

Practical teaching reform of electrical major in colleges and universities in the new era

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Abstract: With the steady progress of a new round of energy reform, the rapid development of smart grid, the demand for high quality electrical talents will increase. The course “Power system analysis” occupies a relatively important position in electrical majors, and the course takes into account both theory and practice. Therefore, teachers should take the initiative to innovate their own teaching ideas, pay attention to practical teaching, and promote the connection between theoretical teaching and practical teaching, so as to comprehensively improve the teaching quality of the course and cultivate the high-quality talents needed by the industry. In this regard, this paper probes into the practical teaching reform of electrical major in colleges and universities in the new era, for reference only.

Key words: universities; Electrical major; Practical teaching; reform

Under the background of the development of the new era, Power System Analysis, as one of the required courses for electrical majors, is mainly composed of transient analysis and steady-state analysis of power systems. Moreover, the theoretical basis of power system engineering construction in this course involves a wide range of teaching content. This requires students to not only master the necessary theoretical knowledge, but also internalize the knowledge into the mastered practical behavior, at this time, the importance of practical teaching has been revealed, teachers should actively reform practical teaching, in order to constantly improve the quality of practical teaching, and cultivate the industry needs of high quality talents.

1. The current teaching of “Power System Analysis” for electrical majors in colleges and universities is insufficient

1. The teaching structure is not scientific

Nowadays, under the restriction of traditional educational concepts, teachers focus on instilling theoretical knowledge to students in the course of “Power System Analysis”, which makes practical teaching neglected. From the perspective of curriculum setting, teachers spend most of their time explaining the theoretical knowledge of “Power System Analysis”, and the hours of practical teaching are relatively small, so it is difficult for students to have enough time for practical operation. As a result, although students have solid theoretical knowledge, they cannot apply the theoretical knowledge they have mastered to solve practical problems. Moreover, the knowledge of “Power System Analysis” course is relatively abstract, if only by theoretical teaching, it is difficult for students to understand it thoroughly, and even some students will have resistance, which restricts the improvement of the teaching quality of the course.

2. The lack of rationality in the teaching content

At this stage, the course material of “Power System Analysis” has not been updated in time, and the cutting-edge theoretical knowledge and technology of power system have not been reflected in it. Moreover, if students learn these old knowledge for a long time, it is easy to be disconnected from the development needs of society and industry, which is unfavorable to their long-term development. In addition, the teaching content taught by teachers is not targeted, and these contents are not profound and substantive, resulting in the knowledge mastered by students is superficial, which is unfavorable to their internalization of the knowledge of “Power System Analysis” course.

3. The teaching method is relatively single

In the background of education reform, modern educational technology and methods have been widely used in the field of education, making teaching methods more diversified. However, in the specific teaching of “Power System Analysis” course, some teachers still use traditional teaching methods to directly instill knowledge to students, or simply demonstrate, failing to use modern educational technologies and methods, even if they are used, they are mere formalities, failing to effectively improve the quality of practical teaching of “Power System Analysis” course, which is not conducive to students’ long-term development.

2. The practical teaching reform strategy of “Power System Analysis” for electrical majors in colleges and universities in the new era

1. Analyze the content structure of the course to clarify the context of knowledge

In the course of Power System Analysis, we should improve the quality of practical teaching and enhance students’ practical ability constantly. Teachers need to analyze the content structure of the course and clarify the knowledge context. Among them, take “Steady State Analysis of Power System” as an example. This course mainly analyzes the problems of power flow distribution calculation, power quality and economic operation in the power system under normal operation, which is related to the normal operation of the power system. Therefore, before practical teaching, teachers should make clear the basic requirements of power system operation, that is, to ensure the safe and reliable operation of power system, to ensure good power quality, and to ensure the economy of power system operation. Under the guidance of the basic requirements, the practical activities carried out by students will be more consistent and malleable, and they will also be able to clarify the focus of practice. At present, China’s power grid construction level has steadily improved, and the level of

technological innovation has also been improved, such as UHV AC and DC transmission technology, flexible transmission technology and smart substation technology and other cutting-edge technologies, so in practical teaching, students can show these new knowledge and technology, and ask them to use the new technology and knowledge to solve practical problems. Alternatively, in the “economy of power system operation”, it can be combined with UHV AC transmission technology, and the calculation formula of active power loss is used to show that increasing voltage can effectively reduce the loss of transmission lines, thus constantly improving students’ practical skills

2. Reform practical teaching methods and build diversified teaching models

First, experiment teaching should be carried out. Give full play to the advantages of laboratory resources, in the process of real experimental operation, let students master the basic practical operation skills, and can use reasonable experimental data processing methods to analyze experimental phenomena, which not only accurately grasp the difference and connection between theory and practice, but also enhance their hands-on ability. Secondly, carry out the simulation practice. Build the simulation experiment platform of the power system, use MATLAB, PSASP and other simulation software to simulate and calculate the various operating states of the power system, for example, you can simulate the power system power distribution, short circuit calculation and stability, give full play to the educational advantages of the simulation model. And constantly improve the students’ computer programming and calculation ability, for their follow-up to achieve high-quality employment to lay a solid foundation. Finally, go out to practice. Teachers are not limited to on-campus practice teaching, but should extend the scope of practice teaching to off-campus, and timely arrange students to go to the surrounding power enterprises, power plants, substations and other places. For example, when practical teaching is carried out in the power dispatching center, experienced teachers or enterprise experts can carry out on-site teaching. Or, in the production and operation site of the power system, guide the students to use the power flow distribution diagram to monitor the operation of the power grid, observe the state of short circuit through fault recording, and master the meaning of reactive power compensation and the principle of voltage adjustment by using the setting of power capacitors in the substation. In this way, carrying out practical teaching outside the school can also allow students to have a preliminary cognition of the jobs they will be engaged in, and ensure that they can quickly adapt to the jobs in the future.

3. Deepening school-enterprise cooperation to enhance students’ comprehensive practical ability

In the practice reform of “Power System Analysis”, the practice base is established through school-enterprise cooperation, and a team of guiding teachers composed of backbone teachers in schools and backbone technical personnel in enterprises is set up. On this basis, the talent training mode of “before practice-during practice-after practice” is constructed. For example, in the cognition of 500 kV hub substation, before the internship, students should not only understand the basic knowledge of voltage regulation, but also master the characteristics of various pressure regulation means and the calculation method of voltage regulation. In the practice, the teacher should require the students to follow the prescribed substation inspection route, so as to have a perceptual understanding of the substation reality and equipment, and transform the knowledge from the book into a real engineering scene. In the main control room of the substation, students can understand the structure of relay protection and automatic devices, and also observe the working condition of the substation through the monitoring system. In the substation monitoring system, taking the low bus voltage of the substation as an example, the remote control process of capacitor bank switching is shown to the students, thus deepening the knowledge of voltage regulation, and at the same time, they also have a preliminary understanding of the business process of power grid dispatching. In the process of practice, the students also combined with the substation on-site operation management requirements, have a deeper understanding of substation management and corporate culture, and have a deeper understanding of electric power professional ethics and engineering norms. At the end of the internship, students are required to submit a knowledge of the internship report, explore the application scenarios of different voltage regulation methods, and guide students to focus on the voltage problem of the new power system with new energy as the main body in the form of literature review, so as to effectively enhance their comprehensive practical ability.

4. Reform the practice evaluation system and improve the teaching quality

After the end of the practical teaching of Power System Analysis, teachers should reform the practical evaluation system in combination with the actual situation of practical teaching, so as to improve the rationality and perfection of teaching evaluation. In the course evaluation, the problem of arbitrary and subjective evaluation should be avoided, but to seek truth from facts, so as to accurately evaluate the real level of students. When teachers reform the practice evaluation system, they should also be combined with the relevant evaluation system formulated by the state, so as to improve the operability of the practice evaluation system of Power System Analysis. At the same time, teachers should also correctly understand the practical teaching objectives of Power System Analysis, so as to reasonably divide the evaluation indicators and build a diversified evaluation system, for example, from the perspectives of enterprises, schools and students. In addition, in the process of constructing the practical teaching evaluation system, teachers should widely listen to the suggestions of students, schools and enterprises, so as to maximize the comprehensiveness of teaching evaluation, so as to apply it in the actual teaching evaluation, judge the grasp of students’ practical ability, and teachers can make targeted adjustments to the content and methods of practical teaching according to the evaluation results. Thus, the quality of practical teaching can be comprehensively improved.

5. Optimize the construction of practice platform to ensure the implementation of teaching activities

In practical teaching, a perfect practice platform can provide a strong guarantee for the orderly development of teaching activities. Therefore, if teachers want to further improve the practical teaching quality of Power System Analysis, they need to pay attention to optimizing the practical teaching platform. First of all, teachers should establish correct concepts to improve the practical teaching platform, promote the close combination of practical teaching with the needs of students, the actual industry and the needs of social development, and control the practical teaching direction of Power System Analysis in an all-round way. Secondly, teachers should thoroughly and

systematically analyze the feasibility and necessity of constructing practical teaching platform in combination with the actual situation, with the core requirement of cultivating practical skills of students majoring in electrical engineering and the ultimate goal of improving their innovative consciousness and practical level to meet the requirements of curriculum standards. At the same time, colleges and universities should also pay attention to the cooperation between enterprises, give full play to the positive role of school-enterprise cooperation in expanding practical teaching platforms, improve the applicability of practical teaching platforms in full cooperation with enterprises, and constantly improve the comprehensiveness of practical teaching platforms.

6. Implement external introduction and internal training to build a double-qualified teaching staff

The key to the success of the practical teaching reform of Power System Analysis is a strong teaching team. In this regard, teachers should adopt the training mode of “bringing in and sending out”, and strengthen the construction of the teaching staff. First of all, “bring in”, the school should from the electrical research institutes, enterprises and institutions, the introduction of strong ability, rich experience of the backbone talents. Second, “send out”. The school can send young teachers to electrical research institutes, enterprises and institutions for temporary training, and can also organize them to actively participate in electrical professional related innovation and entrepreneurship activities, skill innovation competitions, etc., in order to accelerate the growth of the teacher team, create a “double-qualified” teacher team, in order to better carry out the practical teaching of “Power System Analysis” course. In addition, in order to further improve practical teaching, through a variety of ways and channels, the technical backbone of electrical research institutes and enterprises and institutions is hired as part-time tutors to regularly carry out practical teaching activities or lectures, forming a good interaction between the campus and the off-campus teacher configuration, so that the entire electrical teacher team and its educational background and age structure can be further optimized and improved. In this way, the school can comprehensively improve the quality of the teaching staff through the implementation of external introduction and internal training, and then the orderly development of practical teaching escort.

In summary:

All in all, there are still some problems in the practical teaching of “Power System Analysis”, so it is imperative to reform the practical teaching of “Power System Analysis”, which can be started from the following links: analyze the content structure of the course, clarify the knowledge context; Reform the practical teaching method, build a diversified teaching model; Deepen school-enterprise cooperation to enhance students’ comprehensive practical ability; Reform the practice evaluation system to improve teaching quality; Optimize the construction of practice platform to ensure the implementation of teaching activities; The implementation of external introduction and internal training, to create a double-qualified teacher team, and then train the industry to effectively need high quality talents.

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