Instructive Cultivation Plan for the Program of Measurement Control Technology and Instruments

(Grade 2019)

Course code: 080301

1. Orientation

Cultivate senior application-oriented technical talents of intelligent manufacturing related industrial fields, especially the automotive electronics industry, based on Shanghai and facing to the whole country that can be engaged in the research, development, engineering design, technical management and service of modern instruments and testing equipment.

2. Cultivation Objectives

1. General cultivation objective

According to the needs of national economic and technological development, this program aims at cultivating senior application-oriented technical talents who have solid basic theory, wide range of professional knowledge, strong practical ability, modern scientific innovation spirit and international vision, be able to engage in research, development, engineering design, technical management and service of modern instrumentation and test equipment in smart manufacturing related industries, especially the automotive electronics industry.

2. Objective of value guidance

With the objective of cultivating application-oriented engineering and technical talents that adapt to social development, this program adheres to the value orientation of craftsmanship, takes school-enterprise cooperation and curriculum teaching as the carrier, aim at cultivating students' rigorous, meticulous, dedicated and responsible professionalism, and enhancing their independent learning ability, teamwork ability, innovation ability and social adaptability.

3. Objectives students must achieve five years after graduation:

(1) Master the natural science knowledge, engineering science knowledge, engineering technology knowledge and engineering environment knowledge required for measurement and control and related fields, and be familiar with the current situation and development trend of the industry at home and abroad;

(2) Have the professional ability to design, develop and debug the measurement and control system in consideration of social, environmental factors and relevant policies and regulations, thus proposing solutions according to the needs of the project;

(3) Have good team organization, communication and coordination skills, and be able to play a key role as a key member in the work team;

(4) Have humanities and social science literacy, professional ethics, social responsibility, global vision and sense of innovation in careers and professional activities;

(5) Have the ability of lifelong learning.

3. Requirement for Graduation

This program explores the talent training model of CDIO engineering education mode facing the strategic development needs of national innovative talents. Through four-year course study, experiment and engineering practice training, graduates should have the following knowledge and

abilities.

1. Engineering knowledge. Have the mathematics, natural sciences, engineering foundation and other professional knowledge required for working in the field of measurement and control engineering, and be able to apply these knowledge comprehensively to solve engineering problems in the field of measurement and control and related engineering fields;

Index point 1.1: master the knowledge of mathematics and natural sciences, understand the important thinking and methods of mathematics and physics, and be able to comprehensively apply the language of mathematics, natural sciences and engineering science to the appropriate expression of engineering problems in the field of measurement and control and related engineering.

Index point 1.2: be able to establish mathematical and physical models and solve them for engineering problems in the field of measurement and control and related engineering.

Index point 1.3: master the professional basic knowledge in measurement and control and related engineering fields, and be able to analyze and design engineering problems in related engineering fields.

Index point 1.4: master the professional knowledge of measurement and control and related engineering fields, and be able to comprehensively apply relevant knowledge to solve engineering problems in measurement and control and related fields.

2. Problem analysis ability. Be able to apply basic knowledge of mathematics, natural sciences and engineering sciences in the field of measurement and control engineering, and be able to model and analyze engineering problems in the field of measurement and control and related engineering fields through literature and research, and obtain effective conclusions;

Index point 2.1: be able to apply basic knowledge of mathematics, natural science and engineering science related to measurement and control engineering to identify and judge the key links of engineering problems.

Index point 2.2: be able to apply professional basic knowledge to correctly express engineering problems and analyze object characteristics.

Index point 2.3: be able to comprehensively use professional knowledge and literature research to analyze the influencing factors of engineering problems, seek multiple ways to solve problems, and obtain effective conclusions.

3. Ability to design/develop solutions. Be able to apply basic principles and technical methods related to the field of measurement and control engineering to design solutions to measurement and control and related engineering problems, and be able to reflect the sense of innovation in the design process, as well as taking into account social, health, safety, legal, cultural and environmental factors;

Index point 3.1: be able to use relevant professional knowledge to design and develop solutions to simple engineering problems, and understand various factors that affect design goals and technical solutions.

Index point 3.2: master the basic design (development) methods and technologies for the entire cycle and process of measurement and control engineering design and product development, and be able to apply them to design solutions to complex engineering problems, reflecting the sense of innovation.

Index point 3.3: be able to consider social, health, safety, legal, cultural and environmental factors in the design process, and evaluate the feasibility of the solution.

4. Scientific research ability. Be able to conduct modeling, simulation, optimization and synthesis based on scientific principles and methods, and be able to study complex engineering problems in the field of measurement and control and related engineering;

Index point 4.1: be able to determine reasonable objectives and feasible solutions for complex engineering problems in the field of measurement and control and related engineering based on scientific principles and through investigation and theoretical analysis.

Index point 4.2: be able to select research routes, design simulations or experimental programs, build experimental systems and determine required materials and devices based on professional theories and object characteristics.

Index point 4.3: be able to conduct simulation or experimental research, collect and process experimental data, analyze, interpret and process experimental results, and obtain reasonable and effective conclusions through information synthesis.

5. Ability to use modern tools. Be able to develop, select and use appropriate technology, resources, modern engineering tools and information technology tools for complex engineering problems in the field of measurement and control and related engineering fields, including the prediction, simulation and testing of complex engineering problems in the field of measurement and control and related engineering, and be able to understand its limitations;

Index point 5.1: Ability to inquire and retrieve professional literature and materials for measurement and control through information technology tools and channels such as the Internet, etc.

Index point 5.2: Ability to select and use commonly used instruments, information technology tools, modern engineering tools and simulation software in the field of measurement and control and related engineering fields to analyze, calculate and design complex engineering problems.

Index point 5.3: Be able to develop or re-develop appropriate instruments, modern engineering tools and simulation software for the simulation and prediction of complex engineering problems, and be able to understand its limitations.

6. Engineering and society. Be able to conduct reasonable analysis based on relevant background knowledge in the field of measurement and control engineering, evaluate the impact of professional engineering practice and solutions to measurement and control and related engineering problems on society, health, safety, law, and culture, and understand the responsibilities that should be undertaken;

Index point 6.1: Have experiences in engineering practice and social practice.

Index point 6.2: Recognize and understand the development trend of international and domestic situations, and have a sense of social responsibility.

Index point 6.3: be able to objectively analyze and evaluate the impact of measurement and control professional engineering practices and solutions on society, health, safety, law and culture, and understand the responsibilities that should be undertaken.

7. Environment and sustainable development. Be able to understand and evaluate the impact of professional engineering practices on the environmental and social sustainable development of engineering problems in the field of measurement and control and related engineering fields;

Index point 7.1: Understand the concepts and connotations of environmental protection and sustainable development in the specific practical process of solving complex engineering problems.

Index point 7.2: From the perspective of environmental protection and sustainable development, be able to correctly understand and reasonably evaluate the impact of professional engineering practices on the environmental and social sustainable development of complex engineering issues in the field of measurement and control and related engineering.

8. Professional norms. Have humanities and social science literacy, a sense of social responsibility, be able to understand and abide by engineering professional ethics and norms in engineering practice, and always perform responsibilities;

Index point 8.1: Establish a correct outlook on life, values and world outlook, and have humanities and social science literacy and a sense of social responsibility.

Index point 8.2: Be able to understand and abide by engineering professional ethics and regulations in engineering practice, and perform responsibilities.

9. Individuals and teams. Be able to assume the roles of individuals, team members and leaders in a team under a multidisciplinary background;

Index point 9.1: Be able to understand the composition of the team under a multidisciplinary context and the responsibilities of members in different roles.

Index point 9.2: Be able to assume the roles of individuals, team members and leaders in a team, be able to organize, coordinate and direct the work of the team, and have a good team spirit.

10. Communication skills. Be able to effectively communicate and exchange with industry colleagues and the public on engineering issues in the measurement and control and related engineering fields, have a certain international perspective, and be able to communicate and exchange under a cross-cultural context.

Index point 10.1: Understand the basic composition and requirements of professional technical documents for measurement and control, and be able to accurately express their views on professional issues in oral, manuscripts, charts and other forms, respond to queries, and understand the differences in communication with industry peers and the public.

Index point 10.2: Have a certain international vision, have a basic understanding of international development trends and research hotspots in the field of measurement and control and related engineering fields, and be able to communicate and exchange ideas on engineering issues in the field of measurement and control engineering under a cross-cultural context.

Index point 10.3: Have English language and written expression ability, be able to use English to communicate more accurately in oral or by written on professional issues.

11. Project management ability. Understand and master the procedures of project initiation, implementation, acceptance, improvement and promotion, have small-scale project management capabilities, and be able to apply them in a multi-disciplinary environment;

Index point 11.1: Understand and master the engineering management principles and economic decision-making methods involved in engineering projects.

Index point 11.2: Be able to apply engineering management principles and economic decision-making methods to the design, operation and management of automated engineering in a multidisciplinary environment.

12. Lifelong learning ability. Have the consciousness of independent learning and lifelong learning, and have the ability to continuously learn and adapt to development.

Index point 12.1: Have a correct understanding of autonomous learning and lifelong learning.

Index point 12.2: Have certain self-learning and perfect ability.

4. Schooling System

Four years

5. 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.

6. 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 151 credits for graduation; those who meet the requirements for bachelor's degree can be conferred bachelor degree in engineering.

7. Discipline

Control science and engineering, instrument science and technology, detection technology and automation equipment.

8. Core Courses

1. Foundation of Programming Design

This course is a professional basic course, which teaches the basic concepts, composition principles, implementation methods of structured programming design and the modularization of programming system. This course requires mastering the basic types and structure types of program data; mastering the program representation methods of sequence, conditions, and cycles; mastering the modular design and calling methods of functions; mastering the design and commissioning methods of modular programs. Through the study of this course, students will grasp the concept of program input/output ports.

This course integrates the basic methods of structured programming, supplemented by related experimental links, to cultivate students' ability to actually write application programs. In the teaching process, structured programming is the main content. The relevant knowledge of class and visual programming will be introduced according to the actual situation of the students, and the creative ability of students to write large engineering programs will be cultivated.

2. Principle of Automatic Control

This course is a professional basic course. It mainly teaches the establishment of mathematical models, block diagrams and simplification methods, transfer functions, system stability and other performance indicators, time domain analysis of linear systems, root locus analysis, frequency analysis, controller design, etc. Through the study of this course, students will be proficient in relevant mathematics and physics knowledge, proficient in the use of mathematical means to model the system, proficient in methods to solve system response and controller design, proficient in modern scientific computing tools (such as MATLAB , Python, etc.) to assist in calculation, design and solution, and obtain the initial training of lifelong learning ability.

3. Principle of Sensing Device

This course is a professional basic course. It mainly teaches the basic principles of sensors and measurement circuits related to sensor signal processing. The main contents include the working

principle, basic characteristics and application of sensors; it introduces the working principle and practical circuit of common sensors in detail, including resistive, capacitive, inductive, piezoelectric, photoelectric, pyroelectric, magnetoelectric, radiation and other types of sensors.

Through the study of this course, students will understand and master the detection, conversion and measurement methods of various non-electrical physical information, thus lay a solid foundation for students' follow-up professional courses and related professional work after graduation.

4. Signal and System

This course is a professional basic course, which mainly teaches three major transforms (Fourier transform, Laplace transform and z transform); continuous and discrete signals and systems; time domain, frequency domain and complex frequency domain analysis, etc.

Through the study of this course, students need to be proficient in relevant mathematics and physics knowledge, proficient in the use of mathematical means to model the system, proficient in the method of solving system responses, and proficient in modern scientific computing tools (such as MATLAB, Python, etc.), so as to assist in calculation, design and solving, and students are required to be able to conduct in-depth communication, division and cooperation with other students in the same group in the group work of the team, and initially cultivate the ability of lifelong learning, communication and teamwork.

5. Theory of Errors and Data Processing

This course is a compulsory course for the program. It mainly teaches the basic concepts, principles and methods of error theory and data processing, as well as the processing and evaluation of measurement data. Through the study of this course, the students will be able to master evaluation of random errors, gross errors, systematic errors generated by measurement systems, environments and methods, estimation of measurement values, elimination of gross values, and correction of general system errors; master equal precision measurement and unequal precision measurement, direct measurement and indirect measurement and related data processing methods of combined measurement; master the data processing method of least square method and its application in regression equation; basically master the uncertainty data measurement and evaluation method.

This course integrates the basic processing methods of measurement data, supplemented by related experimental links, to cultivate students' practical application ability. In the teaching process, this course takes static measurement data processing as the main line, and introduces the relevant knowledge of dynamic measurement data appropriately according to the actual situation of students, so as to stimulate students to understand the frontier and development direction of this course.

6. Motion Control System

This course is a professional compulsory course. This course mainly trains students in the methods of controlling motor speed and control system application based on the engineering problems of motor motion control application system in the field of measurement and control. The task of this course is to master the motion control system composed of DC motors, including the basic composition and control laws of single closed loop speed control system, double loop speed control system, reversible speed control system and DC pulse width speed control system, static and dynamic performance analysis and engineering design method. The teaching objective of this course is to cultivate the experimental ability with the characteristics of single-loop and double-loop speed control systems.

Through the understanding and application of comprehensive promotion knowledge of circuits, electronic technology, electrical and electronic, automatic control and other knowledge, the

teaching objective of this course is to highlight the mastery of basic motion control knowledge, focus on the cultivation of application ability, and emphasize the formation of engineering awareness; focus on training students' practical application ability and innovation ability; solve specific problems in engineering practice related to the course group, make theoretical teaching and engineering practice closely integrate and support each other, and train students' professional ability, communication ability, and team spirit.

7. Photoelectric sensing and detection

This course is a compulsory professional course. It is a professional foundation for researchers engaged in optical engineering, instrumentation, measurement and control, and is an emerging discipline that is closely connected with modern science and technology. This course mainly teaches the basic knowledge of photoelectric detection theory, the structural composition, design ideas and application characteristics of photoelectric detection, the basic principles of photoelectric conversion and various knowledge necessary for photoelectric detection technology, common photoelectric measurement methods and the use of common measuring instruments, as well as various basic skills required for photoelectric measurement and the methods of designing photoelectric detection circuits.

Through the study of this course, students will master the basic principles and basic methods of photoelectric detection, so that students are able to use photoelectric detection technology to solve practical problems, and able to independently complete the design of photoelectric detection system, thus effectively improving the talents engineering practice ability and comprehensive quality of scientific research. The assessment runs through the entire teaching process, giving full play to the potential and creativity of outstanding students.

8. Intelligent Instrument Technology

This course is a required professional course. Through the study of this course, students will master the basic concepts, types, information processing and design methods of intelligent instruments and virtual instruments, improve the application technology of single-chip processor, solid-state camera sensors and the intelligent monitoring instruments composed by them and improve related software and hardware design capabilities, thus laying the foundation for students to learn and practice other professional courses in the future.

9. Digital Image Processing (Bilingual)

This course is a compulsory professional course, which mainly teaches the basic concepts, methods, principles of digital image processing and their applications in industrial inspection, aerospace, military and civilian fields. This course requires students to firmly grasp the basic algorithms of image digitization theory, image histograms and their applications, Fourier transform and image enhancement, image segmentation, basic analysis methods of image texture and binary image processing, master algorithms such as convolution algorithms of spatial filtering, geometric correction and gray-scale interpolation, and understand image restoration and reconstruction, data compression, template matching, classification and other technologies.

This course integrates the knowledge of image sensing, detection, recognition, measurement, etc., and is supplemented by experimental and practical links to cultivate students' knowledge application, practical and innovative abilities. In the teaching process, it stimulates and guides students' interest and pursuit of cutting-edge knowledge in this field, and cultivates students' rigorous and realistic scientific spirit. This course uses English textbooks and is taught bilingually.

10. Virtual instrument technology I, virtual instrument technology II (second-level project)

This course series is a professional compulsory course and a professional practice course, which uses the integrated teaching method of theory and practice. Virtual instrument technology is the product of the combination of test technology and computer technology. It combines test

technology, instrument principles, computer interface technology and graphical programming technology, reflects a trend to replace traditional instruments in many fields and has become an important direction for contemporary instrument development. The virtual instrument development environment featured by graphical software programming methods and integrated development environment is an important content of virtual instrument technology research, and is also the technical basis for the application and development of virtual instrument technology.

Through theoretical teaching, experimental practice, group discussion and other links, students will master LabVIEW (the most widely used virtual instrument software development environment at present) programming technology and data acquisition technology. Meanwhile, this course also pays attention to the students' spirit of inquiry and cooperation during the course.

11. Measurement and Control Technology and System

This course is a professional selective course which teaches the basic concepts and principles of measurement systems and control systems, as well as system integration methods and simulation methods. The course requires students to master the construction principles and methods of a single-loop measurement and control system; basically grasp the basic methods of the construction and integration of a computer control system; basically understand the application of digital filters in a measurement and control system; basically understand the simulation application of a computer in a measurement and control system.

This course integrates the basic principles and construction methods of measurement and control technology and systems supplemented by related experimental links, to cultivate students' practical application ability. In the teaching process, this course takes the single-loop digital measurement and control system as the main line, and according to the actual situation of the students, introduces the multi-loop digital measurement and control system, random digital control system, discrete event control system and other related knowledge, so as to stimulate students to understand the frontier and development direction of this course. .

12. Engineering Optics

This course is a required professional course. This course mainly teaches the basic laws of light propagation in media from the concepts of geometric optics such as light waves, light rays and imaging. This course describes the imaging properties and laws of paraxial optics, ideal optical systems, flat mirrors and prisms, discusses the working principle, imaging performance and resolution of common optical instruments, and introduces the variable refractive index light optics and the optical system analysis of the zoom lens.

Through the study of this course, students will master the professional basic knowledge in the field of optical engineering, and lay the necessary foundation for them to learn subsequent courses such as photoelectric sensing and visual inspection design.

13. Modern Control Theory (English teaching)

This course is a professional elective course, involving part of the content of one of the program courses for the postgraduate entrance examination, mainly teaching state space description, stability analysis, controllability and observability, time domain analysis, discretization and other knowledge. Through the study of this course, students will be proficient in relevant mathematics and physics knowledge, proficient in the use of mathematical means to model the system, proficient in solving system responses and controller design, and proficient in modern scientific computing tools (such as MATLAB, Python, etc.) to assist in calculation, design and solution, and accept the initial training of lifelong learning ability. This course is taught in English, which cultivates students' ability to learn and apply technical English while studying professional theory.

14. Artificial Intelligence Technology

This course is a professional elective course, mainly teaches the latest scientific and technological achievements by several teachers in their respective research fields. Through the study of this course, students will understand certain knowledge of mathematics and natural sciences, understand the content of some cutting-edge literature, understand how to optimize the current model, and understand how to use Python and deep learning frameworks (such as TensorFlow, etc.) for training and testing, and understand how to apply these new content to industry and engineering, thus cultivating students' lifelong learning ability.

15. Automotive sensors and testing technology

This course is a professional elective course, which mainly lectures: basic concepts of sensors, current status of sensor technology, basic knowledge of detection technology, working principles and applications of commonly used sensors, structure, principles and detection of automotive sensors, signal processing technology of automotive sensors and detection systems, automotive sensors and detection system interference suppression technology and the application of microcomputer in the detection system.

This course is based on the principle of necessary ad sufficient theoretical knowledge, takes novel materials, highlights key points, and attaches importance to the application of knowledge and the cultivation of practical skills.

9. Practical Training

1. Measurement and control system design and development I, II, III (level one project)

This course is a professional practice course. As the main line of the first-level engineering training program, the measurement and control system design and development project runs through seven semesters from the summer semester of the first grade to the summer semester of the third grade. The training is divided into three stages. In the initial stage, students will learn the concept of the measurement and control system, the use method of software and hardware of the measurement and control platform, and complete the integration of a specific measurement and control system through the combination of software and hardware. On this basis, students are allowed to complete specific objectives through project collaboration, so that students can establish the concept of engineering projects and cultivate the sense of innovation. Through teamwork, this course will cultivate students' communication skills and teamwork spirit. Through the subsequent summary and speech defense, students' speech ability and report writing ability will 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, this course will instruct students to design and produce modern intelligent measurement and control systems by themselves. The difficulty of design and production tasks will gradually increase, and students' ability to integrate theory with practice and comprehensive practice will be improved significantly, so that the students will gradually obtain independent design and production capabilities of measurement and control systems.

In the process of course teaching, by adding the stories of the older generation of scientists, this course will cultivate students' ability to discover and solve problems from the aspect of ideological level, cultivate students' innovative ability, cultivate their communication and coordination skills, and cultivate their expressive skills.

2. Electronic design (second-level project)

This course is a professional practice course, which takes the common electronic technology application system engineering problems in the field of measurement and control as the background, and trains students in the basis and basic skills of electronic technology. The main contents include: application of basic electronic components, application of integrated operational

amplifier, design and production of integrated stabilized power supply, design and production of single-chip processor minimal system and construction of man-machine dialogue interface. Students study in groups, usually 3 to 4 people are in a group. The teaching objective of this course is to highlight the mastery of basic knowledge, focus on the cultivation of application ability, and emphasize the formation of engineering awareness; focus on cultivating students' practical application ability and innovation ability; solve specific problems in engineering practice related to the course group, so that theoretical teaching and engineering practice are closely integrated and mutually supportive, and students' professional ability, communication ability, team spirit and leadership ability are trained.

3. Computer Aided Design

This course is a professional practical course. Based on engineering requirements such as mechanical drawing production and application in the field of measurement and control, this course trains students to rely on Solidworks software as a tool to complete sketching, datum planes, entity features, entity editing, 3D sketches, 3D entities, assembly drawing, engineering drawing, section view, and engineering icon annotation and other functions. These concepts lay a good foundation for students to complete the drawing of an overall mechanical drawing, and cultivate the good mechanical drawing ability for the subsequent study and application of mechanical processing, mechanical design and other subjects. This course cultivates students' professional ability and design ability with the team.

4. Embedded system training (level 2 project)

The embedded system training project organizes teaching and practical activities through the unit of course group, including: main courses such as single-chip processor technology basis, microcomputer principle and interface technology, etc. This project takes the common embedded application engineering problems in the field of Measurement Control Technology and Instrumentsation as the background, and trains students to be proficient in applying embedded system knowledge to solve problems.

5. Intelligent detection and motion control (second-level project)

The intelligent detection and motion control integrated project organizes teaching and practical activities through the unit of curriculum group, including: main courses such as automatic control principles, signals and systems, digital image processing, industrial automation and robotics, etc. The project takes the common intelligent detection and control engineering application problems in the industrial automation field as the background, and trains students to learn how to flexibly apply knowledge of automatic control principles, digital image processing, signals and systems, and robots to control technology.

6. Comprehensive practice of measurement and control

The comprehensive practice of measurement and control program mainly develops students' practical ability in the fields of robotics, intelligent detection, motion control, machine vision and automotive electronics based on our professional school-enterprise cooperative enterprise. Through the internship in the enterprise, students will have a comprehensive understanding on the whole process of products from production to market, as well as the operation and maintenance of products. At the same time, under the influence of corporate culture, this course will strengthen students' professional standards, enhance social responsibility, and teamwork awareness. This program selects 3-4 companies to carry out practice in batches.

7. Graduation practice and graduation design of Measurement Control Technology and Instruments (thesis)

The graduation practice and graduation design (thesis) of the Measurement Control Technology and Instruments major are teaching and practical activities that comprehensively use the

knowledge learned by the undergraduate. Taking the common engineering problems in the field of Measurement Control Technology and Instrumentsation as the background, for a certain topic, this course will cultivate students' ability to comprehensively use the relevant theories and technologies of this major to solve specific problems in engineering practice, integrate theory and engineering practice and make them support each other, and train students' professional ability, problem analysis ability, problem solving ability, communication ability and project management ability.

10. Course Structure and Course Hours (excluding extracurricular class)

Category	Total Credit	%	Total Course Hours	Theory Learning	Practical Training
Public Course	51	34	976	908	68
Basic Course	33	22	528	408	120
Professional Course	25	17	400	332	68
Practical Training	31	20	888	0	888
General Course	10	7	160	160	0
Total	150	100	2952	1808	1144
Theory : Practice(%)	61:39				

11. 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	b1080003	Ideological and moral cultivation and legal foundation	non-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	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 Arts and Sciences	b1020018	College Chinese	non-test	2	32	32		Spring 1
	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	autumn 2
	required	College of Arts and Sciences	b1020035	College chemistry	non-test	1	32	28	4	autumn 1
	required	Department of Physical Education	-----	Physical Education I～VI	non-test	3	160	160		autumn 1～autumn 4
	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
	★English (Selective, 1 module, 10 credits)	Module A	b1020003	General English III	test	3	48	48		autumn 1
			b1020004	General English IV	test	3	48	48		Spring 1
			b1020005	General Academic English A	test	2	32	32		autumn 2
			---	English development	non-test	2	32	32		Spring 2
		Module B	b1020002	General English II	test	3	48	48		autumn 1
			b1020003	General English III	test	3	48	48		Spring 1
			b1020006	General Academic English B	test	2	32	32		autumn 2
			---	English development	non-test	2	32	32		Spring 2
		Module C	b1020001	General English I	test	4	64	64		autumn 1
			b1020002	General English II	test	3	48	48		Spring 1
			b1020003	General English III	test	3	48	48		autumn 2
	★German	College of Arts and Sciences	b1020040	German I	test	3	48	48		autumn 1
		College of Arts and Sciences	b1020041	German II	test	3	48	48		Spring 1
		College of Arts and Sciences	b1020042	German III	test	4	64	64		autumn 2
	★Japanese	College of Arts and Sciences	b1020077	Japanese I	test	3	48	48		autumn 1
		College of Arts and Sciences	b1020078	Japanese II	test	3	48	48		Spring 1
		College of Arts and Sciences	b1020079	Japanese III	test	4	64	64		autumn 2
Total (General Education Basic Courses)						51	976	908	68	
General Course	required	College of Engineering	b1020018	Scientific paper writing and document retrieval	non-test	2	32	32		autumn 1
	selective	Others	b0-----	Social Science and Humanities Literacy (4 credits) Natural Science and Technological Innovation (2 credits) Public Art (2 credits)	non-test	8	128	128		autumn ， Spring
Subtotal (general course)						10	160	160	0	

(★Note: The first foreign language has a total of 10 credits, including college English, German, and Japanese. Choose the appropriate language according to your needs; among them, if you choose college English, please choose the appropriate module in module ABC)

11. 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 Arts and Sciences	b1020098	Complex function	test	2	32	32		autumn 2
	required	College of Engineering	b2011296	Introduction to Measurement Control Technology and Instrumentss	non-test	1	16	16		autumn 1
	required	College of Engineering	b2011137	Modern Engineering Drawing I	test	3	48	40	8	Spring 1
	required	work training	b2011031	Circuit	test	4	64	48	16	Spring 1
	required	College of Engineering	b2011169	Foundation of Programming Design	test	3	48	32	16	Spring 1
	required	work training	b2012060	Analog electronics	test	3	48	36	12	autumn 2
	required	College of Engineering	b2011257	Single-chip processor technology basis	test	2	32	24	8	Spring 2
	required	work training	b2012099	Digital Electronic Technology	test	3	48	36	12	Spring 2
	required	College of Engineering	b2011292	Principle of Automatic Control	test	3	48	36	12	Spring 2
	required	College of Engineering	b2011023	Sensor principle	test	2	32	24	8	autumn 3
	required	College of Engineering	b2011418	Fundamentals of Precision Machinery	test	2	32	24	8	autumn 3
	required	College of Engineering	b2011273	Microcomputer Principle and Interface Technology	test	2	32	24	8	autumn 3
	required	College of Engineering	b2012129	Signals and Systems	test	3	48	36	12	Spring 2
Subtotal (Basic professional courses)						33	528	408	120	
Professional courses	required	College of Engineering	b2011131	Error theory and data processing	test	2	32	24	8	autumn 3
	required	College of Engineering	b2011297	Motion Control System	test	2	32	24	8	autumn 3
	required	College of Engineering	b2011419	Photoelectric sensing and detection	non-test	2	32	24	8	Spring 3
	required	College of Engineering	b2011298	Smart instrument technology	non-test	2	32	24	8	Spring 3
	required	College of Engineering	b2011006	PLC PRINCIPLE AND APPLICATION	non-test	2	32	24	8	autumn 3
	required	College of Engineering	b2011124	Digital Image Processing (Bilingual)	non-test	3	48	36	12	Spring 3
	required	College of Engineering	b2011230	Virtual instrument technology I	non-test	2	32	24	8	autumn 2
	required	College of Engineering	b2011045	Engineering Optics	test	2	32	32		autumn 3
	required	College of Engineering	b2011056	Industrial Automation and Robotics	non-test	2	32	24	8	Spring 3
	Subtotal (required professional courses)					19	304	236	68	
	Selective, 6 credits	College of Engineering	b2011299	DSP PRINCIPLE	non-test	2	32	32		autumn 4
		College of Engineering	b2011420	Optoelectronic Circuit Design and Application	non-test	1	16	16		autumn 4
		College of Engineering	b2011426	Infrared technology	non-test	1	16	16		autumn 4
		College of Engineering	b2011421	Image detection technology	non-test	1	16	16		autumn 4
		College of Engineering	b2011014	Measurement and control technology application	non-test	2	32	32		autumn 4
		College of Engineering	b2011153	Instrument communication interface technology	non-test	2	32	32		autumn 4
		College of Engineering	b2011274	Measurement and Control Technology and System	non-test	2	32	32		autumn 4
		College of Engineering	b2011275	Modern Control Theory (English teaching)	test	2	32	32		autumn 4
		College of Engineering	b2011422	Artificial intelligence technology	non-test	1	16	16		autumn 4
		College of Engineering	b2011423	Automotive sensors and detection technology	non-test	1	16	16		autumn 4
		College of Engineering	b2011424	Introduction to Automobile	non-test	2	32	32		autumn 4
		College of Engineering	b2011425	Automotive electronics	non-test	2	32	32		autumn 4
	Subtotal (selective professional courses)					6	96	96		
Subtotal (professional courses)						25	400	332	68	

11. Teaching schedule (3)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hour	Theory Learning	Practical Training	Semester
Vocational practice	required	College of Engineering	b4011141	Measurement and control system design and development I (Level 1 project)	non-test	2	48		48	summer 1
	required	College of Engineering	b4011142	Measurement and control system design and development II (Level 1 project)	non-test	2	48		48	summer 2
	required	College of Engineering	b4011143	Measurement and control system design and development III (Level 1 project)	non-test	2	48		48	summer 3
	required	work training	b4090002	Basic engineering training B	non-test	2	48		48	autumn 1
	required	College of Engineering	b4011128	Electronic technology practice	non-test	1	24		24	summer 1
	required	College of Engineering	b4011170	Electronic design(Level 2 project)	non-test	2	48		48	summer 2
	required	College of Engineering	b4011145	Computer Aided Design	non-test	1	24		24	summer 1
	required	College of Engineering	b4011171	Printed board design and realization	non-test	1	24		24	summer 2
	required	College of Engineering	b4011172	Embedded system training (Level 2 project)	non-test	2	48		48	summer 3
	required	College of Engineering	b4000004	Innovation and entrepreneurship of Measurement Control Technology and Instrumentsation	non-test	2	48		48	Spring 3
	required	College of Engineering	b4011295	Electrical control and programmable controller training	non-test	1	24		24	Spring 3
	required	College of Engineering	b4011296	Virtual instrument technology II(Level 2 project)	non-test	2	48		48	summer 2
	required	College of Engineering	b4011297	Intelligent detection and motion control (Level 2 project)	non-test	1	24		24	summer 3
	required	College of Engineering	b4011149	robot (Level 2 project)	non-test	2	48		48	autumn 4
	required	College of Engineering	b4011298	Comprehensive practice of measurement and control	non-test	2	48		48	autumn 4
	required	College of Engineering	b4011251	Graduation Practice and Graduation Design of Measurement Control Technology and Instruments (Thesis)	non-test	6	288		288	Spring 4
Subtotal (professional practice)						31	888		888	
Extracurricular Class	required	Others	b5110001	Extracurricular Class	non-test	1	-	-	-	autumn , Spring , summer
Total						151	2952	1808	1144	

Professional Certificates can be gained after learning following courses:

Students who have passed the virtual instrument technology I course can participate in the professional qualification certificate assessment related to this program: LabVIEW Assistant Development Engineer (CLAD) ---- National Instruments Corporation global certification. Students obtained the certificate can be exempt from Level 2 project (virtual instrument technology II), and the score of this course is converted from the test scores of the certificate.

12. Schedule for Semesters(Suggested)

Autumn semester 1:

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	College chemistry	non-test	1	32
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	Introduction to Measurement Control Technology and Instrumentss	non-test	1	16
required	Basic engineering training B	non-test	2	48

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 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	Military theory	non-test	0.5	32
required	Modern Engineering Drawing I	test	3	48
required	Circuit	test	4	64
required	Foundation of Programming Design	test	3	48

Summer semester 1:

Type	Course Name	Assessment	Credit	Course Hour
required	Measurement and control system design and development I (Level 1 project)	non-test	2	48
required	Electronic technology practice	non-test	1	24
required	Computer Aided Design	non-test	1	24

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	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	College Physics C	non-test	1	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 function	test	2	32
required	Analog electronics	test	3	48
required	Virtual instrument technology I	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
selective	General Course	non-test	2	32
required	Single-chip processor technology basis	test	2	32
required	Digital Electronic Technology	test	3	48
required	Principle of Automatic Control	test	3	48
required	Signals and Systems	test	3	48

Summer semester 2:

Type	Course Name	Assessment	Credit	Course Hour
required	Measurement and control system design and development II (Level 1 project)	non-test	2	48
required	Electronic design(Level 2 project)	non-test	2	48
required	Printed board design and realization	non-test	1	24
required	Virtual instrument technology II(Level 2 project)	non-test	2	48

Autumn semester 3:

Type	Course Name	Assessment	Credit	Course Hour
required	Physical Education V	non-test	0.5	16
selective	General Course	non-test	2	32
required	Sensor principle	test	2	32
required	Fundamentals of Precision Machinery	test	2	32
required	Microcomputer Principle and Interface Technology	test	2	32
required	Error theory and data processing	test	2	32
required	Motion Control System	test	2	32
required	PLC PRINCIPLE AND APPLICATION	non-test	2	32
required	Engineering Optics	test	2	32

Spring semester 3:

Type	Course Name	Assessment	Credit	Course Hour
required	Photoelectric sensing and detection	non-test	2	32
required	Smart instrument technology	non-test	2	32
required	Digital Image Processing (Bilingual)	test	3	48
required	Industrial Automation and Robotics	non-test	2	32
required	Innovation and entrepreneurship of Measurement	non-test	2	48

	Control Technology and Instrumentsation			
required	Electrical control and programmable controller training	non-test	1	24

Summer semester 3:

Type	Course Name	Assessment	Credit	Course Hour
required	Measurement and control system design and development III (Level 1 project)	non-test	2	48
required	Embedded system training (Level 2 project)	non-test	2	48
required	Intelligent detection and motion control (Level 2 project)	non-test	1	24

Autumn semester 4:

Type	Course Name	Assessment	Credit	Course Hour
required	Physical Education VI	non-test	0.5	16
selective	DSP PRINCIPLE	non-test	2	32
selective	Optoelectronic Circuit Design and Application	non-test	1	16
selective	Infrared technology	non-test	1	16
selective	Image detection technology	non-test	1	16
selective	Measurement and control technology application	non-test	2	32
selective	Instrument communication interface technology	non-test	2	32
selective	Measurement and Control Technology and System	non-test	2	32
selective	Modern Control Principles (English teaching)	test	2	32
selective	Artificial intelligence technology	non-test	1	16
selective	Automotive sensors and detection technology	non-test	1	16
selective	Introduction to Automobile	non-test	2	32
selective	Automotive electronics	non-test	2	32
required	robot (Level 2 project)	non-test	2	48
required	Comprehensive practice of measurement and control	non-test	2	48

Spring semester 4:

Type	Course Name	Assessment	Credit	Course Hour
required	Graduation Practice and Graduation Design of Measurement Control Technology and Instruments (Thesis)	non-test	6	288

13. Prerequisite for Course Study

No.	Course name	Prerequisite Course	No.	Course name	Prerequisite Course
1	Analog electronics	Circuit	11	PLC PRINCIPLE AND APPLICATION	Digital Electronic Technology
					Circuit
					Foundation of Programming Design
2	Digital Electronic Technology	Circuit	12	Digital image processing	Digital Electronic Technology
		Analog electronics			Signals and Systems
3	Principle of Automatic Control	Circuit	13	Virtual instrument technology	Digital Electronic Technology
		College Physics			Circuit
		Digital Electronic Technology			Foundation of Programming Design
		Analog electronics			
4	Sensor principle	Digital Electronic Technology	14	Industrial Automation and Robotics	Principle of Automatic Control
		Analog electronics			Mechanical foundation
					Foundation of Programming Design
5	Microcomputer Principle and Interface Technology	Digital Electronic Technology	15	DSP PRINCIPLE	Sensor principle
		Analog electronics			Single-chip processor technology basis
					Microcomputer Principle and Interface Technology
6	Signals and Systems	Calculus	16	Optoelectronic Circuit Design and Application	Analog electronics
		Linear algebra			Digital Electronic Technology
					Sensor principle
7	Error theory and data processing	Probability Theory and Mathematical Statistics	17	Image detection technology	Digital Electronic Technology
					Signals and Systems
					Digital image processing
8	Photoelectric sensing and detection	Digital Electronic Technology	18	Measurement and control technology application	Microcomputer Principle and Interface Technology
		Analog electronics			Sensor principle
		Sensor principle			Virtual instrument technology I
9	Motion Control System	Principle of Automatic Control	19	Engineering Optics	Advanced Mathematics
		Circuit			College Physics
10	Smart instrument technology	Digital Electronic Technology	20	Single-chip processor technology basis	Circuit
		Analog electronics			Digital Electronic Technology
		Sensor principle			Analog electronics

14.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.