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Reform and Practice of the Course “Fundamentals of Control Engineering” from the Perspective of Engineering Education Professional Certification

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Abstract: Engineering education is one of the key driving forces for national innovation and competitiveness. Engineering education professional certification is an important activity in the field of international engineering education, aiming to improve the quality and level of engineering education, promote the internationalization and mutual recognition of engineering education. Fundamentals of Control Engineering “is the core course of Control Science and Engineering, and an important content of engineering education certification. In order to meet the requirements of engineering education professional certification, this article explores the main content and strategies of the curriculum reform and practice of “Fundamentals of Control Engineering” from the perspective of engineering education professional certification, for reference.

Keywords: Engineering Education Professional Certification; Fundamentals of Control Engineering; Curriculum Reform

Introduction

Fundamentals of Control Engineering "is an important foundational course in engineering majors, mainly introducing the basic concepts, methods, and applications of control theory, laying the foundation for students to further study control related courses and engage in scientific research and work related to control engineering. With the advancement of professional certification in engineering education, higher requirements have been put forward for the course "Fundamentals of Control Engineering". The course requires not only the teaching of theoretical knowledge, but also the cultivation of students' abilities, especially the cultivation of international concepts, innovative abilities, and the ability to solve complex engineering problems. It strengthens the project-driven and problem-oriented teaching mode, adopts diversified evaluation methods, and improves students' learning enthusiasm and initiative, Improve the teaching quality and effectiveness of the course.

1. Innovate course content and optimize teaching methods

1.1 Revise the teaching syllabus and reconstruct teaching objectives

Revising the teaching syllabus and restructuring teaching objectives are key requirements for engineering education professional certification, aiming to ensure that engineering education in universities is consistent with industry needs, and cultivate students with the required engineering practical abilities and innovative awareness. Firstly, revising the teaching syllabus needs to reflect the latest development trends and technological changes in the professional field. Schools need to re-examine the existing curriculum content and structure to ensure that they match the latest engineering trends and needs. Secondly, the reconstruction of teaching objectives requires transforming the traditional indoctrination teaching model into a collaborative education model led by teachers, student-centered, and enterprise participation. In the teaching process, students should be regarded as active participants, encouraged to unleash creativity, solve problems, and apply theoretical knowledge to practical engineering projects.

1.2 Innovate teaching models and enrich teaching methods

Firstly, the innovative teaching model takes enriching teaching methods as the starting point, and concretizes abstract theoretical problems by introducing project tasks. Due to the fact that knowledge in the fields of engineering and control often involves complex and abstract concepts, students can more easily understand and apply these concepts by combining them with practical engineering cases. In addition, project-based driving methods can combine theoretical knowledge with practical engineering problems, encouraging students to use control theory thinking methods to solve practical problems. This teaching method can stimulate students' interest in learning and show them the practical application and practicality of the knowledge they have learned. Secondly, the innovation of teaching methods includes the use of diverse methods such as multimedia, animation, typical cases, and blackboard writing. Each student may have different learning preferences

for different concepts and knowledge points, and this diversity can better meet the learning needs of different students. By using various teaching methods, such as real-life examples, animations, images, and blackboard writing, students can better understand basic concepts, help improve their learning efficiency and motivation, and also deepen their understanding of knowledge. Once again, adopt a hybrid teaching mode of online and offline, such as using tools such as Xuetong and WeChat for pre class preview, online teaching, and post class discussion. This teaching method provides students with greater flexibility and convenience, allowing them to learn at their own pace. Through the use of online tools, students can better preview and review course content, and actively participate in classroom interaction, increasing their learning enthusiasm through methods such as answering questions. This blended teaching mode helps the student better grasp the course content and also promotes classroom interaction. Finally, teachers should also encourage Xu Sheng to engage in thematic discussions after class, encourage students to search for relevant materials, and conduct in-depth research on the course content. This type of thematic discussion can help students further understand and apply the knowledge they have learned, while also encouraging them to learn independently. Through thematic discussions, students can share resources, exchange opinions, and gain a deeper understanding of the course content.

1.3 Optimize course evaluation and improve assessment methods

Optimizing course evaluation and improving assessment methods is one of the requirements for engineering education professional certification to ensure that students cultivate engineering abilities that meet industry standards. Firstly, by introducing process based assessment, schools will no longer rely on traditional final exams to comprehensively evaluate students. This is a positive change, as relying solely on final exams is difficult to reflect students' true abilities. Process-based assessment allows schools to have a more comprehensive understanding of students' learning progress and growth. Secondly, engineering education certification requires students to possess various engineering abilities such as analysis, design, research, and evaluation. Therefore, in terms of improving the assessment methods, the final exam papers should be more comprehensive, not only testing the mastery of basic knowledge, but also examining students' comprehensive ability to apply knowledge points. This means that test questions may include application questions, design questions, or case studies to solve complex engineering problems, in order to evaluate whether students can apply the knowledge they have learned to practical situations. In addition, process-based assessment usually includes various components such as classroom participation, group projects, reports, experiments, assignments, etc. These methods can more accurately evaluate students' engineering abilities. Student participation in group projects can demonstrate their collaboration and teamwork abilities, reports and experiments can evaluate their research and experimental abilities, and assignments can help test their analytical and problem-solving abilities. Finally, optimizing course evaluation can also introduce elements of peer evaluation and self-evaluation, encourage students to actively reflect on their learning process, identify their strengths and weaknesses, and cultivate students' independent learning and self-management abilities.

2. Restructure the teaching practice system and improve practical abilities

Reconstructing the teaching practice system to improve students' practical abilities is a key measure to meet the requirements of engineering education professional certification. This measure helps to ensure that students are competent in engineering practice and solving complex engineering problems upon graduation. Firstly, deep cooperation between schools and enterprises is a key aspect of system reconstruction. Through school enterprise cooperation, students will have the opportunity to participate in virtual enterprise projects, which helps them understand the complexity of real engineering problems, learn engineering business skills and communication skills, and collaborate in a multidisciplinary context. Secondly, the introduction of project management courses is a key component of improving practical skills. Students will learn full cycle and full process project management, including cost management, project risks, engineering management principles, and economic decision-making methods, to equip them with better project planning and execution abilities, and enhance their ability to solve complex engineering problems and implement projects. In addition, transforming graduation projects and internships is also a key measure to improve practical abilities. The topic of the graduation project can come from real engineering projects, and students will have the opportunity to apply their knowledge in practical engineering projects. Graduation internship is also an important practical opportunity, which enables students to enhance their professional cognition, practical skills, and career planning in a real engineering work environment.

3. Establish a course quality assurance mechanism and construct a system for cultivating students' engineering abilities

Firstly, schools need to carry out top-level design based on engineering education certification standards, including revising talent cultivation plans and curriculum systems, determining specific graduation assessment requirements and ability goals for students, especially the setting of graduation practice links. By scientifically formulating and adjusting these plans, we ensure that the curriculum can better meet the training needs of students' engineering abilities. Secondly, teachers need to work closely around the teaching objectives of the course in teaching. By continuously improving teaching methods, introducing practical engineering cases, and adjusting according to students' needs and

feedback, the quality of the course can be improved. At the same time, strengthen school enterprise cooperation, combine academic theory with practical engineering practice, in order to cultivate students' practical engineering and technical abilities, and cultivate students' lifelong learning literacy to continuously adapt and learn new engineering technologies and knowledge.

Conclusion

In summary, the quality of engineering education is closely related to students' engineering practical abilities. Therefore, when facing the challenge of engineering education professional certification, universities need to continuously optimize their curriculum and teaching system to improve students' engineering ability cultivation. By revising the teaching syllabus, innovating teaching models, and optimizing course evaluation and assessment methods, universities can better meet the requirements of engineering education professional certification, provide high-quality engineering ability training for students, and respond to the demand for engineering talents in modern society and the market.

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