

Research on Teaching Reform of Electrical Power System Relay Protection Course based on Engineering Professional Certification

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Abstract: Under the background of globalization and the rapid growth of power technology, the teaching of Electrical power system (EPS) relay protection is facing new challenges and opportunities. The traditional teaching mode and content have gradually exposed the problems of being out of touch with the needs of the industry and lacking practicality and innovation. At the same time, engineering professional certification, as an internationally accepted education quality assurance system, provides a clear direction for the educational reform of power engineering specialty. In order to adapt to this change, this article deeply studies the teaching status of EPS relay protection course, finds its existing problems, and puts forward corresponding reform ideas. In order to meet the development needs of the power industry, this article puts forward a student-centered teaching concept, combines the perspective of liberal arts, strengthens the humanistic care and social responsibility education of the course, and enhances students' communication and expression ability. Through the reform, it is expected to cultivate power engineering and technical personnel with innovative spirit, practical ability and social responsibility, and make contributions to the safe and stable operation of the EPS. In this article, the reform ideas and implementation suggestions are elaborated in detail, which provides useful reference for the education of power engineering specialty.

Keywords: Engineering Professional Certification; Electrical Power System; Relay Protection Course; Reform in Education.

1. Introduction

With the continuous progress of society and the rapid growth of science and technology, EPS, as an important infrastructure of modern society, is undergoing unprecedented changes [1]. As the "guardian" of EPS, relay protection plays an important role in ensuring the safe and stable operation of EPS [2]. Under such a background, how to cultivate relay protection talents with innovative spirit and practical ability has become an urgent problem for electric power engineering education [3].

China's engineering education has long been committed to cultivating high-quality talents in line with the needs of the industry [4]. As an internationally accepted education quality assurance system, engineering professional certification provides a clear direction and standard for engineering professional education [5]. However, in the traditional teaching of EPS relay protection course, there are often some problems, such as the teaching content is out of line with the needs of the industry, the practice teaching is weak, and the teaching method is single [6]. These problems not only affect students' learning effect, but also can't meet the demand for talents with the rapid growth of power industry.

This article aims to explore the teaching reform of EPS relay protection course based on the background of engineering professional certification. Through in-depth analysis of the current teaching situation and problems, this article puts forward some reform ideas such as student-centered teaching concept, strengthening humanistic care and social responsibility education in courses, and improving students' communication and expression ability. It is expected that through this series of reform measures, new vitality will be injected into the teaching of EPS relay protection course, the quality of personnel training will be improved, and a

contribution will be made to the growth of China power industry. Under such original intention and background, this article has carried out in-depth research and discussion.

2. EPS Relay Protection Course under the Background of Engineering Professional Certification

2.1. EPS Relay Protection Course

In the operation of EPS, relay protection is the key link to ensure the stable and safe operation of the system. Therefore, the course of EPS relay protection plays an important role in the teaching of power engineering specialty [7]. The teaching content of EPS relay protection course mainly includes relay protection principle, protection device, protection system design and operation. Through the study of this course, students should be able to master the basic theory and skills of EPS relay protection, and have the ability to design, configure, debug and maintain relay protection devices. At the same time, the course should also focus on cultivating students' innovative spirit and engineering practice ability to meet the development needs in the field of electric power engineering.

2.2. Influence of Engineering Professional Certification on Relay Protection Course of EPS

Engineering professional certification is an internationally accepted education quality assurance system, and its purpose is to ensure the quality of engineering professional education and make it consistent with industry standards and professional needs [8]. In China, more and more attention has been paid to engineering professional certification, which is

not only the evaluation of engineering professional education quality, but also the guidance for engineering talent training. Through the engineering professional certification, the school can clearly define the training objectives, optimize the curriculum system, strengthen practical teaching, and better cultivate engineering and technical talents that meet the needs of society.

Engineering professional certification has a far-reaching impact on the course of EPS relay protection [9]. First of all, engineering professional certification emphasizes the importance of practical teaching, requiring schools to strengthen practical teaching links and improve students' practical ability. For the course of EPS relay protection, it means that the time and content of practical teaching such as experiment and course design need to be increased. Secondly, engineering professional certification requires the course content to be connected with industry demand and professional standards. Therefore, the course of EPS relay protection needs to keep up with the growth of the industry and introduce new protection technologies, devices and strategies in time to ensure the advanced and practical content of the course. Finally, engineering professional certification also emphasizes the education of engineering ethics and social responsibility. Therefore, in the course of EPS relay protection, it is also necessary to integrate relevant contents to cultivate students' engineering ethics and social responsibility.

3. Present Situation and Problems of Relay Protection Course Teaching in EPS

3.1. Status

In the current teaching of EPS relay protection course, most colleges and vocational colleges still adopt the traditional teaching mode. This model is usually based on teachers' classroom teaching, supplemented by some experiments and curriculum design. However, due to the complexity and technicality of the course content, it is often difficult for students to fully understand and master the principle and technology of relay protection through classroom teaching [10]. On the other hand, although some schools have begun to try to introduce new teaching methods and means, such as multimedia teaching and online education, in practice, these new teaching methods are often only used as a supplement to traditional teaching, but they are not really integrated into curriculum teaching.

3.2. Problem Analysis

The problems existing in the teaching of EPS relay protection course are mainly manifested in the following aspects:

The teaching content is out of line with the needs of the industry: at present, the content of relay protection courses in some schools is slowly updated, which can not reflect the latest development and technological progress of the industry in time. This leads to the gap between what students have learned and the actual demand, which makes it difficult to adapt to the growth of the industry.

Relay protection is a practical course, but at present, the practice teaching in some schools is relatively weak, and the experimental equipment and venue conditions are limited, which is difficult to meet the practical needs of students.

The traditional teacher-centered teaching method easily

leads to students' low interest in learning and poor learning effect. In addition, the lack of effective teaching interaction and personalized teaching can not meet the learning needs of different students.

3.3. The Demand and Necessity of Teaching Reform

In view of the current situation and problems in the teaching of EPS relay protection course, it is particularly important to carry out teaching reform. First of all, teaching reform can improve students' learning effect and better meet the needs of the industry. By optimizing teaching content and improving teaching methods, students' interest in learning can be stimulated, and their learning enthusiasm and initiative can be improved, so as to better master the knowledge and skills of relay protection. Secondly, teaching reform can improve the quality of education and enhance the competitiveness of schools. By updating the course content and strengthening the practice teaching, the school education can meet the needs of society and improve the quality of school education. Finally, teaching reform is also an inevitable requirement for the growth of electric power industry. With the continuous development and technical progress of the power industry, it is necessary to adapt the teaching of the EPS relay protection course to cultivate qualified talents for the industry.

4. Teaching Reform of EPS Relay Protection Course based on Liberal Arts Perspective

Table 1. Thoughts on teaching reform of EPS relay protection course

Way	Ideas for reform	Specific measures
General idea	Take students as the center, strengthen humanistic care and social responsibility, and improve communication and expression ability.	Adjust teaching ideas and pay attention to students' learning needs; Integration into social responsibility education; Set up special training links to improve students' communication and expression ability.
Student-centered teaching concept	Pay attention to students' learning needs and learning process, and cultivate students' autonomous learning and lifelong learning ability.	Conduct demand research; Adopting practical teaching methods; Provide personalized learning support and counseling.
Strengthening humanistic care and social responsibility education in curriculum	Guide students to pay attention to social influence and cultivate social responsibility and engineering ethics.	Social integration impact cases; Strengthen the education of engineering ethics; Discuss the responsibility and influence on society.
Improve students' communication and expression skills	Train students' communication and expression skills, broaden their horizons and improve their comprehensive quality.	Set up special communication and expression training links; Encourage students to participate in competitions and social practice; Introduce industry experts to give lectures or guidance.

Under the background of engineering professional certification, the course of EPS relay protection is facing

multiple challenges, such as rapid knowledge updating, weak practical links and single teaching methods. Therefore, it is necessary to reform the teaching of EPS relay protection course to meet the needs of talent training under the new situation. For example, Table 1 briefly reflects the teaching reform ideas of EPS relay protection course.

4.1. Student-centered Teaching Concept

In the teaching reform of EPS relay protection course, the primary task is to change the traditional teaching concept and adopt the student-centered teaching concept. The core of this concept is to regard students as the main body of teaching activities, pay attention to students' learning needs and learning process, and pay attention to cultivating students' autonomous learning ability and lifelong learning ability. The course structure of EPS relay protection is shown in Figure 1.

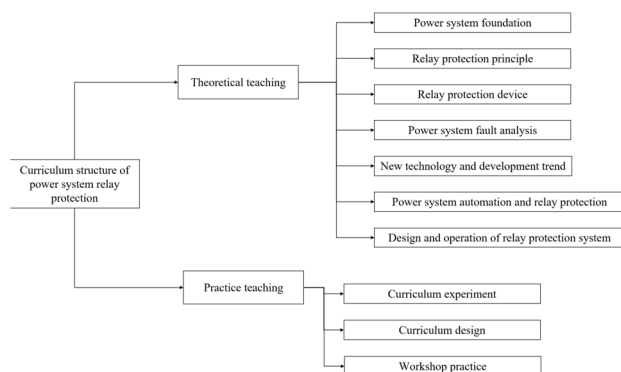


Figure 1. Curriculum structure of EPS relay protection

The student-centered teaching concept can be realized in the course of EPS relay protection through the following methods: First, carry out demand research, deeply understand students' learning needs and interests, and adjust teaching contents and methods according to students' learning characteristics and needs. The second is to use practical teaching methods such as case teaching and project teaching to guide students to actively participate in classroom discussion and practical operation, and to stimulate students' interest and initiative in learning. The third is to provide personalized learning support and counseling, pay attention to students' learning progress and feedback, and adjust teaching strategies in time to ensure that every student can obtain effective learning.

4.2. Strengthening Humanistic Care and Social Responsibility Education in Curriculum

As an important social infrastructure, the safety and stability of EPS operation are directly related to social well-being and economic development. Therefore, humanistic care and social responsibility education should be strengthened in the teaching reform of EPS relay protection course.

Specifically, the following contents can be integrated into the course: First, guide students to pay attention to the impact of EPS operation on society, environment and economy, and cultivate students' sense of social responsibility and environmental protection. Second, through case analysis, role-playing, etc., let students understand the impact of EPS failure on society, and guide students to think about how to minimize the negative impact on society while protecting the EPS. Third, pay attention to engineering ethics education, let students know the professional responsibility and moral requirements of engineers, and cultivate students' engineering

ethics literacy.

4.3. Improve Students' Communication and Expression Skills

As future engineers and technicians, good communication and expression skills are very important for students majoring in electric power. In the teaching reform of EPS relay protection course, we should pay attention to improving students' communication and expression ability.

To this end, the following measures can be taken: First, set up special communication and expression training links, such as organizing group discussions, reports and demonstrations, so that students can exercise their communication and expression skills in practice. The second is to encourage students to participate in academic competitions, social practice and other activities, broaden their horizons and social circles, and improve their comprehensive quality. The third is to introduce industry experts and industry leaders to give lectures or guidance, so that students can understand the frontier trends of the industry and the requirements of career development, and stimulate students' learning motivation and goal consciousness.

5. Conclusion

Considering the background of global energy reform, technical progress of power industry and engineering professional certification, the teaching reform of EPS relay protection course is not only an educational issue, but also an important issue related to national energy security and economic development. After an in-depth analysis of the current situation and problems in the teaching of EPS relay protection course, and a discussion of the teaching reform ideas based on the perspective of liberal arts, this article draws the following conclusions: First, the teaching reform of EPS relay protection course is imperative to adapt to the rapid growth of power industry and meet the social demand for high-quality talents. Secondly, the student-centered teaching concept should run through the whole teaching process, pay attention to students' learning needs and stimulate students' learning interest and initiative. Thirdly, strengthening the education of humanistic care and social responsibility in the course is helpful to cultivate students' sense of social responsibility and engineering ethics, so that they can better adapt to the growth of occupation and society. Finally, improving students' communication and expression ability is an inevitable requirement for cultivating electric power engineering and technical personnel. Through the implementation of this series of teaching reform measures, it is expected to improve the teaching quality of EPS relay protection course, cultivate more outstanding talents with innovative spirit and practical ability, and inject new vitality into the growth of China power industry.

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References

- [1] Liu Cheng, Li Shuquan, Jin Enshu, et al. On the teaching reform of power system relay protection based on OBE concept [J]. Education and Teaching Forum, 2020(37):2.

- [2] Chen Kunyi, Li Qin. Teaching syllabus design of power system relay protection suitable for engineering education certification [J]. Century Star-High School Edition, 2021(2):0053-0054.
- [3] Yan Baiping, Hong Junjie, Li Xiyu. Exploration of teaching reform of "Power System Relay Protection" course based on OBE [J]. China Electric Power Education, 2020(10):2.
- [4] Qiu Cunyong, Han Lu. Teaching reform and practical research of power system courses under the engineering background [J]. Science and Education Guide, 2020(1):2.
- [5] Zhang Jihong, Yang Peihong, Zhang Zilei, et al. Discussion on the teaching reform of "Power System Relay Protection" course with engineering certification [J]. China Electric Power Education, 2020(10):2.
- [6] Wei Chaoyang. Ideological and Political Exploration of "3+2" Professional Curriculum in Higher Vocational Colleges-Taking the Course of Power System Relay Protection Principle as an Example [J]. auto time, 2023(15):65-67.
- [7] Liu Ying, Zheng Shufang, Chen xingyu. Effective measures for ideological and political teaching reform of electrical engineering and automation major courses in colleges and universities under the OBE concept-taking the course of "Power System Relay Protection" as an example [J]. Western Quality Education, 2022, 8(1):53-55.
- [8] Han Xupeng, Li Daolin. Exploration on the new training mode of power system relay protection and automation professionals [J]. 2021(2013-1):128-129.
- [9] Zhang Baojie, Gao Faliang, Yu Hongguo, et al. Exploration on the teaching reform of "Power System Relay Protection" course in application-oriented universities [J]. Industrial Control Computer, 2023, 36(7):163-164.
- [10] Wang Xiaofei, Xu Liang, Wang Kangyuan. Experimental teaching reform of digital relay protection based on OBE concept [J]. china modern educational equipment, 2021(17):3.