# Instructive Cultivation Plan for the Program of Automation

**(Grade 2019)**

**Course code: 080801**

## I. Orientation

In accordance with the strategic requirements of “Made in China 2025” and the needs of national economic development, this program combines the development orientation of “career-oriented higher education” of the school to cultivate senior application-oriented engineering technical talents who have automation expertise, practical ability and comprehensive quality in the fields of electrical and electronic technology, control theory, sensor technology, information processing, system engineering, computer technology and application, etc., and can be engaged in the operation and maintenance of automation system, design, integrated application, and project management in the field of electrical control, especially in the field of robotics.

## II. Cultivation Objectives

1. General cultivation objective

This program aims at cultivating wide-scope, compound and senior application-oriented engineering technical talents who are comprehensively developed on the aspects of morality, intelligence, physique, beauty and labor, have a solid basic knowledge of natural science theory and good humanities, master automation expertise and practical ability in electrical and electronic technology, control theory, sensor technology, information processing, computer technology and application, power electronics, electrical engineering, systems engineering, etc., have good professional ethics and strong practical ability to innovate, and can be engaged in the operation and maintenance of automation system, design, integrated application, and project management in the field of electrical control, especially in the field of robotics.

2. Objective of value guidance

Guide students to understand the overall objective of the "Made in China 2025" development plan and the urgent need for the cultivation of automation talents. Students are required to determine to learn automation expertise, and actively participate in the national industrial construction after graduation, so as to strive for achieving the development goal of a manufacturing power and the great rejuvenation of the Chinese nation. This program will be expanded with the ideological and political education of the introduction to the automation program, throughout the entire process of talent training and training program design, take the spirit of model workers and craftsmanship as the value orientation, aim at building ingenuity and educating craftsmen, and in the process of education and teaching, incorporate engineer values and engineering ethics education through the spirit of craftsmanship. This program will cultivate students to develop a rigorous, meticulous, dedicated and responsible work attitude, a meticulously crafted and refined work philosophy, and master superb skills and exquisite skills, so as to promote China's "manufacturing" to China's "Intelligent Manufacturing", thus improving quality, speed, product and efficiency.

3. Objectives students must achieve five years after graduation:

Five years after graduation:

1) Be able to adopt automation expertise, technology and skills to analyze and solve technical problems related to complex automation systems in professional positions.

2) Be able to strictly abide by professional norms at work, have a good humanistic quality, have a

sense of social responsibility, professionalism, safety and environmental protection at work, and actively serve the country and society in the industry.

3) Familiar with the current situation and development trend of automation program at home and abroad; familiar with industry regulations and standards;

4) Be able to communicate effectively with colleagues, peers, and customers, adapt to team work, and carry out project activities as a team member or person in charge.

5) Be able to continuously improve one's own quality and ability through self-learning, and adapt to career development.

**III. Requirement for Graduation**

The automation program of our school expands the core competence and quality expression of 12 graduation requirements based on the 12 general standards for program certification and the actual situation of our school. Each index points of graduation requirements are broken down as follows:

**Graduation requirement 1: Ability to acquire and apply engineering knowledge: be able to apply basic principles of mathematics, natural sciences, engineering foundations and professional knowledge to abstract automated complex engineering problems into mathematics and physics models, select appropriate models to describe, and analyze and solve the models.**

Index point 1-1: master natural science knowledge such as mathematics and physics;

Index point 1-2: use mathematics, natural sciences, engineering foundations and professional knowledge to solve complex engineering problems appropriately;

Index points 1-3: use mathematics, natural sciences, engineering foundations and professional knowledge for calculation and analysis of engineering problems;

Index points 1-4: abstract complex engineering problems into mathematical and physical models, select appropriate models for description, make inference solutions and necessary corrections to the models, and understand their limitations.

**Graduation requirement 2: Problem analysis ability: be able to apply the basic principles of mathematics, natural science and engineering science to identify, express, and analyze complex automation engineering application problems through literature research and obtain effective conclusions.**

Index point 2-1: be able to use professional knowledge to reason, analyze, identify and judge the key links and parameters of complex automation engineering application problems;

Index point 2-2: be able to recognize that there are multiple solutions to complex automation engineering application problems, and be able to find effective solutions to engineering problems through literature research and analysis;

Index points 2-3: be able to model and analyze automation engineering problems and obtain effective conclusions based on mathematics, natural sciences and engineering sciences.

**Graduation requirement 3: Ability to innovate design/development solutions: be able to design solutions for users' complex automation needs, design systems, units (components) or process flows that meet specific needs, and be able to reflect the sense of innovation in the design process, and always consider social, health, safety, legal, cultural and environmental factors.**

Index point 3-1: Master the basic methods of automation engineering design, and be able to analyze complex automation engineering problems, propose design goals, and determine solutions;

Index point 3-2: Be able to formulate solutions based on the characteristics of users' complex automation needs, and can design systems, units or technological processes that meet specific needs;

Index point 3-3: Be able to comprehensively consider social, health, safety, legal, ethical, cultural and environmental factors in the design to reflect a certain sense of innovation.

Index point 3-4: Be able to present the design results in the form of design reports, engineering drawings or objects.

**Graduation requirement 4: Scientific research ability: Be able to study complex automation engineering application problems based on scientific principles and by using scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis.**

Index point 4-1: Be able to apply the knowledge learned to formulate feasible experimental plans for related problems in automation engineering;

Index point 4-2: Be able to construct an experimental system or process according to the experimental plan, and be able to conduct experiments;

Index point 4-3: Be able to correctly analyze and interpret experimental data/results, and obtain reasonable and effective conclusions through information synthesis.

**Graduation requirement 5: Ability to use modern tools: Be able to develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools for complex automation engineering application problems, including the prediction and simulation of complex automation engineering application problems, and can understand its limitations.**

Index point 5-1: Understand the status and development trend of automation engineering, and be able to grasp and use modern engineering technology, methods, tools or equipment in practice;

Index point 5-2: Be able to predict and simulate complex automation engineering application problems by using appropriate modern engineering tools, and understand the working principles and limitations of the modern tools used;

Index point 5-3: Master the sources and acquisition methods of important documents in the field of automation engineering.

**Graduation requirement 6: Ability to analyze and evaluate the relationship between engineering and society: be able to conduct reasonable analysis and evaluation on the impact of professional engineering practices and complex engineering problem solutions on society health, safety, law and culture based on the relevant background knowledge of automation, and understand the responsibility.**

Index point 6-1: Master the technical standards, intellectual property rights, industrial policies, laws and regulations related to automation;

Index point 6-2: Be able to conduct reasonable analysis based on professional knowledge and standards in terms of social, health, safety, legal and cultural influences, and evaluate solutions to complex automation engineering problems;

Index point 6-3: Be able to correctly understand the social, safety and legal responsibilities that automation engineers should bear in engineering practices.

**Graduation requirement 7: Ability to understand and evaluate the environment and sustainable development: be able to understand and evaluate the impact of complex automation engineering application processes on the environment and sustainable development of society.**

Index point 7-1: Be able to understand national and local policies, laws and regulations on environmental and social sustainable development;

Index point 7-2: Be able to correctly learn about and understand the impact of engineering practice aimed at automation engineering problems on the environment and the sustainable development of society.

**Graduation requirement 8: Abide by professional standards: have humanities and social science literacy and a sense of social responsibility, be able to understand and abide by engineering professional ethics and standards in engineering practices, and can undertake responsibilities correctly.**

Index 8-1: Have humanities and social science literacy, understand the social responsibilities that should be undertaken, and be willing to serve the society;

Index 8-2: Understand the professional nature and responsibilities of automation engineers, have legal awareness and consciously abide by professional ethics and norms in automation engineering practices.

**Graduation requirement 9: Ability to assume individual and team roles: Be able to assume the roles of individuals, team members and leaders in a multidisciplinary team.**

Index point 9-1: Have basic interpersonal and communication skills, and be able to correctly understand the role and significance of team strength and wisdom on complex engineering problems;

Index point 9-2: Be able to understand the meaning of each role in a multidisciplinary team for the goals of the entire team, and be able to play a role in a multidisciplinary team.

**Graduation requirement 10: Ability to effectively communicate and exchange: be able to effectively communicate and exchange with industry colleagues and the public on complex automation engineering application issues, including reports and design manuscripts, presentations, clear expressions or response instructions. Have a certain international perspective, and be able to communicate and exchange under a cross-cultural context.**

Index point 10-1: Be able to express one's thoughts orally or in writing, and effectively communicate and exchange with industry colleagues and the public on complex automation engineering issues;

Index point 10-2: Master at least one foreign language, be able to read the foreign literature of the major, and be able to use technical language to communicate and exchange in a cross-cultural context.

**Graduation requirement 11: Ability to manage engineering projects: understand and master the principles of automation engineering project management and economic decision-making methods, and be able to apply them in a multidisciplinary environment.**

Index point 11-1: Understand and master the important economic and management factors involved in automation engineering activities;

Index point 11-2: Be able to apply engineering management and economic decision-making knowledge in a multidisciplinary environment.

**Graduation requirement 12: Have the consciousness and ability of lifelong learning: Have the consciousness of independent learning and lifelong learning, and be able to continuously learn and adapt to development.**

Index point 12-1: Be able to correctly understand the necessity of lifelong learning, and have the consciousness of independent learning and lifelong learning;

Index point 12-2: Be able to learn independently according to personal or professional development needs, and have the ability to adapt to the development of society and automation engineering technology.

**IV. Schooling System**

Four years

**V. Length of Study**

Flexible study period, generally four years, the minimum length of flexibility is not less than three years, the longest not more than six years.

**VI. Requirements for Graduation and Degree Conferring**

Students of this program must complete the minimum credits required for each category of courses and complete all the content specified in extracurricular class according to the requirements of the instructional training plan, and the total credits must reach 153 credits for graduation; those who meet the requirements for bachelor's degree can be conferred bachelor degree in engineering.

**VII. Discipline**

Control Science and Engineering, Electrical Engineering, Computer Science and Technology.

**VIII. Core courses**

**1. Level 1 project (robot operation and maintenance, design and integrated application)**

As the main line of the first-level engineering training program, the robot project runs through six semesters from the first grade to the fourth grade. The training is divided into several stages. In the initial stage, students will learn the use of the robot development platform, mainly master the use of control modules and sensors, learn to program robot control strategies by C language, and complete the assembly of specific functional robots through the combination of software and hardware. On this basis, it will guide students to participate in various competitions. Through competition projects, students will establish the concept of engineering projects and cultivate the sense of innovation. Through the collaborative work of the competition team, students' communication skills and teamwork spirit will be cultivated. Through the summary and speech defense after the competition, students' speech ability and report writing ability can be exercised. Through this stage of training, students will be clear about the follow-up professional foundation and professional courses.

In the intermediate and advanced stages, as students gradually learn professional basics and professional courses, the project will instruct students to design and produce various robotic systems by themselves, and use their self-made systems to complete various competition projects and various scientific innovation projects at all levels. The difficulty of design and production tasks will gradually increase, and students' ability to integrate theory with practice and

comprehensive practice will be significantly improved, so that the students will gradually obtain the ability to independently design and produce electronic and electrical systems.

**2. Level 2 project (electronic design)**

The electronic design project organizes teaching and practical activities in the unit of curriculum group, including: electrical and electronic technology, electronic technology practice, engineering technology training, electronic technology and other main courses. Students will be able to use the knowledge and skills of these courses to solve specific problems in engineering practice related to the course group, so that theoretical teaching and engineering practice are closely integrated and mutually supported, and students' professional ability, communication ability, team spirit and leadership ability are trained.

This project is based on the test content of the electronic circuit installation and commissioning module of the electrician (level 4) vocational qualification certificate issued by the Shanghai Municipal Human Resources and Social Security Bureau, and will train students in the basic skills of electronic technology. The main contents include: (1) Application of basic electronic components: test and analysis of transient process characteristics of amplifying circuit composed of resistance, capacitance and inductance, bridge oscillation circuit; (2) Application of thyristor: characteristics test and analysis of thyristor pulse trigger circuit, thyristor dimming circuit, and thyristor delay circuit; (3) Design and manufacture of voltage regulator circuit: transistor voltage regulator circuit, W78 series, W317 series voltage regulator chip application. (4) characteristic test and analysis of transistors and diode circuits (signal amplifying circuit, power amplifying circuit, level shifting circuit).

Students can work in groups, usually a group includes 3 to 4 people; students can also train and operate individually. After completing this module and basic training on electrical wiring, electrical troubleshooting, and PLC, students can participate in the electrician (level 4) vocational qualification certificate examination of the Shanghai Human Resources and Social Security Bureau. Those who pass the examination can obtain a nationally recognized vocational qualification certificate.

**3. Embedded system application practice (second-level project)**

This project is an engineering training course, which takes common problems in the field of detection and automation engineering as the learning object, and trains students to skillfully apply embedded system knowledge to solve problems. By designing hardware and software, this project uses ARM microprocessor for programming development to realize the input and output of GPIO port, timing and interrupt application, conversion of voltage and temperature analog quantity to digital quantity and detection, transmission of digital quantity to analog quantity and output drive. Students work in groups, usually 3 to 4 students are a group. Through the study of this course, students should exercise their ability to design system schemes, office software editing ability, the ability to use various electronic modules, C language programming ability and language expression ability for function demonstration. The teaching objective of this course is to closely integrate theoretical teaching and engineering practice and make them support each other, train students' professional ability, communication ability and team spirit; focus on cultivating students with strong practical application ability and innovation ability.

**4. Electrical wiring practice, electrical troubleshooting practice, PLC basic training**

The above three items are based on the test contents of the electrical control circuit installation and commissioning module, the electrical control circuit fault analysis and troubleshooting module, the sensor and PLC control circuit installation programming and commissioning module of the electrician (level 4) professional qualification certificate of Shanghai Human Resources and Social Security Bureau Based, and takes the common electrical control and PLC application engineering problems in the automation field as the background to train students to apply electrical control and PLC knowledge to solve problems. The contents include: (1) Design and installation of electrical

control circuit: design and installation of hydraulic control machine tool sliding table movement electrical control circuit, two-speed motor automatic control circuit, three-phase asynchronous motor double chain forward and reverse start energy consumption braking control circuit, power delay Y/△ start control circuit of asynchronous motor with DC energy consumption brake, Y/△ start control circuit of asynchronous motor with DC energy consumption brake and power-off delay, asynchronous motor step-down start reverse brake control circuit, asynchronous motor autotransformer decompression start control circuit, bridge rectifier reversible energy consumption braking control circuit, winding type AC asynchronous motor automatic start control circuit, as well as design of electrical wiring, in order to achieve the required functions; (2) electrical control circuit fault analysis and elimination: M7130 surface grinder electrical control circuit fault analysis and elimination, C6150 lathe electrical control circuit fault analysis and elimination, Z3040 radial drilling machine electrical control circuit fault analysis and elimination; (3) Sensor and PLC control circuit installation, basic instruction programming and commissioning: PLC realization Y/△ start of AC asynchronous motor, PLC realization positive and negative rotation of AC asynchronous motor, PLC realization automatic control of water tower water level, PLC realization automatic control of colored lights flashing, PLC realization automatic control of transmission belt motor, PLC realization control of the quiz answering device of the quiz, PLC realization automatic control of the feeding device of the heating furnace, PLC realization automatic control of the drilling power head, and PLC realization automatic control of opening and closing of warehouse door.

Students can study in groups, usually a group consists of 3 to 4 students; they can also train and operate individually. After students have completed the study of electrical wiring, electrical troubleshooting, PLC basic training and second-level projects (electronic design), they can participate in the electrician (level four) vocational qualification certificate examination organized by Shanghai Human Resources and Social Security Bureau. Those who pass the examination can obtain nationally recognized professional qualification certificate.

**5. Level 2 project (Electrical control and PLC integration)**

Electrical control and PLC foundation organizes teaching and practical activities based on the course group, including: modern engineering drawing, automatic mechanical design, electrical CAD, electrical control and PLC, sensor technology, electrical wiring practice, electrical troubleshooting practice, PLC basic training, etc. The knowledge and skills of these courses are used to solve specific problems in engineering practice related to the course group, so that theoretical teaching and engineering practice are closely integrated and mutually supported, and students' professional ability, communication ability, team spirit and leadership ability are trained.

This project is based on the test content of the relay electrical control circuit surveying and troubleshooting module and the PLC control system installation and adjustment module of the electrician (level three) professional qualification certificate of Shanghai Human Resources and Social Security Bureau, and is under the background of common electrical control and PLC application engineering problems in the automation field. This project will train the students to be proficient in applying electrical control and PLC knowledge to solve problems. The contents include: (1) PLC control system installation, stepping numerical control instruction programming and commissioning: transport trolley control PLC control, mechanical sliding table control PLC control, manipulator control PLC control, mixing tank control PLC control, traffic light control PLC control, spray fountain control PLC control, conveyor belt control PLC control, sewage treatment control PLC control, piece counting control PLC control, bottle picking control PLC control. Students need to design a PLC control system that conforms to industrial reality. (2) Relay control circuit surveying and troubleshooting: X62W universal milling machine control circuit surveying and troubleshooting, T68 horizontal boring machine control circuit surveying and troubleshooting, 20/5t bridge crane control circuit surveying and troubleshooting.

Students can study in groups, usually a group of 3 to 4 students; or can also train and operate individually. After completing the second-level project (electrical control and PLC integration) and the second-level project (motion control system integration), students can participate in the

examination for electrician (level three) vocational qualification certificate organized by Shanghai Human Resources and Social Security Bureau, and those passed the examination can obtain a nationally recognized professional qualification certificate.

**6. Level 2 Project (Comprehensive Project of Motion Control System)**

The comprehensive project of motion control system organizes teaching and practical activities in the unit of course group, including main courses such as automatic control principle, system modeling and simulation, power electronics technology, motor drive foundation, and motion control system. The knowledge and skills of these main courses are used to solve specific problems in engineering practice related to the course group, so that theoretical teaching and engineering practice are closely integrated and mutually supported, and students' professional ability, communication ability, team spirit and leadership ability will be trained.

This project is based on the test content of the AC and DC drive system assembly and adjustment module and the application electronic circuit assembly and maintenance module in the electrician (level 3) professional qualification certificate examination of Shanghai Human Resources and Social Security Bureau, and trains the students to apply the knowledge of automatic control principles, power electronics, and electric motors to control technology is under the background of common control systems engineering application in the industrial automation field. The contents include: (1) AC and DC drive system installation and commissioning: including test and drawing of speed and current double closed loop irreversible DC speed control and system adjustment characteristics static characteristic, test and drawing of logic non-circular current reversible DC speed control and system adjustment characteristic and static characteristic, AC inverter fixed frequency control mode commissioning and system operation curve mapping, AC inverter speed control mode commissioning and system operation curve mapping;

(2) application electronic circuit installation and maintenance: including installation and commission of triangle wave generator, sine wave square wave triangle wave generator, digital timer, single pulse control shift register, shift register ring counter, three-phase half-wave controllable rectifier circuit with inductive load, three-phase half-wave controllable rectifier circuit with common anode connection, three-phase fully-controlled bridge rectifier circuit with inductive load, three-phase half-controlled bridge rectifier circuit with freewheeling diode, and the double reverse star controllable rectifier circuit, as well as the waveform mapping.

Students can study in groups, usually a group of 3 to 4 people; or can also train and operate individually. After completing the second-level project (electrical control and PLC integration) and the second-level project (motion control system integration), students can participate in the electrician (level three) vocational qualification certificate examination of Shanghai Human Resources and Social Security Bureau, and can obtain a nationally recognized professional qualification certificate after passing the examination.

**7. Level 2 Project (Comprehensive project of Process Control System)**

The control system comprehensive project organizes teaching and practice activities in the unit of curriculum group, including main courses such as automatic control principle, automatic instrument and system, process control technology, computer control technology and other main courses. The knowledge and skills of these main courses are used to solve specific problems in engineering practice related to the course group, so that theoretical teaching and engineering practice are closely integrated and mutually supported, and students' professional ability, communication ability, team spirit and leadership ability are trained.

This project takes the common control system engineering application problems in the industrial automation field as the background to trains students to learn how to apply automatic control principles, power electronics, signal and system knowledge flexibly to control technology. The contents include: (1) design of water tank level control algorithm: taking the laboratory water tank as the object, design a water tank level control algorithm, and realize specific control on the

experimental system to verify the control effect of the algorithm; (2) design of water tank temperature control algorithm: taking the laboratory water tank as the object, design a water tank water temperature fuzzy control algorithm, and realize specific control on the experimental system to test the control effect of the algorithm; students study in groups for training, usually a group consists of 3 to 4 students, and finally the student will conduct an exam presentation alone.

**8. Introduction to Engineering**

The purpose of the "Introduction to Engineering" course is as follows: by introducing the basic features and concepts of engineering, solutions to general engineering problems, economic characteristics of engineering projects, and tasks and responsibilities faced by engineers, this course will allow students to understand the engineering issues involved in related engineering programs and stimulate their interest to learn about engineering programs, and clear motivation for study. Through the study of this course, students can put forward some ideas and thoughts to solve engineering problems when facing general engineering problems; can cultivate their interpersonal communication and teamwork spirit; and lay a certain foundation for them to learn follow-up professional courses and smoothly carry out and complete the first, second and third level projects.

**9. Modern Engineering Drawing I**

"Modern Engineering Drawing I" is a main professional basic course for engineering programs of higher technical schools. The task of this course is to cultivate students' ability to draw and read engineering drawings. Through the study of this course, students will be able to master the basic theory of projection method, master the projection diagram expression method of mechanical parts, and be able to correctly and proficiently use common drawing tools and instruments and computers to draw engineering drawings, so as to lay a certain practical foundation for facilitating subsequent professional courses and smooth progress at all levels.

**10. Electric Circuit**

This course is an important professional basic course for automation programs. The main content of this course is to analyze electromagnetic phenomena in circuits, study the basic laws of circuits and circuit analysis methods. This course will provide basic circuit theory and electric circuit analysis for subsequent professional basic courses. This course mainly teaches linear circuits, sinusoidal circuits, DC circuits, transformers, RLC circuit transition processes, motors, electrical control circuits, and safe use of electricity, etc. After completing the study of this course, students should meet the following basic requirements: first, master the concepts and basic laws of ideal components, circuit models, reference directions, and related reference directions; second, understand the constraints of voltage and current in lumped parameter circuits; third, proficiency in the analysis of resistance circuits, the time domain analysis of linear dynamic circuits, the analysis of sinusoidal steady-state circuits, the steady-state analysis of non-sinusoidal periodic current circuits, and the analysis methods of nonlinear circuits. The purpose of this course is to cultivate students' solid circuit analysis ability and the ability to solve practical problems through the study of basic circuit theory and circuit analysis methods, so as to lay a solid foundation for future practical work.

**11. Analog Electronic Technology**

This course is one of the main professional basic courses for automation program, and is a highly applied course that closely combines theory and practice. This course mainly teaches the principles and application technology of diodes, triodes, amplifier circuits, power amplifiers, oscillator circuits, analog integrated circuits and functional module circuits. After completing the study of this course, students should meet the following basic requirements: first, master the basic working principles, characteristics and main parameters of commonly used semiconductor devices (diodes, triodes, field effect tubes, linear integrated circuits), and be able to select and use these devices reasonably; second, master the principle, structure, performance and application of basic circuits (common-emitter amplifier circuit, common-collection amplifier circuit, complementary

symmetrical power amplifier circuit, negative feedback amplifier circuit, integrated operational amplifier circuit); third, familiar with the structure, working principle, performance and application of the application circuit (sine signal producing circuit, non-sinusoidal signal generating circuit, first-order active filter circuit, rectifier filter circuit, etc.); fourth, master certain analysis and calculation ability, including mastering the diagram analysis method of single-stage amplifier circuit, master the analysis method of the triode simplified H-parameter micro-change equivalent circuit, understand the analysis method of the multi-stage amplifier circuit, master the method of identifying the type of negative feedback amplifier circuit and estimating the method of voltage amplification of the deep negative feedback circuit, etc.; fifth, grasp the basic application skills, including the primary grasp of the general laws of reading and analyzing analog circuit schematics, primary grasp of the design calculation steps and methods of general analog unit circuits, and the ability to consult electronic device manuals and reasonably select devices. Through the study of this course, students will be able to acquire the basic theories and basic knowledge necessary for analog electronic technology. Furthermore, this course focuses on cultivating students' skills and improving their ability to analyze problems, solve problems, and apply practical applications, thus laying the necessary foundation for learning subsequent courses and practical applications,.

**12. Digital Electronic Technology**

This course is an important professional technical basic course for automation programs. The digital electronic technology is the main direction of electronic technology development in the future. This course mainly teaches design examples of number systems, combinational logic, flip-flops, A/D, D/A, medium and large-scale integrated circuits, and various digital logic circuits. Through the study of this course, students will be able to master the basic concepts, basic principles and basic analysis and design methods of digital electronic technology, familiar with typical basic unit circuits and digital system reading diagrams, can perform simple digital circuit installation and commissioning, and obtain the ability to further study electronics technology and professional courses.

**13. Fundamentals of Motor and Drive**

This course mainly teaches the main structure, basic principles and working characteristics of AC and DC motors and transformers; the mechanical characteristics, starting, braking and speed regulation of AC and DC electric drive systems; the selection of electric motors for electric drive systems.

**14. Principles of Automatic Control**

This course is a basic engineering course that studies the basic concepts, basic principles, and basic analysis and design methods of automatic control systems. The main contents of this course include three aspects: automatic control system modeling, automatic control system analysis, and automatic control system design (correction). Through the study of this course, students will master the classic control theory and methods of analyzing and synthesizing SISO automatic control system, be able to analyze and design the control system, and be able to perform computer-aided analysis and design of the control system with the support of MATLAB and Simulink, thus laying a solid foundation for further in-depth study and research on other control theories and control system design in the future.

**15. Fundamentals of Control Program Design**

This course mainly teaches the basic concepts and basic techniques of programming, and cultivates students' logical thoughts and engineering design thinking. Taking C language as an example, this course requires students to learn to draw simple program flowcharts, be more proficient in the grammar and semantics, master the basic methods of structured program design, master some common program design skills, master the top-down gradually refined program design technology, cultivate good program design habits and styles, thus enabling students to

master the basic process of computer programming operations and the basic methods of eliminating grammatical and semantic errors.

**16. Signals and Systems**

This course mainly teaches the analysis of time domain, frequency domain and complex frequency domain of continuous and discrete signals and systems, and time domain analysis and transformation domain analysis of signals while passing through linear time invariant systems. Through the study of this course, students will have a firm grasp of the basic principles and basic methods of time domain and transform domain analysis of signals and systems, understand the mathematical concepts, physical concepts and engineering concepts of Fourier transform, Laplace transform, and Z transform and master the basic theories and methods of using signals and systems to analyze and solve practical problems, thus laying a solid foundation for further study of follow-up courses such as digital signal processing, communication principles, automatic control principles, and computer control technology.

**17. Motion Control System**

This course teaches motion control composed of DC motors, AC motors, servo motors, and stepping motors, including single closed-loop speed control systems, double-loop speed control systems, reversible speed control systems, DC pulse width speed control systems, basic composition and control law of AC speed control system, static and dynamic performance analysis and engineering design method.

**18. Process Control**

This course mainly teaches the basic concepts of process control, process channel signal processing and regulating instruments, actuators, dynamic characteristics of process control objects, single loop and complex control systems, and computer process control systems.

**19. Computer Control Technology**

This course mainly teaches the composition, application methods and common models of computer control systems, input and output channels and interface technology. Through the study of this course, students will master the principles and applications of basic computer control algorithms, understand the general structure of control software, and initially grasp the use of an industrial control configuration software method.

**20. Sensor Technology**

This course is a follow-up course of self-control principles, detection technology and other courses. The content of electrical courses is integrated and used flexibly in this course. Through the study of this course, students will have a complete understanding of the process control instruments necessary for the automatic regulation system, that is, the function, principle and composition of the regulator, distributed control system and regulating valve, and will understand the basic working principles of various detection instruments and process control instruments, understand the composition, adjustment methods and applications of process control systems. This course is an important professional course for training automation talents.

**IX. Practical Training**

Basic engineering training B, second-level project (embedded system application), automatic machinery (solikworks) design, first-level project (robot operation and maintenance, design and integrated application) I, second-level project (electronic design), second-level project (embedded system design), PLC basic training, electrical wiring training, electrical troubleshooting training, control system CAD, secondary project (motion control system integration), secondary project (electric control and PLC integration), automated production line training, level one project (robot

operation and maintenance, design and integrated application) II, level one project (robot operation and maintenance, design and integrated application) III, second classroom, automation (CDIO) graduation internship and graduation design (thesis).

**X. Course Structure and Course Hours (excluding extracurricular class)**

| Category | Total Credit | % | Total Course Hours | Theory Learning | Practical Training |
|---|---|---|---|---|---|
| Public Course | 52 | 34 | 976 | 912 | 64 |
| Basic Course | 28.5 | 19 | 456 | 376 | 80 |
| Professional Course | 27.5 | 18 | 440 | 385 | 55 |
| Practical Training | 34 | 22 | 960 | 0 | 960 |
| General Course | 10 | 7 | 160 | 160 | 0 |
| Total | 152 | 100 | 2992 | 1833 | 1159 |
| Theory : Practice(%) | 61:39 | | | | |

## XI. Teaching schedule (1)

| Category | Type | Provided by | Course Code | Course Name | Assessment | Credit | Course Hour | Theory Learning | Practical Training | Semester |
|---|---|---|---|---|---|---|---|---|---|---|
| General Education Basic Course | required | School of Marxism | b1080001 | Basic principles of Marxism | test | 3 | 48 | 42 | 6 | spring 1 |
| | required | School of Marxism | b1080006 | Outline of Chinese Modern History | non-test | 3 | 48 | 42 | 6 | autumn 1 |
| | required | School of Marxism | b1080003 | Ideological and moral cultivation and legal foundation | non-test | 3 | 48 | 42 | 6 | spring 1 |
| | required | School of Marxism | b1080004 | Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics I | test | 3 | 48 | 42 | 6 | autumn 2 |
| | required | School of Marxism | b1080007 | Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics II | test | 2 | 32 | 28 | 4 | spring 2 |
| | required | School of Marxism | ----- | Situation and Policy (module 1～4) | non-test | 2 | 32 | 28 | 4 | autumn 1～spring 2 |
| | required | College of Arts and Sciences | b1020080+ | Advanced Mathematics A1 | test | 4 | 64 | 64 | | autumn 1 |
| | required | College of Arts and Sciences | b1020081+ | Advanced Mathematics A2 | test | 4 | 64 | 64 | | spring 1 |
| | required | College of Arts and Sciences | b1020012 | Linear algebra | test | 2 | 32 | 32 | | autumn 2 |
| | required | College of Arts and Sciences | b1020013 | Probability Theory and Mathematical Statistics | test | 2 | 32 | 32 | | autumn 2 |
| | required | College of Engineering<br>College of Arts and Sciences | b1020023 | Complex variable function and integral transformation | test | 2 | 32 | 32 | | autumn 2 |
| | required | College of Arts and Sciences | b1020062 | College Physics A(module 1) | test | 3 | 48 | 48 | | spring 1 |
| | required | College of Arts and Sciences | b1020065 | College Physics B | test | 2 | 32 | 32 | | autumn 2 |
| | required | College of Arts and Sciences | b1020066 | College Physics C | non-test | 1 | 32 | | 32 | spring 1 |
| | required | College of Arts and Sciences | b1020018 | College Chinese | non-test | 2 | 32 | 32 | | spring 1 |
| | required | Others | b1110003 | Military skills | non-test | 0.5 | 2W | | | autumn 1 |
| | required | College of Arts and Sciences | b1110002 | Military theory | non-test | 0.5 | 32 | 32 | | autumn 2 |
| | required | College of Arts and Sciences | b1020003 | General English III | test | 3 | 48 | 48 | | autumn 1 |
| | required | College of Arts and Sciences | b1020004 | General English IV | test | 3 | 48 | 48 | | spring 1 |
| | required | College of Arts and Sciences | b1020005 | General Academic English A | test | 2 | 32 | 32 | | autumn 2 |
| | required | College of Arts and Sciences | --- | English development | non-test | 2 | 32 | 32 | | spring 2 |
| | required | Department of Physical Education | ----- | Physical Education I～VI | non-test | 3 | 160 | 160 | | autumn 1～autumn 4 |
| Total (General Education Basic Courses) | | | | | | 52 | 976 | 912 | 64 | |
| General Course | selective | Others | b0----- | Social Science and Humanities Literacy (2 credits)<br>Public Art (2 credits) | non-test | 4 | 64 | 64 | | Autumn, spring |
| | required | College of Engineering | b2013127 | Computer and Information Technology Fundamentals | non-test | 2 | 32 | 32 | | autumn 1 |
| | required | College of Engineering | b2013024 | Scientific paper writing and document retrieval | non-test | 2 | 32 | 32 | | autumn 1 |
| | required | College of Engineering | b2012236 | Engineering ethics | non-test | 2 | 32 | 32 | | autumn 2 |
| Subtotal (general course) | | | | | | 10 | 160 | 160 | | |

## XI. Teaching schedule (2)

| Category | Type | Provided by | Course Code | Course Name | Assessment | Credit | Course Hour | Theory Learning | Practical Training | Semester |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic professional courses | required | College of Engineering | b2012237 | Introduction to Engineering | non-test | 1.5 | 24 | 24 | 0 | autumn 1 |
| | required | College of Engineering | b2011398 | Modern Engineering Drawing I | test | 2 | 32 | 26 | 6 | spring 1 |
| | required | Work training | b2011031 | Electric Circuit | test | 4 | 64 | 52 | 12 | autumn 2 |
| | required | Work training | b2012060 | Analog electronics | test | 3 | 48 | 36 | 12 | spring 2 |
| | required | Work training | b2012099 | Digital Electronic Technology | test | 3 | 48 | 36 | 12 | spring 2 |
| | required | College of Engineering | b2011408 | Fundamentals of motor and drive | test | 2.5 | 40 | 34 | 6 | spring 2 |
| | required | College of Engineering | b2011267 | Fundamentals of control programming | test | 3 | 48 | 36 | 12 | spring 2 |
| | required | College of Engineering | b2011257 | Single-chip microcomputer technology basis | test | 2 | 32 | 28 | 4 | spring 2 |
| | required | College of Engineering | b2011409 | Principle of Automatic Control | test | 3.5 | 56 | 48 | 8 | autumn 3 |
| | required | College of Engineering | b2011273 | Microcomputer Principle and Interface Technology | test | 2 | 32 | 24 | 8 | autumn 3 |
| | required | College of Engineering | b2012128 | Signals and Systems | test | 2 | 32 | 32 | 0 | autumn 3 |
| | Subtotal (Basic professional courses) | | | | | 28.5 | 456 | 376 | 80 | |
| Professional courses | required | College of Engineering | b2011410 | Power electronic converter technology | test | 2.5 | 40 | 34 | 6 | autumn 3 |
| | required | College of Engineering | b2011411 | Electrical control and PLC | test | 3 | 48 | 39 | 9 | autumn 3 |
| | required | College of Engineering | b2011344 | Motion Control System | test | 2.5 | 40 | 34 | 6 | spring 3 |
| | required | College of Engineering | b2011399 | Industrial Robot Technology | non-test | 2 | 32 | 32 | | spring 3 |
| | required | College of Engineering | b2011400 | Sensor Technology | non-test | 2 | 32 | 26 | 6 | spring 3 |
| | required | College of Engineering | b2011401 | Industrial Control Configuration Software Technology | non-test | 1.5 | 24 | 16 | 8 | spring 3 |
| | required | College of Engineering | b2011402 | Intelligent control | test | 2 | 32 | 28 | 4 | spring 3 |
| | required | College of Engineering | b2011301 | Control system modeling and simulation | non-test | 2 | 32 | 28 | 4 | autumn 4 |
| | required | College of Engineering | b2011044 | Factory power supply and distribution | test | 2 | 32 | 28 | 4 | autumn 4 |
| | required | College of Engineering | b2011083 | Computer control technology | test | 2 | 32 | 28 | 4 | autumn 4 |
| | Subtotal (required professional courses) | | | | | 21.5 | 344 | 293 | 51 | |
| | ★Module, Selective, 6 credits | Module A | b2011412 | Process control technology | non-test | 2 | 32 | 26 | 6 | spring 3 |
| | | | b2011275 | Modern control theory | test | 2 | 32 | 28 | 4 | spring 3 |
| | | | b2011166 | Automation instrumentation and measurement | non-test | 2 | 32 | 28 | 4 | autumn 4 |
| | | | b2011403 | Intelligent optimization calculation | non-test | 2 | 32 | 28 | 4 | autumn 4 |
| | | Module B | b2011404 | C# PROGRAMMING | non-test | 2 | 32 | 20 | 12 | spring 3 |
| | | | b2011405 | Machine vision | non-test | 2 | 32 | 26 | 4 | spring 3 |
| | | | b2011230 | Virtual instrument technology | non-test | 2 | 32 | 18 | 6 | autumn 4 |
| | | | b2011406 | Android system development | non-test | 2 | 32 | 16 | 16 | autumn 4 |
| | | Module C | b2011041 | Wind power technology | non-test | 2 | 32 | 28 | 4 | spring 3 |
| | | | b2011039 | Electrical part of wind power plant | non-test | 2 | 32 | 28 | 4 | spring 3 |
| | | | b2011064 | Photovoltaic power generation technology | non-test | 2 | 32 | 26 | 6 | spring 3 |
| | | | b2011040 | Wind turbine monitoring and control | non-test | 2 | 32 | 26 | 6 | autumn 4 |
| | | | b2011407 | Power System Analysis | non-test | 2 | 32 | 26 | 4 | autumn 4 |
| | Subtotal (modular professional courses) | | | | | 6 | 96 | 92 | 4 | |
| Subtotal (professional courses) | | | | | | 27.5 | 440 | 385 | 55 | |

## XI. Teaching schedule (2)

| Category | Type | Provided by | Course Code | Course Name | Assessment | Credit | Course Hour | Theory Learning | Practical Training | Semester |
|---|---|---|---|---|---|---|---|---|---|---|
| Vocational practice | required | Work training | b4090002 | Basic engineering training B | non-test | 2 | 48 | | 48 | summer 1 |
| | required | College of Engineering | b4011265 | Automated machinery (solikworks) design | non-test | 2 | 48 | | 48 | autumn 2 |
| | required | College of Engineering | b4011266 | Embedded System Design (Level 2 project) | non-test | 2 | 48 | | 48 | summer 2 |
| | required | College of Engineering | b4011267 | Robot operation and maintenance, design and integrated application I (Level 1 project) | non-test | 1.5 | 36 | | 24 | summer 2、autumn 3 |
| | required | College of Engineering | b4011268 | Electronic design(Level 2 project) | non-test | 1.5 | 36 | | 36 | summer 2、autumn 3 |
| | required | College of Engineering | b4011269 | PLC BASIC TRAINING | non-test | 1.5 | 36 | | 36 | autumn 3 |
| | required | College of Engineering | b4011270 | Electrical wiring practice | non-test | 1.5 | 36 | | 36 | autumn 3 |
| | required | College of Engineering | b4011271 | Electrical troubleshooting practice | non-test | 1.5 | 36 | | 36 | autumn 3 |
| | required | College of Engineering | b4011272 | Automated production line training | non-test | 2 | 48 | | 48 | summer 3 |
| | required | College of Engineering | b4011273 | Electrical control and PLC integration (Level 2 project) | non-test | 3.5 | 84 | | 96 | spring 3 |
| | required | College of Engineering | b4011274 | Control System CAD (Bilingual) | non-test | 1 | 24 | | 24 | spring 3 |
| | required | College of Engineering | b4011275 | Electrical CAD | non-test | 1 | 24 | | 24 | spring 3 |
| | required | College of Engineering | b4011276 | Robot operation and maintenance, design and integrated application II (Level 1 project) | non-test | 1.5 | 36 | | 36 | summer 3 |
| | required | College of Engineering | b4011277 | Motion Control System integration(Level 2 project) | non-test | 3.5 | 84 | | 96 | summer 3 |
| | required | College of Engineering | b4011253 | Automation Program (CDIO) Graduation Practice and Graduation Design (Thesis) | non-test | 6 | 288 | | 288 | spring 4 |
| | Subtotal (required practice courses) | | | | | 32 | 912 | | 912 | |
| | ★Professional module selective 2 credits | module A | b4000021 | Automation Professional Innovation and Entrepreneurship Course _ Process Control System Integration(Level 2 project) | non-test | 2 | 48 | | 48 | autumn 4 |
| | | module B | b4011278 | Automation Professional Innovation and Entrepreneurship Course _ Robot operation and maintenance, design and integrated application III(Level 1 project) | non-test | 2 | 48 | | 48 | autumn 4 |
| | | module C | b4011279 | Automation Professional Innovation and Entrepreneurship Course _ New energy power generation system integration(Level 2 project) | non-test | 2 | 48 | | 48 | autumn 4 |
| | Subtotal (practice module) | | | | | 2 | 48 | | 48 | |
| Total (professional practice) | | | | | | 34 | 960 | | 960 | |
| Extracurricular Class | required | Others | b5110001 | Extracurricular Class | non-test | 1 | - | - | - | autumn ，spring ，summer |
| Total | | | | | | 153 | 2992 | 1833 | 1159 | |

**★1. Guidance for professional module courses and practical module courses:**

Professional courses are divided into modules according to different ability requirements. Students must selective one of the modules and meet the required credits for that module. Professional practice modules must be selected according to the corresponding professional course modules.

1. Module A: Automation instrumentation and measurement, Modern control theory, Process control technology, Intelligent optimization calculation
2. Module B: C# PROGRAMMING (integration of theory and practice), Virtual instrument technology (integration of theory and practice), Machine vision (integration of theory and practice), Android system development (integration of theory and practice)
3. Module C: Wind power technology, Electrical part of wind power plant, Photovoltaic power generation technology, Wind turbine monitoring and control, Power System Analysis

**2. Professional Certificates can be gained after learning following courses:**

Students who have passed PLC BASIC TRAINING, Electrical wiring practice, Electrical troubleshooting practice, Level 2 project (Electronic design) courses, can participate in the professional qualification certificate assessment related to this program: Electrician (Level 4) certificate.

Students who have passed the Level 2 project (Electrical control and PLC integration) and Level 2 project (Motion Control System integration) courses can participate in the professional qualification certificate assessment related to this program: electrician (level three) certificate.
Students who have passed the Fundamentals of control programming course can participate in the professional qualification certificate assessment related to the program: Level 2 C programming (Shanghai or the whole country) certificate.
Students who have passed the Electrical CAD course can participate in the professional qualification certificate assessment related to this program: Electrical CAD (Intermediate) Certificate.
Students who have passed Single-chip microcomputer technology basis, Microcomputer Principle and Interface Technology, Level 2 project (Embedded System Design) courses can participate in the professional qualification certificate assessment related to this program: Embedded System Development (Level 3) certificate.
Students who have obtained electrical engineering (Level 4) can apply for exemption from PLC BASIC TRAINING, Electrical wiring practice, Electrical troubleshooting practice, and Level 2 project (Electronic design) courses and obtain corresponding credits.
Students who have obtained electrical engineering (Level 3) can apply for exemption from Level 2 project (Electrical control and PLC integration) and Level 2 project (Motion Control System integration) courses and obtain corresponding credits.
Students who have obtained Level 2 C programming certificate (Shanghai or National Certificate) can apply for exemption from Fundamentals of control programming courses and obtain corresponding credits.
Students who have obtained Electrical CAD (Intermediate) can apply for the exemption of Electrical CAD courses and obtain corresponding credits.
Students who have obtained embedded system development certificate (level three) can apply for exemption from single-chip microcomputer technology basis, Microcomputer Principle and Interface Technology, and Level 2 project (Embedded System Design) courses and obtain corresponding credits.

**XII. Schedule for Semesters (Suggested)**

**Autumn semester1:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Outline of Chinese Modern History | non-test | 3 | 48 |
| required | First Foreign Language | test | 3 | 48 |
| required | Advanced Mathematics A1 | test | 4 | 64 |
| required | Situation and Policy | non-test | 0.5 | 8 |
| required | Physical Education I | non-test | 0.5 | 32 |
| required | Military skills | non-test | 0.5 | 2W |
| required | Scientific paper writing and document retrieval | non-test | 2 | 32 |
| required | Computer and Information Technology Fundamentals | non-test | 2 | 32 |
| required | Introduction to Engineering | non-test | 1.5 | 24 |

**Spring semester 1:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Basic principles of Marxism | test | 3 | 48 |
| required | Ideological and moral cultivation and legal foundation | non-test | 3 | 48 |
| required | First Foreign Language | test | 3 | 48 |
| required | Advanced Mathematics A2 | test | 4 | 4 |
| required | College Physics A | test | 3 | 48 |
| required | College Physics C | non-test | 1 | 32 |
| required | College Chinese | non-test | 2 | 32 |
| required | Situation and Policy | non-test | 0.5 | 8 |
| required | Physical Education II | non-test | 0.5 | 32 |
| selective | General Course | non-test | 2 | 32 |
| required | Modern Engineering Drawing | test | 2 | 32 |

**Summer semester 1:**

| Course Property | Course name | Assessment | Total credits | Total course hours |
|---|---|---|---|---|
| required | Basic engineering training B | test | 2 | 48 |

**Autumn semester 2:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics I | test | 3 | 48 |
| required | Military theory | non-test | 0.5 | 32 |
| required | First Foreign Language | test | 2 | 32 |
| required | Linear algebra | test | 2 | 32 |
| required | Probability Theory and Mathematical Statistics | test | 2 | 32 |
| required | College Physics B | test | 2 | 32 |
| required | Situation and Policy | non-test | 0.5 | 8 |
| required | Physical Education III | non-test | 0.5 | 32 |
| selective | General Course | non-test | 2 | 32 |
| required | Complex variable function and integral transformation | test | 2 | 32 |
| required | Electric Circuit | test | 4 | 64 |
| required | Automated machinery (solikworks) design | non-test | 2 | 48 |

| | | | | |
|---|---|---|---|---|
| required | Engineering ethics | non-test | 2 | 32 |

**Spring semester 2:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics II | test | 2 | 32 |
| required | First Foreign Language | non-test | 2 | 32 |
| required | Situation and Policy | non-test | 0.5 | 8 |
| required | Physical Education IV | non-test | 0.5 | 32 |
| required | Analog electronics | test | 3 | 48 |
| required | Digital Electronic Technology | test | 3 | 48 |
| required | Motor and drag foundation | test | 2.5 | 40 |
| required | Fundamentals of control programming | test | 3 | 48 |
| required | Single-chip microcomputer technology basis | test | 2 | 32 |

**Summer semester 2 :**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Level 2 project(application of embedded system) | | 2 | 48 |
| required | Level 2 project(Electronic design) | | 1.5 | 36 |

**Autumn semester 3:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Physical Education V | non-test | 0.5 | 16 |
| required | Principle of Automatic Control | test | 3.5 | 56 |
| required | Microcomputer Principle and Interface Technology | test | 2 | 32 |
| required | Signals and Systems | test | 2 | 32 |
| required | Power electronic converter technology | test | 2.5 | 40 |
| required | Electrical control and PLC | test | 3 | 36 |
| required | Level 1 project(Robot operation and maintenance, design and integrated application )I | non-test | 1.5 | 36 |
| required | PLC BASIC TRAINING | non-test | 1.5 | 36 |
| required | Electrical wiring practice | non-test | 1.5 | 36 |
| required | Electrical troubleshooting practice | non-test | 1.5 | 36 |

**Spring semester 3:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Motion Control System | test | 2.5 | 40 |
| required | Industrial Robot Technology | non-test | 2 | 32 |
| required | Sensor Technology | non-test | 2 | 32 |
| required | Industrial Control Configuration Software Technology | non-test | 1.5 | 24 |
| required | Intelligent control | test | 2 | 32 |
| module A | Process control technology | non-test | 2 | 32 |
| module A | Modern control theory | non-test | 2 | 32 |
| module B | C# PROGRAMMING | non-test | 2 | 32 |
| module B | Machine vision | non-test | 2 | 32 |
| module C | Wind power technology | non-test | 2 | 32 |
| module C | Electrical part of wind power plant | non-test | 2 | 32 |

| | | | | |
|---|---|---|---|---|
| module C | Photovoltaic power generation technology | non-test | 2 | 32 |
| required | Electrical CAD | non-test | 1 | 24 |
| required | Control System CAD (Bilingual) | non-test | 1 | 24 |
| required | Automated production line training | non-test | 2 | 48 |
| required | Level 2 project(Electrical control and PLC integration ) | non-test | 3.5 | 84 |

**Summer semester 3:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Level 1 project(Robot operation and maintenance, design and integrated application )II | non-test | 1.5 | 36 |
| required | Level 2 project(Motion Control System integration) | non-test | 3.5 | 84 |

**Autumn semester 4:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Physical Education VI | non-test | 0.5 | 16 |
| required | Computer control technology | non-test | 2 | 32 |
| required | Factory power supply and distribution | test | 2 | 32 |
| required | Control system modeling and simulation | non-test | 2 | 32 |
| module A | Automation instrumentation and measurement | non-test | 2 | 32 |
| module A | Intelligent optimization calculation | non-test | 2 | 32 |
| module B | Virtual instrument technology | non-test | 2 | 32 |
| module B | Android system development | non-test | 2 | 32 |
| module C | Wind turbine monitoring and control | non-test | 2 | 32 |
| module C | Power System Analysis | non-test | 2 | 32 |
| module A | Level 2 project(Process control system integration) | non-test | 2 | 48 |
| module B | Level 1 project(Robot operation and maintenance, design and integrated application )III | non-test | 2 | 48 |
| module C | Level 2 project(New energy power generation system integration) | non-test | 2 | 48 |

**Spring semester 4:**

| Type | Course Name | Assessment | Credit | Course Hour |
|---|---|---|---|---|
| required | Automation Program (CDIO) Graduation Practice and Graduation Design (Thesis) | non-test | 6 | 288 |

## XIII. Prerequisite for Course Study

| No. | Course name | Prerequisite Course | No. | Course name | Prerequisite Course |
|---|---|---|---|---|---|
| 1 | Electric Circuit | Calculus A1 | 16 | Level 2 project(Motion Control System integration) | Modern control theory |
| | | Calculus A2 | | | Motion Control System |
| | | College Physics | | | Power electronic converter technology |
| 2 | Analog electronics | College Physics | 17 | Electrical wiring practice | Electrical control and PLC |
| | | Electric Circuit | 18 | Electrical troubleshooting practice | Electrical control and PLC |
| 3 | Digital Electronic Technology | College Physics | | | Electrical wiring practice |
| | | Electric Circuit | 19 | PLC BASIC TRAINING | Electrical control and PLC |
| | | Analog electronics | 20 | Level 2 project(Electrical control and PLC integration ) | Electrical control and PLC |
| 4 | Fundamentals of Motor Drive | College Physics | | | PLC BASIC TRAINING |
| | | Electric Circuit | | | Electrical troubleshooting practice |
| 5 | Principle of Automatic Control | Calculus A2 | 21 | Electrical CAD | Electrical control and PLC |
| | | Electric Circuit | | | Electrical control and PLC integration |
| | | Fundamentals of Motor Drive | 22 | Sensor Technology | Level 2 project(Embedded System Design ) |
| 6 | Single-chip microcomputer technology basis | Electric Circuit | | | Level 2 project(Electronic design) Mathematical Statistics and Probability Theory |
| | | Analog electronics | | | |
| | | Digital Electronic Technology | 23 | Computer control technology | Microcomputer Principle and Interface Technology |
| 7 | Fundamentals of control programming | Digital Electronic Technology | | | C# PROGRAMMING |
| | | Single-chip microcomputer technology basis | 24 | Industrial Control Configuration Software Technology | Electrical control and PLC |
| 8 | Microcomputer Principle and Interface Technology | Single-chip microcomputer technology basis | | | Computer control technology |
| | | Level 2 project(Embedded System Design ) | 25 | Industrial Robot Technology | Motion Control System |
| | | | | | Sensor Technology |
| 9 | Signals and Systems | Calculus A2 | 26 | Factory power supply and distribution | Electrical control and PLC |
| | | Electric Circuit | 27 | Intelligent control | Principle of Automatic Control |
| | | Principle of Automatic Control | | | Control system modeling and simulation |
| 10 | Power electronic converter technology | Electric Circuit | 28 | Intelligent optimization algorithm | Intelligent control |
| | | Analog electronics | | | System modeling and simulation |
| | | Digital Electronic Technology | 29 | Automation instrumentation and measurement | Sensor Technology |
| 11 | Electrical control and PLC | Fundamentals of Motor Drive | | | Single-chip microcomputer technology basis |
| | | Level 2 project(Embedded System Design ) | 30 | Process control technology | Principle of Automatic Control |
| | | | | | Automation instrumentation and measurement |
| 12 | Motion Control System | Principle of Automatic Control | | | Industrial Control Configuration Software Technology |
| | | Fundamentals of Motor Drive | 31 | C# PROGRAMMING | Fundamentals of control programming |
| | | Power electronic converter technology | | | Microcomputer Principle and Interface Technology |
| 13 | Control System CAD | Principle of Automatic Control | 32 | Virtual instrument technology | Sensor Technology |
| 14 | Modern control theory | Linear algebra | | | Single-chip microcomputer technology basis |
| | | Principle of Automatic Control | 33 | Machine vision | Sensor Technology |
| 15 | Control system modeling and simulation | Control System CAD | | | C# PROGRAMMING |
| | | Motion Control System | 34 | Android system development | Fundamentals of control programming |
| | | Modern control principle | | | C# PROGRAMMING |

| No. | Course name | Prerequisite Course | No. | Course name | Prerequisite Course |
|---|---|---|---|---|---|
| 34 | Wind power technology | Fundamentals of Motor Drive | 41 | Automated production line training | Electrical control and PLC |
| | | Motion Control System | | | Industrial Control Configuration Software Technology |
| | | Power electronic converter technology | | | Electrical CAD |
| | | | 42 | Automated mechanical design | Modern Engineering Drawing I |
| 35 | Electrical part of wind power plant | Electrical control and PLC | | | Automated production line training |
| | | Wind power technology | 43 | Process control system integration | Process control technology |
| 36 | Photovoltaic power generation technology | College Physics | | | Computer control technology |
| | | Electric Circuit | | | Industrial Control Configuration Software Technology |
| | | Power electronic converter technology | 44 | Level 2 project(New energy power generation system integration) | Photovoltaic power generation technology |
| 37 | Wind turbine monitoring and control | Wind power technology | | | Factory power supply and distribution |
| | | Electrical part of wind power plant | 45 | Level 1 project(Robot operation and maintenance, design and integrated application )I | Level 2 project(Electronic design) |
| | | Industrial Control Configuration Software Technology | | | Level 2 project(Embedded System Design ) |
| 38 | Power System Analysis | Electric Circuit | 45 | Level 1 project(Robot operation and maintenance, design and integrated application )II | Motion Control System integration |
| | | Fundamentals of Motor Drive | | | Industrial Robot Technology |
| 39 | Level 2 project(Embedded System Design ) | Single-chip microcomputer technology basis | | | Level 1 project(Robot operation and maintenance, design and integrated application )I |
| | | Fundamentals of control programming | | | |
| 40 | Level 2 project(Electronic design) | Electric Circuit | 46 | Level 1 project(Robot operation and maintenance, design and integrated application )III | Machine vision |
| | | Analog electronics | | | Level 1 project(Robot operation and maintenance, design and integrated application )II |
| | | Digital Electronic Technology | | | |

**XIV. Extracurricular Class**

Through taking extracurricular classes, students are encouraged to take part in academic lectures, social practice activities, campus cultural and sports activities, innovative and entrepreneurial activities, voluntary activities, etc. to improve their social adaptability and enhance the competitiveness in the job market. Details are specified in Students' Manual.