

# Teaching Reform Measures of Power Electronic Technology Course Based on Hybrid Teaching

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**Abstract:** The teaching mode of “hybrid learning” is introduced into the course of power electronics technology, which combines classroom teaching with network classroom, and uses the teaching video in the existing excellent learning platform to assist theoretical teaching to realize online and offline hybrid teaching. Practice has proved that the “blended learning” teaching model is a very effective and feasible teaching model, which can be extended to other courses.

**Keywords:** Mixed Teaching; Power Electronic Technology Course; Reform in Education

## Introduction

Power electronic technology is the abbreviation of power electronic transformation and control technology. It is a new interdisciplinary subject of comprehensive electronic technology, control technology and power technology. It is an important professional basic course for electrical engineering and automation or related majors. The biggest feature of its classroom teaching is that there are many circuit diagrams and waveform diagrams and strong practicality. With the continuous development of power electronic technology and the increasing content, how to make full and effective use of classroom time, integrate innovative education into traditional classroom teaching, cultivate students' scientific and technological innovation ability and cultivate compound talents in line with the requirements of the times has become an urgent problem to be solved in the current teaching reform.

### 1. Nature of power electronic technology course

Power electronic technology can control and transform electric energy with the help of power semiconductor switch. It belongs to the abbreviation of control technology and power electronic transformation. Power electronics technology is a very important professional basic course for electrical engineering and its automation, industrial automation and other related majors. After learning this course, students can learn the basic exploration methods, basic concepts and basic theories of power electronic circuits, which lays a foundation for learning other related professional courses in the future<sup>[1]</sup>. At the same time, students can also analyze and solve some practical problems combined with their own knowledge.

### 2. Problems existing in the course of “power electronic technology” at the present stage

#### 2.1 Low interest in learning

As the teaching content of “power electronic technology” involves the knowledge integration of multiple courses, the knowledge covers a wide range and has a strong theoretical depth, students need to have a good knowledge reserve. In actual teaching, because many students' learning objectives are not clear, their theoretical knowledge is not solid, and their learning enthusiasm and initiative are not high in the learning process, they are prone to fear of difficulties when they encounter knowledge that is difficult to understand and digest. The fear for a long time will eventually affect the learning effect of the course.

#### 2.2 Single teaching means

At this stage, the course of “power electronic technology” mostly adopts the way of active indoctrination to help students understand more complex electronic knowledge, that is, teachers organize the teaching content into PPT and explain it in the way of PPT demonstration and blackboard writing in class. At the same time, it is supplemented by classroom questions, classroom exercises and other ways of interaction with students. The teaching method is single and the interactive way is old, which can not effectively mobilize students' enthusiasm.

#### 2.3 Obsolete content system

At present, the more general courses of “power electronic technology” are mostly taught according to the introduction of power electronic devices, power electronic conversion circuit and its control technology and power electronic devices<sup>[2]</sup>. Although books focus on introducing relatively new electronic devices, due to the rapid development of power electronic technology and the increasing updating of electronic devices at home and abroad, the current textbook system has limited introduction to these contents, which makes the practical application divorced from the teaching content and affects the scope of students' knowledge.

#### 2.4 Lack of experimental links

The experimental course of “power electronic technology” is mostly combined with the test bench and relevant instruments and meters. In the process of experiment, teachers mostly make the students carry out the imitation experiment in a programmed and step-by-step manner from the perspective of the presenter, and fail to guide the students to think deeply and diverge about the causes or principles of the phenomena in the process of experiment. Therefore, the existence of various disadvantages in the experimental link fails to make the teaching achieve the ideal teaching effect.

### **3. Curriculum reform of “power electronic technology” based on Hybrid Teaching**

#### **3.1 Teaching philosophy**

First of all, in the daily teaching process, add the cultivation of students’ innovative consciousness, improve students’ innovative ability, and let students find, ask and solve problems in the learning process. Turn “online resources” into rich “sources of innovation”, turn “offline teaching process” into open “innovation guidance”, turn “classroom + laboratory” into “innovation platform”, and turn “teachers” into “enlighteners”. By adding the thinking guidance of “why, what is different and” in the process of learning knowledge, we can cultivate students’ discovery ability and innovation ability.

#### **3.2 Teaching methods**

Combined with the widely used information-based teaching methods, online and offline teaching methods are adopted. The specific method is: online teaching is adopted before class, that is, students conduct pilot understanding of the relevant knowledge, application scope and application cases involved in each teaching content through the school teaching platform, timely adjust the teaching focus, design the teaching content and select the teaching method through students’ feedback on the learning effect. Online and offline synchronous teaching is adopted in the course, that is, while offline teaching, the difficulties in students’ learning are recorded into micro videos, combined with the graphics, text, cases and PPT designed in the teaching process, and put them on the teaching platform, so that students can learn and download after class, so as to help students eliminate the knowledge points they do not understand in the classroom and improve their interest in learning. Online teaching is adopted after class, that is, the after-class test is released through the school teaching platform to feed back the students’ learning situation, supplemented by relevant cases and the latest trends of the industry, so as to synchronize the students with the development of the industry, improve the practical application, and help the students understand its practical application in the fields of industrial production, logistics and transportation, daily household use and so on. Through persistent persistence, students can understand the practical significance of the course “power electronic technology”. This course is definitely not an empty and boring theoretical research, but can have a closely related impact on our human daily life. In this process, students can clearly understand the role of power electronic system in daily life, and deepen their understanding and application of the learned knowledge.

At the same time, the project driven method is introduced to improve students’ practical ability and teamwork ability. In the course of “power electronic technology”, according to the learning content, it is combined with widely used or current hot topics, such as battery charger, switching power supply, high-frequency inverter welding power supply, electric vehicle power battery, uninterruptible power supply, variable frequency speed regulation device, solar power generation, wind power generation, etc. Select some simple cases and use the project driven teaching method. According to the knowledge points and teaching contents of the course, combined with the effects of students’ Online Autonomous Learning and offline interactive teaching, teachers inspire, teach, guide and let students master the application occasions and deficiencies in practical application of each device<sup>[3]</sup>. In addition, students can complete the power electronic technology design in a week in groups. They can complete the curriculum design related to electronic technology through topic selection, design, improvement and expansion. In the process of curriculum design, students cultivate their professional ability of teamwork and problem-solving by assigning tasks, finding relevant materials, designing circuits, purchasing components, testing and adjusting circuits. At the same time, in the process of curriculum design, teachers and students make up for the lack of interaction between teachers and students in traditional teaching by seeking help, putting forward suggestions and checking the integrity of circuit design.

I mainly teach in MOOC and super star learning. Using the existing videos of MOOC, I built my own courses on super star learning, including recording micro videos, courseware PPT, exercise bank, online testing, discussion, etc.

#### **3.3 Teaching content**

According to the talent training program and vocational skill requirements of Electrical engineering and automation, combined with the teaching purpose of students’ experiment in class and curriculum design, project-based teaching is adopted for students. When teaching, teachers can decompose the teaching content according to the teaching objectives, and increase and expand the relevant content in combination with practical application cases. In the process of theoretical teaching, in the teaching of component related knowledge, light component structure, heavy component control and application development; In the aspect of circuit, it neglects the circuit structure and emphasizes the ideas and principles of circuit analysis, focuses on deepening students’ understanding and understanding of the content, and improves students’ ability to analyze problems and circuit design. While imparting knowledge, help students cultivate the ability of independent thinking and independent inquiry. (1) First of all, let students understand the teaching purpose, practical application scope and the relationship between the course and subsequent courses of “power electronic technology”, so that students can learn purposefully. (2) In the teaching process, introduce more simple and practical relevant application cases, so that students’ knowledge can be combined with practical application, so as to stimulate students’ interest in learning. (3) After mastering the basic knowledge, we can design progressive cases to improve the depth and breadth of students’ learning, and then cultivate their divergent thinking ability and problem-solving ability<sup>[4]</sup>.

#### **3.4 Practical aspect**

In the teaching process of “power electronic technology”, we must make it clear that students are the main body of teaching and teachers are the guides and enlighteners of teaching. When teaching practical content, teachers should not only provide physical

resources for students to observe and understand, but also guide students to practice. In addition, when students encounter problems in the process of practice, teachers should guide students to find problems. Through continuous knowledge superposition, on the one hand, it can enhance the combination of students' theory and practice, on the other hand, it can cultivate students' ability to find and solve problems. As an auxiliary teaching, the experiment is combined with the teaching platform, and the experimental links are divided into online and offline parts. Online: through the learning platform, learn the steps and specific implementation methods of the experiment, understand the model of applied components, the principle of the experiment and the final phenomenon. Offline: verify the knowledge through experimental equipment. In case of problems, you can ask questions online on the learning platform, initiate discussions on a problem, or seek the help of teachers or classmates. After the experiment, summarize the problems encountered in the experiment, the principle application understood through the experiment and the innovative ideas that can be expanded through the experiment.

### 3.5 Assessment

The purpose of assessment is to master the learning situation of students in this course. Therefore, the assessment of "power electronic technology" course should increase the proportion of assessment process. The content of the assessment is combined with online and offline learning, discussion, completion of experiment, course design and final examination results, accounting for 20%, 10%, 15%, 15% and 40% respectively<sup>[5]</sup>. This assessment method increases the score of process learning for online and offline students, which is intended to cultivate students' ability to find problems, raise problems and jointly solve problems in daily learning, and enhance students' awareness of teamwork.

## 4. Conclusion

The teaching mode of "hybrid learning" is introduced into the course of power electronic technology. Students can make up for the deficiency of theoretical teaching through network teaching, and realize the hybrid teaching of online and offline. Watching video learning makes the learning process easier, the learning interest is naturally improved, and the teaching effect and quality are improved to a great extent. Facts have proved that it is feasible to introduce the teaching mode of "mixed learning" into teaching and can be extended to other courses.

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