Instructive Cultivation Plan for the Program of Intelligent Manufacturing Engineering

(Grade 2019)

Course code: 080213T

1. Orientation

According to the urgent need of "Made in China 2025" manufacturing power development plan for smart manufacturing talents training and the "career-oriented higher education" development positioning of the school, this program aims at cultivating inter-disciplinary and application-oriented talents who have professional knowledge in related disciplines such as mechanical design, electrical control, computer and information management technology, have practical ability and comprehensive quality, can be engaged in the design, manufacture and integration of intelligent electromechanical systems in the field of Intelligent Manufacturing Engineering, and can be engaged in the fields of operation management of intelligent factories, smart equipment assembly and adjustment, application and maintenance.

2. Cultivation Objectives

1. General cultivation objective

This program aims at cultivating inter-disciplinary and application-oriented talents who are comprehensively developed on the aspects of morality, intelligence, physique, beauty and labor, have a solid basic knowledge of mathematics and natural sciences and good humanities, have mastered the basic knowledge, basic theories and professional skills of mechanical design, electrical control, computer and information management technology, can be engaged in the design, manufacturing and system integration of intelligent electromechanical systems in the field of smart engineering initiative, and can be engaged in the operation management of intelligent factories, intelligent equipment assembly, application and maintenance.

2. Objective of value guidance

This program is guided by the overall objective of the "Made in China 2025" manufacturing power development plan, and takes the spirit of model workers and craftsmen as its value orientation. In the implementation process of education and teaching, the engineer values and engineering ethics education are embedded in the teaching process in the form of spirit of craftsmanship. Through the study, students will develop a rigorous, meticulous, dedicated and responsible work attitude, obtain a work philosophy of meticulous crafting and excellence, and superb skills and superb skills. This program will cultivate students to learn the professional knowledge of intelligent manufacturing engineering, have a sense of mission to participate in the construction of a manufacturing power, aspire to work hard for the realization of the development goal of a manufacturing power and the realization of the great rejuvenation of the Chinese nation.

3. Objectives students must achieve five years after graduation:

(1) Ability to analyze and solve complex engineering technical problems related to professional posts in the field of Intelligent Manufacturing Engineering.

(2) Be able to strictly abide by professional norms during work, have a sense of social responsibility, professionalism, safety and environmental protection, and be able to actively serve the country and society in the industry.

(3) Be able to communicate effectively with colleagues, peers and customers, adapt to team work,

and carry out project activities as a team member or person in charge.

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

3. Requirement for Graduation

According to the 12 general standards for engineering certification and combined with the program positioning of Intelligent Manufacturing Engineering, the core competence and quality expressions of the 12 graduation requirements are expanded. The index points of each graduation requirement are broken down as follows:

Graduation requirement 1: Ability to acquire and apply engineering knowledge: be able to use mathematics, natural sciences, engineering foundations and professional knowledge to solve complex engineering problems in the field of Intelligent Manufacturing Engineering.

Index point 1-1: Have the knowledge of mathematics and natural science and application ability needed to solve the problems of Intelligent Manufacturing Engineering;

Index point 1-2: Have the basic engineering knowledge and application ability required to solve the problem of Intelligent Manufacturing Engineering;

Index points 1-3: Have the professional basic knowledge and application capabilities required to solve the problems of Intelligent Manufacturing Engineering;

Index points 1-4: Have the professional knowledge and application capabilities required to solve the problems of Intelligent Manufacturing Engineering.

Graduation requirement 2: Ability to analyze problems: be able to apply the basic principles of mathematics, natural science and engineering science to identify, express and analyze complex engineering problems in the field of Intelligent Manufacturing Engineering through literature and to obtain effective conclusions.

Index point 2-1: be able to use professional basic knowledge and other related theories to identify and judge the key technologies and key parameters of complex smart manufacturing problems;

Index point 2-2: be able to recognize that there are multiple solutions to complex smart manufacturing problems, and be able to seek effective solutions (engineering problems) through literature research and analysis;

Index point 2-3: be able to apply basic knowledge of mathematics, natural science, and engineering to the expression of smart manufacturing engineering problems;

Index points 2-4: based on mathematics, natural science and engineering principles, be able to verify the rationality of the solution.

Graduation requirement 3: Ability to develop solutions: for complex engineering problems in the field of smart manufacturing engineering, be able to design solutions and systems, control engineering, parts or equipment that meet specific needs, be able to reflect the sense of innovation in the design, and consider factors of society, environment, health, safety, law, culture and so on.

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

Index point 3-2: be able to design components, units or processes that meet the specific needs of

intelligent electromechanical systems or equipment;

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

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

Graduation requirement 4: Scientific research ability: be able to study complex engineering technical issues in the field of smart manufacturing engineering based on scientific principles and through scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis.

Index point 4-1: be able to apply the knowledge learned to formulate experimental plans for related issues of smart manufacturing engineering;

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

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

Graduation requirement 5: Ability to use modern tools: For complex engineering problems in the field of smart manufacturing engineering, be able to develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools, including the prediction and simulation of complex engineering problems, and be able to understand its limitations.

Index point 5-1: understand the development status of smart manufacturing engineering discipline, and be able to initially master and use modern engineering technology, methods, tools or equipment in practice;

Index point 5-2: be able to predict and simulate complex intelligent electromechanical system engineering problems by using the selected appropriate modern engineering tools, and understand the working principles and limitations of the modern tools used;

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

Graduation requirement 6: Ability to analyze and evaluate the relationship between engineering and society: be able to conduct a reasonable analysis based on the background knowledge of smart manufacturing engineering, evaluate the impact of smart manufacturing engineering solutions on society, health, safety, law and culture, and understand the responsibility which should be undertaken.

Index point 6-1: understand the technical standards, intellectual property rights, industrial policies, laws and regulations related to smart manufacturing engineering;

Index point 6-2: be able to correctly understand the current situation of the field of smart manufacturing engineering and the development and application of new products, new technologies, new processes, and new materials, and their impact on the objective world and society;

Index point 6-3: be able to correctly understand the social, safety and legal responsibilities of smart manufacturing engineers in engineering practices.

Graduation requirement 7: Ability to understand and evaluate the environment and

sustainable development: be able to understand and evaluate the impact of engineering practices in the field of smart manufacturing on the sustainable development of the environment and society.

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

Index point 7-2: be able to correctly understand and recognize the impact of engineering practices for the problems of smart manufacturing engineering on the environment and the sustainable development of society.

Graduation requirement 8: Abide by professional standards: have humanities and social science literacy, a sense of social responsibility, be able to understand and abide by engineering professional ethics and standards in engineering practice, and always perform responsibilities.

Index point 8-1: understand the basic meaning and influence of the world outlook and outlook on life;

Index point 8-2: have a healthy physique and good psychological quality, and understand the status of an individual in history, society and the natural environment;

Index point 8-3: understand the professional nature and responsibilities of smart manufacturing engineers, have legal awareness and consciously abide by professional ethics and norms in the practice of smart manufacturing engineering.

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

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

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

Graduation requirement 10: Ability to effectively communicate and exchange: be able to effectively communicate and exchange with industry colleagues and the public on complex engineering issues in the field of smart manufacturing engineering, including writing reports and designing manuscripts, making presentations and clear expressions, and responding instructions, have a certain international perspective and be able to communicate and exchange in a cross-cultural context.

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

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

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

Index point 11-1: understand the important economic and management factors involved in smart manufacturing engineering activities;

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

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

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

Index point 12-2: be able to take appropriate methods for independent learning according to personal or professional development needs, and have the ability to adapt to the development of society and smart manufacturing engineering technology.

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

0802 Mechanical Engineering; 0811 Control Science and Engineering; 0812 Computer Science and Technology.

8. Core Courses

Modern Engineering Drawing, Engineering Mechanics, Mechanical Design, Electrician and Electronics, Artificial Intelligence Technology, Internet of Things Technology and Application, Embedded System Design, Industrial Robot Technology and Application, Electrical Control and PLC Application, CNC Machine Tool and Programming, Sensor and Intelligence Detection Technology, Smart Factory Integration Technology, Smart Manufacturing Execution System (MES), Smart Equipment and Fault Diagnosis, First-level Project (intelligent electromechanical system design, manufacturing and integration) and five second-level projects, etc.

1. Intelligent electromechanical system design, manufacturing and integration (level one project) (3 credits)

The training plan takes the design, manufacture and integration of intelligent electromechanical systems as the main line, and is divided into two levels: level I and level II. The smart manufacturing engineering introduction course in grade one begins to introduce the concept of engineering. In grade two, the project is established and the conceptual design is completed fall semester; complete the preliminary design and detailed design in summer semester in grade two, in autumn semester grade three, complete the intelligent electromechanical system design, manufacturing and integration; I. In the fall semester of the third grade, the intelligent electromechanical system design, manufacturing and integration will be carried out; II. Project

establishment: the system integration and final report will be completed in the fall semester of the fourth grade.

(1) Design, Manufacturing and Integration of Intelligent Electromechanical System I (1 credit)

This course is the level 1 of the first-level project that runs through the entire teaching process of smart manufacturing engineering. This course does not arrange the teaching of theoretical lessons. Students are required to form a team with the whole life cycle of the conception, design, implementation and operation of intelligent electromechanical products, processes or systems as the carrier. The objective of the course is to cultivate students' engineering application ability of design, manufacture and integration of intelligent electromechanical systems. This course will cultivate students' ability to analyze and solve problems, enable students to master the basic theories and basic methods of the design and manufacturing process of intelligent electromechanical systems, and obtain the ability to design, manufacture and integrate simple intelligent electromechanical systems. As the level 1 of the first-level project, complete project investigation, conceptual design, preliminary theoretical design, detailed design, manufacturing and integration of intelligent electromechanical systems (units or devices). Students can combine college student innovation projects or choose topics provided by teachers to establish projects, so that students can establish the concept of engineering projects and cultivate students' sense of innovation. Through teamwork, the course will cultivate students' communication skills and teamwork spirit, and at the same time, cultivate students' communication and collaboration skills and team spirit.

Prerequisite course: Introduction to Smart Manufacturing Engineering, Modern Engineering Drawing, Electrician and Electronics, Embedded System Design, etc.

(2) Design, Manufacturing and Integration of Intelligent Electromechanical System II (2 credits)

This course is the second level of the first-level project that runs through the entire teaching process of smart manufacturing engineering. This course does not arrange theoretical lessons. This course takes the whole life cycle of the conception, design, implementation and operation of intelligent electromechanical products, processes and systems as the carrier. The objective of this course is to cultivate students' engineering application capabilities in the design, manufacturing and integration of intelligent electromechanical systems. On the basis of completing the design, manufacturing and integration of the simple intelligent electromechanical system at level I, through study and training on more level 2 and level 3 projects, students can use CNC machine tools, laboratory 3D printing equipment, and outside conditions of the school and many other conditions to complete multiple processes such as raw material procurement, processing, assembly and debugging, complete the design, manufacture and integration of more complex intelligent electromechanical systems, cultivate the ability to analyze and solve problems, and be able to master the basic theories and basic knowledge of the manufacturing process, obtain the ability to design, manufacture and integrate intelligent electromechanical systems. At the same time, this course will cultivate students' communication and collaboration skills and team spirit.

Prerequisite course: Design, Manufacturing and Integration of Intelligent Electromechanical System I.

2. Embedded system application practice (second-level project)

This course is a follow-up practical course of "Embedded System Design". The practical content is based on the embedded microprocessor as the basic development platform, allowing each student to independently design an embedded application system project. The project implementation process includes topic selection, topic opening, system scheme design, system hardware design, system software design, system programming and commissioning, system function demonstration and other links. Each link shall be reasonably allocated to the practical arrangement. The content of topic selected is based on the common electronic modules in electronic design, including LED lights, digital tubes, dot matrix screens, buzzers, buttons, wireless remote control, infrared device,

relays, steering gears, sensors, displays, etc. Through this course, students will exercise their ability to design system schemes, office software editing ability, the ability to use various electronic modules, C language programming ability and language expression ability for function demonstration.

3. Digital design and manufacturing (second-level project)

This course is a second-level project. The objective of this course is to realize the digital design and manufacturing of mechanical parts. This course aims at realizing three aspects of training in the Digital Manufacturing Engineering Center and 3D Printing Laboratory based on the completion of the prerequisite courses of "Numerical Control Machine Tool" and "CAD/CAM", etc.: first, realize simple mechanical parts manufacturing and processing through manual programming; secondly, after part modeling, automatic programming and digital simulation verification are carried out through CAD/CAM software, the manufacturing and processing of slightly more complicated parts can be realized on CNC machine tools; third, after the initial learning of the method and type of additive manufacturing (rapid prototyping) technology, user the 3D printer to realize the manufacturing and processing of a part through additive manufacturing technology.

4. Modern Engineering Drawing I/II

"Modern Engineering Drawing" is a main professional basic course for mechanical programs in higher engineering schools. The task of this course is to cultivate students' ability to read and draw engineering drawings, as well as the ability to initially conceive spatial shapes. Through the study of this course, students will be able to master the basic theory of projection method, master the projection rules of spatial points, lines, surfaces and bodies, master the expression methods of projection diagrams of mechanical parts, be able to use common drawing tools and instruments to draw engineering drawings correctly and skillfully, master the computer drawing ability of engineering drawings, master the general methods and specific steps of reading engineering drawings, and comprehensively improve the comprehensive quality of mechanical disciplines.

In the course of Modern Engineering Drawing II, while introducing the knowledge of assembly drawings, the contents of interchangeability and measurement technology are added.

5. Engineering Mechanics I/II

Through the study of "Engineering Mechanics I", students will be able to select the isolator from the mechanism or structure and draw the free-body diagram accurately; be able to analyze the static force of the component and determine the binding force correctly; understand and solve the friction of the plane force system; correctly calculate the velocity and acceleration of a point, the angular velocity and angular acceleration of a rigid body; understand the relativity of motion, master the method of point motion and synthesis; correctly calculate the velocity and acceleration of each point on a rigid body in plane motion; use dynamics general theorems (theorem of momentum, theorem of moment of momentum, theorem of kinetic energy, theorem of mass center motion, differential equation of fixed axis rotation) to solve dynamic problems; use D'Alembert principle to solve dynamic reaction problems; understand the principle of virtual displacement.

Through the study of "Engineering Mechanics II", students will obtain the preliminary ability to simplify general rod-like components into mechanical diagrams; be able to make the internal force diagrams of rods under basic deformation proficiently, calculate their stress and displacement, and carry out strength and stiffness calculations; understand the concept of stress state and strength theory, and apply it to the strength calculation of rods under combined deformation; understand the method of solving simple statically indeterminate problems; understand the concept of stability of compression rods, and be able to calculate the critical load and critical stress of axial compression rod, and check for stability; understand the concepts of dynamic load coefficient in dynamic load and fatigue failure and endurance limit in alternating stress; have a preliminary understanding of the basic mechanical properties and test methods of commonly used materials.

This course adds the content of finite element analysis to make students understand a method of using finite element.

6. Mechanical Design

This course allows students to master and understand the working principles and design calculation methods of various mechanisms, master and understand the basic theories and basic knowledge of mechanical structure, mechanical kinematics and dynamics, and initially have the ability to determine the transmission system scheme and mechanism design. This course mainly teaches the basic principles of mechanism composition, the motion analysis and force analysis of planar mechanisms. Through the study of this course, students will understand and master the relevant theories and design calculation methods of various commonly used mechanisms (such as gear mechanisms, cam mechanisms, linkage mechanisms, gear trains, etc.), understand the general knowledge of mechanical design, understand the main types, performance, structural characteristics, applications, materials, standards, etc. of mechanical parts, grasp the basic principles of mechanical design, working principles, stress analysis, stress state, failure mode, working capacity calculation criteria, etc. of mechanical parts, learn to design and calculate simple machines, and be trained in design calculations, structural design and drawing, experiments, and technical documentation skills.

7. Electrician and Electronics

This course mainly teaches the basic principles and application methods of electrical engineering, analog electronic technology, and digital electronic technology. In this course, students will learn circuit principles, analysis methods of linear and non-linear electronic devices. Through classroom learning, experiments and computer simulations, it will enable students to acquire the basic theories, basic knowledge and basic skills necessary for electrical engineering and electronic technology, and lay a solid foundation for students' further in-depth study of various programs.

8. Foundation of Programming Design

This course mainly teaches the basic concepts and basic techniques of programming, and cultivates students' logical thinking and engineering design thinking. Taking C language as an example, students are required to learn to draw simple program flowcharts, be more proficient in their grammar and semantics, master the basic methods of structured program design, master some common program design skills, and master the top-down gradual refinement program design technology. This course will cultivate students' good program design habits and styles, and enable students to master the basic process of computer programming operations and the basic methods of eliminating grammatical and semantic errors.

9. Fluid mechanics and hydraulic transmission

This course mainly teaches the basics of hydraulic fluid mechanics, working principle, structure and performance of common hydraulic and pneumatic components. Through the study of this course, students will be familiar with the working principles and characteristics of typical hydraulic and pneumatic basic circuits, be able to reasonably use hydraulic and pneumatic components and hydraulics basic principles and methods of the basic circuit, thus laying a solid foundation for the application of hydraulic and pneumatic transmission technology in intelligent manufacturing and mechatronics systems.

10. Embedded system design

This course combines theory and practice, focuses on embedded microprocessors and core embedded real-time operating systems of embedded software, takes application as the purpose, systematically explains the embedded system from the aspects of hardware, software, system development process, environment, tools and methods, etc., including the principles of various external interface modules of the embedded system microprocessor, the programming of external

interfaces, and the calling of library functions. Through the study of this course, students will systematically master the application methods of embedded microprocessors and have basic embedded system software development capabilities. Cooperating with the practical activities of experimental courses, this course will deepen students' understanding and mastery of theoretical knowledge, and enable them to obtain the ability and experience to develop actual embedded systems. Learning this course also requires basic knowledge of C language and basic knowledge of hardware circuits.

11. Sensors and intelligent detection technology

This course mainly explains the commonly used sensors of intelligent electromechanical equipment, and teaches the composition and selection principles of the test system. Through the study of this course, students will be familiar with the basic knowledge and some typical parameter test methods required in mechanical dynamic testing and failure analysis, understand the description, analysis and processing methods of the test signal in the time domain and frequency domain, understand the static and dynamic characteristics and evaluation methods of the test device and the measured object, and be familiar with the application technology of smart sensors and detection technology.

12. Intelligent electromechanical transmission control

This course mainly teaches the general knowledge of electromechanical transmission control. Through the study of this course, students will master the working principles, characteristics, applications and selection methods of motors and electrical appliances, be familiar with common control methods of electromechanical equipment, including the working principles, characteristics, performance and application sites of commonly used open-loop and closed-loop control systems and master the application of the latest control technology in electromechanical equipment, especially the use of stepper motors and servo motors.

13. Artificial Intelligence Technology

This course mainly describes the basic concepts and basic technologies of artificial intelligence. The main contents include: history of artificial intelligence, problem representation and solution, expert systems, reasoning methods, machine learning methods, as well as major symbolic learning methods such as explanation learning, analog learning, concept learning, machine learning and so on. Through the study of this course, students will understand the concepts, research fields, and main applications of artificial intelligence; master problem representation, search and other reasoning and solving techniques; understand the structure and construction methods of expert systems; understand new theories and methods of artificial intelligence and the development trends.

14. Machine Vision Technology and Application

This course mainly introduces the basic concepts, system composition and development trends of machine vision technology; and introduces the hardware technology of machine vision systems, teaching experimental equipment, configuration software, and image processing technology. Through the study of this course, students will learn the size measurement technology and defect detection technology, pattern recognition technology and image fusion technology, etc. commonly-used in machine vision application.

15. Internet of Things Technology and Application

This course mainly introduces the key technologies of the Internet of Things, and summarizes the characteristics and performance of various technologies of the Internet of Things. The specific contents include Internet of Things perception technology, Internet of Things domain name, Internet of Things transmission technology, Internet of Things positioning technology and Internet of Things cloud computing. Meanwhile, this course will introduce the application of the Internet

of Things technology in the smart manufacturing industry through examples. The specific contents include the application of radio frequency identification technology, sensors and machine vision technology, data transmission technology and real-time positioning system in the manufacturing industry.

16. Intelligent manufacturing production management (MES/ERP)

MES is a kind of monitoring and feedback to the ERP plan, and is a field operation-level system. ERP is the refinement of business management at the production site, and is a business management-level system. This course mainly introduces the definition, framework, and rapid response generating and execution mode and technical system of MES; teaches core key technologies such as manufacturing execution process coordination, complex information association management, dynamic batch and material coordination, incremental assembly control, production scheduling, etc. Meanwhile, this course will introduce the concept and development of ERP and the general composition of the ERP system; the connections and differences between MRP, MRPII and ERP; manufacturing production planning methods and product life cycles; ERP Basic data environment such as material master files, bills of materials, process routes, lead time and inventory records, etc.; plan management, material management, shop floor management, procurement management and cost management, etc.

17. Industrial Robot Technology and Application

This course is a professional course on industrial robot technology and application, and combines theory and practical technology. The teaching purpose of this course is to enable students to master the conventional operation and programming methods of industrial robots, and to learn the structure of industrial robots, control technology of industrial robots, dynamics, statics and kinematics of industrial robots, industrial robot systems and other related theories, thus laying the foundation for students to work in robotics and applications in the future.

9. Practical Training (Related courses)

First-level project: design, manufacture and integration of intelligent electromechanical system; second-level project: digital design and manufacturing, PLC technology application integration, sensor and intelligent detection technology practice, intelligent electromechanical system integrated practice, embedded system application practice. Other practical links: Basic Engineering Training A, Engineering Drawing Surveying and Interchangeability Practice, Electrician and Electronic Technology Skills Practice, Mechanical Design Course Design (English), Industrial Robot Application and Maintenance Practice, Graduation Practice and Graduation Design (Thesis), etc.

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	36	24	576	494	82
Professional Course	23	15	368	282	86
Practical Training	30	20	856	32	824
General Course	10	7	320	320	0
Total	150	100	3096	2036	1060
Theory : Practice(%)	66:34				

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	non-test	2	32	32		autumn 2
	required	College of Arts and Sciences	b1020013	Probability Theory and Mathematical Statistics	non-test	2	32	32		autumn 2
	required	College of Arts and Sciences	b1020062	College Physics A(module 1)	test	3	48	48		spring 1
	required	College of Arts and Sciences	b1020065	College Physics B	test	2	32	32		autumn 2
	required	College of Arts and Sciences	b1020066	College Physics C	non-test	1	32		32	spring 1
	required	College of Arts and Sciences	b1020035	College chemistry	test	1	32	28	4	spring 1
	required	College of Arts and Sciences	b1020018	College Chinese	non-test	2	32	32		spring 1
	required	Others	b1110003	Military skills	non-test	0.5	2W			autumn 1
	required	College of Arts and Sciences	b1110002	Military theory	non-test	0.5	32	32		autumn 2
	required	College of Arts and Sciences	b1020003	General English III	test	3	48	48		autumn 1
	required	College of Arts and Sciences	b1020004	General English IV	test	3	48	48		spring 1
	required	College of Arts and Sciences	b1020005	General Academic English A	test	2	32	32		autumn 2
	required	College of Arts and Sciences	-----	English development	non-test	2	32	32		spring 2
	required	Department of Physical Education	-----	Physical Education I～VI	non-test	3	160	160		autumn 1～autumn 4
Total (General Education Basic Courses)						51	976	908	68	
General Course	required	College of Engineering	b2013024	Scientific paper writing and document retrieval	non-test	2	32	32		autumn 1
	required	College of Engineering	b2011393	Mathematical foundation of smart manufacturing	non-test	2	32	32		autumn 3
	required	College of Engineering	b2011327	Artificial intelligence technology	non-test	2	32	32		spring 3
	selective	Others	---	Social Science and Humanities Literacy (2 credits) Public Art (2 credits)	non-test	4	64	64		autumn，spring
Subtotal (general course)						10	320	320		

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 Engineering	b2011394	Introduction to Smart Manufacturing Engineering	non-test	1	16	14	2	autumn 1
	required	College of Engineering	b2011137	Modern Engineering Drawing I	test	3	48	40	8	autumn 1
	required	College of Engineering	b2011138	Modern Engineering Drawing II	non-test	3	48	32	16	spring 1
	required	College of Arts and Sciences	b1020076	Calculation method	test	2	32	32	0	spring 2
	required	College of Engineering	b2011143	Project management	non-test	2	32	26	6	autumn 3
	required	College of Engineering	b2011049	Engineering Mechanics I	test	3	48	48		autumn 2
	required	College of Engineering	b2011050	Engineering Mechanics II	test	3	48	44	4	spring 2
	required	College of Engineering	b2011324	Mechanical Design	test	5	80	72	8	autumn 3
	required	Work training	b2090009	Electrician and Electronics	test	4	64	54	10	spring 2
	required	College of Engineering	b2011427	Engineering materials and machinery manufacturing foundation	test	4	64	54	10	spring 2
	required	College of Engineering	b2011090	Control Engineering Foundation	test	3	48	44	4	spring 3
	required	College of Engineering	b2011169	Foundation of Programming Design	test	3	48	34	14	autumn 2
Subtotal (Basic professional courses)						36	576	494	82	
Professional courses	required	College of Engineering	b2011428	Embedded System Design	non-test	2	32	16	16	spring 2
	required	College of Engineering	b2011330	Electrical control and PLC application	test	2	32	26	6	autumn 3
	required	College of Engineering	b2011429	CNC Machine Tools	test	2	32	28	4	autumn 3
	required	College of Engineering	b2011430	Fluid mechanics and hydraulic transmission	test	3	48	40	8	autumn 3
	required	College of Engineering	b2011329	Sensors and intelligent detection technology	test	2	32	26	6	spring 3
	required	College of Engineering	b2011431	Intelligent electromechanical transmission control	test	2	32	26	6	spring 3
	required	College of Engineering	b2011331	Machine vision technology and application	non-test	2	32	26	6	spring 3
	required	College of Engineering	b2011333	Industrial Robot Technology and Application	test	2	32	28	4	spring 3
	Subtotal (required professional courses)					17	272	216	56	
	★module selective, 6 credits	module A	b2011432	Smart manufacturing system integration	non-test	2	32	20	12	autumn 4
			b2011433	Smart manufacturing production management(MES/ERP)	test	2	32	24	8	autumn 4
			b2011332	Internet of Things Technology and Application	test	2	32	26	6	autumn 4
		module B	b2011434	Intelligent equipment fault diagnosis and maintenance	test	2	32	26	6	autumn 4
			b2011435	Predictive maintenance of electromechanical equipment	test	2	32	26	6	autumn 4
			b2011436	Big data and deep learning	non-test	2	32	26	6	autumn 4
	Subtotal (professional module courses)					6	96	66	30	
Subtotal (professional courses)						23	368	282	86	

11. Teaching schedule (3)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hour	Theory Learning	Practical Training	Semester
Professional practice	required	Work training	b4090001	Basic engineering training A	non-test	3	72		72	summer 1
	required	College of Engineering	b4011299	Engineering Drawing Surveying and Mapping and Interchangeability Practice	non-test	2	48		48	summer 1
	required	College of Engineering	b4011300	Electrician and Electronics Technical Internship	non-test	2	48		48	summer 2
	required	College of Engineering	b4011301	Smart manufacturing production practice	non-test	1	24		24	summer 2
	required	College of Engineering	b4011280	Industrial robot application and maintenance practice	non-test	1	48		48	autumn 4
	required	College of Engineering	b2011001	CAD/CAM	non-test	2	32	16	16	autumn 3
	required	College of Engineering	b4011302	Mechanical Design Course Exercise (English)	non-test	2	32	16	16	spring 3
	required	College of Engineering	b4011303	Embedded system application practice (second-level project)	non-test	2	48		48	summer 2
	required	College of Engineering	b4011304	Digital design and manufacturing (second-level project)	non-test	2	48		48	summer 3
	required	College of Engineering	b4011305	PLC TECHNOLOGY APPLICATION PRACTICE (SECOND-LEVEL PROJECT)	non-test	1	24		24	spring 3
	required	College of Engineering	b4011193	Sensors and intelligent detection technology comprehensive practice (secondary project)	non-test	1	24		24	summer 3
	required	College of Engineering	b4011306	Comprehensive Practice of Intelligent Electromechanical System (Level 2 Project)	non-test	2	48		48	summer 3
	required	College of Engineering	b4011307	Design, manufacturing and integration of intelligent electromechanical system I (level 1 project)	non-test	1	24		24	autumn 3
	required	College of Engineering	b4000022	Smart Manufacturing Engineering Professional Innovation and Entrepreneurship: Intelligent Mechanical and Electrical System Design, Manufacturing and Integration II (Level 1 Project)	non-test	2	48		48	autumn 4
	required	College of Engineering	b4011252	Graduation Practice and Graduation Design of Intelligent Manufacturing Engineering (Thesis)	non-test	6	288		288	spring 4
Subtotal (professional practice)						30	856	32	824	
Extracurricular Class	required	Others	b5110001	Extracurricular Class	non-test	1	-	-	-	Autumn, spring, summer
Total						151	3096	2036	1060	

★1.Guidance for selective practical module courses:

Professional practice is set up in modules according to different ability requirements. Students are required to selectively learn one of the modules and achieve the required credits for that module.

(1) Module A: Smart manufacturing system integration module. Focus on cultivating students' integrated application and management capabilities for smart manufacturing systems, smart factories, and electromechanical systems;

(2) Module B: Smart equipment fault diagnosis module. It focuses on cultivating students' application abilities in the principles, fault diagnosis, maintenance and management of intelligent equipment.

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

Students who have passed Industrial Robot Technology and Application, Industrial robot application and maintenance practice, CNC Machine Tools, CAD/CAM, digital design and manufacturing, sensors and intelligent detection technology, machine vision technology and application, Smart manufacturing production management (MES/ERT), etc. can participate in the professional qualification certificate assessment related to this program: smart manufacturing system application maintainer (level 3 / 4), machine vision system technology application division (level 3 / 4), additive manufacturing technology application division (Level 3 / Level 4), CNC Machine Tools operation adjustment worker (Level 3 / 4), CNC Machine Tools assembly and adjustment maintenance worker (Level 3 / 4), industrial robot operation adjustment certificate (Advanced), CAD/CAM skill certificates, etc.

Students who have obtained the qualification certificate of smart manufacturing system application maintainer can apply for exemption from Industrial Robot Technology and Application, CNC Machine Tools course and obtain corresponding credits. Students who have obtained the qualification certificate of machine vision technology application division can apply for exemption from machine vision technology and application courses and obtain corresponding credits. Students who have obtained the qualification certificate of additive manufacturing technology applicator can apply for exemption from digital design and manufacturing, CAD/CAM courses and obtain corresponding credits.

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	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 Smart Manufacturing Engineering	non-test	1	16
required	Modern Engineering Drawing I	test	3	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 Physics C	non-test	1	32
required	College chemistry	non-test	1	32
required	College Chinese	non-test	2	32
required	Situation and Policy	non-test	0.5	8
required	Physical Education II	non-test	0.5	32
selective	General Course	non-test	2	32
required	Modern Engineering Drawing II	non-test	3	48

Summer semester 1:

Type	Course Name	Assessment	Credit	Course Hour
required	Basic engineering training A	non-test	3	72
required	Engineering Drawing Surveying and Mapping and Interchangeability Practice	non-test	2	48

Autumn semester 2:

Type	Course Name	Assessment	Credit	Course Hour
required	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics I	test	3	48
required	Military theory	non-test	0.5	32
required	First Foreign Language	test	2	32
required	Linear algebra	test	2	32
required	Probability Theory and Mathematical Statistics	test	2	32
required	College Physics B	test	2	32
required	Situation and Policy	non-test	0.5	8
required	Physical Education III	non-test	0.5	32
selective	General Course	non-test	2	32
required	Engineering Mechanics I	test	3	48
required	Foundation of Programming Design	test	3	48

Spring semester 2:

Type	Course Name	Assessment	Credit	Course Hour
required	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics II	test	2	32
required	First Foreign Language	non-test	2	32
required	Situation and Policy	non-test	0.5	8
required	Physical Education IV	non-test	0.5	32
required	Calculation method	non-test	2	32
required	Engineering Mechanics II		3	48
required	Electrician and Electronics	test	4	64
required	Engineering materials and machinery manufacturing foundation	test	4	64
required	Embedded System Design	non-test	2	32

Summer semester 2:

Type	Course Name	Assessment	Credit	Course Hour
required	Electrician and Electronics Technical Internship	non-test	2	48
required	Smart manufacturing production practice	non-test	1	24
required	Embedded system application practice (second-level project)	non-test	2	48

Autumn semester 3:

Type	Course Name	Assessment	Credit	Course Hour
required	Physical Education V	non-test	0.5	16
required	Mathematical foundation of smart manufacturing	non-test	2	32
required	Project management	non-test	2	32
required	Mechanical Design	test	5	80
required	Electrical control and PLC application	test	2	32
required	CNC Machine Tools	test	2	32
required	Fluid mechanics and hydraulic transmission	test	3	48
required	CAD/CAM	non-test	2	32
required	Design, manufacturing and integration of intelligent electromechanical system I (level one project)	non-test	1	24

Spring semester 3:

Type	Course Name	Assessment	Credit	Course Hour
required	Mechanical Design Course Exercise (English)	non-test	2	32
required	Control Engineering Foundation	test	3	48
required	Sensors and intelligent detection technology	test	2	32
required	Intelligent electromechanical transmission control	test	2	32
required	Machine vision technology and application	non-test	2	32
required	Industrial Robot Technology and Application	test	2	32
required	PLC TECHNOLOGY APPLICATION PRACTICE (SECOND-LEVEL PROJECT)	non-test	1	24

Summer semester 3:

Type	Course Name	Assessment	Credit	Course Hour
required	Digital design and manufacturing (second-level project)	non-test	2	48
required	Sensors and intelligent detection technology synthesis	non-test	1	24

	(second-level project)			
required	Comprehensive practice of smart electromechanical system design (second-level project)	non-test	2	48

Autumn semester 4:

Type	Course Name	Assessment	Credit	Course Hour
required	Physical Education VI	non-test	0.5	16
module A	Smart manufacturing system integration	non-test	2	32
module A	Smart manufacturing production management(MES/ERP)	test	2	32
module A	Internet of Things Technology and Application	test	2	32
module B	Intelligent equipment fault diagnosis and maintenance	test	2	32
module B	Predictive maintenance of electromechanical equipment	test	2	32
module B	Big data and deep learning	non-test	2	32
required	Industrial robot application and maintenance practice	non-test	1	48
required	Intelligent electromechanical system design, manufacturing and integration II (level one project) (smart manufacturing engineering professional innovation and entrepreneurship)	non-test	2	48

Spring semester 4:

Type	Course Name	Assessment	Credit	Course Hour
required	Graduation Practice and Graduation Design of Intelligent Manufacturing Engineering (Thesis)	non-test	6	288

13. Prerequisite for Course Study

No.	Course name	Prerequisite Course	No.	Course name	Prerequisite Course
1	Calculation method	Advanced Mathematics Linear algebra Probability Theory and Mathematical Statistics	10	Electrical control and PLC application	Electrician and Electronics Foundation of Programming Design
2	Mathematical foundation of smart manufacturing	Introduction to Smart Manufacturing Engineering Advanced Mathematics Linear algebra	11	CNC Machine Tools and programming	Mechanical Design Foundation of Programming Design
3	Engineering Mechanics	Advanced Mathematics College Physics	12	Fluid mechanics and hydraulic transmission	Engineering Mechanics Calculation method
4	Mechanical Design	Advanced Mathematics Engineering Mechanics Calculation method	13	Intelligent electromechanical transmission control	Introduction to Smart Manufacturing Engineering Control Engineering Foundation Electrician and Electronics
5	Electrician and Electronics	Advanced Mathematics College Physics	14	Machine vision technology and application	Electrical control and PLC application Foundation of Programming Design Mechanical Design
6	Engineering materials and machinery manufacturing foundation	Advanced Mathematics College Physics Modern Engineering Drawing	15	Industrial Robot Technology and Application	Electrical control and PLC application Foundation of Programming Design Mechanical Design
7	Control Engineering Foundation	Foundation of Programming Design Calculation method Electrician and Electronics	16	Internet of Things Technology and Application	Foundation of Programming Design Electrical control and PLC application
8	Mechanical Design Course Exercise (English)	General English English development Mechanical Design	17	Sensors and intelligent detection technology	Foundation of Programming Design Introduction to Smart Manufacturing Engineering Electrician and Electronics
9	Embedded System Design	Foundation of Programming Design Electrician and Electronics	18		

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.