in an important position, we give students sufficient practical operation and experiment opportunities. After practical operations, students can be better to consolidate theoretical knowledge. At the same time, timely feedback and guidance are provided to help students to correct errors and improve designs.

Secondly, we introduce practical cases and industry cooperation into practical training courses and cooperate with the industry to carry out electronic design practical training projects, which provide opportunities for students to learn the skill under the situation of project practice. This also make students directly contact with real problems and needs.

Finally, to cultivate students' innovation and collaboration ability through project-based training, we motivate students to participate in subject competitions such as the National Electronic Design Competition for College Students and the National Intelligent Hardware Design Competition for College students. These activities make students acquire knowledge and skills in independent exploration and stimulate their innovation motivation. We establish a teamwork environment that encourages students to communicate and collaborate, which can help students promote their innovative thinking and practical abilities.

5. Summary

The application of modern experimental equipment and software can encourage students to use the experimental equipment and software to master the basic knowledge of circuit design. We combine laboratory projects, competitions, engineering practices into course, which encourages students to use new ideas and methods to develop innovative thinking and problem-solving skills. At the same time, students are supported to continue to learn new knowledge and participate in industry application.

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