The Construction and Implementation of the Special Feature for Mechanical Design, Manufacturing and Automatization Speciality in Zhengzhou University of Light Industry

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Abstract. To build a specialty which has certain influence in the region and promote the engineering accreditation for the specialty, Mechanical design, manufacturing and automatization specialty of the Zhengzhou University of Light Industry (ZZULI) conducted the exploration and practice in orientation of cultivating talents model, curriculum system improvement and optimization, promoting the combination of school-enterprise, training student's practical ability, strengthening and improving teacher's engineering accomplishment and so on. By highlighting professional characteristics, strengthening specialty construction, and improving engineering accreditation, this specialty and its affiliation discipline possess the foundation and ability to become the characteristic and superiority of specialties and disciplines. The relevant measures and methods provide a reference for the construction of similar colleges and universities.

Introduction

At present, the Mechanical design, manufacturing and automatization specialty in Zhengzhou University of Light Industry is the only mechanical specialty which maintains the characteristics of light industry in the China. Around the orientation of school-running and development planning, three specialized direction, including mechanical design and automation, machinery manufacturing and automation, mechanical and electronic engineering, have been formed. Especially for the direction of mechanical design and automation, with the characteristic of design and manufacture of automatic machinery and packaging machinery, it has a certain influence in the industry.

In constructing our specialty, the training model is constantly studied, adjusted and continuously improved according to the development of the society. In recent years, we analyzed the weak links and causes for the basic engineering quality training of the undergraduates in our specialty; researched the new system and mechanism for cultivating excellent engineers; reorganized and constructed the curriculum system, highlighted the contents of the teaching contents satisfying the needs of the enterprise; focused on enhancing practical teaching ability for professional teachers, explored methods and measures to improve teachers’ own engineering qualities and combine enterprises, education, research; formed a stable teaching practice base with the well-known light industrial machinery manufacturing and application enterprises; constantly supplied and improved teaching contents, applied the latest technological achievements to teaching, cultivated students' innovative ability and practical ability, improved students' learning initiative, strengthened monitoring and evaluation of training process, and enabled students to become senior applied talents as soon as possible. Remarkable achievements, in aspect of the personnel training mode reform, the curriculum system construction, the school-enterprise combination, the practical ability training, the teacher training and team construction, have been made in specialty construction and development, which have been widely recognized by society.
The Orientation of Talent Training Mode

In recent years, the talent training mode for our speciality has been continuously optimized. The undergraduate training plans in the 2017 edition make clear as follows:

1. Adhere to engineering accreditation concept of the student-centered, output-oriented and continuous improvement. The goal of training has been condensed, which emphasis on training students to have high moral values establishment and with the socialist core values.

2. The graduation requirements are refined. The support matrices between the graduation requirements and the training goals, as well as the curriculum system are optimized.

3. Decrease credits and free students from heavy classes, actively develop students' autonomous and lifelong learn ability.

4. Implement people-oriented idea, and pay attention to the individual needs of the students. From the seventh semester, the classification training for the students is carried out, and the students' innovative and entrepreneurial ability is emphasized.

5. In order to ensure the full coverage of the engineering education curriculum system, previous elective courses, such as "General Chemistry", "Modern Business Management", "Drive Control" and other courses, are set to compulsory courses.

6. A number of new comprehensive training links are added in compulsory courses to strengthen students' ability for solving complex engineering problems.

7. Optimize the curriculum system, cut out some old-fashion and less application curriculum content, and supply novel curriculum content with a sense of the times.

The continuous improvement of talent training mode makes students be more adaptable to the needs of economic and social development.

The Continuous Improvement and Optimization of the Curriculum System

In our Specialty development and construction, the core curriculum system is constantly optimized.

Optimize the Curriculum System, Highlight the Characteristics of Light Industry Machinery

Taking the knowledge content and advanced technology needed for core competency training as the goal, we set up the curriculum system cultivating three core competencies of light industry machinery design, manufacture and control in terms of professional knowledge training.

For Automatic Machine (packaging machinery) Design direction (machinery design direction): core curriculum system is built based on modern mechanism innovation design, automatic machinery (packaging machinery) design, modern design methods and means.

For modern light industry machinery manufacturing technology direction (mechanical manufacturing direction): core course installation is built based on mechanical manufacturing process innovation capability, light industry machinery manufacturing skills and modern manufacturing methods, CNC machining technology and other courses.

For modern light industry machinery control technology direction (mechanical electronics direction): core course installation is built based on the mechatronics control technology of light industry machinery, modern electrical control and PLC application technology, robotics and application courses and other courses.

Profoundly Research and Optimize Teaching Contents and Curriculums, Strengthen Ability Cultivation for Knowledge Application

On the main course of cultivating ability of mechanism innovation, the course contents including “Mechanical Theory”, “Mechanism Design”, “Design Methodology”, “Mechanical System Design” and “Industrial Robotics” are integrated and optimized.

On the main course of training innovation ability of machining process, we integrate the course contents including “Mechanical Manufacturing Technology Foundation”, “Mechanical Manufacturing Equipment Design”, “Precision Machining and Special Machining”, “CNC
Technology” and so on. The relationship between the traditional manufacturing technology and the advanced manufacturing technology is optimized.

In the main line of training technology ability of modern electromechanical control, we expand the course contents including “Electromechanical Transmission Control”, "Modern Electrical and PLC”, “Mechano-electrical Unification Design” and other courses. At the same time, comprehensive control technical trains, integrating machine, light, electricity, liquid and gas, are introduced.

In the training of automatic machinery (packaging machinery) design skills, the course contents including “Principles and Design of Automatic Machinery”, “Packaging Equipment and Design” are integrated. We highlight design skill training of light industry machinery design and modern design methods.

**Promoting Combination Mode of School and Enterprise**

After many years of practice and exploration, a curriculum configuration system is established, which includes “continuous engineering education, continuous innovation and practice, and continuous cooperation between school and enterprises”. We increase the content of practice and learning in enterprise, concern the mental practice of engineering system.

**Strengthening the Connection between School and Enterprise**

In order to train qualified talents for the industry, the entire link in specialty construction, including training objectives, graduation requirements, curriculum setting and teaching content optimization, is closely related to industry and enterprises. To formulate the undergraduate training program, enterprise experts are invited to participate. We absorb the experts’ opinions and understand the professional needs of the industry and enterprises. Elites of the industry and enterprise are invited to give special lectures in our university.

By engaging business experts as tutors for postgraduates and undergraduates, students have more opportunities to get close to engineering practice. In the graduation design of the undergraduate, we work closely with the domestic food packaging machinery research institute and the packaging machinery manufacturing company to design the real subject.

**Building Multi-channel Practical Training Bases and Cultivating the Practical Ability of Students**

**Build a Stable Teaching Practice Base with the Famous Light Industry Machinery Production Enterprises in China.** Our speciality is combined with famous enterprises to build a stable practical teaching base outside the school. More than 10 enterprises, including Henan Frestech Electrical Appliance Co. Ltd, Xuchang tobacco machinery Limited Co. Ltd, and so on, are our practice teaching base out of school.

**Exploit and Utilize Domestic and Foreign Resources and Channels.** Utilizing introducing products and cultivating local needs of international famous enterprise, We actively cooperate with well-known foreign enterprises to improve the level of professional laboratory construction, and pay close attention to the international development trend of related products and technologies.

**Cooperate with Well-known Universities to Integrate Resources and Form Complementary Advantages.** Under the guidance of the technical personnel from Huazhong University of Science and Technology, a “Research Center of Robot” has been established. In cooperation with key universities such as Zhejiang University, we explored methods and measures to cultivate the innovative ability of undergraduate and graduate students.

**Training Practical Ability**

We strengthen the cultivation and construction of the practice base with characteristic skills inside and outside school.
Constructing a Spiral Process-oriented Practical Teaching System

We use the appropriate training mode for different grades students, construct a spiral process of practical teaching system, and gradually strengthen the practical ability of students.

Guiding Students to Actively Participate in Teachers' Scientific Research Projects

Among the scientific research projects attended by the students, there are the National Natural Science Foundation project, the national science and technology support plan, the science and technology project in Henan Province, etc. By actively participating in high level scientific research projects of teachers, students can cultivate their ability of innovation and scientific research.

Encouraging Students to Actively Participate in a Variety of Innovative Competitions

In all kinds of science and technology innovation activities for students, students are encouraged to apply for the project and actively participate in the competition, which stimulate students' innovative enthusiasm and innovative potential.

Strengthening the Students' Producing Practice, Highlighting the Comprehensive Practice of Curriculum Design and Graduation Design, and Facing the Practical Project

Through the producing practice in stable producing practice base, students acquire professional knowledge of production process, understand the relationship between science technology and economy, organization and society in the process of production management, and master the actual characteristics of specific production enterprises. Students are trained to contact and solve practical problems of production by highlighting selected topic guide role of the curriculum design and graduation design.

Condensing the Teaching Research Results, Strengthening Hands-on Ability of the Teaching Process

In the teaching of course, we introduce three dimensional digital design, computer simulation of design and manufacture process, and other modern design methods and platforms establish new teaching mode combined traditional knowledge with modern technology.

Integrating of the Teaching and Experimental Content of Professional Courses

The basic experiment, the design experiment and the comprehensive experiment are rationally planned. Through the opening of the laboratory and various innovative competitions, the practical teaching system in class and outside school is realized.

Through the opening of the laboratory and the establishment of a group of makes, students will be encouraged to carry out various innovative practices in the laboratory and participate in a variety of innovative competitions. Three-dimensional experimental teaching system is realized in class and after class, on campus and off.

Setting up a Characteristic Laboratory, Creating an Innovative Practice Platform

The advanced manufacturing technology laboratory of modern light industry machinery is constructed on the basis of virtual assembly and the Internet manufacturing. Based on parallel (serial) joint robot system, a laboratory for material inspection and packaging of automatic mechanical in light industry is constructed. At the same time, on the basis of the manufacturing execution system, the control technology laboratory of the light industrial equipment production line is constructed. What’s more, based on the mechanical equipment test platform, typical fault diagnosis and performance prediction test equipment, a laboratory for testing and analyzing the performance of light industry machinery is constructed. Modern light industry machinery and technology laboratory are constructed with the key equipment and technology of the typical packaging machinery and production line, food machinery and production line.
Strengthening and Improving the Engineering Quality of Teachers

In order to strengthen and improve the teachers' engineering quality, teachers are encouraged to enter the enterprise or strengthen cooperation with enterprises. Through selecting teachers to work part-time in enterprises and research institute, engage in product development, production and manufacturing. The professional backbone teachers have made remarkable achievements in the cooperation of enterprises, universities and research institutes. Young teachers are sent to high-level universities in the United States, Britain, Germany as exchange visitors, focusing on cutting-edge technology in international science and technology.

The Effect of the Construction of the Major Characteristics

Taking the design, manufacture and control of light industry machinery as the characteristic, the speciality for Mechanical design, manufacturing and automatization in Zhengzhou University of Light Industry is based on regional economic construction and social development, aiming at the current situation and demand of light industry equipment development. By highlighting professional characteristics, strengthening specialty construction, and promoting engineering accreditation, this specialty possesses the foundation and ability with a certain influence in China.

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