

Curriculum Reform of Printed Circuit Board Design and Production

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Abstract

Printed circuit board design and production is a core course for the major of electronic information technology. Curriculum orientation, curriculum design and content directly affect the quality of personnel training of electronic information technology. Curriculum reform is conducive to improving teaching quality and teaching effect, cultivating talents needed by enterprises, and achieving high-quality employment.

Keywords

Curriculum, Design, Components, Students.

1. Introduction

Printed circuit board design and production is an important course for the major of electronic information technology. This course will not only affect the follow-up course learning, but also affect the employment of students. After learning this course, it is necessary to design a follow-up course or graduation design of circuit diagrams and printed circuit boards, students can do well. After learning this course and the basic circuit and the application technology of single chip computer, students can work in the design department of electronic enterprises. The orientation, design, content and assessment methods of the curriculum directly affect the development of students. Therefore, we earnestly study the curriculum reform to achieve better teaching effect and the real employment needs of enterprises.

2. Curriculum Orientation

Great changes have taken place in curriculum orientation through reform. The course orientation changes from "learning the course" to the combination of "learning the course well" and "learning the course", from the traditional way of teachers' teaching knowledge to the combination of teachers' teaching knowledge and learning by oneself, from the traditional teaching with the same requirements for each student to the hierarchical teaching.

Learning this course is the basic requirement for each student, but each student has different request by himself and different thirst for knowledge, which leads to different levels of students. We teach this course at different levels according to the different requirements of students. The course content is divided into two parts which is the basic part and the improvement part. Every student must "learn" all the basic parts well, mainly in the way that teachers teach knowledge. After finishing the learn of the basic knowledge part, students can select to learn the improvement part. the content of the improvement part is not taught by teachers. Students learn by themselves. In the class, the study of the basic part is mainly finished, and the improvement part needs to be studied by students' extra time in class or after-class. Through hierarchical teaching, some students have mastered the main knowledge of printed circuit board design, and the printed circuit board designed can be directly put into production.

3. Curriculum Design and Content

It takes 60 lessons to learn this course. This course is divided into five projects, including circuit schematic design, component design, printed circuit board design, component footprints design and printed circuit board production. It takes 20 lessons to learn circuit schematic design. It takes 4 lessons to learn component design. It takes 16 lessons to learn printed circuit board design. It takes 6 lessons to learn component footprints design. It takes 14 lessons to learn printed circuit board production.

3.1. Circuit Schematic Design

The design of circuit schematic includes the design of analog circuit schematic, digital circuit schematic and analog-digital hybrid circuit schematic. The examples used in circuit diagrams are all taken from the real projects of the products in the enterprises. The basic learning part of the schematic design of analog circuit is the design of amplifier circuit and power supply circuit. Every student needs to learn the knowledge well. The improvement part is the design of oscillator circuit and modulation and demodulation circuit. The basic learning part of digital circuit schematic design is logic gate circuit design and time base circuit design, and the improvement part is combination logic circuit design and trigger circuit design. The basic learning part of analog-to-digital hybrid circuit design is analog-to-digital conversion circuit design, and the improvement part is digital-to-analog conversion circuit design.

3.2. Component Design

The design of components includes the design of simple components and the design of complex components. The design content of simple components is to design single components with fewer pins, such as resistance and capacitance components, diodes, transistors and so on. These are the requirements of basic parts. The improvements are relays, digital tubes, amplifiers, etc. The design content of complex components is to design multi-pin and multi-part components. The basic parts are single chip computer, logic gate circuit and so on. The improvement part is motor, contactor and so on.

3.3. Printed Circuit Board Design

The design of printed circuit board includes the design of analog PCB, digital PCB and analog-digital hybrid printed circuit board. The examples are taken from all the circuits in the circuit schematic design, including the basic part and the improvement part. The results of circuit schematic design project are converted into printed circuit board drawings, and then the layout and wiring are carried out according to the requirements. The synchronization from circuit schematic diagram to printed circuit board diagram is realized.

3.4. Component Footprints Design

The design of component footprints includes manual design footprints and wizard design footprints. Wizard design footprints is mainly designed for resistors, capacitors, inductors, diodes, integrated circuits and other graphics of regular components. The process of wizard design footprints includes measuring the product, getting the corresponding size, choosing the corresponding encapsulation type, inputting the corresponding parameters, and performing according to the given steps, the footprints graphics can be obtained. If you can use wizard to design footprints, try to use wizard design, wizard design is faster than manual design. footprints that cannot be designed with wizards can be designed manually. The process of manually designing footprints includes measuring products, getting corresponding dimensions, placing pads, drawing frames, etc. When placing the first pad, it is necessary to set the parameters of the pad, and then place the other pads behind according to the measured size. After all the pads are placed, they are switched to the silk screen drawing frame. After all the pads are placed, switch to the silk-screen and draw frame. Simple footprints in wizard design

and manual design is the basic learning content that every student must study. The improvement part will choose some products with complex shapes, which mainly require manual design, such as chip integrated circuit packaging, relay packaging and so on.

3.5. Printed Circuit Board Production

The production of printed circuit board usually requires students to make two products. The first product is designated by teachers and the second product is designated by students themselves. The products designated by teachers include light-controlled night lights, simple alarms and so on. Light-controlled night lamp can control the light on or off., through the resistance value is changed by different light. The shell size of the lamp has been determined, so the external size of the circuit board has been determined, and the size should be just right. If the printed circuit board is larger, it can not be put into the shell, and if the circuit board is too small, it can not put down the components. A large hole must be drilled in the middle of the circuit board, and the location of the hole away from the edge of the circuit board is also determined. So if the circuit board is designed well, it can be used normally. If the size of the circuit board is not right, the circuit board will not be assembled into the shell and will become a waste product. In addition to learning the basic circuit board process design, it also trains students' care and patience. After successful design and production, the lamp can be used by itself or sold. This process improves students' interest and enthusiasm. The second product is decided by students themselves, but it can't be too simple. Teachers will set a certain range of choices. According to the students' interests and hobbies, the products of choice will be varied. Making the second product further improves students' ability to make circuit boards. The production of the two products is the basic content, and the improvement part is not the content arranged in the course. Teachers will contact the teachers who have enterprise cooperation projects to let students participate in these teachers' projects, so that some students' PCB design ability can achieve a qualitative leap, and lay a good foundation for his subsequent employment.

4. Scoring Standard

The course of printed circuit board design and production mainly includes two parts which is design and production. The design mainly uses computer to operate with design software, and the production part mainly uses fast board making system. Scoring is also made up of these two parts. The total score includes 60% of the project score, 10% of the usual score and 30% of the final score. Before the reform, 5 projects were scored five times, and the average score of 5 projects was taken as the project achievement. In order to stimulate each student and better grasp the learning dynamics of each lesson, the current project scores are refined to scoring for each task, scoring almost once in each lesson, and finally taking the average of all the task scores as the project scores. If there is one absence from class or no task handed in, there will be one less score, and the total number of projects for each person is the same, so absence from class or no task handed in will affect the final project performance. The difference of project results directly reflects the seriousness of the lesson, so the proportion of the usual results is relatively small. Usual results are mainly for truancy, late and early retirement statistics, truancy once reduced by 1%, no matter what the reason for truancy, as long as students who are not in the classroom are truancy. Late or early retirement reduced by 0.5%. Finally, there is a final examination, which includes all knowledge points of five projects. According to the ratio of 6:1:3, the final score was obtained. The proportion of such achievements pays attention to the usual learning process. After the formation of such scores, students' learning enthusiasm is greatly improved, the failure rate is greatly reduced, and better teaching effect is achieved.

5. Conclusion

The teaching reform has aggravated the teaching task of teachers. Traditional teaching only needs to prepare the content of the basic part. After the reform, besides the knowledge of the basic part, it also needs to increase the content of the improvement part. In order to promote students' autonomous learning, teachers often provide students with extra-curricular answers and guidance besides normal teaching time. But there must be a return for the effort. A considerable part of the students trained have strong professional knowledge, hands-on and operational ability. Students have been favored and recognized by most enterprises and achieved high-quality employment.

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