2025 Program for Talent Cultivation in Electrical Engineering and Intelligent Control

I. Program Overview

Major Code: 080604T

Admission Category: National College Entrance Examination (Gaokao)

Discipline and Major Category: Engineering — Electrical Category

Standard Duration of Study: 4 Years

II. Educational Objectives

In accordance with the talent cultivation principles of "Emphasizing Practice, Strengthening Foundations, Integrating School-Enterprise, Promoting Internationalization, and Developing Interdisciplinary Talents," this program aims to cultivate applied engineering and technical talents who possess solid ideological integrity, profound literacy in humanities and social sciences, and rigorous professional ethics; demonstrate competence in practical application and technological innovation; exhibit strong learning capabilities and a collaborative teamwork spirit; and master systematic theoretical knowledge and practical skills in electrical engineering, intelligent control, and information technology. Graduates will be capable of undertaking engineering design, installation, and commissioning of intelligent production lines, industrial robot systems, and intelligent power supply and distribution systems in the advanced equipment manufacturing field. They will also be qualified for equipment maintenance, production management, and technical services in intelligent factories, serving as applied engineering and technical professionals specialized in solving on-site engineering and technical challenges.

The program is committed to cultivating high-quality applied socialist builders and successors who are well-rounded in morality, intelligence, physical fitness, aesthetics, and labor—characterized by unwavering political integrity, exquisite professional skills, uncompromising honesty, and rational composure—thereby contributing to regional economic transformation, industrial upgrading, and technological innovation.

Approximately 5 years after graduation, through continuous personal effort and professional experience accumulation, graduates are expected to grow into engineers or outstanding professional talents with the following capabilities:

Objective 1: Familiar with the latest development status and cutting-edge trends in electrical engineering and intelligent control-related fields. Capable of systematically analyzing complex engineering problems in the equipment manufacturing field and proposing feasible solutions by integrating mathematical, physical, and engineering foundational knowledge with professional expertise in electrical engineering and intelligent control. (Professional Quality — Comprehensive Problem Solving)

Objective 2: Proficient in utilizing modern engineering tools and professional knowledge in electrical engineering and intelligent control to conduct engineering project design, technological RandD, equipment

maintenance, and production management in the equipment manufacturing field. (Professional Quality — Career Applicability)

Objective 3: Possess the essential professional qualities of an engineer and a strong sense of social responsibility, and strictly adhere to professional ethics and industry norms. In engineering practice, prioritize public interests and comprehensively consider factors such as legal compliance, environmental protection, and sustainable development. (Professional Literacy)

Objective 4: Maintain physical and mental wellbeing alongside excellent humanistic literacy. Demonstrate strong teamwork spirit, effective communication skills, and clear expression abilities, enabling them to play a pivotal role as technical backbones in enterprise production and management. (Humanities Literacy)

Objective 5: Cultivate lifelong learning awareness and self-improvement capabilities, coupled with a broad international perspective. Capable of continuously enhancing professional competence and personal qualities through engineering practice, continuing education, and other channels to adapt to technological advancements and industry development. (Development Potential)

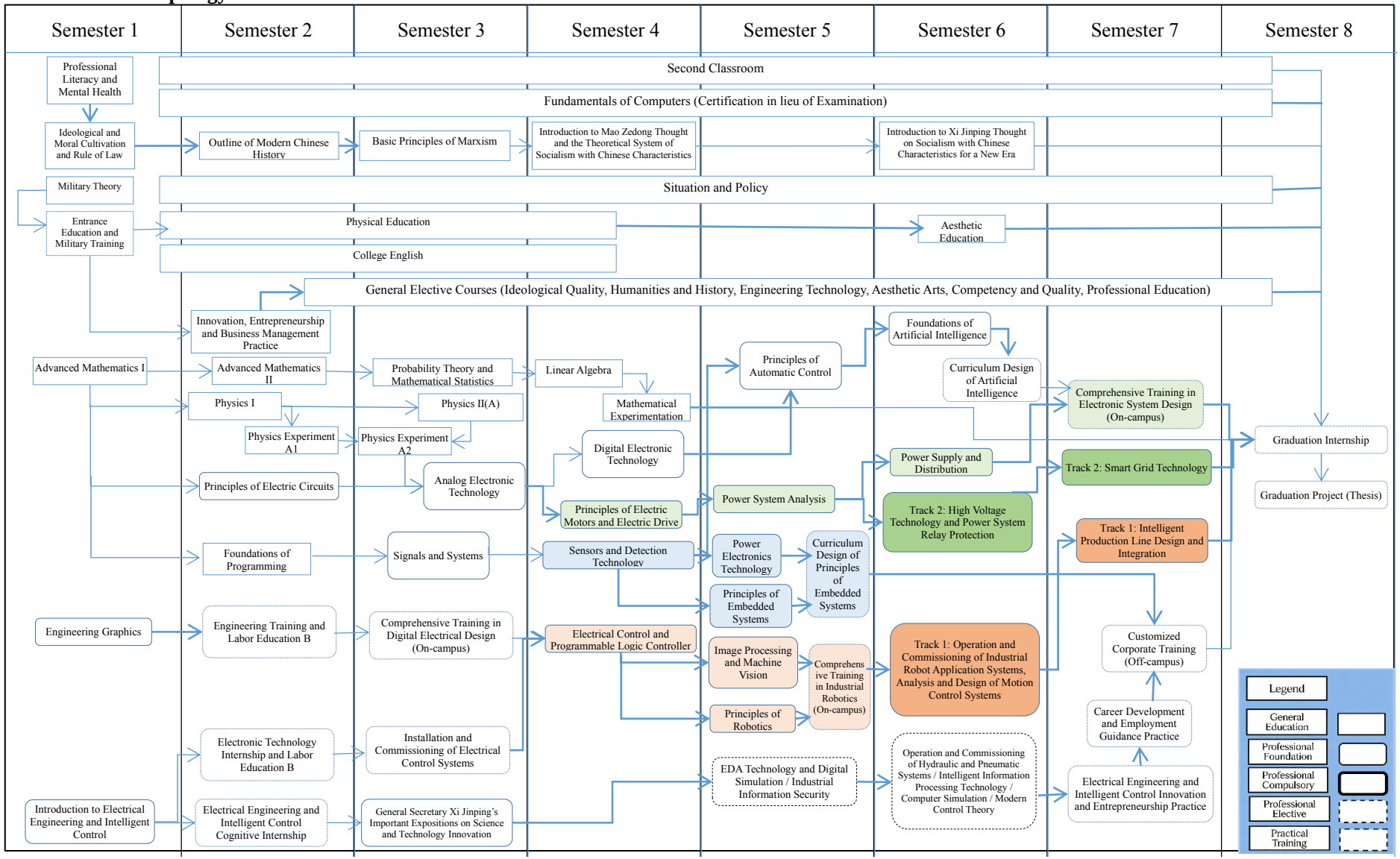
III. Graduation Requirements and Mapping Matrix

Graduation Requirements	Implementation Components / Channels
1. Engineering Knowledge: Capable of applying knowledge of mathematics, natural sciences, engineering fundamentals, and professional expertise to solve complex engineering problems.	Advanced Mathematics, Physics, Linear Algebra, Probability Theory and Mathematical Statistics, Engineering Graphics, Principles of Electric Circuits, Signals and Systems, Analog Electronic Technology, Digital Electronic Technology, Principles of Automatic Control, Sensors and Detection Technology, Power System Analysis, Power Electronics Technology, Principles of Embedded Systems, Electrical Control and PLC, Fundamentals of Electric Motors and Electric Drive, Principles of Robotics.
2. Problem Analysis: Capable of applying basic principles of mathematics, natural sciences, and engineering sciences to identify, express, and analyze complex engineering problems through literature research to reach valid conclusions.	Mathematical Experimentation, Foundations of Programming, Signals and Systems, Principles of Automatic Control, Sensors and Detection Technology, Foundations of Artificial Intelligence, Modern Control Theory, Intelligent Information Processing Technology.
3. Design/Development of Solutions: Capable of designing solutions for complex engineering problems and designing systems, units (components), or technological processes that meet specific needs; capable of incorporating innovation awareness during the design process while considering social, health, safety, legal, cultural, and environmental factors.	Principles of Electric Circuits, Analog Electronic Technology, Digital Electronic Technology, Principles of Automatic Control, Sensors and Detection Technology, Power System Analysis, Power Electronics Technology, Principles of Embedded Systems, Electrical Control and PLC, Fundamentals of Electric Motors and Electric Drive, Principles of Robotics, Image Processing and Machine Vision, Operation and Commissioning of Industrial Robot Application Systems, Intelligent Production Line Design and Integration, Analysis and Design of Motion Control Systems, Power

	Supply and Distribution Technology, EDA Technology and Digital Simulation, Computer Simulation.
4. Research: Capable of conducting research on complex engineering problems based on scientific principles and using scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis.	Foundations of Programming, Signals and Systems, Principles of Automatic Control, Sensors and Detection Technology, Foundations of Artificial Intelligence, Power System Analysis, Power Electronics Technology, Principles of Embedded Systems, Modern Control Theory, Intelligent Information Processing Technology.
5. Use of Modern Tools: Capable of developing, selecting, and using appropriate techniques, resources, modern engineering tools, and information technology tools for complex engineering problems, including the prediction and simulation of complex engineering problems, while understanding their limitations.	Foundations of Programming, Mathematical Experimentation, Physics Experiment, EDA Technology and Digital Simulation, Computer Simulation, Foundations of Artificial Intelligence, Principles of Embedded Systems, Intelligent Information Processing Technology, Analysis and Design of Motion Control Systems, Power Supply and Distribution Technology, High Voltage Technology, Power System Relaying Protection, Smart Grid Technology.
6. Engineering and Society: Capable of conducting rational analysis based on engineering-related background knowledge to evaluate the impact of professional engineering practices and solutions for complex engineering problems on society, health, safety, law, and culture, and understanding the responsibilities to be assumed.	Ideological and Moral Cultivation and Rule of Law, Outline of Modern Chinese History, Basic Principles of Marxism, Introduction to Mao Zedong Thought and Theoretical System of Socialism with Chinese Characteristics, Situation and Policy, Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Military Theory, Professional Literacy and Mental Health, Innovation, Entrepreneurship and Business Management Practice.
7. Environment and Sustainable Development: Capable of understanding and evaluating the impact of engineering practices for complex engineering problems on environmental and social sustainable development.	Ideological and Moral Cultivation and Rule of Law, Basic Principles of Marxism, Introduction to Mao Zedong Thought and Theoretical System of Socialism with Chinese Characteristics, Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Power Supply and Distribution Technology, High Voltage Technology, Power System Relaying Protection, Smart Grid Technology.
8. Professional Norms: Possess humanities and social science literacy and a sense of social responsibility; capable of understanding and abiding by engineering professional ethics and norms in engineering practice and fulfilling responsibilities.	Ideological and Moral Cultivation and Rule of Law, Professional Literacy and Mental Health, Career Development and Employment Guidance Practice.
9. Individual and Team: Capable of assuming the roles of individual, team member, or leader in a team within a multidisciplinary background.	Physical Education, Innovation, Entrepreneurship and Business Management Practice, Installation and Commissioning of Electrical Control Systems, Engineering Training and Labor Education B, Electronic Technology Internship and Labor Education B, Professional Innovation and Entrepreneurship Practice, Customized Corporate Training (Off-campus), Vocational Ability Cultivation (Off-campus).

10. Communication: Capable of communicating and exchanging ideas effectively with industry peers and the public regarding complex engineering problems, including writing reports and design manuscripts, making presentations, and clearly expressing or responding to instructions. Possess a certain international perspective and the ability to communicate and exchange ideas in cross-cultural settings.	College English, Innovation, Entrepreneurship and Business Management Practice, Comprehensive Training in Digital Electrical Design (On-campus), Intelligent Production Line Design and Integration, Comprehensive Training in Electronic System Design (On-campus), Professional Innovation and Entrepreneurship Practice, Engineering Graphics, Graduation Project (Thesis).
11. Project Management: Understand and master engineering management principles and economic decision-making methods, and be able to apply them in multidisciplinary environments.	Innovation, Entrepreneurship and Business Management Practice, Comprehensive Training in Digital Electrical Design (On-campus), Intelligent Production Line Design and Integration, Comprehensive Training in Electronic System Design (On-campus), Professional Innovation and Entrepreneurship Practice.
12. Lifelong Learning: Possess the awareness and ability of autonomous learning and lifelong learning, and the ability to continuously learn and adapt to technological and industrial development.	Situation and Policy, Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, Second Classroom, Ideological and Political Practice.

IV. Curriculum Topology



V. Core Professional Courses

(1) Principles of Electric Circuits

Principles of Electric Circuits is an important fundamental course for undergraduate students majoring in electrical categories in institutions of higher learning. The course focuses on analyzing electromagnetic phenomena in circuits, studying basic circuit laws, and exploring circuit analysis methods. It serves the core function of providing theoretical circuit knowledge and supporting circuit analysis methods for subsequent professional foundation and professional courses. Learning this course requires students to have completed Advanced Mathematics and Physics to possess the necessary foundation in mathematics and physics knowledge.

(2) Analog Electronic Technology

This course focuses on introducing the performance and working principles of typical analog devices, with emphasis on technologies related to diodes, transistors, CMOS, and operational amplifiers. It primarily researches their basic principles, control methods, design calculations, technical-economic indicators, and scientific experimentation. It establishes a foundation for subsequent courses such as Digital Electronic Technology and Power Electronics Technology, as well as for technical work and scientific research related to analog circuit design.

(3) Digital Electronic Technology

Following the Analog Electronic Technology course, Digital Electronic Technology is an introductory technical foundation course for students in electrical majors. As a component of the foundation of electronic technology, its mission is to enable students to acquire basic knowledge, theories, and skills regarding digital circuits. It cultivates students' abilities to analyze and solve problems, laying a solid foundation for the application of digital electronic technology within the profession.

(4) Power Electronics Technology

The content of Power Electronics Technology involves teaching the working principles and characteristics of various power electronic devices, as well as the electromagnetic processes, basic principles, control methods, design calculations, experimental skills, and technical-economic indicators occurring in various types of power converters. Converters mainly include single-phase and three-phase controllable rectification (including active inversion), DC-DC converters, single-phase and three-phase AC voltage regulation, AC-AC frequency conversion, and passive inversion. Additionally, this course introduces the basic principles and application technologies of Pulse Width Modulation (PWM) and the basic concepts and principles of soft-switching.

(5) Principles of Automatic Control

This is a foundational theory course mainly introducing the basic concepts of automatic control theory, along with analysis and design methods for automatic control systems. Specific topics include: the basic composition and structure of automatic control systems, performance indicators of automatic control systems, types and characteristics of automatic control systems (continuous, discrete, linear, nonlinear, etc.), and methods for analysis (time-domain method, frequency-domain method, etc.) and design of automatic control systems.

(6) Sensors and Detection Technology

Sensors and Detection Technology introduces visual detection technology and sensor technology for industrial robots. By analyzing visual detection principles, sensor principles, and sensor selection, students will master knowledge related to various detection sensors commonly used in industrial robots. The main content of this course integrates theoretical foundations with applications and industrial backgrounds, enabling students to understand cutting-edge knowledge in visual detection, master the composition and related technologies of visual detection systems, broaden their knowledge base, and focus on cultivating their ability to analyze and solve problems.

(7) Fundamentals of Electric Motors and Electric Drive

The Fundamentals of Electric Motors and Electric Drive course starts with magnetic circuits and is based on the introduction of electromechanical energy conversion principles. It explains the principles of various motors and electric drive theory in depth. The emphasis of this course is on the physical essence and analysis methods of motors and electric drives. The primary objective is to provide students with a solid foundation in motor applications and to acquire knowledge and experimental skills in basic motor theory and steady-state analysis of motors.

(8) Electrical Control and Programmable Logic Controller

The course utilizes various typical circuits in factory electrical control as objects to explain the structure and working principles of related low-voltage electrical appliances. It covers the working principles of basic control lines, analysis of typical instances, and knowledge related to electrical control design methods. Using Phoenix Contact Programmable Logic Controllers (PLCs) as the primary carrier, the course uses typical cases designed based on actual automatic control projects in daily production and life. By completing relevant learning projects, students will acquire the ability to design and commission integrated control systems involving electrical control systems and PLCs. Simultaneously, it emphasizes cultivating students' realistic scientific attitudes and their ability

to analyze and solve problems.

(9) Principles of Robotics

With industrial robots as the controlled objects, this course systematically covers the principles, applications, and programming of industrial robots. The course integrates the primary knowledge and skill points of this major, including control technology, drive technology, and robotics technology. Through programming and commissioning practice tasks for industrial robots, it systematically cultivates students' ability to apply industrial robot technology.

(10) Foundations of Artificial Intelligence

Foundations of Artificial Intelligence mainly introduces advanced control methods with a certain mathematical foundation and their applications, such as: fuzzy control, neural network control, expert systems, and deep learning. This course broadens students' professional knowledge base, enables them to understand advanced control theories and their application fields, and helps them master basic intelligent control system principles and design methods.

V. Main Practical Training Links

The program organizes social practice activities through various forms, including diverse extracurricular activities, the "Second Classroom", and specific course instruction. Adopting an integrated theory-practice teaching approach, experimental teaching is incorporated primarily into professional (disciplinary) foundation courses—encompassing software, hardware, and system experiments—while practical teaching is integrated into professional courses to enhance students' professional practical capabilities.

Within the centralized practical course platform, two engineering comprehensive training courses and three professional comprehensive training courses are offered. These are implemented through both on-campus execution and school-enterprise cooperation to improve students' professional practical and innovative capabilities across different fields. Three professional practice courses corresponding to three core course groups are provided, enabling students to complete the design and development of three systems of a certain scale and complexity. Furthermore, one professional cognitive internship course and two corporate internship courses are established, utilizing off-campus internship bases to allow students to understand and participate in production practice activities, thereby enhancing their professional literacy. Finally, for the graduation stage, a graduation internship and a graduation project (thesis) course are offered to ensure the practical and engineering nature of the selected topics. The main professional practical courses offered by the centralized practical course platform are as follows:

(1) Engineering Training and Labor Education B (1 week) and Electronic Technology Internship and Labor Education B (1 week): Engineering Comprehensive Training, implemented on-campus for 2 weeks. Taught by instructors from the Basic Experiment and Training Center, the content primarily includes engineering foundation cognition, benchwork skills training, and basic electronic skills training. This develops students' basic engineering literacy, enabling them to master fundamental skills in benchwork, lathe operation, and electronic technology.

(2) Installation and Commissioning of Electrical Control Systems: Engineering Comprehensive Training, implemented on-campus for 1 week. This course is taught by professional faculty, enabling students to understand the requirements and control methods of electrical control systems for typical equipment, and to possess basic capabilities in simple design and improvement of electrical control circuits for general production equipment.

(3) Curriculum Design of Artificial Intelligence Technology: Professional Comprehensive Training, implemented on-campus for 1 week. Taught by professional faculty, students develop an artificial intelligence control system of a certain scale and complexity based on the foundation provided by the Foundations of Artificial Intelligence course, mastering the basic methods of applying artificial intelligence control technology.

(4) Comprehensive Training in Digital Electrical Design (On-campus): Professional Comprehensive Training, implemented on-campus for 1 week. This course is taught by professional supervisors with the assistance of enterprise mentors. Students master the layout, design, and debugging capabilities of electrical control systems. It cultivates students' problem analysis and teamwork abilities. This is a school-enterprise co-constructed course.

(5) Curriculum Design of Principles of Embedded Systems: Professional Practice Course, corresponding to the comprehensive practice of Professional Core Course Group 1, implemented on-campus for 1 week. Taught by professional faculty, students develop an embedded application system of a certain scale and complexity based on the foundation provided by the Principles of Embedded Systems course, mastering embedded system development technology.

(6) Comprehensive Training in Industrial Robotics: Professional Practice Course, corresponding to the comprehensive practice of Professional Core Course Group 2, implemented on-campus for 1 week. This course is taught by professional supervisors with the assistance of enterprise mentors. Based on a common robot technology platform, students master the assembly and commissioning of robot body systems and control systems, as well as the ability to design comprehensive robot application systems. It cultivates students' problem analysis and teamwork abilities. This is a school-enterprise co-constructed course.

(7) Comprehensive Training in Electronic System Design: Professional Practice Course, corresponding to the comprehensive practice of Professional Core Course Group 3, implemented on-campus for 1 week. This course is taught by professional supervisors with the assistance of enterprise mentors. Based on electronic system design topics provided by enterprise mentors, students master the design processes and methods for electronic systems. It cultivates students' problem analysis and teamwork abilities. This is a school-enterprise co-constructed course.

(8) Cognitive Internship for Electrical Engineering and Intelligent Control Major: Professional Cognitive Internship, implemented off-campus (in enterprises). It does not occupy the designated practical weeks and is executed in a distributed manner over 16 hours. The course is taught by enterprise mentors with the assistance of professional supervisors. Students gain an understanding of the basic work content of positions within Electrical Engineering and Intelligent Control, cultivating good professional norms. This is a school-enterprise co-constructed course.

(9) Customized Corporate Training: This course is implemented within an enterprise for 4 weeks and is taught by enterprise mentors with the assistance of professional supervisors. It cultivates students' professional norms and project management capabilities. This is a school-enterprise co-constructed course.

(10) Graduation Internship: Graduation Stage, implemented in enterprises for 6 weeks. Students choose their own internship enterprises. This course is primarily guided by enterprise mentors, with class advisors responsible for management.

(11) Graduation Project (Thesis): Graduation Stage, implemented alternately in enterprises and at the university for 12 weeks. Guidance relationships are determined by mutual selection between teachers and students; students independently complete the graduation design and participate in the final defense. This course is guided by professional supervisors and enterprise mentors (with professional supervisors simultaneously arranged as secondary mentors). Industry and enterprise experts participate in the guidance and evaluation of this course.

VII. Graduation and Degree Requirements

Students who complete all 159.5 credits required by this cultivation program with passing grades, obtain a professional-related vocational qualification certificate (see the table below), and meet all other graduation requirements will be awarded a Bachelor's Graduation Certificate in Electrical Engineering and Intelligent Control. Students who meet the graduation requirements and satisfy the criteria set forth in the *Implementation Rules for Bachelor's Degree Awarding of Tianjin Sino-German University of Applied Sciences* and other relevant

regulations shall be granted a Bachelor of Engineering degree upon review and approval by the University Academic Degree Evaluation Committee.

Table of Vocational Qualification Certificates

No.	Certificate Name	Requirement	Issuing Authority
1	Electrician	Senior Worker	Ministry of Human Resources and Social Security
2	Design and Implementation of Programmable Control Systems	Special Ability Certificate	Tianjin Municipal Human Resources and Social Security Bureau
3	Industrial Robot Application	Special Ability Certificate	Tianjin Municipal Human Resources and Social Security Bureau
4	Automated Instrumentation Technology Application	Special Ability Certificate	Tianjin Municipal Human Resources and Social Security Bureau
5	Installation, Commissioning, and Maintenance of AC/DC Drive Systems	Special Ability Certificate	Tianjin Municipal Human Resources and Social Security Bureau
6	PLC Programming and Application Engineer	Intermediate Level or above	Ministry of Industry and Information Technology
7	Industrial Robot Professional Technical Skill Certificate	Intermediate Level or above	Ministry of Industry and Information Technology
Note: Students must obtain at least one of the required certificates listed in the table above. If a listed certificate is cancelled during the period of study, the teaching unit shall provide a replacement certificate of an equivalent level, report it to the Academic Affairs Office for the record, and notify students in advance.			

VIII. Academic Calendar

Note: Minor adjustments may be made based on actual conditions before the start of each semester, subject to approval by the Academic Affairs Office.

Semester	Week																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	⊙	⊙	★	★	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Exam
2	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	R	●	●	Exam
3	■	■	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Exam
4	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	#	Exam

5	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	▲	■	Exam
6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	■	Exam
7	■	○	○	○	○	○	○	○	○	○	○	○	○	#	#	Q	Q	Q	Q	#
8	◆	◆	◆	◆	◆	◆	※	※	※	※	※	※	※	※	※	※	※	※	#	#

Key to Symbols ： ⊙----Entrance Education ★----Military Training

○----Curricular Teaching Exam----Examination Week

■----Professional Comprehensive Training / Professional Innovation Training ▲----Course Design

●----Engineering Basic Training and Labor Education R----Professional Cognitive Internship (Off-campus)

Q----Corporate Internship (Off-campus) ◆----Graduation Internship (Off-campus)

※----Graduation Project #----Others

This table serves as a reference example; teaching units may add their own symbols and descriptions as needed. However, the general requirements are as follows:

From Semesters 1 to 5, in principle, all types of courses (General Education, Professional Foundation, and Professional Courses), Dedicated Practical Weeks, and Examination Weeks shall operate under the “16+3+1” or “3+16+1” model. Instructional tasks for all categories of courses must be arranged within the 16-week period, and the number of weekly class hours in each semester should be fundamentally balanced. Dedicated Practical Weeks must be centrally scheduled within the 3 weeks at either the beginning or the end of the semester; scheduling them in the middle of a semester is strictly prohibited. The final week of the semester is designated as the Examination Week.

IX. Program Development and Approval

Program Director: Zhang Zhili Associate Dean for Academic Affairs: Fan Qiming Dean:

Director of Academic Affairs: Zhang Chunming Vice President for Academic Affairs: Guan Zhiwei