

Course Construction of Automation Specialty for Applied technical undergraduate in China's Higher Education Reform

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Keywords: Applied technical undergraduate; automation specialty; course construction

Abstract. According to the comprehensive reform thoughts of higher education in China, the resident undergraduate colleges need to transform to the applied technology education. This paper first analyzes the opportunities and difficulties faced by the automation specialty. Then the paper clarifies the relationship between the theoretical courses, the technical courses and the technical practice courses. This paper also puts forward the curriculum construction plan and suggestion of the applied technical undergraduate automation talents who are adapted to the social needs.

Introduction

The development of applied technical undergraduate is an important way to deepen the reform of Higher Engineering Education in Colleges and universities in China [1]. In February 26, 2014, the State Council made a deployment to accelerate the construction of the modern employment-oriented occupational education system. The government also guided a number of regular undergraduate institutions to transform the applied technical colleges. And this transformation has been one of the key tasks of modern occupational education system construction plan". As the main task of the reform of 13th Five-Year higher education is the structure adjustment of higher education. The development, its breakthrough is the transformation of the local undergraduate colleges.

Distinct from the research undergraduate, the applied technical undergraduate aim to cultivate the application engineering-technical personnel and management personnel, who will participate in the work of technological development, technical design, technical innovation and technology management in enterprises and institutions. Therefore, the training plan should aim at cultivating students' ability to implement technology. Teaching content system should base on the application education or the occupation schooling.

However, whether it is subjective or objective reasons, the current teaching of applied technical undergraduate basically accord to academic and research oriented undergraduate training model and teaching contents. Thus, the situation is that enterprises are lack of application talents, while the university trained technical talents cannot find a job. Therefore, it is of great practical significance to construct the professional curriculum knowledge system and teaching model to improve students' comprehensive technological ability.

Automation is an engineering specialty with strong theoretical basis. Theoretical courses of automation specialty include signal analysis and processing, automatic control theory, modern control theory, intelligent control technology, and Introduction to Systems Engineering. These courses have an important position in the professional knowledge system. There is no big difference between the applied technical undergraduate and academic undergraduate in terms of teaching contents and teaching methods in these theoretical courses. Applied technical undergraduate students feel that these theoretical courses are hard to learn. And students have no interest in learning these theoretical courses. They also do not know how to use these theories. They learn these courses just to cope with the exam, and they would completely forget after the test. Therefore, the teaching content and teaching methods of theoretical courses should to be solved to enable students to truly master the basic theoretical knowledge of automation and the ability to solve practical problems by applying theoretical knowledge. Thus it enables students to study the

following courses and to engage in the field of automation technology development and technical innovation after graduation.

In order to comply with the idea of the comprehensive reform of higher education in our country, especially local universities to adapt to the application and development of transformation occupation education, clarify the application type Automation curriculum (curriculum theory), the relationship between technology courses, practice courses, training applied personnel contribute to the social needs the theory of improving the teaching mode and methods, improve the students' learning theory courses of interest, help students better grasp the necessary professional knowledge of the basic theory, this paper studies and discusses from the following aspects, to construct the undergraduate application technology automation professionals must possess the basic theory of professional knowledge system, to overcome the current this kind of curriculum basically is academic oriented compression type, simple type, try to practice to guide the improvement of theory The teaching mode and method of course, overcome the current application technology undergraduate students feel the theory course is difficult to learn, learn how to use it to learn without interest, do not want to learn the situation. Trying to build the application of technology of automation professional theory curriculum group, including the improvement of teaching methods and construction combined with the practical application of the experimental platform, better construction of basic theoretical knowledge in the field of this kind of students must have the knowledge and improve their learning theory, curriculum consciousness and interest, make the students master the ability automation of the basic theoretical knowledge and application of theoretical knowledge to solve practical problems, to lay the foundation for technology development, technology innovation and learning engaged in the field of automation for subsequent courses after graduation.

New Prospects for Automation Specialty

(A) Adjustment of China's Engineering Education System

The contradiction between supply and demand of engineering talents calls for the transformation of engineering specialty. As we all known, there is a prominent contradiction between the demand and the training of engineering and technical personnel. Engineering students generally do not want to be employed in the small and medium sized enterprises. Thus, the total number of engineering and technical personnel is in short supply. The training quality of engineering and technical personnel is not high enough, especially the unfortunate practical ability. Engineering graduates tend to lack industry background and professional spirit. Therefore, a considerable number of enterprises do not agree with wide caliber, generalist model trained engineering students. It is the time to strengthen engineering education, practical teaching, and vocational education to meet the needs of the collective for the engineering and technical personnel. The government had stated the guidance that a number of ordinary undergraduate colleges and universities transform to the applied technical undergraduate and vocational education.

(B) Excellent Engineer Training Program

The "Excellent Engineer Training Program"[2] implemented by the state aims to cultivate a large number of high-quality engineering and technical personnel who are capable of innovating and adapting to the needs of economic and social development. The Program serves the building of an innovation-oriented country and the strategy of strengthening the nation through talents, promotes higher education to the society cultivating talents with the needs, and improves the quality of personnel training in engineering education. The main idea of implementing the "Excellent Engineer Training Program" is to increase the practice of enterprises, explore new practices and cooperation mechanism between schools and enterprises, and strengthen the practice base construction inside and outside the school. The main contents include exploring new cooperation mechanism between schools and enterprises, formulating detailed practical plans and plans, arranging all kinds of practical activities rationally; combining enterprise practice with enterprise courses, strengthening students' cognitive ability and improving the combination of theory and

practice; Strengthening the practical teaching links; signing training agreements with enterprises, establishing enterprise practice teaching bases or joint laboratories, and strengthening practical ability training.

(C) Engineering education professional certification

Engineering education professional certification [3] is the internationally accepted engineering education quality assurance system. It is also an important basis to achieve international recognition of engineering education and engineer qualification. The core of the certification of engineering education is to confirm that engineering graduates meet the established quality standards recognized by the industry. It is a kind of training objectives and graduation export requirements-oriented eligibility evaluation. The curriculum system of professional education, the allocation of teaching staff and the condition of schooling all revolve around the core task of students' graduation ability, and emphasize the establishment of professional continuous improvement mechanism and culture to ensure professional education quality and professional education vigor. In our country, engineering education is an important part of higher education to the one third of the system. Engineering education has played an irreplaceable role in the process of industrialization of the country, and has formed a complete and independent industrial system.

Tab.1. Engineering Education Certification Standard Curriculum System

Course type	Course requirements	Credit proportion
Mathematics and natural science courses	Adapt to the graduation requirements of the professional	At least 15%
Engineering foundation courses and professional foundation courses	Engineering basic courses and professional basic courses can reflect the mathematics and natural sciences in the application of ability training	At least 30%
Professional courses	Professional courses can reflect the training of system design and implementation ability	
Engineering practice	Set up a sound system of practical teaching, and cooperation with enterprises to carry out internships to train students' practical ability and innovation	At least 20%
Graduation design or thesis	Graduation design or thesis topics should combine the engineering professional problems to train students of engineering awareness, the spirit of collaboration and the comprehensive application of the knowledge to solve practical problems. Enterprises or industry experts should participate in graduation design or thesis guidance and assessment.	
Humanities and social sciences general education courses	So that students engaged in engineering design to consider the economic, environmental, legal, ethical and other constraints	At least 15%

(D) “Made in China 2025” provides an unprecedented opportunity for automation

The project of "Made in China 2025" will bring a new era of manufacturing. For higher education, it focuses on how to develop to meet the needs of the times on the high-quality talent [4]. First, this project introduces the demand for industrial automation equipment design talent. Second, this project needs artificial intelligence technical personnel. Third, multi-disciplinary cross-talent is also a need.

New Problems of Automation Specialty Education

(A) Influence of Research Undergraduate

Previous research-oriented colleges and universities need to be in conformity with wide-caliber, generalist model to cultivate a comprehensive, research-oriented talent. But this model has failed to meet the talent needs of contemporary business. A large number of small and medium enterprises need the applied technology talents with the basic theoretical basis, the technology application ability, and the professional quality.

(B) Curriculum system lag behind the development of automation technology

Traditional electrical automation course systems are generally designed for electric electrical and relay control, and obviously emphasis on electrical control [5]. The current situation of scientific and technological development has special emphasis on cross-professional integration that power electronics, automatic detection technology, mechanical technology, and information technology are highly integrated to achieve flexible and intelligent production line. The current courses are currently under a distinct lag. With the continuous improvement of technological content of production equipment to meet the needs of enterprises in emerging industries, we must strengthen the professional direction and optimize the curriculum reform to keep electrical automation professional to maintain its own characteristics.

Curriculum Reform of Automation Specialty

(A) Automation Course System Reform and Construction

The Automation Teaching Steering Committee of the Ministry of Education led the implementation of the automation course system reform and construction of the curriculum system to make great efforts to reform the construction of a new professional curriculum system, a substantial reduction of professional basic course hours, a substantial removal of professional courses in the outdated contents, a substantial increase in modern automation principles, equipment, system content.

(B) Professional certification series Planning materials

"Excellent engineering ability training and engineering education professional certification series planning materials (electrical engineering, automation specialty)" has been successfully selected by the State Press and Publication Administration of Radio in the "thirteen five" national key books, audio, electronic publications publishing plan. Thus these materials become the national planning Publications.

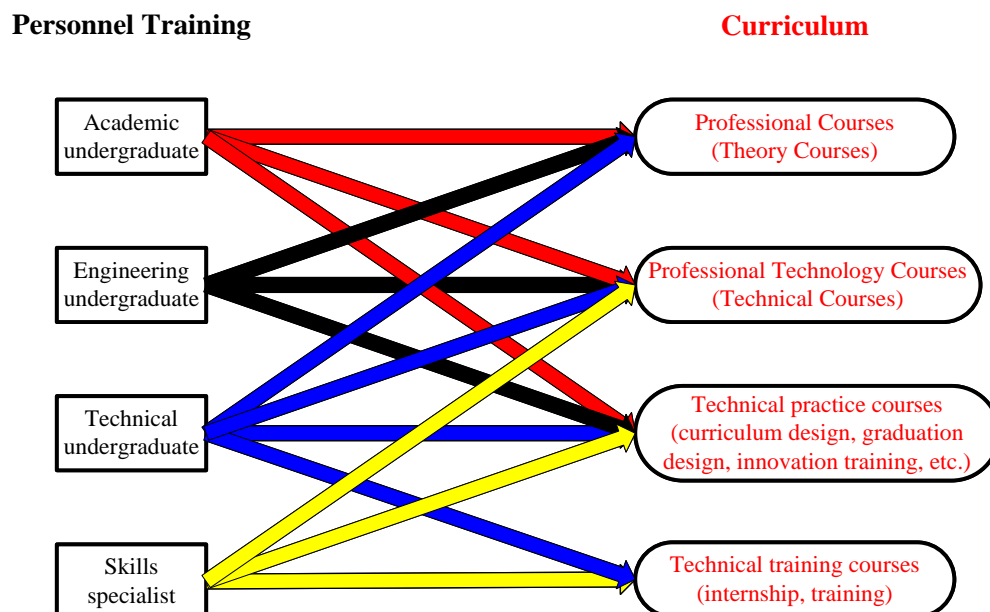


Fig.1. Types of Personnel Training versus Professional curriculum system

(C) Theoretical Courses Construction of Automation Specialty in Applied Technology University

By constructing the knowledge structure of the course group, introducing the case teaching method and setting up the practical experiment platform of multi-course integration, we should co-ordinate the theoretical courses, adapt to the training of applied technology talents of automation specialty.

The curriculum content of Signal, System and Control Theory is outdated and too much emphasis on theory. Applied technical undergraduate should re-integrate the course content. As teaching contents of Signal and System are closely related each other. We consider to integrate the content of Signal, System and Control Theory together. And according to the content of the main line, the latest teaching contents are divided into three parts, which are Signal section, System section, and Control section. The general issues are outlined in the parts of Signal section and System section. Control system-specific analytical methods and the integrated methods are described in the Control section. The common mathematical foundations, such as the three mathematical transformations, are introduced in the fundamentals section. The contents of Signal, the system in the time domain, frequency domain, complex frequency domain are discussed respectively, and then discuss their combination of content, including filters. Related contents of continuous system and discrete system are placed together in each part as far as possible. It should try to highlight the practical problems and strive to do from theory to practice. A suitable experimental platform should also be built.

Suggestions

In view of the contradiction between the talented person's need and the talented person's training, it is imperative to apply the applied technical automation professional education reform.

The primary task of education reform is to reform the curriculum system and attempt to build a new automated curriculum system with great efforts.

The reorganization and integration of the current theoretical courses are the important contents of the curriculum system reform.

Textbook is the carrier of the curriculum. The organization and publication of a series of teaching materials is an important aspect of the implementation of educational reform.

Acknowledgement

In this paper, the research was sponsored by the Professional Education Reform Research of Higher School Automation Professional Teaching Guidance Committee of Education Ministry (Project No. 2014A05) and Ningbo Educational Planning Research (Project No. 2014YGH036).

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