

Research on the teaching mode and method of "engineering dielectric and electrical insulation"

Fuqiang Tian^{1, a}, Wanru Li^{2, b}

¹School of Electrical Engineering, Beijing Jiaotong University, Beijing, 100044 China

²School of Electrical Engineering, Beijing Jiaotong University, Beijing, 100044 China

^afqtian@bjtu.edu.cn, ^b18126113@bjtu.edu.cn

Keywords: Interdisciplinary teaching; teaching resource platform; experimental teaching; exploration.

Abstract. In this paper, aiming at the intersections of "engineering dielectric and electrical insulation" for graduate students majoring in electrical engineering, based on practical teaching experience and making full use of existing teaching resources, this paper explores and practices new teaching methods, educational modes and learning modes, etc. Stimulate the study and research interest of the graduate students, so that the graduate students of electrical engineering can master the engineering dielectric material physics theory and related mechanism, and can be applied in the follow-up research. The reformed teaching mode and method deepen the students' understanding of the field of electrical insulation, and the teaching effect is good.

1. Introduction

"Engineering dielectric and electrical insulation" is an important professional degree course for graduate students of school of electrical engineering, Beijing jiaotong university, learning physical theory of engineering dielectric materials, dielectric properties and mechanism of common insulation materials, analysis and design of insulation structure of electric motors, transformers, power cables, high-voltage bushing and other power equipment.

Nowadays, China's electrical insulation technology develops rapidly. For example, in the UHV/EHV ac and dc power transmission and transformation projects, such as the Yangtze river three gorges hydropower station and the construction of large-scale wind farms, the success of many major power equipment operation, etc., are closely associated with insulation technology development, show that the design, manufacturing, etc. in insulation system have reached the international high level [1].

Through this interdisciplinary course teaching, it is of great significance to continuously enhance the interdisciplinary knowledge integration ability of electrical engineering students, enhance their independent working ability and stimulate their independent innovation ability, so as to expand their comprehensive quality.

The graduate students majoring in electrical engineering in our college have a relatively weak professional knowledge foundation. By combining the complex theoretical knowledge with the forefront of electrical engineering science and engineering practice, the diversified teaching links adapted to the individual differences of students are established to lay a solid foundation for students to do scientific research in the laboratory.

2. The Necessity of Interdisciplinary Teaching Mode Section Headings

At present, the interdisciplinary teaching of electrical engineering major requires teachers and students' professional knowledge breadth and depth as well as their comprehensive application ability, comprehensive innovative thinking ability and independent learning ability, etc. Therefore, how to improve the teaching quality of interdisciplinary subjects requires constant exploration and research in teaching practice by teachers and students.

"Electrical engineering and automation major" is mainly a major studying the generation, transmission, transformation, control, storage and utilization of electric energy. Its foundation also determines that it has strong interdisciplinary and integration ability. Electrical insulation materials play a fundamental, supportive and leading role in the upgrading of electrical and electronic equipment in electric power, rail transit, new energy, microelectronics, aerospace, national defense and military industry. "Engineering dielectrics and electrical insulation" course content involves the high voltage and insulation technology, engineering, electromagnetic field, solid state physics, polymer physics, material physics and chemistry, and other disciplines of knowledge, in view of our advantages in the field of electric energy and electric material, in the aspect of teaching and scientific research to promote the depth of the cross and integration between disciplines, the innovative development of electrical engineering discipline is of great significance [2].

3. Establish teaching resource database and develop network course platform

As the core and foundation of the development of education informationization, the construction of teaching resource base is an important means for colleges and universities to promote professional construction, curriculum reform and teaching method innovation.

Under the background of network, the construction of teaching resource database, as an important link of campus education information construction, has a very important impact on teaching. The main purpose of the construction of teaching resource database is to drive curriculum construction and curriculum reform through the demonstration and radiation effect of resource sharing, so as to promote professional construction and discipline construction and effectively improve teaching quality [3]. The goal of curriculum resource construction is to build high-quality digital resources and form a co-construction and sharing system, so as to provide high-quality curriculum resources for teachers and students of colleges and universities and realize the sharing of resources between teachers and students.

4. Prepare High Quality Electronic Teaching Courseware and Internal Teaching Materials, Keeping Close to the Teaching Content

Interdisciplinary production is conducive to lay a generous foundation for graduate students, familiar with relevant disciplines, form a reasonable knowledge and ability structure, and cultivate the scientific overall consciousness of graduate students and the ability to analyze and solve problems from a multidisciplinary perspective.

Due to the characteristics of interdisciplinary undergraduate courses, the original textbooks cannot fully meet the current teaching requirements. We according to the actual need to write the internal materials suitable for their own needs and the connotation is rich. The content of textbooks is closer to students' learning needs, and some case teaching is added to provide detailed and vivid materials for students, providing a good platform for students to learn and master new knowledge.

At the same time, we will build superior quality course resources (PPT, document resources, etc.), and optimize teaching guidance documents according to the division of labor and cooperation of the team, such as course introduction, course standards, teaching plan; Improve the specific implementation documents according to the construction ideas: unit design, electronic courseware, teaching cases, video resources, literature, etc. Improve the relevant materials of students' independent learning after class: exam database, exam database, etc. Ask students to consult the literature in advance, understand the most cutting-edge technology, and conduct group discussion. Because students can deepen their understanding of theoretical knowledge through literature review, and initially master the structure and writing mode of the paper. At the same time, literature reference is also a key ability to effectively conduct scientific research in the future.

5. Arrange the Teaching Content Reasonably and Change the Assessment Method

Experimental teaching is an important part of higher vocational education teaching system, and it is an important link to increase students' perceptual knowledge, cultivate students' ability of analyzing and solving practical problems, strengthen engineering quality, enlighten innovative thinking and creativity.

"Engineering dielectrics and electrical insulation" teaching experiment content mainly includes "the dielectric constant and dielectric loss tangent of measurement", "lightning arrester on-line monitoring experiment", "insulation resistivity measurement", "the design of data acquisition system based on Lab VIEW", "measurement of partial discharge pulse current law", "insulation breakdown field strength experiment", "solid insulation aging development research", "insulation resistance and absorption ratio experiment" the eight experiments.

Through the opening of these experiments, we strive to make students have a deeper understanding and understanding of various common high-voltage equipment experimental methods, experimental equipment and

experimental content, so as to achieve the effective combination of theoretical knowledge and practice in books and improve students' exploratory creative thinking.

The examination method is the combination of the closed book theory examination and the usual scores, and the evaluation is conducted according to the students' mastery of theoretical knowledge and the experiments they must do. Students can combine the knowledge they have learned in theoretical courses and freely form several groups to operate instruments by themselves, so as to understand the purpose and content of different experiments. Master experimental principles, test instruments and principles; Learn the experimental procedures, correct operation; Summarize the experimental results and analyze and think. According to the students' experiment attitude, evaluate the situation of doing experiments Through these two aspects of evaluation, comprehensive consideration of students' knowledge, deepen students' understanding of the theoretical content.

6. Conclusion

The exploration of teaching mode and method of high-quality engineering dielectric and electrical insulation course is a long-term and comprehensive systematic engineering, which requires the cooperation of multiple platforms and the sharing of resources, and requires the joint efforts of teachers who dare to try multimedia technology and are enthusiastic about the course construction.

According to the characteristics of "engineering dielectric and electrical insulation" course, combining with the specific teaching conditions of the school and the laboratory conditions, the research teaching mode and method exploration of classroom teaching mode, teaching method and teaching method of this course are carried out according to local conditions, which effectively arouses the students' interest in learning.

At the same time, the school and relevant education departments should give strong support to human resources, material resources, funds, equipment and places, so that teachers and students can benefit from the new teaching mode and method, and provide a certain research foundation for the teaching reform of electrical engineering graduate courses.

7. Acknowledgments

Thanks for the funding of the graduate education project of Beijing Jiaotong University.

References

- [1] S.Z. Wu, L.S. Zhong: New exploration on "electrical insulation" in electrical engineering education [J]. China electric power education, Vol. 23 (2013), p. 231-232.

- [2] H.N. Liu, X.Y. Zheng , Q. Li: Teaching exploration and practice of postgraduate course modern chemical analysis method and experimental technology [J]. Guangdong chemical industry, Vol. 43, 09 (2016), p. 247-250.
- [3] L. Zhang. Research on the construction of teaching resource platform under network environment -- taking the construction of English course resource database as an example [J]. Think tank era, Vol. 02(2019), p. 126-128.