

# *Ideological and Political Teaching Practice of the Course "Principles and Applications of Single-chip Computers" for Marine Electrical Engineering*

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**Abstract:** Based on our school's positioning of building an applied university with marine characteristics, and closely centering on the training objectives for applied talents in the marine electrical specialty, we have determined the three-level training objectives of value cultivation, knowledge level, and ability cultivation for the course "Principles and Applications of Single Chip Computers". A "five dimensional integrated" curriculum teaching system of "theoretical teaching+experimental teaching+practical teaching (i.e., major innovation projects)+second classroom+ideological and political micro classroom" is constructed with students as the center. Deeply explore the ideological and political elements of the course in each teaching link, and integrate them into the course teaching system, proposing the ideological and political characteristics and innovative methods of the course. This article presents a typical case of integrating ideological and political elements into the teaching content of the course, fully embodying the goal of achieving all-round education for all staff, the entire process, and all aspects. After several rounds of ideological and political reforms in the course "Principles and Applications of Single Chip Computers", a synergistic effect of cultivating morality and cultivating people has been formed. It has greatly improved the teaching effect and has been praised by experts and students.

## 1. Introduction

In order to adapt to the development trend of ship intelligence in the national maritime field, the Ship Electronic and Electrical Engineering major has implemented the "development with connotation, specialty, and innovation" strategy. It is based in Guangdong, facing the South China Sea, radiating across the country, and relies on the national strategy of building a maritime power to establish a high-level maritime university with distinct marine characteristics as its goal. The major aims to cultivate high-quality, versatile ship engineering and technical professionals with an international perspective, social responsibility, independent learning ability, practical skills, and

innovative spirit, serving the national maritime industry and local economic and social development [1]. It meets the functional requirements specified in the International Maritime Organization's STCW Convention, including "Electrical, Electronic and Control Engineering," "Maintenance and Repair," and "Ship Operation Control and Crew Management." This means that students are not only capable of modern ship electronic, electrical, and control system operation, maintenance, repair, and management, but also engaged in product development, engineering design, supervision, and technical support in the field of ship electronic and electrical engineering. Therefore, this major cultivates versatile and advanced ship engineering and technical professionals with broad expertise [2]. Students mainly learn knowledge of ship power plants, ship systems, and equipment, master the basic theory of intelligent ship technology and design methods of ship electronic and electrical systems, and have the basic ability to engage in application development and technical management in ship electronic and electrical engineering and related fields. The course "Principles and Applications of Single Chip Computers" is an important professional basic course for this major.

This article discusses the process and experience of ideological and political construction of the course "Principles and Applications of Single-chip Computers" for marine electricity majors from five aspects: course introduction, teaching content, overall ideological and political thinking, characteristic methods and typical cases, ideological and political micro-class, effect and evaluation.

## 2. Course Overview

The course "Principles and Applications of Single Chip Computers" is a basic course for majors in electrical engineering, electronic and electrical information technology, intelligent instrumentation, and automation control. In recent years, with the development of the shipbuilding industry, the concept of intelligent ships has been deeply rooted in the hearts of the people. The development of single-chip technology has further promoted the development of intelligent ships. The content of this course is complex, and it is a "three strong" course with strong applicability, practicality, and comprehensiveness. According to the characteristics of students majoring in marine electricity, the main teaching content of the course is formulated based on their aptitude. Including AT89S51 single-chip microcomputer hardware resources and working principles (including input and output, interrupt, timing/counter, etc.), C51 language programming, development and simulation tools (Keil C51 and virtual simulation platform Proteus) from ATMAL. Combining various design cases and properly integrating them into the curriculum ideology and politics, students can learn and master the hardware and software development of single-chip computers, and can conduct general program design. In addition, they can use single-chip technology to provide technical support for the development of intelligent ships.

## 3. Teaching content and overall ideological and political thinking of the course

### 3.1. Teaching content

The teaching content includes 5 parts according to class hour restrictions. Part 1 Introduction (Chapter 1), Part 2 Hardware Structure of 51 Series Single Chip Computers (Chapter 2-4), Part 3 Assembly Language (Chapter 5-7), Part 4 Programming Methods and Comprehensive Application Examples (Chapter 8-13), Part 5 Interrupt System and Timing/Counter (Chapter 14).

The training objectives of Part 1 are to cultivate students' spirit of contract and awareness of rules, strengthen institutional confidence, develop patriotic enthusiasm, and serve the country.

The training objectives of Part 2: to enhance students' enthusiasm for loving the motherland, enhance their sense of national responsibility and mission, enhance their learning motivation, and be prepared and determined to contribute to the motherland and the people.

The training objectives of Part 3 are to cultivate the awareness of industrial power, continuously stimulate the awareness of scientific innovation through hard learning, and gradually form a sense of never abandoning or giving up when encountering difficulties to climb the scientific peak forever; Understand the relationship between industrial development, environmental protection, and energy conservation, and consider environmental protection as one of the important aspects of sustainable development; In engineering design, it is necessary to strive for excellence, and more importantly, to have the perseverance to overcome difficulties.

The training objectives of Chapter 4 are to have a global awareness and rigorous scientific attitude towards engineering issues; Strengthen students' sense of mission to take root in their hometown and build a local place; Encourage students to develop in intelligent oceans.

### **3.2. Overall ideological and political thinking of the course**

Based on the construction of "this section of channel" with marine characteristics in our school, closely surrounding the "responsibility field" of marine electrical engineering specialty, we will construct a "five dimensional integration" curriculum teaching system of "theoretical teaching+experimental teaching+practical teaching (i.e., big innovation project)+second classroom+ideological and political micro classroom" with students as the center.

## **4. Characteristic methods and typical cases**

### **4.1. Featured Methods**

(1)In terms of teaching form, online (Superstar Learning) and offline (Smart Classroom) hybrid teaching is adopted, and the introduction of online course learning improves the width and breadth of offline learning, which can enhance students' concept of lifelong learning.

(2)In terms of teaching content, combining with the restructuring of the teaching content for the ship electricity major, we deeply explore the ideological and political elements of the curriculum, so that the ideological and political curriculum runs silently through the curriculum, and cultivates patriotism education and four self-confidence.

(3)In terms of teaching methods, the method of "classroom teaching+minimum system board of single chip microcomputer+simulation tool+experimental box" is adopted for group discussion to cultivate students' teamwork spirit, enhance their self-confidence and establish a sense of responsibility.

(4)In the experimental practice link, different experimental topics are set up for students at different levels, so as to teach different students, so that students at different levels can gain knowledge through the experimental link, and promote the learning of theoretical courses.

(5)In the second class, the focus is on cultivating students' sense of innovation and the craftsman spirit of excellence.

### **4.2. Typical Cases**

#### **Case 1: Introduction**

The teaching activities are derived from Chapter 1, Introduction: A brief introduction to the development history of domestic and foreign microcontrollers. According to the global competition pattern of single chip computers in 2021, ask students questions and discuss them in groups. Some students commented on "Revitalizing China, everyone has a responsibility", some students commented on "I hope to build a Huawei like enterprise in the electronic field and establish a Chinese brand in the microprocessor field in the future." Some students commented on "Although the market

share of domestic single-chip computers is very low, China's single-chip computer application level is world-class." These discussions have strengthened students' patriotic consciousness and stimulated their learning initiative and internal drive.

#### Case 2: Application of Single Chip Microcomputer Technology

The teaching activity comes from Chapter 12: Design of Single-chip Microcomputer Controlled Stepping Motor and DC Motor: Control the working principle of stepping motor and DC motor; Circuit design and programming. Stepping motors and DC motors are widely used in speed, position, and other control fields. For example, the production line of epidemic prevention masks, China's first self-built aircraft carrier, "Shandong". Through the explanation of mask production line, it extends to the prevention and treatment of "COVID-19" in China, reflects the superiority of the socialist country system with Chinese characteristics, and strengthens the confidence of the system. Improve national pride and enhance students' awareness of being a powerful country in industry and technology.

#### Case 3: Integrated Application of Single Chip Computers

The teaching activity is derived from Chapter 13, Application System Design and Debugging: Application System Design Steps and Methods, Application System Hardware Design, and Application Program Overall Framework Design. In addition, the current popular simulation development tools for single-chip application systems, Keil C51 and Proteus, are introduced to develop and debug single-chip application systems. The classroom teaching process refers to national and provincial college students' innovation and entrepreneurship projects and teachers' scientific research projects.

### 5. Ideological and political micro classroom

Take "lighting up an LED lamp" as an example to demonstrate a micro ideological and political classroom. In this 10 minute micro class of ideological and political education, the video of restarting the lighting show 76 days after the closure of "Wuhan" begins. It introduces the definition of LED lights, completes the understanding of the LED lights and their schematic diagrams in the SCM suite, and briefly understands the programming language and ideas. You can use a single chip computer to illuminate a small light. And make students feel the superiority of the socialist country system with Chinese characteristics when facing the "COVID-19", and imperceptibly complete ideological and political education. The course team recorded 25 micro classes of ideological and political education for about 8-10 minutes, truly achieving the goal of "curriculum containing ideological and political education, ideological and political education curriculum", and quietly completing all-round and multi-dimensional education.

### 6. Effect and Evaluation

After the course was completed, an anonymous "Questionnaire on the Integration of Ideological and Political Elements into the Course" was conducted to students in Learning Pass. The questionnaire was divided into four parts, the first part being about career planning, the second part being about social responsibility, the third part being about political morality, and the fourth part being about learning quality, with a total of 20 questions. Understand the extent to which the integration of ideological and political elements improves teaching effectiveness from these four aspects. Due to limited space, we have presented some of the survey results.

From an anonymous survey, 80% to 90% of students believe that the ideological and political education in the course "Principles and Applications of Single Chip Computers" has achieved good results through learning the course. Through the integration of ideological and political elements, students not only learn scientific knowledge, but also expand their knowledge. Some students left a message in the comment area saying, "The teacher not only has extensive professional knowledge

and advanced teaching concepts, but also has a clear guiding role for me to behave and do things." Some students also said, "Only when the Chinese nation becomes stronger will it not be constrained by others, and we will strive to become the promoters and practitioners of China's transformation from a manufacturing power to a manufacturing power."

Through the study of the theoretical and practical courses of "Principles and Applications of Single-chip Computers", students' innovation ability has been improved, and they have obtained one innovation and entrepreneurship project for university level college students, and the course team has obtained one demonstration course project of "Curriculum Ideology and Politics" at the university level. "The curriculum carries ideological and political education, and ideological and political education is embedded in the curriculum" - the ideological and political teaching practice of the course "Principles and Applications of Single-chip Computers" for the marine electrical specialty, and was awarded the excellent case of ideological and political education in the first undergraduate college curriculum in Guangdong Province. The person in charge of the course team participated in the first course ideological and political teaching competition of Guangdong Ocean University and won the third prize. He published one relevant teaching and research paper in an international journal.

Experts have highly praised the ideological and political development of the course.

## 7. Conclusion

In combination with the talent training program for marine electrical engineering majors, after several rounds of ideological and political teaching reforms in the course "Principles and Applications of Single Chip Computers", not only has the teaching objectives of the course been further improved, but also the goals of ideological and political education have been established: to understand the development process and innovative application of single chip computers, understand their important significance for China's intelligent manufacturing, cultivate national sentiments, correct students' correct outlook on life and values, and firmly adhere to the "four self-confidence". A "five dimensional integrated" curriculum teaching system of "theoretical teaching+experimental teaching+practical teaching (i.e., major innovation projects)+second classroom+ideological and political micro classroom" is constructed with students as the center. Deeply explore the ideological and political elements of the course in each teaching link, and integrate them into the course teaching system, proposing the ideological and political characteristics and innovative methods of the course. Good teaching results have been achieved in five aspects: course introduction, teaching content, overall ideological and political thinking of the course, characteristic methods and typical cases, micro ideological and political classes, and effectiveness and evaluation. The teaching content is advanced and the form is novel, which is highly praised by students.

## References

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