

Cultivating Engineering Innovation Ability Based on Optoelectronic Experimental Platform

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Abstract: As the supporting experimental platform of the Xi'an Technological University education reform experimental class, "optical technological innovation experimental platform" integrated the design and comprehensive experiments of the optical multi-class courses. On the basis of summing up the past two years teaching experience, platform pilot projects were improve. It has played a good role by making the use of an open teaching model in the cultivating engineering innovation spirit and scientific thinking of the students.

Key words: optoelectronic technology; experimental platform; innovative spirit; practice teaching

Introduction

Innovation is the soul of a nation's progress, also is the inexhaustible motive force for the prosperity of a country. Engineering innovation is one part of the national innovation system and has a very high the status in the country. At the same time, innovation is also the soul and power of the engineering development. Innovative talents should have the spirit of innovation and unity cooperation, but also have a strong ability of practical, engineering application, comprehensive, scientific research. They can analysis and solve problem independently. All of these abilities need to combine theory with engineering practice teaching.

We have realized that engineer only have narrow professional knowledge does not guarantee their innovative ability. "Thick foundation, Wide caliber", "Quality Education", "Subject Crossing" and so on were proposed in recent years in order to improve the quality of higher education and cultivate the talents with profound knowledge, good quality and high ability [2]. One of the prominent features of Xi'an Technological University teaching reform is to achieve the diversification of personnel training mode. So, the "photoelectric experimental class" was set which took the method of individualized to these students, trained them with the basic quality of strong creative scientific research and made them up to research-type professionals. Based on these methods, we also developed the photoelectric technology integrated experimental platform, the effective integration and optimization of optical experiment course. The research and construction of comprehensive training engineering innovation ability of photoelectric detection system research and development ability training, involved the courses of "teaching reform project", "sensor", "photoelectric technology basis", "photoelectric signal detection" and "photoelectric imaging technology", etc., provided a comprehensive experimental platform, created intelligent photoelectric laboratory environment, enhanced the learning interest of the students.

1 Understanding of innovation

It has long been recognized that engineers with limited expertise do not guarantee the engineer's ability of innovate. To the engineers, the ability of solving problems implies an assumption that they are already used in engineering science knowledge to solve the technical problems. This assumption does not answer whether they

have the ability to handle non-standard social and technological process. We can be divided the ability into two kinds, one is "hard power" and one is "soft power". Here, "hard ability" refers to a basic professional knowledge and basic literacy, and the "soft ability" refers to all of these abilities not included in hard ability, and it is a kind of habit occupation behavior. "Hard ability" is the hard core of its relative to a professional position, it has a certain range within a certain minimum requirements. If it does not meet the minimum requirements, it will not be think as a professional engineer. It mainly includes the analysis ability of the basic mathematical, a professional basic knowledge and personal learning and application of knowledge. "Soft power" is not meant to be dispensable, but it has a personalized development of space, according to each person's environment and the ability of different interests. The same profession can show a completely different development. For example, innovation ability, some people may be good at hardware manufacturing innovation, some people may be good at software process innovation, and others may be obsessed with the theory of innovation. Based on the above understanding and understanding of innovation ability, we have developed the innovation ability training platform based on the photoelectric detection technology. The following several main aspects of the platform are introduced.

2 Innovative experimental platform

The experiment platform of photoelectric technology innovation is set up based on the course syllabus and the requirements of the training objectives, such as "the sensor technology and application", "the photoelectric technology foundation", "the photoelectric signal detection" and "the photoelectric experimental class", etc., the basic experiment teaching of recent years, a large number of the optoelectronic devices. By combining with the teaching content of modern photoelectric detection technology and MCU technology, we use the method of opening design of research and development. The experimental platform includes light, machine, electricity and other fields, also involves sensors, photoelectric detection, electronic circuit analysis and other courses. Through the application of skills training to enable students master the professional knowledge in practice, cultivate students' innovative spirit and practical ability, to guide students the methods of study and innovative experiment. Hence, the students' ability of scientific research and training of undergraduate teaching are combined organically.

2.1 Step by step experimental system

The step by step experiment system and experiment project are divided into three level according to the foundation, the synthesis and the design. This new system has constructed the new experiment system and the experiment project. In this way, the students will not feel too much difficulty in the course learning in school and produce weariness. It will help students lay a good foundation, consolidate knowledge, so that the experiment ability can be improved. The content of the experiment is representative and each experimental project embodies different aspects of training, such as hands-on ability, system analysis and design ability, comprehensive innovation ability and so on.

2.2 Modular design content

Based on the practicability experiment of optoelectronic devices, a general experimental module is designed to extend the content of the experiment, and then extend the development of the depth and breadth of the experimental project. The module has a strong scalability. The circuit mode in experimental platform has been developed completely, including optical signal detection circuit, optical receiver module, photodiode receiver, photosensitive resistor composed of light control circuit; signal conditioning circuit includes a preamplifier circuit with adjustable gain, high pass filter and low pass filter; display alarm circuit comprises a digital tube display

module, a 1602LCD display module, a buzzer alarm module, a music chip driver and a working module; counting, speed measurement and frequency measuring circuit; Signal chip related circuits include the acquisition of temperature and humidity signal, the smallest single-chip microcomputer system, digital signal output and display module; There are some other common modules: gas detection circuit and square wave generator circuit.

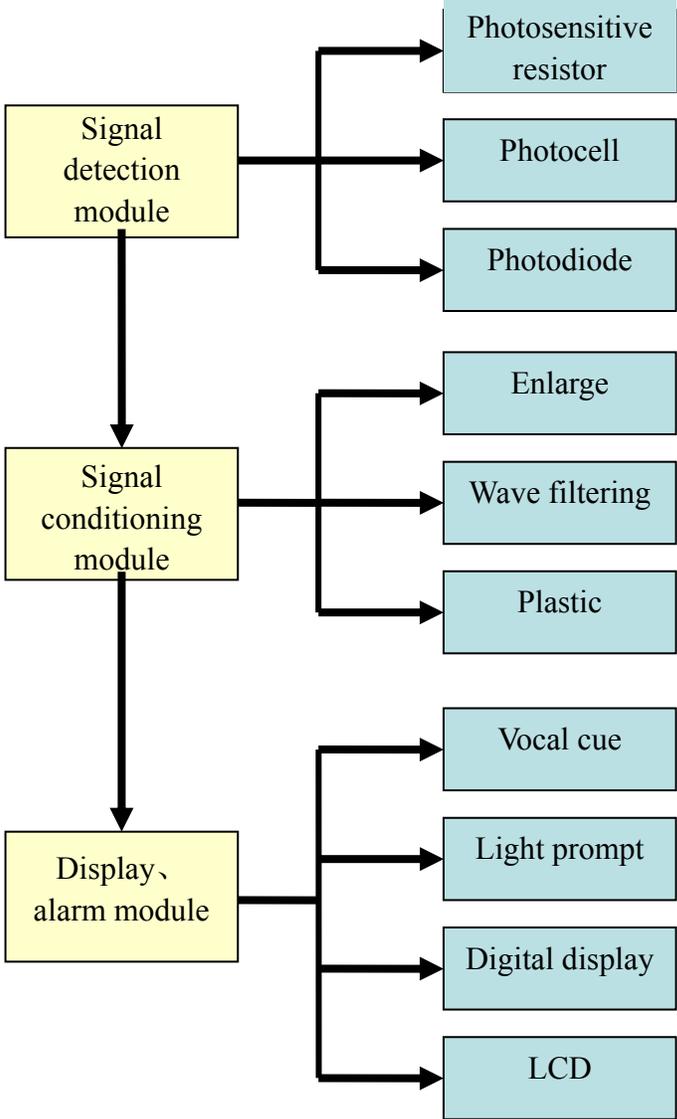


Fig. 1 the schematic of experimental module

2.3 Innovative experimental projects

The experimental content has been changed, and the comprehensive and innovative experiment has been strengthened. The experimental items can be set up as follows: the design of digital optical power meter ;design of multi-channel digital responder; design of combustible gas alarm; design of harmful gas detection system ; design of photoelectric speed testing system; design of photoelectric pulse detection system; design of laser ranging system; design of solar powered supply control system; design of automatic control system for solar automatic battery; design and

manufacture of intelligent vehicle tracking controller; design of intelligent control system for household appliances. The precise test system based on microprogram control unit (MCU) temperature; frequency meter based on single chip design; intelligent electronic anti-theft device design; intelligent vehicle tracking controller and so on. The content of these experiments involves many aspects of life and the field. By the practice of these experiments, students' actively explore consciousness can be stimulated greatly.

3 Experimental platform features

3.1 Full-featured

The optical communication, information control, photoelectric detection technology used in light-emitting devices, such as pieces of photoelectric detector photoelectric principle of various devices are integrated in one platform. It will be very easy for students to confirm and explore the optoelectronic properties, performance parameters of the comprehensive experiment. It also provide a variety of application modules of optoelectronic devices, including photosensitive resistance, light battery, photoelectric diode and phototransistor, commonly used in a variety of voltage and current digital meter, power supply and components required, and it equipped with various power supply interface.

3.2 Modular design

The experiment is designed in a modular style, which is more flexible for the design of complex and powerful system. And it can be carried out for further development, expanding the circuit module and its functions, so as to improve the students' ability to practice and innovation.

3.3 Advanced practical

The advanced practical IC card, display and other optical devices are fixed in the experimental platform, such as infrared remote control, LCD, digital display, voice circuit, photoelectric coupler, optical fiber and so on. Students can finish some complex practical circuit without external circuit on this platform.

3.4 With strong interest

Experimental platform with daily instance, such as automatic doors, automatic lighting control, electronic gate, and product output online counter. These contents not only can effectively stimulate the enthusiasm of students, but also enhance the students' interest and ability to understand things away. The project involves: alarm, infrared remote control, photoelectric counting, light control, tracking and so on. These projects can cultivate the students learning interesting and explore the spirit of the unknown world.

4 Open experimental teaching mode

The reform of open experiment teaching based on the "photoelectric technology innovation experiment platform", the guiding ideology of reform is strengthen the foundation, develop thinking, and cultivate ability. The open experiment teaching system is established, which is composed of three basic levels: "basic experimental skills training, comprehensive design ability training and creative design ability training". In the course of "photoelectric technology foundation",

"photoelectric detection technology" and "single chip microcomputer principle" and so on, the experiment platform of photoelectric technology innovation and the teaching system are adopted. The teaching effect is better than before. The experimental platform is used for one of the compulsory courses contents in the experimental class, also use for an elective ordinary classes. Students can freely and independently design their working plan, and build their own experimental system. It is true that this kind of platform can meet the needs of students at different levels, especially for the top students to create a good learning and Practice the opportunity.

Conclusion

By optimizing the teaching content, combining with the new content of scientific research, improving the teaching methods and means, composing of a variety of circuit system experimental platform for research and development, students can independently design scheme for the cultivation of students' practical ability, in order to cultivate students' practical ability and creative ability, a multifunctional experiment platform was built. Modular design concept provides more resources for students. But how to design the system and demonstration program still requires students to learn and research; using modern means to reform and improve the experimental equipment, greatly reducing the cost of experimental equipment, which has been excavated and the maximum use of resources.

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