

# ***"Packaging and Sensing" Course Group Ideological and Political Reform and Practice***

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**Abstract:** The course group "Packaging and Sensing " is composed of multiple core courses for electronic science and technology majors. According to the connotation of curriculum ideological and political education, it has been proposed to combine ideological and political education with curriculum content to carry out ideological and political work in this curriculum group. Excavate and expand the ideological and political elements contained in the electronic packaging and sensing technology curriculum group. Through reasonable teaching scheme design, adopt a model of combining theory and practice, add curriculum ideological and political elements to chip products or sensors in daily contact, and promote the theoretical knowledge of the curriculum group and ideological and political theory courses to go hand in hand and cultivate people in a collaborative manner. Through the ideological and political teaching reform of the curriculum, the teaching effect of the "Packaging and Sensing Technology" course group has significantly improved, enhancing students' interest in learning, and improving their performance.

## **1. Introduction**

At the 2016 National College Ideological and Political Work Conference, it was pointed out that college teachers should make good use of classroom teaching, and various professional courses should go hand in hand with ideological and political courses to form synergy [1]. From a broad perspective, the understanding of curriculum ideological and political education is to construct a concentric circle of ideological and political education with theoretical courses of ideological and political education as the central and basic courses, professional courses, and educational activities of ideological and political education as the outer circle; From a narrow perspective, curriculum ideological and political education means that both basic and specialized courses should jointly play their ideological guidance and political education functions, and promote students to form a correct world outlook, values, and outlook on life [2,3]. Both in the broad and narrow sense, higher requirements are put forward for non ideological and political teachers. If teachers do not have sufficient ideological and political awareness or are not clear about the ideological and political objectives and elements of the courses they teach, they cannot produce good ideological and political education results. Therefore, curriculum ideological and political education is also a topic of exploration and practice for teachers of non ideological and political courses such as basic

courses and professional courses. At present, teachers emphasize professional knowledge interpretation in the classroom, ignoring students' ideological and political education, and not organically integrating ideological and political content. There is a phenomenon of "two skins" between ideological and political content and professional course content, which cannot achieve a nourishing and silent educational effect.

The course group "Electronic Packaging and Sensing Technology" consists of core courses in electronic science and technology, including electronic packaging and assembly, sensor principles and technology, electronic functional materials and devices, and semiconductor device physics [4]. The ideological and political effects of curriculum groups must have the effect of enhancing the interest of the curriculum and achieving equal emphasis on moral education and cultivating people. Therefore, in combination with the ideological and political requirements of the course group, the ideological and political objectives of the course are determined as follows: combining the daily application of chip integrated circuits and sensors with professional knowledge learning to stimulate students' personal ideals and social responsibility; Combining professional basic courses with education that carries a correct world outlook and values, cultivating morality and cultivating people; Cultivate engineering students to care about society and learn technology in a unified, patriotic and dedicated manner.

## **2. Ideological and Political Content of the Curriculum Group**

As a professional course, "Electronic Packaging and Sensing Technology" is highly theoretical, and has a wide range of processes and applications. A strong theoretical foundation refers to the study of the principles of carrier generation and transmission in semiconductors, based on electricity, optics, heat, mechanics, magnetism, and acoustics, and the comprehensive use of electronic technology fundamentals, electronic materials, and computer technology to solve various chip and sensor application problems. The course requires students to master the basic concepts, principles, and theories of semiconductor device physics, sensor principles, and electronic packaging principles, and understand the internal relationships among various electronic effects, optoelectronic effects, electromagnetic coupling effects, etc. Students feel quite dull and abstract in the process of theoretical learning. The process and application refers to the preparation and application of multiple types of electronic products in the course group. After learning a certain knowledge module, students should take the relevant electronic products in daily life as an example to assemble and apply them to achieve the learning effect of testing theoretical knowledge and practical operation [5]. According to the syllabus of the course group "Electronic Packaging and Sensing Technology", the teaching content mainly includes the following six modules: basic knowledge of semiconductor materials, working principles of semiconductor devices, sensor results and working principles, electronic packaging processes, packaging performance testing, and electronic device applications. In the process of imparting theoretical knowledge, the ideological and political elements in the content of the course group have been fully explored, with specific contents as follows:

(1) In recent years, the chip technology debate at home and abroad has started to cultivate students' core values and achieve value leadership. Starting from the ZTE incident, Huawei incident, and the Sino American integrated circuit chip dispute, this article explains the current domestic and international situations faced by the development of China's integrated circuit industry, guides students to enter the integrated circuit (chip) industry, and takes revitalizing China's integrated circuit industry as its own responsibility, and permeates ideological, political, and moral education [6].

(2) Combining our national spirit, we will carry forward the spirit of craftsmanship and achieve a significant improvement in the level of electronic components in China. From helping to solve problems, to two bombs and one satellite, manned spaceflight, high-speed rail, etc., it demonstrates the inheritance and development of craftsmanship spirit, improves students' innovation ability, accelerates the construction of a powerful country in the manufacturing of electronic components, and promotes high-quality development of the industry.

(3) Combining the moving deeds of China's industry elites, it emphasizes family and country feelings and social responsibility. Starting from well-known scientists and industry elites such as Qian Xuesen and Liang Mengsong, this article discusses the need for practitioners in the electronics industry not only to have a global perspective in technology, but also to have a strong sense of home country in industrial products. Science and technology have no national boundaries, and scientists have a motherland.

(4) Encourage students to think and improve the level of electronic products to serve the production and life of people around the world.

### **3. Ideological and Political Content Practice**

#### **3.1. Starting From the Chip Competition and Combining the Domestic and Foreign Industry Situation, Discussing Value Leadership**

Semiconductor integrated circuit components are the "rice of industry", while electronic packaging is one of the three major semiconductor industries. Its relationship with the consumer, communication, computer, and aerospace industries is shown in Figure 1. In Electronic Packaging and Assembly and Semiconductor Device Physics, electronic process flow is the core content of the course. Due to the current controversy between China and the United States over chip technology, the relevant content, technology, and terminology in this course have repeatedly appeared in the news media. The emergence of relevant knowledge points in the course is extremely easy to resonate with students, and is also an excellent time point for conducting course ideological and political work. Starting from the ZTE incident, Huawei incident, and the Sino American integrated circuit chip dispute, this article explains the current domestic and international situations faced by the development of China's integrated circuit industry, cultivates students' abilities in integrated circuit (chip) packaging, testing, and application, and takes revitalizing China's integrated circuit industry as its own responsibility to improve students' innovation ability [7]. The well-known Qian Xuesen returned to support the development of New China through countless hardships for the cause of New China. Liang Mengsong, a master of the integrated circuit industry, has undoubtedly contributed his own strength to the development of China's integrated circuit industry.

Printed Circuit Board (PCB) is the most commonly used assembly substrate in electronic products, consisting of glass fiber, resin, copper foil, and various additives. For a long time, the international standard of PCB has been monopolized by Europe, the United States, and Japan, which has caused great resistance to the development of China's PCB industry. Over the past four years, Guangdong Shengyi Technology Co., Ltd. has broken through numerous difficulties and presided over the formulation of IEC61249-2-41 "Limited Burning Epoxy Cellulose Paper/Glass Fiber Cloth Copper Clad Laminate for Lead Free Assembly" and IEC61249-2-42 "Limited Burning Epoxy Glass Fiber Paper/Glass Fiber Cloth Copper Clad Laminate for Lead Free Assembly". This is a breakthrough in China's international standard for epoxy resin printed circuit industry, greatly promoting the industrial upgrading of the PCB industry will have a profound impact on the entire industry. China's electronic products started relatively late, and many fields are far behind developed countries in Europe, the United States, and Japan. They are extremely vulnerable to unreasonable demands or "neck sticking" from them. We can use network resources to broadcast

technology documentaries on the chip industry to enhance students' enthusiasm for learning, thereby stimulating students' technological self-confidence and professionalism.

### 3.2. Discuss the Importance of Craftsmanship Spirit Based on Component Defect Analysis

The "Manhattan" phenomenon is caused by the uneven surface tension of the solder paste on the pads at both ends of the passive component during reflow soldering, which manifests as the component partially or completely erecting, like the skyscrapers in Manhattan, New York, USA. The "Manhattan" phenomenon is a problem related to vapor phase (condensation) reflow welding, caused by the rapid heating rate of vapor phase heating and other reasons. And with the reduction of passive components, vapor phase reflow soldering, nitrogen reflow soldering, and the dismantling of new components and PCB boards, the "Manhattan" phenomenon occurs frequently. If one end is rapidly reflowed and wetted, and the force forming the solder joint can pick up the component or make it stand upright, while the solder at the other end has no chance to melt, it is not possible to grip the component end through the pad surface tension between its own component wetting section and the wet pad on the circuit board. How to solve the "Manhattan" problem? This puts forward higher requirements for integrated circuit packaging engineers, requiring excellence in the control of each step of the processing process. Just as in ancient China, the bullock kept all parts of the ox's body in mind, 'I haven't seen the whole ox', and if the knife was inserted into the ox's body, it would be 'without thickness and with ease'. China's Space Administration requires that various components of rockets, satellites, and space stations be repeatedly polished to ensure quality without loss, so as to achieve high-quality development of China's aerospace industry [8]. Through video materials, IGBT chips and super engineering, we are reminded that college students should have the spirit of a great craftsman, practice repeatedly, accumulate over time, master the objective laws of things, and improve product quality.

### 3.3. Combining the Principles of Semiconductor Devices, Talk about Personal Success and Social Development

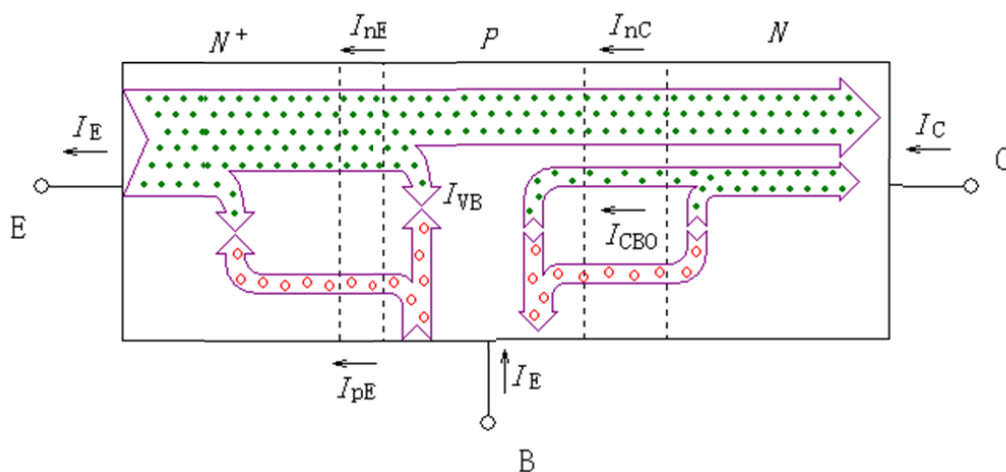


Figure 1: Composition of bipolar transistor terminal current

Electrons are the main carriers of NPN bipolar transistors (Figure 1). The emitter current  $I_E$  is composed of the electron current  $I_{nE}$  injected into the base region by the emitter region and the hole current  $I_{pE}$  injected into the emitter region in the base region, i.e.  $I_E = I_{nE} + I_{pE}$ . The base current  $I_B$  is obtained by adding the hole current  $I_{pE}$  injected into the emitter region in the base region and the composite current  $I_{RB}$  in the base region, and subtracting the reverse saturation current  $I_{CBO}$ , which is

$I_B = I_{pE} + I_{RB} - I_{CBO}$ . The collector current  $I_C$  is obtained by adding the electron current  $I_{nE}$  injected into the base region from the emitter region and the reverse saturation current  $I_{CBO}$ , and subtracting the base recombination current  $I_{RB}$ , i.e.  $I_C = I_{nE} - I_{RB} + I_{CBO}$ . Therefore, the electron current undergoes two losses, their magnitude relationship being  $I_E > I_{nE} > I_C$ . The amplification effect of a transistor depends on the current gain of the bipolar transistor current. Like bipolar transistor currents, personal success depends on many factors. Success can only be achieved through a combination of talent, effort, and opportunity. The same is true of technological development. Significant progress in science and technology can only be achieved with a strong investment in talent, material resources, and financial resources. As Academician Zhao Zisen said, "Technology is always constantly developing, and if we do not hurry to advance, we will lag behind the people." Enterprises and college students should have a sense of crisis and continuously improve their product competitiveness and ability level.

### 3.4. Combining the Application of Electronic Devices in the Internet of Things to Improve People's Living Standards

In recent years, the 5G network, which people have close contact with in their daily lives, is only known by the general public to have higher data transmission capabilities, but little is known to have wider applications in the Internet of Things and intelligent ecology. The teacher explained the development of smart home and smart factory, from the light sensitive voice control lamp that got up in the morning, the smart rice cooker soybean milk machine in the kitchen, the electric car unlocked by mobile phone, and the Internet of things smart production of enterprises. Students can understand the application of chips and sensors in intelligent ecology by videos. How does a light-sensitive-voice-controlled lamp work? Firstly, the photosensitive sensor needs to determine whether the brightness of the room needs to be supplemented by turning on the lights. Secondly, the force sensitive sensor receives sound information to turn on the light. The application of electronic components in daily production and life not only frees people from production lines, but also improves their quality of life [9].

Intelligent agriculture and greenhouses enable people to eat a variety of vegetables in winter [10]. There are also sensors in the non-electrical signal measurement and control of environmental parameters in greenhouses. Nowadays, satellites, high-speed railways, and nuclear power have become a business card in China. It is important to tell students that the application range of the knowledge they have learned can range from aviation and aerospace to daily applications. Students should study hard and become successors with comprehensive moral and intellectual development.

## 4. Analysis of Ideological and Political Effects of Courses

Through the introduction of ideological and political courses, positive ideological and political elements have been added to the "Electronic Packaging and Sensing Technology" classroom, resulting in a good response from students and a significant improvement in teaching effectiveness.

(1) In the classroom, students have received subtle ideological and political guidance, improving the learning atmosphere of professional courses, making the classroom more interesting and full of vitality.

(2) Carry out situational teaching of engineering cases, cultivate students' spirit of unity and cooperation, and guide them to attach importance to engineering professional ethics and industry regulations.

(3) After class, watch the content of optoelectronic products in documentaries such as "Craftsmen of a Big Country" and "Heavy Weapons of a Big Country" to stimulate students'

patriotism and enhance their sense of identity and mission towards their majors and even their nationalities.

## 5. Conclusions

The course group "Electronic Packaging and Sensing Technology" is a number of highly specialized professional courses, but its moral education function cannot be lost. We integrate ideological and political content into classroom teaching, consciously, systematically and systematically integrating professional teaching content and ideological and political elements. Integrate core values into the classroom, and cultivate students' professional ethics, sense of family and country, and responsibility and mission. Curriculum ideological and political construction requires teachers to consciously cooperate with ideological and political workers to do a good job in educating people, build a "big ideological and political" pattern, and achieve the goal of cultivating high-quality talents.

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