

Materials Processing and Controlling Engineering

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

(Grade 2023)

Course code: 080203

I. Cultivation Objectives

1. General cultivation objective

This program is oriented towards the development needs of the material forming process analysis and equipment manufacturing industry in the Yangtze River Delta region, and is committed to cultivating qualified builders and reliable successors of socialism with comprehensive development of moral, intellectual, physical, and aesthetic skills, and to cultivating senior application-oriented engineering and technical talents who have solid basic theories and professional knowledge of mathematics, science, mechanical engineering, materials engineering, with international perspectives, social responsibility, good communication and teamwork skills, and are able to engage in product and process technology development, design and manufacture of molding equipment, product quality control and production management in the advanced manufacturing industry, such as aerospace and automotive etc.

2. Objective of value guidance

Following the school motto of "Great life, Great Morality, great technology " and the educational philosophy of " Student-oriented and Driven by the effectiveness of student learning and development ", and through the talent cultivation mode of core value shaping, comprehensive ability cultivation and multi-dimensional knowledge exploration, this program integrates general knowledge education with professional knowledge education in depth and focuses on cultivating application-oriented engineering and technical talents who have national sentiment, persistent belief, excellent moral character, enriched knowledge and excellent skills.

3. Five years after graduation, students in this program should achieve the following objectives:

- (1) Be able to apply professional knowledge and engineering skills in materials processing and controlling engineering to identify, research and solve complex engineering projects in practice.
- (2) Be able to engage in the design, development, research and application of processes and equipment in the field of materials processing and controlling engineering.
- (3) Have good knowledge of social sciences and management skills to play an effective role in cross-functional team work.
- (4) Be able to establish and practise the core values of socialist, have good humanistic qualities, professional ethics and international perspective, have social responsibility, Career ambition and consciousness of safety and environmental in their work, and can actively serve the country and society.
- (5) Be able to update their knowledge and enhance their abilities through continuing education or other lifelong learning ways, and to further enhance their spirit of innovation and pioneering.

II. Graduation requirements

1. Engineering knowledge: The ability to apply mathematical, natural science, engineering fundamentals and professional knowledge to complex engineering problems in the field of metal/polymer forming process

analysis and equipment manufacturing.

1-1 Modelling for solutions: Master the basic knowledge of the natural sciences relevant to this program, such as mathematics physics, chemistry, etc., and be able to apply them to engineering modelling, reasoning and calculations.

1-2 Comparison and optimization: Master the basic principles and professional knowledge in the field of materials forming and be able to apply the relevant knowledge and mathematical modelling methods to the analysis of professional engineering problems and to the comparison and optimization of solutions to professional engineering problems.

2. Analyse problems: Be able to apply basic principles of mathematics, natural and engineering sciences to identify, express, and through literature research analyse engineering problems in the field of metal/polymer forming process analysis and equipment manufacturing in order to reach valid conclusions.

2-1 Identify and express: Be able to apply basic principles of mathematics, natural sciences and mathematical modelling methods to identify, evaluate and correctly express complex engineering problems and their key aspects in materials processing and controlling engineering.

2-2 Literature Research and Summarisation: Be able to use literature research to synthesize the information obtained and compare and analyse multiple solutions to complex engineering problems in the field of materials forming and be able to analyse the influencing factors of the process using fundamental principles and analyse and summarise valid conclusions.

3. Design/develop of solutions: Be able to design solutions to complex engineering problems such as material forming process development, mould design and manufacture, be able to design processes of component and mould and manufacture processes that meet specific requirements, and be able to demonstrate the spirit of innovation, while taking into account social, health, safety, legal, cultural and environmental factors.

3-1 Determination of needs: Based on the full cycle of metal/polymer materials, forming processes, equipment manufacturing, and using basic methods and techniques of material forming processes, be able to analyse the multiple factors affecting product design to meet design needs.

3-2 Process design and innovation: Be able to reasonably design product forming techniques and processes of metal/polymer material based on basic professional knowledge and be able to demonstrate the spirit of innovation in the design process.

3-3 System solutions: Be able to propose solutions to object-specific system problems in process design and equipment manufacture of metal/polymer material, which take into account social, health, safety, legal, cultural and environmental factors.

4. Research: Be able to adopt suitable methods to investigate and evaluate complex engineering problems related to metal and polymer material forming process analysis, mould design and mould manufacturing in the field of material forming process analysis and equipment manufacturing based on basic knowledge of metal/polymer material forming process and mould design, including the selection of experimental systems and experimental scheme design, experimental testing, analysis and interpretation of data, and be able to obtain reasonable and effective conclusions through comprehensive information processing.

4-1 Research and analysis: Master the impact of material properties, condition and process selection on the quality of product moulding, mould design and manufacture, and master the current state of domestic and international research.

4-2 Design of the experiment and construction of the system: Be able to construct experimental systems and choose

reasonable experimental materials and equipment to construct experimental systems.

4-3 Data Analysis and Synthesis: Be able to analyse and interpret experimental data and to draw reasonable and valid conclusions from the synthesis and evaluation of information.

5. Use of modern tools: Be able to understand, select and use appropriate techniques, resources, modern engineering tools and information technology tools to simulate, predict and validate complex engineering problems in metal/polymer forming processes and equipment manufacturing, and to understand their limitations.

5-1 Understanding of tools: Be able to understand the Principles and methods of application of common modern instruments, IT tools, engineering tools and simulation software in the field of metal and polymer material forming processes and equipment manufacturing and understand their limitations.

5-2 Analysis of design and calculations: Be able to select and use appropriate instruments, engineering tools and simulation software to analyse, design and calculate complex engineering problems in the field of material forming process analysis and equipment manufacturing.

5-3 Simulation, prediction and validation: For specific objects, be able to develop or select modern tools that meet specific needs, be able to simulate and predict professional problems and validate them, and be able to analyse their limitations.

6. Engineering and Society: Be able to perform reasonable analyses based on background knowledge of materials processing and controlling engineering in order to evaluate the impacts on society, health, safety, law and culture of engineering practices and solutions to complex engineering problems in the field of materials forming process analysis and equipment manufacturing, and to understand the responsibilities involved.

6-1 Understanding of engineering: Understand the history, cultural background, technical standards, industrial policies and laws and regulations related to the production and application of engineering.

6-2 Evaluation and Responsibility: Be able to evaluate the impacts on society, health, safety, law and culture of solutions to complex engineering problems in materials forming and understand the responsibilities involved.

7. Environment and Sustainable Development: Be able to understand and evaluate the impacts on the environment and social sustainability of engineering practices in the field of material forming process analysis and equipment manufacturing.

7-1 Understanding of environmental concepts: Understand the meaning and significance of the concept of environmental protection and sustainable social development and the impact of the implementation and operation of engineering projects on the ecological environment.

7-2 Evaluation of impacts on the environment: Be able to comprehensively evaluate the impact of professional engineering practice on environmental and social sustainability based on the concept of green manufacturing.

8. Professional Codes: Be able to establish and carry out core values of socialist, have humanities and social science qualities, social responsibility, be able to understand and abide by engineering professional ethics and codes and fulfill responsibilities in the field of material forming process analysis and equipment manufacturing engineering practice.

8-1 Vision and belief: Have proper world perspective, philosophy and values, professional ethics and codes of conduct, be honest, fair and impartial, and be able to practise the core socialist values.

8-2 Social Responsibility: Have the humanities and social responsibility as an engineer, and be able to consider the

impact and responsibilities of the engineering practice on society, safety and other factors.

8-3 Professional Ethics: Be able to understand the social value of the application of metal materials in engineering practice and the nature of the engineer's profession, be able to comply with engineering ethics and codes of practice and be able to fulfil the responsibilities of an engineer.

9. Individual and team: Be able to assume the role of individual, team member and leader of a team in a multidisciplinary context.

9-1 Communication: Be able to take on an individual role in a multidisciplinary project covering materials processing and controlling engineering, and be able to use professional strengths and complete assigned tasks on time.

9-2 Teamwork: Be able to take on the role of a team member in a multidisciplinary team covering materials processing and controlling engineering, be able to take the initiative to learn the disciplinary knowledge of other team members, communicate effectively with team members and work together to complete team tasks.

10. Communication: Be able to communicate effectively with industry peers and the public on complex engineering issues in the field of material forming process analysis and equipment manufacturing, including writing feasibility reports, designing technical routes for processes, making presentations using professional knowledge, clearly expressing or responding to instructions, and having an international perspective, and be able to communicate and interact in a cross-cultural context.

10-1 Expression and Response: Be able to communicate effectively with industry peers and the public by using reports, documents design, presentation speeches, and by expressing clearly or responding to instructions.

10-2 International Perspective and Intercultural Communication: Be able to read, translate and summarize English literature and technical documents related to materials processing and controlling engineering, and have an international perspective to communicate and interact on complex engineering issues in a cross-cultural context.

11. Project Management: Understand and master the principles of engineering management and economic decision-making methods and apply them to the practice of materials forming engineering, taking into account material costs, process and manufacturing feasibility and the practical conditions of application.

11-1 Mastery of principles: Master the basic principles of engineering management and the basic methods of economic analysis and decision-making.

11-2 Application and Practice: Be able to apply engineering management principles and economic decision-making methods to the practice of materials forming engineering, taking into account material costs, process and manufacturing feasibility and the practical conditions of application.

12. Lifelong learning: Have the spirit of independent and lifelong learning, have the ability to continuously learn and to adapt to technological advances and social development.

12-1 Consciousness and quality: Be able to understand the need for continuous exploration and learning, have the spirit of independent and lifelong learning, and have a good perspective on career development.

12-2 Ability to transfer and apply knowledge: Have a knowledge base for lifelong learning, the ability to transfer and apply knowledge to continuously identify, research and solve problems, and the ability to continuously learn advanced technology in material forming and adapt to technological developments in society.

III. Schooling System

Four years.

IV. 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.

V. 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 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 166 credits for graduation; Those who meet the requirements for bachelor's degree can be conferred bachelor degree in Intelligent Manufacturing Engineering.

VI. Discipline

Mechanical Engineering, Materials Processing Engineering

VII. Core Courses

Fundamentals of Mechanical Design, Modern Engineering Drawing, Fundamentals of Materials Science, Engineering Mechanics, Principles of plastic forming, stamping process and mould design, injection moulding process and mould design, modern mould manufacturing technology, material analysis methods, computer-aided design, numerical simulation of sheet forming, numerical simulation of injection moulding , production practice, comprehensive practice for material forming, etc.

VIII. Course Structure and Course Hours (excluding Extracurricular Class)

Course Type	Total Credits	%	Total Course Hours	Theory Learning	Practical Training
Public Fundamental Course	56.5	34	1040	954	86
General Education	10	6	160	160	0
Engineering Fundamental Course	19	11	304	260	44
Professional Fundamental Course	18	12	288	236	52
Professional Course	28	17	448	341	107
Professional Practice	33.5	20	952	0	952
Total	165	100	3192	1951	1241
Theory: Practical (%)	61:39				

IX. Teaching schedule (1)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester
Public Fundamental Course	required	School of Marxism	b1080001	Basic Principles of Marxism	test	3	48	42	6	Spring 1
	required	School of Marxism	b1080003	Ethics and the Rule of Law	non-test	3	48	42	6	Spring 1
	required	School of Marxism	b1080006	Outline of Modern Chinese History	non-test	3	48	42	6	Autumn 1
	required	School of Marxism	b1080010	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics I	test	3	48	42	6	Spring 2
	required	School of Marxism	b1080011	Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era	test	3	48	42	6	Autumn 2
	required	School of Marxism	----	Situation and Policy (Modules 1 to 4)	non-test	2	32	28	4	Autumn 1 to Spring 2
	required	School of Marxism	b1080008	Labour Education A	non-test	0.5	16	16		Autumn 2
	required	School of Mathematics, Physics and Statistics	b1020080-	Advanced Mathematics A1	test	4	64	64		Autumn 1
	required	School of Mathematics, Physics and Statistics	b1020081-	Advanced Mathematics A2	test	4	64	64		Spring 1
	required	School of Mathematics, Physics and Statistics	b1020012-	Linear Algebra	test	2	32	32		Spring 2
	required	School of Mathematics, Physics and Statistics	b1020013-	Probability Theory and Mathematical Statistics	test	2	32	32		Autumn 2
	required	School of Foreign Language and Cultural Communication	b1020018	Academic Chinese	non-test	2	32	32		Autumn 1
	required	College of Resources and Environment	b1013001-	Academic Chemistry	test	2	32	28	4	Spring 1
	required	School of Mathematics, Physics and Statistics	b1020062-	Academic Physics A (Module 1)	test	3	48	48		Spring 1
	required	School of Mathematics, Physics and Statistics	b1020065-	Academic Physics B	test	2	32	32		Autumn 2
	required	School of Mathematics, Physics and Statistics	b1020111-	Academic Physics C	non-test	2	32		32	Spring 1
	required	College of Physical Education	----	Physical Education I to VI	non-test	3	160	160		Autumn 1 to Autumn 4
	required	Others	b1110003	Military skills	non-test	0.5	2W			Autumn 1
	required	Others	b1110002	Military theory	non-test	0.5	32	32		Autumn 2
	required	Others	b1110004	Mental Health Education for University Students	non-test	2	32	16	16	Autumn 1
	required	School of Foreign Language and Cultural Communication	b1020003-	General English III	test	3	48	48		Autumn 1
	required	School of Foreign Language and Cultural Communication	b1020004-	General English IV	test	3	48	48		Spring 1
	required	School of Foreign Language and Cultural Communication	b1020005-	General Academic English A	test	2	32	32		Autumn 2

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester	
	required	School of Foreign Language and Cultural Communication	---	English Knowledge Expansion	non-test	2	32	32		Spring 2	
Subtotal (Public Fundamental Course)							56.5	1040	954	86	
General Education	selective	Art Education Center	b0----	Aesthetic Education	non-test	2	32	32		Autumn, Spring	
	selective	Each Colleges	b0----	Social Sciences and Humanistic Qualities	non-test	4	64	64		Autumn, Spring	
				Natural Sciences and Technology Innovation	non-test	4	64	64		Autumn, Spring	
Subtotal (General Education)							10	160	160		

IX. Teaching schedule (2)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester	
Engineering Fundamental Course	required	School of Intelligent Manufacturing and Control Engineering	b2011246	Modern Engineering Drawing	test	4	64	40	24	Autumn 1	
	required	School of Intelligent Manufacturing and Control Engineering	b2011049	Engineering Mechanics I	test	3	48	48		Autumn 2	
	required	Engineering Training	b2090001	Electrical and Electronic Engineering	test	3	48	42	6	Autumn 2	
	required	School of Intelligent Manufacturing and Control Engineering	b2011523	Fundamentals of Materials Science (Bilingual)	test	3	48	42	6	Autumn 2	
	required	School of Intelligent Manufacturing and Control Engineering	b2011050	Engineering Mechanics II	test	3	48	44	4	Spring 2	
				Subtotal (Engineering Fundamental Course)		19	304	260	44		
Professional Fundamental Course	required	School of Intelligent Manufacturing and Control Engineering	b2011241	Introduction to Materials Processing and Controlling Engineering	non-test	1	16	14	2	Autumn 1	
	required	School of Intelligent Manufacturing and Control Engineering	b2011080	Fundamentals of machine manufacturing	test	3	48	42	6	Spring 1	
	required	School of Intelligent Manufacturing and Control Engineering	b2011345	Fundamentals of mechanical design	test	4	64	60	4	Spring 2	
	required	School of Intelligent Manufacturing and Control Engineering	b2011152	Hydraulic and Pneumatic Transmission	test	2	32	28	4	Spring 2	
	required	School of Intelligent Manufacturing and Control Engineering	b2011496	Numerical calculation method	non-test	2	32	10	22	Spring 2	
	required	Engineering Training	b2090012	Fundamentals of Programming C++	test	2	32	26	6	Spring 2	
	required	School of Intelligent Manufacturing and Control Engineering	b2011126	Principle of plastic forming	test	2	32	30	2	Autumn 3	
				Subtotal (Professional Fundamental Course)		18	288	236	52		
Professional Course	required	School of Intelligent Manufacturing and Control Engineering	b2011468	Material forming equipment and automation	non-test	2	32	30	2	Autumn 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011528	Injection Moulding Process and Mould Design II	test	3	48	45	3	Autumn 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011500	Numerical simulation of injection moulding	non-test	2	32	4	28	Autumn 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011520	Scientific and Technical Paper Writing and Literature Search	non-test	1	16	16	0	Autumn 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011055	Industrial robots and applications	non-test	2	32	24	8	Spring 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011529	Stamping Process and Mould Design II	test	3	48	42	6	Spring 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011502	Numerical simulation of sheet forming	test	2	32	4	28	Spring 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011524	Modern mould manufacturing technology	non-test	3	48	44	4	Spring 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011525	Methods of material analysis	non-test	2	32	28	4	Spring 3	
	required	School of Intelligent Manufacturing and Control Engineering	b2011327	Artificial Intelligence Technology	non-test	2	32	32	0	Spring 3	
					Subtotal (Required Professional Course)		22	352	269	83	
		Selective 6 credits	School of Intelligent Manufacturing and Control Engineering	b2011251	Introduction to Smart Manufacturing	non-test	2	32	28	4	Spring 2
			School of Intelligent Manufacturing and Control Engineering	b2011330	Electrical control and PLC applications	test	2	32	26	6	Spring 2
			School of Intelligent Manufacturing and Control Engineering	b2011476	Additive manufacturing technology	non-test	2	32	24	8	Spring 2
	School of Intelligent Manufacturing and Control Engineering		b2011295	Reverse Engineering Technology	non-test	2	32	24	8	Spring 2	
	School of Intelligent Manufacturing and Control Engineering		b2011433	Production Management of Intelligent Manufacturing (MES/ERP)	test	2	32	24	8	Autumn 3	
	School of Intelligent Manufacturing and Control Engineering		b2011477	Materials Surface Engineering	non-test	2	32	24	8	Autumn 3	
	School of Intelligent Manufacturing and Control Engineering		b2011526	Materials properties and testing technology	non-test	2	32	24	8	Autumn 3	
	School of Intelligent Manufacturing and Control Engineering		b2011474	Material Forming and Light-weighting Technology	non-test	2	32	24	8	Autumn 3	
		School of Intelligent Manufacturing and Control Engineering	b2011527	Green manufacturing and recycling of materials	non-test	2	32	24	8	Autumn 3	
		School of Intelligent Manufacturing and Control Engineering	b2011475	Forming technology of automobile panels	non-test	2	32	24	8	Autumn 3	
				Subtotal (Selective Professional Course)		6	96	72	24		
				Subtotal (Professional Course)		28	448	341	107		

IX. Teaching schedule (3)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester
Professional Practice	required	School of Intelligent Manufacturing and Control Engineering	b4011332	Internship for Understanding	non-test	1	24		24	Summer 1
	required	School of Intelligent Manufacturing and Control Engineering	b4011340	Comprehensive practice for mould drafting	non-test	2	48		48	Summer 1
	required	School of Intelligent Manufacturing and Control Engineering	b4011151	Computer-aided design	non-test	2	48		48	Summer 1
	required	School of Intelligent Manufacturing and Control Engineering	b4011043	Practice for Interchangeability and measurement technology	non-test	2	48		48	Spring 2
	required	School of Intelligent Manufacturing and Control Engineering	b4011056	Course Design of Mechanical Design	non-test	2	48		48	Summer 2
	required	School of Intelligent Manufacturing and Control Engineering	b4011395	Comprehensive practice for 3D Printing Technology	non-test	3	72		72	Summer 2
	required	School of Intelligent Manufacturing and Control Engineering	B4011048	Comprehensive practice for electromechanical-hydraulic (pneumatic) automation	non-test	1	24		24	Summer 2
	required	School of Intelligent Manufacturing and Control Engineering	b4000001	Innovation and Entrepreneurship Practice in Material Forming and Control Engineering	non-test	2	48		48	Autumn 3
	required	School of Intelligent Manufacturing and Control Engineering	b4011333	Course Design of Injection moulding	non-test	3	72		72	Spring 3
	required	School of Intelligent Manufacturing and Control Engineering	b4011339	Labour Education B	non-test	0.5	16		16	Spring 3
	required	School of Intelligent Manufacturing and Control Engineering	b4011334	Course Design of Stamping Die	non-test	3	72		72	Summer 3
	required	School of Intelligent Manufacturing and Control Engineering	b4011217	Production internships	non-test	2	48		48	Autumn 4
	required	School of Intelligent Manufacturing and Control Engineering	b4011348	Comprehensive practice for Materials Forming	non-test	5	120		120	Autumn 4
required	School of Intelligent Manufacturing and Control Engineering	b4011250	Material Forming and Control Engineering Graduation Internship and Graduation Design (Thesis)	non-test	6	288		288	Spring 4	
Subtotal (Professional Practice)							33.5	952	952	
Extracurricular Class	required	Others	b5110001	Extracurricular Class	non-test	1				Autumn, Spring, Summer
Total							166	3192	1951	1241

X. Credit of 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 Details are specified in Students' Manual.