

Design of Teaching Mode for Electrical Engineering Course Under the Background of Ideological and Political Education

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Abstract. In response to the demand for cultivating high-quality applied professionals with both engineering and humanistic qualities in the new era, contemporary university education not only undertakes the responsibility of imparting professional knowledge and skills, but also shoulders the responsibility of ideological and political education for students. This article design the teaching process and evaluation system of Electrical Engineering courses in order to cultivate engineers with both moral integrity and professional competence. Through course learning, students will not only master the basic knowledge and corresponding skills of electrical and electronic technology, but also possess the spirit of striving for excellence as a national craftsman, with a sense of serving the country through science and technology. And the students will be able to undertake the mission of the great rejuvenation of the Chinese nation. By studying the teaching mode of electrical engineering courses, reference value is provided for the reform and innovation of higher education related majors and teaching curriculum systems.

Keywords: Course Ideology and Politics; Electrical Engineering Course; Teaching Model Design.

1. Introduction

Faced with the turbulent domestic and international situation, General Secretary Xi Jinping called on higher education institutions to make good use of classroom teaching as the main channel, combine ideological and political education with professional courses, and cultivate students' patriotism and global vision. To enable students to become talents who not only possess strong professional knowledge but also love their country and care about national rejuvenation. Starting from this, providing ideological and political education to students has become a top priority in contemporary higher education^[1]. Chinese universities have launched a vigorous reform of curriculum ideological and political education, and achieving certain results^[2-4].

The course of Electrical Engineering mainly focuses on the basic theories, fundamental knowledge, and comprehensive applications of electrical and electronic technology. The content learned by students is objective and realistic, lacking a natural connection with ideological and political education. If teachers forcefully add ideological and political content into teaching, it may break the existing mature curriculum system, causing the course content to be neither coherent nor diverse, and students not only lose interest, but even develop aversion, failing to achieve the goal of educating students. How to use diversified teaching methods to not only enable students to learn professional knowledge, but also invisibly influence their thinking and form good behavioral habits, is a difficult point in contemporary Electrical Engineering curriculum teaching^[5-7]. Exploring and reforming the teaching mode of Electrical Engineering to achieve the goal of cultivating high-quality talents is of great significance in addressing this challenge.

This article utilizes modern educational technology to design a teaching mode for the Electrical Engineering course, aiming to achieve a seamless integration of professional knowledge and skills with ideological and moral education.

2. Teaching Design of Electrical Engineering Course

Electrical Engineering is an important basic course for non-electrical majors such as Intelligent Manufacturing Engineering, Vehicle Engineering, Metal Materials Engineering. It lays a solid foundation for students' subsequent professional courses and their employment in electrical-related work after graduation. It is a professional foundational course with strong theoretical and practical aspects. The course has the characteristics of wide application, fast knowledge updating and iteration, and being closely related to production and life. However, there are difficulties in having fewer class hours and more content, including not only theoretical but also experimental aspects. To integrate professional knowledge and ideological elements into a limited amount of time, it is necessary to design a reasonable teaching model.

2.1 Teaching Syllabus and Teaching Plan Design

The syllabus is the basic guarantee for implementing the teaching plan and plays an important role in teaching. Changing the traditional teaching emphasis on knowledge and skills in Electrical Engineering and adopting a new teaching mode centered around cultivating morality and integrity requires a teaching syllabus that clearly outlines the goals of ideological and political education in terms of teaching objectives and tasks. The ideological and political education of the course "Electrical Engineering" has always been carried out around the educational philosophy of "putting education first and serving the industry". The goal of ideological and political education in the course is to cultivate high-quality applied professionals with both engineering and humanistic qualities.

A teaching plan is a necessary means to ensure orderly teaching, improve teaching quality, and implement the teaching syllabus. Introducing ideological and political education elements into the teaching plan is a necessary means to realize the teaching purpose of the syllabus. Some ideological and political elements of this course are shown in Table 1.

Table 1. Some ideological and political elements in the course of Electrical Engineering

Teaching Chapter	Ideological and Political Content
DC Circuit	1. Introducing Qian Weichang's famous saying "The needs of the country are my major", inspiring students to study electrical engineering seriously and lay a solid foundation in engineering. 2. Introduce the background of Kirchhoff's law and Davidian's theorem, inspire students to strive for excellence and study hard in their youth, just like scientists such as Kirchhoff and Davidian. 3. Introducing achievements in the theory of recursive changes in resistance networks in China can inspire students to not be afraid of starting late and having weak foundations, but to have the enthusiasm and fighting spirit to catch up with the frontiers of Science. 4. In the process of circuit analysis, through problem analysis and resolution, students learn to view problems from a connected, comprehensive, and developmental perspective. 4. Learning to extract its source from a bewildering variety of appearances, and discovering the essence and laws from the appearance is an ability that requires focused learning. It is not only applicable to professional knowledge, but also has guiding significance for a wide range of life phenomena.

AC Circuit	1. Through the application of phasor in sinusoidal steady-state circuits analysis, the concept that mathematics is a tool for solving engineering problems and engineering problems should be established. 2. The story behind the introduction of phasor analysis method - German engineer C P. Steinmetz. 3. By comparing and analyzing DC and AC circuits, students are guided to develop a habit of summarizing and categorizing problems. 4. Introduce the controversy between Edison and Truss, and guide students to be open-minded and not exclude dissidents. 5. Through China's achievements in ultra-high voltage, inspire student's national pride, educate students to be compatible and good at looking at problems with a developmental perspective, and have an innovative spirit.
Three-Phase Circuit	1. Looking back on the 70 years of China's power development, through the hardships of predecessors and rural electricity consumption, we inspire students to save on environmental protection, diligence and thrift. 2. Broadcasting short videos on electric shock accidents, emphasizing that "safety is no small matter", complying with national and industry regulations, improving safety awareness, and operating in compliance are the foundation for becoming a qualified engineer after graduation. 3. Introduce the development history of AC power transmission systems from single-phase AC power to three-phase AC power, summarize the advantages of three-phase AC power from the perspective of operation and maintenance costs, and inspire students to learn and deal with problems from a universal and three-dimensional perspective. Cost and mechanical rigidity should not be ignored in engineering design.
Electric Motor	Through China's extraordinary achievements in new energy vehicles, students are encouraged to work hard By analyzing the operating status of electric motors under different conditions, we can identify the essence of the problem, cultivate students' ability to solve practical problems, and exercise their scientific thinking skills. 3. By discussing the Y-shaped and Δ - shaped connections of three-phase asynchronous motors, students are guided to develop the habit of induction and summarization, and to approach problem-solving in a dialectical manner, establishing a materialistic and simple worldview.
Semiconductor Devices	To break the bottlenecks, the chip industry of China can not do without the joint efforts of electronics, materials, chemistry, mechanical manufacturing and other links. As an engineering student, we have a great responsibility and a long way to go. We need to work hard to learn and serve the motherland. Introduce the story of Shockley, who invented the transistor. Guiding students to understand the leap in the quality of human life cannot be separated from the dedication of scientists. In the process of seeking knowledge and exploration, they should not be afraid of failure and dare to be the first. Introduce the great achievements of China's photovoltaic cell industry under the strong support of the government, help students build a sense of national pride, and let students have a perceptual understanding of the impact of Chinese values and behavior patterns on industrial development under the influence of five thousand years of Chinese civilization. Only the government under the leadership of the CPC can strongly guarantee the healthy and vigorous development of private enterprises in China.
The Basic Amplifying Circuit	Through the transistors needs to be linearized in the circuit analysis, inspired students in the approximate processing often need to focus on the primary contradiction and ignore the secondary contradiction, and can not grasp everything at once. The various parameters and performance indicators of a circuit are interdependent and unified in meeting the application requirements of the same functional goal, thus integrating the laws of opposition and unity in dialectical materialism. Designing amplifier circuits must start from design requirements and comprehensively consider various performance aspects to achieve optimal performance. To be a qualified

	craftsman of a great country, one must have engineering awareness and be able to comprehensively and systematically consider problems. Having a correct understanding of "positive feedback" and "negative feedback" helps us to engage in systematic thinking and avoid the one-sided approach.
Gate Circuits and Combinational Logic Circuits	Through the fact that digital circuit can not completely replace analog circuits, the fundamental principle that "everything in the world is universally interconnected and in an eternal state of development" is expounded, and students are encouraged to view things with a developmental and open-minded perspective, and be a broad-minded, optimistic, and positive individuals. The simplification of logical functions, in some cases, there is no standard answer, and the simplest result obtained is not unique. Guide students to realize that there is no absolute correct standard answer to problems in the field of natural sciences, and scientists can only strive to approach that correct answer as far as possible through their own efforts to reveal the truth of the world. The analysis of combinational logic circuits is the foundation of combinational logic circuit design. From national development to individual learning, analysis and imitation are indispensable. And the results of "innovation" rely on "design" to achieve. We should start from reality, stand on the shoulders of our predecessors, and have a broad perspective when doing things.

2.2 Teaching Process Design

In order to achieve better teaching results, it is necessary to change the preaching mode. Diversified teaching methods and rich interesting cases can not only enable students to learn professional knowledge, but also invisibly help them accept and establish socialist core values, and form good behavioral habits.

2.2.1 Supplement the Course Ideological and Political Case Library

For all non-electrical engineering majors, the course of "Electrical Engineering" focuses on adding cases related to electrical engineering in different majors. For example, for students in the School of Environmental Science and Engineering, there have been significant progress cases of China's green energy. Through this case, the advantages of Chinese social system and the shortcomings of Western social systems are discussed. For students of the School of Mechanical and Automotive Engineering, the case of the flourishing development of new energy vehicles in China was added, and the profound impact of the country's long-term planning was discussed. To motivate students as engineering talents, they need to have the courage to take on responsibilities and break through difficulties. For students in the School of Materials Science and Engineering, we have added cases of the close connection between electronic components and materials science, exploring opportunities for materials majors in interdisciplinary backgrounds.

In addition, the cases that are closely related to the development of The Times and social progress are added, such as artificial intelligence, big data, and cloud computing in the electrical industry.

2.2.2 Enrich the Means of Ideological and Political Education in the Curriculum

Actively introduce the DIY and maintenance videos of Small Red Books and Douyin, which is popular among young people, discuss the need to pay attention to safety norms, cost management and quality management in engineering practice, and promote the meticulous craftsmanship spirit. Set up a "Ask Me and Answer" game during break time. Introducing Zhipu Qingyan to enable students to expand their knowledge with the assistance of AI. And then understand China's relevant industrial policies and domestic and international development status.

2.2.3 Expand Experimental Content

Expand the original offline experiment into a combined mode of offline operation experiment and online simulation experiment. Online experiments are divided into three modes: mandatory experiments, elective experiments, and professional integration exploratory experiments, leading

students on the path of engineering. The hierarchical experimental mode utilizes the characteristics of online simulation experiments that are not limited by class hours and locations, which not only does not increase students' academic burden, but also stimulates their learning desire. Especially, exploratory experiments on professional integration can stimulate students' interest in professional integration and their thirst for interdisciplinary knowledge.

By comparing the works completed by classmates in online mandatory experiments such as "Designing Transistor Voltage Amplification Circuits" and "Designing Password Lock Circuits", the quality and cost analysis of different circuits under the same design indicators can be introduced, gradually guiding students to understand the importance of quality and cost management.

Introduce "Design Passive Filter", "Design DC Stabilized Power Supply", "Design Waveform Generator", "Design Answerer", and other free choice of experiment topics to help students expand their knowledge, improve their experimental skills, cultivate innovative thinking and teamwork consciousness.

Professional integration exploratory experiments, targeting thousands of people from different majors, such as setting up "Domestic Sewage Recycling and Reuse" experiments for environmental majors, setting up "New Energy Vehicle Anti Lock Braking System" experiments for vehicle majors, and setting up "Nanofilm and Memristor" experiments for material majors.

These online experiments have solved the problem of less hours and more content in Electrical Engineering. In the process of learning professional knowledge, it has exercised students' self-learning and interpersonal communication abilities, and promotes the cultivation of a scientific spirit that is not afraid of difficulties and dares to innovate.

2.2.4 Online Teaching Expansion

Actively utilize the pre-class preview section of Rain Classroom, search for teaching resources rich in ideological and political elements, and push it to students' WeChat anytime and anywhere. By utilizing the teacher-student interaction function of Rain Classroom, real-time tracking of students' learning and ideological dynamics is achieved. Through caring for and timely responses to students, efforts are made to educate and influence them, cultivating their correct values. Share the recorded videos of Rain Classroom on the QQ group, so that even if students fail to keep up with the pace during class, they can review the videos and improve their mastery of basic knowledge and skills.

2.3 Design of Teaching Assessment and Evaluation Mechanism

The past course assessment methods mainly tested students' mastery of key knowledge points and skills, but did not pay enough attention to their thoughts. The impact of courses on the establishment of life and values lacked an effective assessment system.

Regarding the above issues: After discussion by the teaching team, the proportion of process evaluation in learning in the score of this course is strengthened. Introducing flipped classroom, course learning summary reports, and large-scale assignments to evaluate the effectiveness of students' learning process. Not only focuses on professional knowledge exam scores, but also truly utilizes course ideological and political education to help students grow.

3. Summary

In the era of unprecedented change that have not occurred in a century, what kind of mental outlook should our students embrace to welcome the wave of the Fourth Industrial Revolution? As a guide for preaching and teaching, teachers have a long way to go. As teachers, we should bear in mind that we are responsible for cultivating talents needed by our country. We should not only impart professional skills to students, but also pay attention to cultivating their moral character. Electrical Engineering has a wide range of teaching contents and relatively few class hours. The teaching team of scholars has introduced ideological and political elements into the curriculum through reasonable teaching design, stimulated students' interest in learning, promoted

their moral cultivation, and received good feedback from students, creating a comprehensive and three-dimensional teaching system. It plays a positive role in promoting the reform and innovation of related majors and teaching curriculum systems in other universities.

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