Hunan Institute of Engineering (HIE)

Cultivation Plan

Measurement and Control Technology and Instrumentation Programme

Major Version: V2023
Effective Date: Sept 2023
With Minor Revisions Made Annually (V2023.7)

Programme: Measurement and Control Technology and Instrumentation
Programme Code: 080301
Core Discipline: Instrumentation Science and Technology
Degree Awarded: Bachelor of Engineering
Duration: 4 years

1 Program Overview

This major began enrolling undergraduate students in 2006 and has been running for 17 years. It relies on the discipline of "Control Science and Engineering," which is a key construction discipline in Hunan Province during the "Eleventh Five-Year Plan" and "Twelfth Five-Year Plan" periods, as well as a distinctive discipline in Hunan Province's "Double First-Class" initiative. Through school-enterprise cooperation, six provincial-level practice platforms have been established. Collaborations with 63 well-known enterprises in the electromechanical industry in Changsha-Zhuzhou-Xiangtan, the Yangtze River Delta, and the Guangdong-Hong Kong-Macao Greater Bay Area have jointly built practical education bases. The effectiveness of talent cultivation is remarkable. In 2021, the major won two first prizes in the National Electronic Design Competition. The employment rate has consistently remained above 95%, ranking among the top in the university.

2. Objectives

This program cultivates high-level specialized talents who can adapt to the economic and social development of the country and region, with all-round development in morality, intelligence, physical fitness, aesthetics, and labor. They should have a solid foundation, innovative awareness, self-learning ability, practical skills, and team spirit. These talents can work in areas such as sensor and detection technology, automation instruments and systems, intelligent instruments and meters, and computer measurement and control systems. Upon graduation, students should possess the following qualities and professional abilities:

1: Be able to adapt to the development of modern measurement and control technology, have certain engineering innovation ability, and be able to use modern tools to engage in design, optimization operation, engineering practice and production management in the field of instruments.

2: Have a sense of social responsibility, understand and adhere to professional ethics, take into account the impact of law, environment and sustainable development, and prioritize public interests in engineering practice.

3: Have a healthy body and mind, good humanistic science literacy, team spirit, effective communication and expression ability, and project management ability.

4: Be able to actively adapt to the changing domestic and international situation and environment, and have independent lifelong learning habits and abilities.

3. Learning Outcomes

Upon graduation, students are expected to demonstrate the following competencies:

(1). Engineering Knowledge: The ability to apply mathematics, natural sciences, engineering fundamentals, and professional knowledge to solve complex engineering problems in the field of measurement and control technology.（R1）

(2). Problem Analysis: The ability to apply the basic principles of mathematics, natural sciences, and engineering science to identify, express, and analyze complex engineering problems in the field of measurement and control technology through literature research to obtain effective conclusions.（R2）

(3). Design/Development of Solutions: The ability to design solutions for complex engineering problems in the field of measurement and control technology, design systems, units (components), or processes that meet specific requirements, and demonstrate innovation consciousness, considering social, health, safety, legal, cultural, and environmental factors in the design process.（R3）

(4). Research: The ability to conduct research on complex engineering problems in the field of measurement and control technology based on scientific principles and scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis.（R4）

(5). Use of Modern Tools: The ability to develop, select, and use appropriate technologies, resources, modern engineering tools, and information technology tools for complex engineering problems in the field of measurement and control technology, including prediction and simulation of complex engineering problems in the field of measurement and control technology, and understanding their limitations.（R5）

(6). Engineering and Society: The ability to analyze and evaluate the impact of professional engineering practices and solutions to complex engineering problems in the field of measurement and control technology on society, health, safety, law, and culture based on engineering-related background knowledge, and understanding of responsibilities.（R6）

(7). Environment and Sustainable Development: The ability to understand and evaluate the impact of engineering practices on the environment and social sustainability in addressing complex engineering problems in the field of measurement and control technology.（R7）

(8). Professional Ethics: Possession of humanistic and social science literacy, social responsibility, the ability to understand and comply with engineering professional ethics and norms, and fulfill responsibilities in engineering practice.（R8）

(9). Individual and Team: The ability to assume individual, team member, and leader roles in interdisciplinary teams.（R9）

(10). Communication: The ability to effectively communicate and interact with peers in the industry and the general public on complex engineering problems, including writing reports and designing documents, making presentations, clear expression, or responding to instructions. Also, possessing a certain international perspective and being able to communicate and interact in a cross-cultural context.（R10）

(11). Project Management: Understanding and mastering engineering management principles and economic decision-making methods, and applying them in a multidisciplinary environment.（R11）

(12). Lifelong Learning: Possession of awareness of independent learning and lifelong learning, and the ability to continuously learn and adapt to development.（R12）

4 Relationship Between Training Objectives and Graduation Requirements

Matrix table of the relationship between training objective and graduation requirement

Objective / Requirement	Objective 1	Objective 2	Objective 3	Objective 4
1 Engineering knowledge	•			
2 Problem analysis		•	•	
3 Design/development of solutions	•	•		
4 Research	•	•		
5 Use of modern tools	•		•	
6 Engineering and society		•		•
7 Environment and sustainable development	•	•		
8 Professional norms			•	•
9 Individuals and teams	•		•	
10 Communication			•	•
11 Project management	•		•	
12 Lifelong learning		•		•

5 Main Disciplines and Specialized Core Courses

Main Disciplines: Instrument science and Technology, Control Science and Engineering.

Specialized Core Courses: Circuit Theory, Analog Electronics, Digital Electronics, Principle and Application of Microcontroller, Digital Signal Processing, Sensor and Detection Technology, Measurement bus and Virtual Instrument, Measurement and Control Circuit, Visual Inspection Technique.

6 Duration and Degree

Duration: 4 years Degree awarded: Bachelor of Engineering

7 Credits

Total credits: 170

Course category	In-class teaching			Engineering practice and graduation design
	General education foundation courses	Subject foundation course	Professional course	
Credits	69	32	27	42
Percentage in total credits	40.58%	18.82%	15.8%	24.7%

8 Table of Teaching Schedule

1 Time Allocation Table

Item / No. of weeks / Semester	Military training and entrance education	Course teaching	Course Design	Intensive training	Comprehensive experiment	Practice	Comprehensive practice of morals and ethics	Graduation design (thesis)	Graduation education	Assessment	Feasible	Number of weeks in a semester
1st	2	13	1							2	2	20
2st		16		1		1				2		20
3st		15				3				2		20
4st		14	2			1	1			2		20
5st		14	4							2		20
6st		14	4							2		20
7st		13	3		2					2		20
8st						2		15	1		2	20
Total	2	100	14	1	2	7	1	15	1	14	4	160

2 Practice Teaching Schedule

Code	Type	Name	Semester	Number of weeks	Credits
1602000	Military training and entrance education	National defense education and entrance education	1st	2	1
0502001	Practice of ideological, and political course	Comprehensive practice of ideological, and political course	2st	(1)	1
0502002	Social practice	Social investigation	Summer	(4)	(4)
0502000	Comprehensive practice of morals and ethics	Laboring for public benefit	4st	1	1
0302000	Course Design	Course Design of C Programming Language Design	1st	1	1
1402000	Practice	Metalworking practice (1)	2st	1	1
0402000	Intensive training	English application ability practice	2st	1	1
0102501	Practice	Professional cognition practice	3st	1	1
1402006	Practice	Electronic practice(2)	3st	2	2
0102001	Course Design	Course Design of Digital Electronics	4st	2	2
1402007	Practice	Electronic practice(1)	4st	1	1
0102502	Course Design	PCB board making and technology Course Design	5st	2	2
0102503	Course Design	Course Design of Principle and Application of Single-chip Microcomputer	5st	2	2
0102504	Course Design	Course Design of measurement and control circuit	6st	1	1
0102505	Course Design	PLC principle and application Course Design	6st	1	1
0102506	Course Design	Course Design of virtual instrument	6st	2	2
0102507	Course Design	DSP technology Course Design	7st	2	2
0102508	Comprehensive experimental week	Engineering practice training	7st	2	2
0102509	Course Design	Visual inspection technology Course Design	7st	1	1
0102510	Professional practice	Determined based on specific job and project requirements in enterprise	8st	2	2
0102511	Graduation design (thesis)	Graduation design (thesis)	8st	15	15
Total				42	42

3 Course Teaching Schedule

Course category	Course nature	Course Code	Course name	Credit	Course hours			Division of class-hour in a week in each semester								Assessment method
					Total	Teaching	Experiment and practice	1st	2nd	3rd	4th	5th	6th	7th	8th	
								13 weeks	16 weeks	15 weeks	14 weeks	15 weeks	11 weeks	6 weeks		
Basic courses in general education	Compulsory	Module of ideology and politics														
		0500000	Ideological Morality and Rule of Law	2.5	40	32	8		3				`			Exam
		0500001	The Basic Principles of Marxism	3	48	40	8	4								Exam
		0500002	Outline of Contemporary and Modern Chinese History	2.5	40	32	8				3					Exam
		0500003	Introduction of Mao Tse-tung's Thoughts and Chinese Characteristic Socialism Theories System	2	32	32						3				Exam
		0500004	Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	3	48	40	8						4			Exam
		0500005	Situation and Policy (1)	1.5	24	24		*	*	*	*					Check
		0500008	Situation and Policy (2)	0.5	8	8						*	*			Check
		Module of mathematics and natural science														
		1000000	Advanced Mathematics A(1)	4.5	72	72		6								Exam
		1000001	Advanced Mathematics A(2)	6	96	96			6							Exam
		1000004	Linear Algebra	2	32	32			2							Exam
		1000005	Complex Function and Integral Transformation	2	32	32				2						Check
		1000006	Probability and Mathematics Statistics	2	32	32					3					Exam
		1000008	College Physics (1)	2.5	40	40			3							Exam

Course category	Course nature	Course Code	Course name	Credit	Course hours			Division of class-hour in a week in each semester								Assessment method
					Total	Teaching	Experiment and practice	1st	2nd	3rd	4th	5th	6th	7th	8th	
								13 weeks	16 weeks	15 weeks	14 weeks	15 weeks	11 weeks	6 weeks		
		1001000	Experiments in College Physics (1)	1	16		16		1							Check
		1000009	College Physics(2)	3	48	48				4						Exam
		1001001	Experiments in College Physics (2)	1	16		16			1						Check
Basic courses in general education	Compulsory	Module of comprehensive application ability														
		0400000	College English (1)	3	48	48		4								Exam
		0400001	College English (2)	2	32	32			3							Exam
		0400002	College English (3)	3	48	48				4						Exam
		0400003	College English (4)	3	48	48					4					Exam
		0300901	C Language Programming	4	64	44	20	5								Check
		0100006	Literature Review and Research Paper Writing	1	16	16								2		Check
		Module of quality development														
		1100000	Physical Education (1)	1	36	32	4	2								Check
		1100001	Physical Education (2)	1	36	32	4		2							Check
		1100002	Physical Education (3)	1	36	32	4			2						Check
		1100003	Physical Education (4)	1	36	32	4				2					Check
		0000000	Cultural Education (Chinese culture, natural science, etc.)	1	16	16										Check
		0000001	Cultural Education (Public Art)	2	32	32										Check
		1600000	Military Theory and National Security Education	2	36	24	12		*							Check
		1800000	Mental Health Education for College Students	1	16+(16)	16	(16)	*								Check
		0000002	Second Classroom	*												Check

Course category	Course nature	Course Code	Course name	Credit	Course hours			Division of class-hour in a week in each semester								Assessment method
					Total	Teaching	Experiment and practice	1st	2nd	3rd	4th	5th	6th	7th	8th	
								13 weeks	16 weeks	15 weeks	14 weeks	15 weeks	11 weeks	6 weeks		
		Module of innovation and entrepreneurship														
		0010000	Career Development and Employment Guidance for College Students	2	16+(22)	16	(22)						*			Check
		5210000	Innovation and Entrepreneurship Education (1)	1	8+(8)	8	(8)			2						Check
		5210001	Innovation and Entrepreneurship Education (2)	1	8+(8)	8	(8)						2			Check
		Subtotal		69	**1156 +(54)**	1044	112 **(54)**	21	20	15	12	3	6	2	0	
Disciplinary basic courses	Compulsory	0200902	Engineering Drawing B	2.5	40	40		3								Check
		0100501	Introduction to Measurement and Control Profession	0.5	8	8		1								Check
		0100001	Circuit Theory (1)	3	48	48			3							Exam
		0101001	Circuit Measurement Technology (1)	1	16		16		1							Check
		0100002	Circuit Theory (2)	2.5	40	40				3						Exam
		0101002	Circuit Measurement Technology (2)	0.5	8		8			1						Check
		0100004	Digital Electronics C	3	48	48				4						Exam
		0101004	Digital Electronics Measurement Technology	1	16		16			1						Check
		0100003	Analog Electronics	3.5	56	56					4					Exam
		0101003	Analog Electronics Measurement Technology	1	16		16				1					Check
		0100205	Microcomputer Principle and	3.5	56	48	8				4					Exam

Course category	Course nature	Course Code	Course name	Credit	Course hours			Division of class-hour in a week in each semester								Assessment method
					Total	Teaching	Experiment and practice	1st	2nd	3rd	4th	5th	6th	7th	8th	
								13 weeks	16 weeks	15 weeks	14 weeks	15 weeks	11 weeks	6 weeks		
			Interface Technology													
		0100206	Principle of Automatic Control A	3.5	56	48	8				4					Exam
		0100208	Principle and Application of Single-chip Microcomputer A	3	48	36	12					4				Exam
		0100211	Signals and Systems B	2	32	28	4					4				Exam
		0100502	Error Theory and Data Processing	2	32	32							3			Exam
		Subtotal		32.5	520	432	88	4	4	9	13	8	3	0	0	
Specialized courses	Compulsory	0100503	Measurement Bus and Virtual Instrument	3	48	40	8					4				Exam
		0100504	Sensor and Detection Technology	2.5	40	32	8					4				Exam
		0100505	Digital Image Processing A	2.5	40	32	8						3			Exam
		0100506	Measurement and Control Circuit	3	48	40	8					4				Exam
		0100209	Principle and Application of PLC	2.5	40	34	6						4			Exam
		0100507	Digital Signal Processing	2	32	26	6							4		Exam
		0100215	Process control and system simulation	2	32	20	12						3			Exam
		0100508	DSP Technology A	2	32	26	6							4		Exam
		0100509	Visual Inspection Technique	2.5	40	32	8							4		Exam
		Subtotal		22	352	282	70	0	0	0	0	12	10	12	0	
	Elective	0100511	Signal Detection and Valuation	1.5	24	24						2				Check
		0100512	Photoelectric Detection	2	32	32							3			Check

Course category	Course nature	Course Code	Course name	Credit	Course hours			Division of class-hour in a week in each semester								Assessment method
					Total	Teaching	Experiment and practice	1st	2nd	3rd	4th	5th	6th	7th	8th	
								13 weeks	16 weeks	15 weeks	14 weeks	15 weeks	11 weeks	6 weeks		
			Technology													
		0100513	Electronic Circuit Design and Testing	2	32	32								3		Check
		0100514	Precision Measurement and Control Technology and System	2	32	32							3			Check
		0100515	Fundamentals of Computer Software Technology	1.5	24	24						2				Check
		0100516	Computer Networks and Communications	2	32	32								3		Check
		0100517	Process Testing and Instrumentation	2	32	32								3		Check
		0100518	Interchangeability and Measurement Techniques	1.5	24	24								2		Check
		0100227	Process and Manufacturing Technology of Electronic and Electrical Equipment	1	16	16								2		Check
		0100519	Measurement and Control System Reliability	2	32	32								3		Check
		0100520	Control System Simulation Technology	2	32	20	12							3		Check
		0100521	Internet of Things Technology A	1.5	24	24								2		Check
		0100522	Intelligent Instrument	2	32	28	4							3		Check
		0100721	Fundamentals of Intelligent Robot	2	32	32								3		Check
		0100719	Python Programming	1.5	24	18	6						2			Check
		0100217	Modern Control Theory	2	32	28	4						3			Check

Course category	Course nature	Course Code	Course name	Credit	Course hours			Division of class-hour in a week in each semester								Assessment method
					Total	Teaching	Experiment and practice	1st	2nd	3rd	4th	5th	6th	7th	8th	
								13 weeks	16 weeks	15 weeks	14 weeks	15 weeks	11 weeks	6 weeks		
		0100523	Embedded System	2	32	26	6							3		Check
		Subtotal	At least 4.5 credits	4.5	72	62	10						5	5		
		Total		128	2100	1820	280 **(54)**	25	24	24	25	23	24	19	0	

9 Observation Points of the Connotation of Graduation Requirements

Graduation requirement	Observation Points of the Connotation of Graduation Requirements	Supporting course
1.Engineering knowledge	**1.1 Problem description:** Be able to apply the basic concepts, terms, graphics, symbols and other language tools of mathematics, natural science and engineering science to the description of engineering problems.	1. Maths * 2. College Physics 3. Principle of Automatic Control 4. Engineering Drawing
	1.2 Problem modeling: Apply basic engineering knowledge and professional knowledge to model and solve complex engineering problems, and propose a variety of solutions.	1. Signal and System 2. Digital Electronic Technology 3. Analog Electronics Technique
	1.3 Model verification: Be able to use basic engineering knowledge to synthesize the solution ideas of complex engineering problems and give appropriate solutions.	1. Maths * 2. Theory of Circuit 3. Engineering Drawing 4. Signal and System
2.Problem analysis	**2.1 Reasonable expression of key parameters and links:** Able to apply the basic principles of mathematics, natural science knowledge and control science, identify the key parameters and links in the complex engineering of industrial process control, motion control and electrical automation equipment, and express them reasonably.	1. Circuit 2. Sensor and Detection Technology 3. Digital Signal Processing 4. Error Theory and Data Processing
	2.2 Problem analysis: Apply mathematics, natural science, engineering foundation and professional knowledge to preliminarily analyze complex engineering problems and seek multiple sets of effective solutions.	1. Error Theory and Data Processing 2. Digital Electronic 3. Process control and system simulation 4. Principle of Automatic Control 5. Digital Image Processing
	2.3 Evaluation and improvement plan: To further understand and evaluate the influencing factors and solutions of complex engineering problems in related fields such as sensor and detection	1. Process control and system simulation 2. Digital Electronic 3. Visual Inspection

	technology, automated instrumentation and system, intelligent instrumentation and computer measurement and control system, so as to obtain effective conclusions.	Technique
3.Design/development	**3.1 Requirement determination:** Being able to clarify user requirements based on actual situations, establish design objectives for complex engineering problems in the measurement and control field, and be familiar with fundamental design methods throughout the entire cycle and process of engineering design and product development.	1.Principle and Application of Microcontroller 2. Principle and Application of PLC 3.Graduation design (thesis)
	3.2 Scheme Design: Consideration should be given to social, health, safety, legal, cultural, and environmental factors in order to propose design schemes that meet the design objectives. Complete the design of relevant units or subsystems and conduct feasibility studies on the design schemes through evaluation indicators such as technical and economic aspects.	1.Principle of Automatic Control 2.Graduation design (thesis) 3.Microcomputer Principle and Interface Technology 4. Measurement and Control Circuit
	3.3 Scheme optimization: Optimize units and subsystems based on the functional modules in the design scheme, reflecting innovative thinking.	1.Computer Control Technology 2.Course Exercise in Professional Synthesis 3.Digital Electronic Technology Course Design
	3.4 Scheme determination and implementation: Determine the development scheme according to the system design scheme and realize the software and hardware design.	1.Principle and Application of Microcontroller Course Design 2. Measurement and Control Circuit Course Design 3.Principle and Application of PLC Course Design 4.Graduation design (thesis) 5.DSP Technology Course Design
4.Research	**4.1 Design experiments:** Determine research objectives and design reasonable simulation and experiment schemes for complex engineering	1.Circuit Measurement Technology 2.Analog Electronic

	problems.	Measurement Technology 3.Digital Electronic Measurement Technology 4.Process control and system simulation
	4.2 Carry out experiments: The experimental platform can be built in the form of software simulation, physical or semi-physical, etc., to carry out system implementation and experiment.	1.CircuitMeasurement Technology 2.Analog Electronic Measurement Technology 3.Digital Electronic Measurement Technology 4.Principle and Application of Microcontroller 5.Visual Inspection Technique Course Design
	4.3 Analysis Experiment: Ability to accurately collect, organize and analyze experimental data, evaluate the results of experiments, propose improvement plans, obtain reasonable and effective interpretations, and provide support for solving complex engineering problems.	1.Microcomputer Principle and Interface Technology 2.Visual Inspection Technique 3.Analog Electronic Measurement Technology 4.Digital Electronic Measurement Technology
5.Use of modern tools	**5.1 Knowledge of modern tools:** Effective knowledge of information technology tools, modern instruments, engineering tools and simulation software.	1.C Language Programming 2.Principle and Application of Microcontroller 3.Principle and Application of PLC 4.DSP Technology 5.Digital Image Processing
	5.2 Selection of modern tools: Be able to select and use modern engineering tools, apply them to the scheme design of complex engineering problems in the field of measurement and control, component selection, module design and system integration.	1.Literature Reading and Thesis Writing 2.Principle and Application of Microcontroller Course Design 3.Principle and Application of PLC Course Design 4.Digital Electronic Technology Course Design

		5. Printed Circuit Board and Technology Curriculum Design Course Design
	5.3 Development and application of modern tools: Able to develop modern engineering tools and information technology tools to predict and simulate complex engineering problems in the field of measurement and control, judge and analyze the effectiveness of the results, and understand their limitations.	1.Measurement Bus and Virtual Instrument 2.Process control and system simulation 3.Course Exercise in Professional Synthesis
6.Engineering and society	**6.1 Familiar with engineering background:** have engineering internship and practice experience, understand the operation management mode, intellectual property rights, industrial policies and laws and regulations of related enterprises in the measurement and control circuit industry.	1.Cognition Practice 2. Printed Circuit Board and Technology Curriculum Design Course Design 3.Introduction to Measurement and Control Profession
	6.2 Assessment of influencing factors: Can understand the influence of relevant technical standards, intellectual property rights, industrial policies and quality management systems in the field of measurement and control, and can consider the influence of different cultures on sensor and detection technology, automated instrumentation and systems, intelligent instrumentation and computer measurement and control system engineering practices.	1.Course Exercise in Professional Synthesis 2.Cognition Practice
	6.3 Understanding of social responsibility: can objectively analyze and evaluate the development, production and operation of new products, new technologies and processes and the mutual impact of society, health, safety, law and culture, and understand the responsibility to be borne.	1.Course Exercise in Professional Synthesis 2.Cognition Practice
7.Environment and sustainable development	**7.1 Cognitive Sustainable Development:** Being able to understand the connotation and significance of environmental protection and social sustainable development, familiar with relevant laws and regulations on environmental protection, understanding the relationship between sensor and	1.Situation and Policy 2.Cultivation of Ideological Morality and Basic Laws

	detection technology, automation instruments and systems, intelligent instruments and computer measurement control system engineering practice with environment and social sustainable development.	
	7.2 Assessment of sustainable development: For solutions to complex engineering problems in the field of sensor and inspection technology, automated instrumentation and systems, intelligent instrumentation and computer measurement and control systems engineering, to evaluate their resource utilization efficiency, pollutant disposal schemes and safety precautions, and to determine the possible damage to humans and the environment during the product cycle.	1.Sensor and Detection Technology 2.Course Exercise in Professional Synthesis
8.Professional norms	**8.1 Have humanistic literacy:** have humanistic and social science literacy and critical thinking ability, have socialist core values, understand the national conditions, can safeguard national interests, and clearly define the responsibility and mission as a builder and successor of the socialist cause.	1.Outline of Modern Chinese History 2.Situation and Policy 3.Introduction to MAO Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics 4.The basic Principles of Marxism 5.Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era
	8.2 Professional quality: Understand the core concept of engineering ethics, and be able to abide by the professional ethics and norms of honesty, fairness, integrity code, respect for life, care for others and advocate justice in the development, experiment and production practice of measurement and control projects.	1.Graduation design (thesis) 2.Graduation Practice
	8.3 Fulfill social responsibility: Be able to recognize the social responsibility of measurement	1.Cultivation of Ideological Morality and Basic Laws

	and control engineering technicians for public safety, health and well-being, as well as environmental protection, and consciously fulfill their responsibilities in engineering practice.	2.Engineer Ethics and Responsibilities
9.Individuals and teams	**9.1 Sense of cooperation:** In a multidisciplinary context, can actively cooperate with members of other disciplines to carry out work.	1. Metalworking Practice 2. Electronic Technology Practice
	9.2 Teamwork: Capable of playing the role and responsibility of a team member, listening to the opinions of other team members, and completing team tasks independently or cooperatively.	1.Course Exercise in Professional Synthesis 2.Graduation Practice
	9.3 Role understanding: Be able to build a team according to tasks and personnel characteristics, understand the division of roles and responsibilities in the team, manage and coordinate team operation.	1.Course Exercise in Professional Synthesis 2.C Language Programming Course Design
10.Communication	**10.1 Oral and written expression:** In response to the theoretical, technical research, and engineering practice needs in sensors and detection technology, automation instruments and systems, intelligent instruments and computer measurement and control systems, one should be able to accurately express opinions and respond to doubts through oral or written means based on industry requirements as well as societal demands.	1.Virtual Instrument Course Design 2.Literature Reading and Thesis Writing 3.Principle and Application of Microcontroller Course Design 4.Graduation design (thesis)
	10.2 Understand the frontier and understand the difference: In the practice of measurement and control engineering, understand the development trend and research hotspot, understand and respect the difference and diversity of different cultures.	1.Graduation Practice 2.Course Exercise in Professional Synthesis
	10.3 International perspective: With a certain international perspective, able to carry out basic communication and exchange on complex engineering problems in the fields of Sensor and Detection Technology, automation instrumentation and system, intelligent instrumentation and computer measurement and control system under a cross-cultural background.	1. College English 2. Translation Theory and Practice 3.Graduation design (thesis)

11.Project management	**11.1 Understanding Project Management:** Master the methods of management and economic decision-making related to engineering project, and have a certain degree of fundamental knowledge of market economy and engineering management.	1. Innovation and Entrepreneurship Education 2.Graduation Practice
	11.2 Engineering Management application: The ability to apply management principles and economic decision methods to product development, design and measurement and control engineering optimization in a multidisciplinary environment.	1.Principle and Application of Microcontroller Course Design 2. Printed Circuit Board and Technology Curriculum Design Course Design 3.Graduation design (thesis)
12.Lifelong learning	**12.1 Lifelong learning awareness:** Be able to recognize the necessity of investigate and learn continuously, and have the awareness of autonomous and lifelong learning.	1.Principle and Application of Microcontroller 2. Psychological and Health Hducation of Hollege Students 3. Career Development and Employment Guidance for College Students 4. Innovation and Entrepreneurship Education
	12.2 Master lifelong learning methods: Have the knowledge base of lifelong learning, master the methods of independent learning, and understand the ways to expand knowledge and ability.	1.Course Exercise in Professional Synthesis 2.Graduation design (thesis) 3.Introduction to Measurement and Control Profession
	12.3 Have lifelong learning ability: Have the ability to learn independently, summarize and ask questions in a concise way, and have the ability to initially adapt to the development of the measurement and control industry and society.	1. Innovation and Entrepreneurship Education 2.Graduation Practice

10 Implementers and Reviewers

Implementers：Chao Wang、Xiaoping Song

Reviewers: Di Wu, Qin Wan