# Instructive Cultivation Plan for the Program of Mechatronics Engineering (Numerical Control Equipment Assembly and Maintenance)

# (Pathway from Secondary Vocational to Undergraduate Education---Undergraduate Level)

**(Grade 2021)**

**Course code: 080204**

## 1. Orientation

Shanghai Polytechnic University and Shanghai Industrial Technology School have jointly build a pathway platform of Mechatronics Engineering (Numerical Control Equipment Assembly and Maintenance) by following the national and Shanghai medium and long-term educational reform and development planning outline to promote the connection between secondary vocational education and higher education and to build a bridge between the courses, training models and schooling systems in both secondary vocational education and higher education. In this way, the program trains innovative talents with abundant knowledge and strong skills to meet the needs of economic and social development.

The program of Mechatronics Engineering (Numerical Control Equipment Assembly and Maintenance) follows the "Made in China 2025" strategy and the requirements of "Shanghai Intelligent Manufacturing" development plan. Rooting at Pudong New Area and covering Shanghai and the Yangtze River Delta Area, the program aims to train senior applied engineering talents who meet the needs of production, management and service, have certain design, development and application capabilities for electromechanical systems, and strong installation, debugging, repair, maintenance and application capabilities for intelligent mechatronics equipment, especially CNC machine tools, industrial robots, etc.

## 2. Cultivation Objectives

### 2.1. General Objective

According to the Shanghai development plan and the demand for advanced manufacturing talents, the program trains applied senior professional talents who are developed in an all-round way, an innovative team player and with strong communication skills and practical abilities. They are bel to manage works like installation, debugging, maintenance, application research, production management and marketing of intelligent electromechanical equipment such as CNC machine

tools in the production line.

2.2. Value

With the rapid development of advanced manufacturing technology and robotics, as well as the release of the "Made in China 2025" strategy, companies' demand for mechanical and electronic engineering professional talents has undergone significant changes. In order to further promote the training of intelligent manufacturing technical talents in line with the international advanced manufacturing industry, it's a necessary and urgent task to implement the training strategy of vocational technical talents characterized by "technical skills, compound skills, and knowledge skills", and establish a "middle and undergraduate education through" cultivating model for mechatronics engineering program.

Mechatronics engineering is often referred to as mechatronics technology. It is a comprehensive discipline formed by the organic integration of mechanics, electronics, information technology, computer technology, and control technology. Mechatronics Engineering is positioned in the large field of "mechanical engineering", highlighting the organic integration and integration of light, mechanics, and electricity, and mainly conducts research and design on mechanical control, measurement, and condition monitoring. Therefore, its main key technologies include: (1) detection and sensing technology, (2) information processing technology, (3) automatic control technology, (4) servo drive technology, (5) precision machinery technology, (6) system overall technology.

The four-year undergraduate degree in mechanical and electronic engineering has a short academic system, which is not conducive to the training of technical skills. The "middle and undergraduate education through" cultivating model adopts a 7-year consistent curriculum, a long training cycle, professional technical advantages, and establishes a solid theoretical foundation which are conducive to the training of technical skills talents, thus ensuring the students have strong professional development capabilities. Therefore, by constructing an overpass for cultivating vocational schools and colleges, highlight vocational skills, clarify training objectives, and closely integrate the economic and social development needs of Shanghai and the Yangtze River Delta, establish a modern vocational education system with a reasonable structure, and strengthen the "middle and undergraduate education through" cultivating model which are featured with school-enterprise cooperation, work-study integration, and modularized teaching mode, thus playing an exemplary role in promoting the reform and innovation of vocational education system.

In this program, the students' thinking and philosophy are cultivated through the basic mode of this program: quality training is the foundation, machinery is the foundation, control is the core, the emphasis is on the combination of electromechanics and innovation.

2.3. Objectives students must achieve five years after graduation:

(1) Be able to apply the professional knowledge, skills and technology of mechatronics engineering to the process of design and manufacture, technical transformation, maintenance and repair of electromechanical systems. Be able to independently discover, analyze, formulate and solve complex mechanical and electrical engineering problems in production practice.

(2) Be able to carry out research work on mechanical structure characteristics, motion control, fault diagnosis of CNC equipment, etc., and have the ability to engage in the design, testing, development, application and integration of intelligent electromechanical equipment and electromechanical integration systems.

(3) Have strong engineering practical experiences and certain management capabilities, and be able to serve as technical backbones, project supervisors, and grassroots managers in electromechanical related industries and enterprises.

(4) Have good humanities, professional ethics, teamwork and international vision, have a sense of social responsibility, professionalism, safety and environmental protection in the work, and can actively serve the country and society in the industry.

**3. Requirement for Graduation**

**3.1: Be able to acquire and apply engineering knowledge: be able to use mathematics, natural sciences, engineering foundations and professional knowledge to solve complex mechanical and electronic engineering problems.**

1-1: Possess the knowledge and application ability of mathematics and natural science required to solve mechatronics engineering issues;

1-2: Have the basic engineering knowledge and application capabilities required to solve mechanical and electronic engineering problems;

Index points 1-3: Have the professional basic knowledge and application capabilities required to solve mechanical and electronic engineering problems;

Index points 1-4: Possess the professional knowledge and application capabilities required to solve mechanical and electronic engineering problems.

**3.2: Problem analysis ability: be able to apply the basic principles of mathematics, natural science and engineering science to identify, express, and analyze complex mechanical and electronic engineering problems through literature research, so as to obtain effective conclusions.**

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 mechanical and electronic engineering problems;

2-2: Be able to recognize that there are many ways to solve complex mechanical and electronic engineering problems, and be able to find effective solutions (engineering problems) through literature research and analysis;

2-3: Based on the principles of mathematics, natural science and engineering, be able to verify the rationality of solution.

**3.3: Ability to develop solutions: be able to design solutions to complex mechanical and electronic engineering problems and systems, parts, equipment or manufacturing processes that meet specific needs, and reflect the sense of innovation in the design, while considering society, environment, health, security, law, culture and other factors.**

3-1: Master the basic methods of mechanical and electrical engineering design, and be able to analyze complex mechanical and electronic engineering problems, propose design objectives, and determine solutions;

3-2: Be able to design mechanical parts, control systems or technological processes that meet the specific needs of electromechanical equipment or systems;

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

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

**3.4: Scientific research ability: Be able to study complex mechanical and electronic engineering problems based on scientific principles and by using scientific methods, including designing experiments, analyzing and interpreting data, thus obtaining reasonable and effective conclusions through information synthesis.**

4-1: Be able to apply the knowledge learned to study various physical phenomena, mechanisms, components or equipment characteristics related to mechatronics engineering, and formulate experimental plans;

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

4-3: Be able to correctly analyze and interpret experimental data/results, and obtain reasonable and

effective conclusions through information synthesis.

**3.5: Ability to use modern tools: Be able to develop, select and use appropriate technologies, resources, modern engineering tools and information technology tools for complex mechatronics engineering problems, including prediction and simulation of complex mechatronics engineering problems, and be able to understand the limitations.**

5-1: Understand the development status of mechatronics engineering discipline, and be able to initially master and use modern engineering technology, methods, tools or equipment in practice;

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

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

**3.6: Ability to analyze and evaluate the relationship between engineering and society: be able to conduct reasonable analysis based on the background knowledge of mechatronics engineering, evaluate the impact of professional engineering practices and complex engineering problem solutions on society, health, safety, law, and culture, and understand the responsibilities.**

6-1: Understand the technical standards, intellectual property rights, industrial policies, laws and regulations related to mechanical and electronic engineering;

6-2: Be able to correctly understand and evaluate the current situation in the field of mechatronics engineering and the development and application of new products, new technologies, new processes, and new materials, as well as their impact on the objective world and society;

6-3: Be able to understand the social, safety and legal responsibilities of mechanical and electronic engineers in engineering practice.

**3.7: Ability to understand and evaluate the environment and sustainable development: be able to understand and evaluate the impact of engineering practice for complex mechanical and electrical engineering problems on the environment and sustainable development of society.**

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

7-2: Be able to correctly recognize and understand the impact of engineering practices aimed at

mechatronics engineering issues on the environment and the sustainable development of society.

**3.8: Comply with professional standards: Possess 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 can perform responsibilities.**

8-1: Understand the basic meaning and influence of the world outlook and outlook on life;

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

8-3: Understand the professional nature and responsibilities of mechanical and electrical engineers, and be able to consciously abide by professional ethics and norms in the practice of mechanical and electrical engineering.

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

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

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

**3.10: Ability to effectively communicate and exchange: be able to effectively communicate with industry colleagues and the public on complex mechanical and electrical engineering issues, including writing reports and design manuscripts, presentations, clear expressions or response instructions, and possess a certain degree of international vision, and be able to communicate in a cross-cultural context.**

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

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 in a cross-cultural context, and have a certain international perspective.

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

11-1: Understand the important economic and management factors involved in mechatronics

engineering activities;

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

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

12-1: Be able to correctly understand the importance of lifelong learning, and have the awareness of independent learning and lifelong learning;

12-2: Be able to take appropriate methods to learn independently according to personal or professional development needs, and possess the ability to adapt to the development of society and mechanical and electronic 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 152 credits for graduation; those who meet the requirements for bachelor's degree can be conferred bachelor degree in engineering.

**7. Discipline**

Mechanical engineering, control science and engineering

**8. Core Courses**

8.1. Engineering Mechanics I

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.

8.2. Engineering Mechanics II

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; have a preliminary understanding of the basic principles and methods of stress analysis in electrical measurement experiments.

8.3. Machinery Manufacturing Technology

The course "Machinery Manufacturing Technology" is a professional basic course for mechanical programs. This course will further enhance students' understanding of mechanical engineering materials based on the secondary vocational "Mechanical Engineering Fundamentals" course. Through the study of this course, students will further understand the basic knowledge and applications of casting, forging, welding and other processes, and understand the basic knowledge of metal cutting principles and tool angles, tool materials and surface processing knowledge of mechanical parts.

The basic requirements of this course: master the performance characteristics of mechanical engineering materials; understand the crystal structure of metals; master the phase diagram of iron-carbon alloys; master the heat treatment of steel; master carbon steel and alloy steel; understand the classification and use of cast iron; master casting and forging, welding and other process basic knowledge; understand the basic principles of metal cutting, tool angle marking, tool material requirements; be familiar with plane processing, cylindrical surface processing,

cylindrical gear processing equipment and basic knowledge of processing technology.

8.4. Basics of Control Engineering

This course is an important theoretical basis for modern mechatronics engineering, focusing on the basic control analysis methods in mechanical and circuit systems. This course will enable students to master the establishment of mathematical models of mechanical and electrical systems; master the definition of Laplace transform, the Laplace transform of commonly used functions and important properties of Laplace transform; master the basic concepts, basic variables, basic components and working principles of the control system; grasp the definition and basic parameters of the first and second order systems; be able to solve the unit impulse response, unit step response and unit ramp response of the first and second order systems; understand that when the input of a linear system has a differential or integral relationship, its output will also be the same conclusion of the relationship; understand the basic shape and meaning of the unit step response curve of the first-order and second-order systems; the definition of the performance indicators of second-order system and the relationship with the characteristic parameters; instruct students to learn to abstract the actual control system and complete the mathematical model; establish and analyze and design the control system. This course mainly includes the mathematical model of the system in the three domains (time domain, complex domain, frequency domain), the three elements of system analysis (stability, static characteristics and dynamic characteristics), and various device correction methods for the design of the system based on the root locus method and frequency method.

8.5. Mechanical Engineering Testing Technology

This course teaches the commonly used sensors of intelligent electromechanical equipment, and understands 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 understand the development trend and cutting-edge technology of sensors and test technologies.

8.6. CNC machine tools

This course teaches the basic concepts and structural characteristics of CNC machine tools from the perspective of the basic knowledge that should be mastered for using CNC machine tools; the functions and interpolation principles of CNC systems; the form and composition of servo drive systems; and the application knowledge of CNC machine tool selection and maintenance.

8.7. Electromechanical drive control

This course teaches 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 and performance of commonly used open-loop and closed-loop control systems and application places, and understand the application of the latest control technology in electromechanical equipment.

8.8. CNC machine tool assembly and maintenance

This course is a practical professional core course for the application and maintenance of CNC equipment. Through the installation and commissioning of CNC machine tool feed axis, spindle, tool post, tool magazine and other mechanical parts, students will master the feed axis assembly and inspection, spindle assembly and inspection, tool post assembly and inspection, and understand the assembly and inspection of tool magazine components. At the same time, students will be able to correctly read and understand the relevant requirements of mechanical assembly drawings, can correctly select tools, measuring tools, fixtures and inspection tools according to the instruction book, master the general methods of mechanical assembly and commissioning, and develop good work habits, thus laying a solid foundation for professional ability development.

**9. Main internship and practical training**

Basic engineering training A, related main course design, comprehensive practice of electromechanical system design, comprehensive practice of electromechanical equipment fault diagnosis and maintenance, graduation design (thesis), etc.

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

| Category | Total Credit | % | Total Course Hours | Theory Learning | Practical Training |
|---|---|---|---|---|---|
| General Education | 50.5 | 33 | 1312 | 1248 | 64 |
| Basic Course | 26 | 17 | 416 | 340 | 76 |
| Professional Course | 34 | 23 | 544 | 402 | 142 |

| | | | | | |
|---|---|---|---|---|---|
| Practical Training | 30.5 | 20 | 880 | 0 | 880 |
| General Course | 10 | 7 | 160 | 160 | 0 |
| **Total** | **151** | **100** | **3312** | **2150** | **1162** |
| Theory : Practice(%) | 65:35 | | | | |

**11. Teaching schedule (1)**

| Category | Type | Provided by | Course Code | Course Name | Assessment | Credit | Course Hour | Theory Learning | Practical Training | Semester |
|---|---|---|---|---|---|---|---|---|---|---|
| General Education | required | School of Marxism | b1080001 | Basic principles of Marxism | test | 3 | 48 | 42 | 6 | Spring 1 |
| | required | School of Marxism | b1080003 | Morality and Laws | 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 | School of Marxism | b1080008 | Labor Education A | Non-test | 0.5 | 16 | 16 | | Autumn 2 |
| | Required | College of Arts and Sciences | b1020080- | Advanced Mathematics A1 | test | 4 | 64 | 64 | 0 | Autumn 1 |
| | required | College of Arts and Sciences | b1020081- | Advanced Mathematics A2 | test | 4 | 64 | 64 | 0 | Spring 1 |
| | required | College of Arts and Sciences | b1020012- | Linear algebra | test | 2 | 32 | 32 | 0 | Autumn 2 |

| Category | Type | Provided by | Course Code | Course Name | Assessment | Credit | Course Hour | Theory Learning | Practical Training | Semester |
|---|---|---|---|---|---|---|---|---|---|---|
| | required | College of Arts and Sciences | b1020013- | Probability Theory and Mathematical Statistics | test | 2 | 32 | 32 | 0 | Autumn 2 |
| | required | College of Arts and Sciences | b1020062- | College Physics A(module 1) | test | 3 | 48 | 48 | 0 | Spring 1 |
| | required | College of Arts and Sciences | b1020065- | College Physics B | test | 2 | 32 | 32 | 0 | Autumn 2 |
| | required | College of Arts and Sciences | b1020066- | College Physics C | non-test | 1 | 32 | 0 | 32 | Spring 1 |
| | required | Department of Physical Education | ----- | Physical Education I～VI | non-test | 3 | 160 | 160 | 0 | Autumn 1～Autumn 4 |
| | required | Others | b1110003 | Military skills | non-test | 0.5 | 2W | | | Autumn 1 |
| | required | College of Arts and Sciences | b1110002 | Military theory | non-test | 0.5 | 32 | 32 | | Autumn 2 |
| | required | College of Arts and Sciences | b1020018 | College Chinese | non-test | 2 | 32 | 32 | | Spring 1 |
| | required | College of Arts and Sciences | b1020096- | German I | test | 3 | 144 | 144 | | Autumn 1 |
| | required | College of Arts and Sciences | b1020097- | German II | test | 3 | 144 | 144 | | Spring 1 |
| | required | College of Arts and Sciences | b1020048- | German III | test | 2 | 112 | 112 | | Autumn 2 |
| | required | College of Arts and Sciences | b1020046- | German IV | test | 2 | 112 | 112 | | Spring 2 |
| **Total (General Education)** | | | | | | **50.5** | **1312** | **1248** | **64** | |

| Category | Type | Provided by | Course Code | Course Name | Assessment | Credit | Course Hour | Theory Learning | Practical Training | Semester |
|---|---|---|---|---|---|---|---|---|---|---|
| General Course | required | Art Education Center | b0----- | Aesthetic Education | non-test | 2 | 32 | 32 | | Autumn , Spring |
| | selective | Each College | b0----- | Social Science and Humanities Literacy | non-test | 4 | 64 | 64 | | Autumn , Spring |
| | | | | Natural Science and Technological Innovation | non-test | 2 | 32 | 32 | | Autumn , Spring |
| | required | Library | b0021162 | Scientific Paper Writing and Document Retrieval | non-test | 2 | 32 | 32 | | Autumn 1 |
| **Subtotal (general course)** | | | | | | **10** | **160** | **160** | | |

**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 | School of Intelligent Manufacturing and Control Engineering | b2011237 | Introduction to Mechatronics Engineering | Non-test | 1 | 16 | 16 | 0 | Autumn 1 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011320 | Basic Programming (C language) | Test | 3 | 48 | 24 | 24 | Autumn 1 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011049 | Engineering Mechanics I | Test | 3 | 48 | 48 | 0 | Spring 1 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011050 | Engineering Mechanics II | Test | 3 | 48 | 44 | 4 | Autumn 2 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011345 | Fundamentals of Mechanical Design | Test | 4 | 64 | 58 | 6 | Autumn 2 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011090 | Control Engineering Fundamentals | Test | 3 | 48 | 44 | 4 | Spring 2 |
| | Required | School of Intelligent Manufacturing and Control | b2011485 | Mechanical Manufacturing and Engineering Material | Test | 3 | 48 | 42 | 6 | Autumn 3 |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | Engineering | | Foundation | | | | | | |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011483 | Comprehensive Theoretical Foundation of Maintenance Electrician (advanced) | Test | 6 | 96 | 64 | 32 | Autumn 3 |
| **Subtotal (Basic professional courses)** | | | | | | **26** | **416** | **340** | **76** | |
| Professional courses | Required | School of Intelligent Manufacturing and Control Engineering | b2011342 | Principle and Application of Single Chip Microcomputer | Test | 2 | 32 | 26 | 6 | Spring 1 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011074 | Mechanical Engineering Testing Technology | Test | 3 | 48 | 42 | 6 | Spring 2 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011486 | CNC system | Test | 3 | 48 | 40 | 8 | Autumn 3 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011176 | Hydraulic and Pneumatic Transmission | Test | 3 | 48 | 42 | 6 | Autumn 3 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011498 | Computer Aided Design and Manufacturing | Test | 3 | 48 | 32 | 16 | Spring 3 |
| | Required | School of Intelligent Manufacturing and Control Engineering | b2011249 | Electromechanical Drive Control | Test | 3 | 48 | 42 | 6 | Spring 3 |

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|---|---|---|---|---|---|---|---|---|---|
| Required | School of Intelligent Manufacturing and Control Engineering | b2011119 | CNC Machine Tools and Programming | Test | 2 | 32 | 26 | 6 | Autumn 3 |
| Required | School of Intelligent Manufacturing and Control Engineering | b2011484 | CNC Machine Tool Assembly and Maintenance | Test | 5 | 80 | 48 | 32 | Spring 3 |
| Required | School of Intelligent Manufacturing and Control Engineering | b2011413 | PLC Advanced Application | Test | 2 | 32 | 20 | 12 | Spring 3 |
| Required | School of Intelligent Manufacturing and Control Engineering | b2011348 | Industrial Robot Technology and Application | Test | 2 | 32 | 26 | 6 | Autumn 4 |
| **Subtotal (required professional courses)** | | | | | **28** | **448** | **344** | **104** | |
| Selective, 6 credits | School of Intelligent Manufacturing and Control Engineering | b2011338 | Innovative design basis | non-test | 2 | 32 | 26 | 6 | Autumn 3 |
| | School of Intelligent Manufacturing and Control Engineering | b2011032 | Circuit design | non-test | 2 | 32 | 16 | 16 | Autumn 3 |
| | School of Intelligent Manufacturing and Control Engineering | b2011135 | Advanced Manufacturing Technology | non-test | 2 | 32 | 26 | 6 | Autumn 3 |
| | School of Intelligent | b20011447 | Matlab and Electromechanical | non-test | 2 | 32 | 16 | 16 | Spring 3 |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | Manufacturing and Control Engineering | | Aystem Simulation | | | | | | |
| | | School of Intelligent Manufacturing and Control Engineering | b2011251 | Introduction to Intelligent Manufacturing | non-test | 2 | 32 | 26 | 6 | Autumn 3 |
| | **Subtotal (selective professional courses)** | | | | | **6** | **96** | **58** | **38** | |
| **Subtotal (professional courses)** | | | | | | **34** | **544** | **402** | **142** | |

**11. Teaching schedule (3)**

| Category | Type | Provided by | Course Code | Course Name | Assessment | Credit | Course Hour | Theory Learning | Practical Training | Semester |
|---|---|---|---|---|---|---|---|---|---|---|
| Professional courses | required | School of Intelligent Manufacturing and Control Engineering | b4011043 | Interchangeability and measurement technology practice | non-test | 2 | 48 | | 48 | |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011215 | Principle and Application of Mono-Chip Computers Course Design | non-test | 2 | 48 | | 48 | Summer 1 |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011056 | Mechanical Design Course Exercise | non-test | 2 | 48 | | 48 | Summer 1 |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011052 | Mechanical Engineering Testing Technology Comprehensive Experiment | non-test | 2 | 48 | | 48 | Summer 2 |
| | required | School of Intelligent Manufacturing and Control Engineering | b4000011 | Innovation and Entrepreneurship of Mechatronics Engineering | non-test | 2 | 48 | | 48 | Spring 3 |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011281 | Comprehensive Training of Maintenance Electrician (advanced) | non-test | 6 | 144 | | 144 | Spring 3 |
| | required | School of Intelligent Manufacturing and | b4011217 | Production Practice | non-test | 2 | 48 | | 48 | Summer 3 |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | Control Engineering | | | | | | | | |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011220 | Comprehensive Practice of Electrical Control | non-test | 2 | 48 | | 48 | Summer 3 |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011280 | Industrial robot application and maintenance practice | non-test | 1 | 24 | | 24 | Autumn 4 |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011219 | Comprehensive practice of electromechanical system | non-test | 3 | 72 | | 72 | Autumn 4 |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011339 | Labor Education B | non-test | 0.5 | 16 | | 16 | Spring 3 |
| | required | School of Intelligent Manufacturing and Control Engineering | b4011246 | Graduation Practice and Graduation Design (Thesis) for Mechatronics Engineering | non-test | 6 | 288 | | 288 | Spring 4 |
| **Subtotal (professional practice)** | | | | | | **30.5** | **880** | **0** | **880** | |
| Extracurricular Class | required | Others | b5110001 | Extracurricular Class | non-test | 1 | - | - | - | Autumn ， Spring ， Summer |
| **Total** | | | | | | **152** | **3312** | **2150** | **1162** | |

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

Students passing computer-aided design and manufacturing, CNC machine tool assembly and

maintenance, comprehensive theoretical foundation of maintenance electrician (advanced), comprehensive training of maintenance electrician (advanced), can participate in the professional qualification certificate assessment related to this program: UG Advanced, fitter skills intermediate certificate, maintenance electrician certificate (advanced), CNC machine tool assembly and adjustment maintenance certificate (intermediate), CNC machine tool assembly and adjustment maintenance certificate (advanced).

Students who have obtained the UG advanced certificate can apply for exemption of computer-aided design and manufacturing courses and obtain corresponding credits; obtain the maintenance electrician certificate (advanced) qualification certificate; can apply for the comprehensive theoretical foundation of maintenance electrician (advanced), maintenance electrician comprehensive training (advanced) course exemption and obtain the corresponding credits; obtain the CNC machine tool assembly and maintenance work certificate (advanced) qualification certificate, and can apply for the CNC machine tool assembly and maintenance course exemption and get the corresponding credits.

**12. Prerequisite for Course Study**

| No. | Course name | Prerequisite Course | No. | Course name | Prerequisite Course |
|---|---|---|---|---|---|
| 1 | Engineering Mechanics I | Calculus A1 | 7 | Electromechanical drive control | Control Engineering Foundation |
| | | Calculus A2 | | | Fundamentals of Mechanical Design |
| | | College Physics A | | | Comprehensive Theory and Practice of Maintenance Electrician |
| 2 | Engineering Mechanics II | Calculus A1 | 8 | Industrial Robot Technology and Application | Fundamentals of Mechanical Design |
| | | Calculus A2 | | | Control Engineering Foundation |
| | | College Physics A | | | Comprehensive Theory and Foundation of Maintenance Electrician |
| 3 | Fundamentals of Mechanical Design | Calculus A1 | 9 | CNC machine tools assembly and maintenance | CNC machine tools |
| | | Calculus A2 | | | Comprehensive Theory of Maintenance Electrician |
| | | Engineering Mechanics I | | | |
| | | | | | |
| 4 | Principle and Application of Mono-Chip Computer | Calculus A1 | 10 | CNC machine tools | Mechanical Design |
| | | Calculus A2 | | | Machinery Manufacturing and Engineering Materials |
| | | Foundation of programming design | | | Mechanical Engineering Testing Technology |
| | | | | | |
| 5 | Control Engineering Foundation | Calculus A1 | 11 | Mechanical Engineering Testing Technology | Calculus |
| | | Calculus A2 | | | College Physics |
| | | College Physics | | | Foundation of programming design |
| | | | | | |
| 6 | Computer Aided Design and Manufacturing | Mechanical Design | 12 | | |
| | | Machinery Manufacturing Technology | | | |
| | | CNC Machine Tools | | | |
| | | | | | |

**13. 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.