

Composites Manufacturing Engineering

(Grade 2024)

Course code: 080416T

I. Cultivation Objectives

1. General cultivation objective

This program cultivates application-oriented talents who can meet the needs of national economic development, adapt to the needs of composite materials applications, have a broad basic knowledge of materials and machinery, solid theory, methods and skills of composite materials design, preparation and molding, have team spirit, innovation and certain organizational and management skills, and can be engaged in the field of materials production and molding processing, especially in the field of aviation manufacturing in the design, preparation, molding, application and related management of composite materials.

2. Objective of value guidance

The major aims to cultivate engineering application-oriented talents who can adapt to the development of society, takes the spirit of aviation as its value orientation, takes school-enterprise cooperation and curriculum teaching as its carrier, and strives to enhance students' independent learning ability, team cooperation ability, innovation ability and social adaptation ability.

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

- Professional foundation and skills: Have solid knowledge of natural sciences such as mathematics, physics, chemistry, etc.; have knowledge of basic engineering theories such as electrical and electronic, engineering drawing, computer, etc. and certain knowledge of engineering management; master professional knowledge and technology in the field of composites, and analyze and research and put forward systematic solutions to complex engineering problems in the field of composite material molding.
- Career positioning: Be able to follow the cutting-edge technology of composite molding engineering and related fields; have engineering practice ability and innovative thinking; undertake the production, management, research and development, design and other work in the field of composite molding engineering and related fields, and to reach the level of practicing engineers.
- Basic qualities: Be familiar with the laws and regulations as well as guidelines and policies of the professions and industries related to composites; have good ideological and moral qualities and humanistic qualities, awareness of legal, environmental and sustainable development, compliance with professional ethics and social responsibility.
- Self-development: Understand the law of composite material technology development; continuously improve the application ability and level; have the habit and ability of self-development and lifelong learning; and be able to take the initiative to adapt to the changes and development of the professional environment.

II. Graduation requirements

According to the 12 general standards for professional certification, the core competencies and qualities of the 12 graduation requirements have been expanded in accordance with the actual situation of the university, and each graduation requirement are as follows:

1. Engineering knowledge: Have the ability to apply mathematical, natural science and engineering

fundamentals and professional knowledge to solve Composites Manufacturing Engineering problems.

1.1 Be able to apply basic concepts from mathematics and the natural sciences to the appropriate formulation of complex engineering problems in Composites Manufacturing Engineering.

1.2 Be able to develop a mathematical model for a complex system or process specializing in composite molding and be able to solve it.

1.3 Be able to apply relevant knowledge and mathematical models to the derivation and analysis of complex engineering problems in Composites Manufacturing Engineering.

1.4 Be able to analyse, compare and attempt to improve solutions to complex engineering problems in composite molding from a mathematical and natural science perspective.

2. Analysis of the Problem: Have the ability to apply basic knowledge of mathematics, natural sciences, and composites engineering science to identify, represent, and analyze Composites Manufacturing Engineering problems through literature research in order to reach valid conclusions.

2.1 Be able to apply the fundamental principles of mathematics, natural and engineering sciences to identify and evaluate critical aspects of complex engineering problems in Composites Manufacturing Engineering.

2.2 Be able to apply the fundamental principles of mathematics, natural and engineering sciences to express the complex engineering problems of Composites Manufacturing Engineering and seek solutions.

2.3 Be able to apply the fundamental principles of mathematics, natural and engineering sciences to analyse complex engineering problems in Composites Manufacturing Engineering through literature research in order to reach valid conclusions.

3. Design/develop of solutions: Be able to design for composite structures, formulations and moulding processes, and reflect a sense of innovation in their design, taking into account social, environmental, health, safety, legal and cultural factors.

3.1 Have knowledge of basic design solutions or process design solutions for the full cycle and full process of composite engineering design and product development, and understanding of the factors that influence design objectives and technical solutions.

3.2 Have the ability to carry out formulation and moulding process design in the development of composite materials to meet specific requirements.

3.3 Be able to perform process calculations for the design, development and processing of composite materials, reflecting a sense of innovation.

3.4 Have the ability to design processes in composite moulding and to optimize process design options, taking into account social, health, safety, legal, cultural and environmental realities and constraints.

4. Research: Have the ability to investigate and experimentally validate complex composite moulding problems based on scientific principles and using scientific methods, including materials analysis and testing, designing experimental protocols, analyzing and interpreting data, and synthesizing information to reach reasonable and valid conclusions.

4.1 Be able to apply basic knowledge of materials and to research and analyse solutions to complex engineering problems in composite matrix resin synthesis, composite moulding and applications through literature research.

4.2 Be able to apply professional technical knowledge and principles to determine research routes for composite matrix synthesis and composite molding;

4.3 Be able to select and construct research and experimental systems for the preparation and forming of

composite materials, carry out materials analysis and testing, carry out experimental operations under guaranteed safety conditions and collect experimental data correctly.

4.4 Be able to analyse and interpret experimental phenomena and data collected and synthesize information to reach reasonable and valid conclusions.

5. Use of modern tools: Have the ability to develop, select and use appropriate techniques, resources, modern engineering tools and information technology tools for composite material preparation, moulding and processing problems, including the prediction and simulation of complex Composites Manufacturing Engineering problems, and the ability to understand their limitations.

5.1 Be proficient in the use of modern instrumentation, information resources, literature search tools, modern engineering tools and information technology tools, and be aware of cutting-edge trends in the field of Composites Manufacturing Engineering.

5.2 Be able to use relevant modern engineering tools and information technology tools to model predictions and simulate engineering problems in Composites Manufacturing Engineering and related fields of engineering, and be able to understand their limitations.

6. Engineering and Society: Be able to carry out sound analysis based on background knowledge of Composites Manufacturing Engineering and evaluate the social, health, safety, legal and cultural impacts of solutions to engineering problems, and understand the responsibilities involved.

6.1 Have experience of engineering internships, practice and knowledge of technical standards, intellectual property rights and legal norms in relation to Composites Manufacturing Engineering.

6.2 Be able to evaluate solutions to composite engineering problems in terms of social, health, safety, legal and cultural impacts, based on professional knowledge and criteria.

7. Environment and Sustainable Development: Have the ability to understand and evaluate the environmental and social sustainability impacts of engineering practices for complex composite moulding technologies.

7.1 Be aware of relevant industry developments and be able to develop a sound understanding of the place and role of composite moulding technology in the overall industrial environment.

7.2 Understand the methods for evaluating the environmental impacts and social sustainability of technologies related to Composites Manufacturing Engineering and be able to make a reasonable assessment.

8. Professional Codes: Have humanities and social sciences literacy, social responsibility and the ability to understand and comply with engineering ethics and codes of practice and responsibilities in the practice of engineering.

8.1 Have a correct perspective on life and values, a healthy physique and good qualities, an understanding of the individual's place in society and in the natural environment, an understanding of the importance of physical and mental health to one's professional development, a respect for life and a humanistic quality.

8.2 Be familiar with the regulations and systems relevant to the Composites Manufacturing Engineering context and understand and comply with professional ethics and codes of practice.

9. Individual and Team: Have the ability to assume the role of individual, team member and leader of a team in a multidisciplinary context.

9.1 Be able to take the initiative in sharing professional information with members of other disciplines when solving complex engineering problems in Composites Manufacturing Engineering and be able to work independently on work assigned by the team.

9.2 Competently assume the role and responsibilities of a team member or leader in solving complex engineering problems in Composites Manufacturing Engineering and collaborate to complete set tasks.

10. Communication: Have the ability to communicate effectively with industry peers and the public on Composites Manufacturing Engineering issues, including writing reports and submissions design, making presentations, and articulating or responding to instructions. Have the ability to communicate and interact in a cross-cultural context.

10.1 Be able to accurately articulate and express complex engineering problems in the field of materials molding and communicate and interact effectively with industry peers and the public by writing reports, briefs design, presenting statements, articulating or responding clearly to instructions.

10.2 Have knowledge of at least one foreign language, the ability to read and understand professional literature in foreign languages, and to communicate and interact effectively with industry peers or the public.

11. Project Management: Understand and master engineering management methods and apply them in a multidisciplinary environment.

11.1 Understand the key management elements involved in the field of Composites Manufacturing Engineering and have a knowledge of relevant engineering management methods.

11.2 Be able to apply engineering management to the implementation of design development solutions

12. Spirit and ability of lifelong learning: Have a sense of independent and lifelong learning, with the ability to learn and adapt to development.

12.1 Be able to recognize the diversity of the world and the need for continuous exploration and learning, and have a sense of independent and lifelong learning.

12.2 Have the ability to engage in independent and lifelong learning, including the ability to understand technical issues, to condense syntheses, to propose and solve problems, and to be able to learn and adapt to societal developments.

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 must complete the minimum number of credits required for each type of course in accordance with the requirements of the Instructive Cultivation Plan and complete the corresponding extra-curricular arrangements, with a total of 168 credits, in order to graduate; those who meet the requirements for the award of bachelor's degree will be awarded the Bachelor of Engineering degree.

VI. Discipline

Materials Science and Engineering

VII. Core Courses

Organic Chemistry, Physical Chemistry, Modern Engineering Drawing, Engineering Mechanics, Mechanical Principles and Design, Fundamentals of Materials Science, Polymer Chemistry, Polymer Physics, Composite Material Preparation and Performance Testing, Polymer Matrix Composites, Composite Molding Processes and Equipment, Composite Molding Mould Design.

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

Category	Total Credit	%	Total Course Hours	Theory Learning	Practical Training
Public Fundamental Course	58.5	35	1072	982	90
General Education	10	6	160	160	0
Engineering Fundamental Course	12	7	192	186	6
Professional Fundamental Course	17	10	272	272	0
Professional Course	27	16	432	432	0
Professional Practice	42.5	26	1024	0	1024
Total	167	100	3152	2032	1120
Theory: Practical (%)	64:36				

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	Autumn 1
	required	School of Marxism	b1080009	Ethics and the Rule of Law	non-test	3	48	42	6	Autumn 1
	required	School of Marxism	b1080006	Outline of Modern Chinese History	non-test	3	48	42	6	Spring 1
	required	School of Marxism	b1080010	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	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		Spring 1
	required	School of Mathematics, Physics and Statistics	b1020080	Advanced MathematicsA1	test	4	64	64		Autumn 1
	required	School of Mathematics, Physics and Statistics	b1020081	Advanced MathematicsA2	test	4	64	64		Spring 1
	required	School of Mathematics, Physics and Statistics	b1020012	Linear Algebra	test	2	32	32		Spring 1
	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		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	b1080009	Mental Health Education for University Students	non-test	2	32	16	16	Autumn 1
	required	Engineering Training	b1010005	University Computer Fundamentals	non-test	2	32	32		Spring 1
	required	School of Computer and Information	b1012001	Artificial Intelligence Application and Practice	non-test	1	16	8	8	Spring 1
	required	School of Resources and	b1012002	Green, Low-carbon and Ecological Civilization	non-test	1	16	16		Autumn 1
	★ Academic English(Select 1 Module for 10 Credits)	Module A	b1020003	General English III	test	3	48	48		Autumn 1
			b1020004	General English IV	test	3	48	48		Spring 1
			b1020005	General Academic English A	test	2	32	32		Autumn 2
			---	English Knowledge Expansion	non-test	2	32	32		Spring 2
		Module B	b1020002	General English II	test	3	48	48		Autumn 1
			b1020003	General English III	test	3	48	48		Spring 1
			b1020006	General Academic English B	test	2	32	32		Autumn 2
			---	English Knowledge Expansion	non-test	2	32	32		Spring 2
		Module C	b1020001	General English I	test	4	64	64		Autumn 1
			b1020002	General English II	test	3	48	48		Spring 1
			b1020003	General English III	test	3	48	48		Autumn 2
	★ Academic German	School of Foreign Language and Cultural Communication	b1020040	Academic German I	test	3	48	48		Autumn 1

		School of Foreign Language and Cultural Communication	b1020041	Academic German II	test	3	48	48		Spring 1
		School of Foreign Language and Cultural Communication	b1020042	Academic German III	test	4	64	64		Autumn 2
	★ Academic Japanese	School of Foreign Language and Cultural Communication	b1020077	Academic Japanese I	test	3	48	48		Autumn 1
		School of Foreign Language and Cultural Communication	b1020078	Academic Japanese II	test	3	48	48		Spring 1
		School of Foreign Language and Cultural Communication	b1020079	Academic Japanese III	test	4	64	64		Autumn 2
	Subtotal (Public Fundamental Course)					58.5	1072	982	90	
General Education	selective	Art Education Center	b0----	Aesthetic Education	non-test	2	32	32		Autumn, Spring
	selective	Each College	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		

(★Note: The first foreign language is 10 credits in total, including 3 languages: Academic English, Academic German and Academic Japanese, choose the appropriate language as required; When Academic English is chosen, please choose the appropriate module in Module A, B, C)

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 Energy and Materials	b2014026	Modern Engineering Drawing	test	3	48	48		Autumn 2
	required	Engineering Training	b2090001	Electrical and Electronic Engineering	test	3	48	42	6	Spring 2
	required	School of Energy and Materials	b2014005	Engineering Mechanics	test	3	48	48		Autumn 2
	required	School of Intelligent Manufacturing and Control Engineering	b2014006	Mechanical principles and design	test	3	48	48		Spring 2
Subtotal (Engineering Fundamental Course)							12	192	186	6
Professional Fundamental Course	required	School of Energy and Materials	b2011317	Introduction to the Program of Composites Manufacturing Engineering	non-test	1	16	16		Autumn 1
	required	School of Energy and Materials	b2013178	Inorganic chemistry	test	3	48	48		Autumn 1
	required	School of Energy and Materials	b2013093	Organic Chemistry	test	3	48	48		Spring 1
	required	School of Energy and Materials	b2013177	Physical Chemistry	test	3	48	48		Autumn 2
	required	School of Energy and Materials	b2013015	Fundamentals of Materials Science	test	3	48	48		Spring 2
	required	School of Energy and Materials	b2014007	Materials Analysis and Testing (In Chinese and English)	test	2	32	32		Autumn 3
	required	School of Energy and Materials	b2014008	Composite structures and properties	test	2	32	32		Spring 3
Subtotal (Professional Fundamental Course)							17	272	272	
Professional Course	required	School of Energy and Materials	b2014059	Artificial Intelligence Programming (Python)	non-test	2	32	32		Spring 2
	required	School of Energy and Materials	b2011351	Composite interfaces and properties	test	2	32	32		Spring 2
	required	School of Energy and Materials	b2014010	Polymer Chemistry (In Chinese and English)	test	2	32	32		Spring 2
	required	School of Energy and Materials	b2013175	Scientific and Technical Paper Writing and Literature Search	non-test	2	32	32		Autumn 1
	required	School of Energy and Materials	b2011388	Polymer Physics	test	2	32	32		Autumn 3

	required	School of Energy and Materials	b2014012	Polymer matrix composites	test	2	32	32		Autumn 3
	required	School of Energy and Materials	b2014013	Composite material preparation and performance testing	non-test	2	32	32		Spring 3
	required	School of Energy and Materials	b2014014	Composite molding processes and equipment	test	2	32	32		Spring 3
	required	School of Energy and Materials	b2014060	Smart Composite Material Forming Processes and Equipment	test	2	32	32		Spring 3
	required	School of Energy and Materials	b2014015	Project Management	non-test	1	16	16		Autumn 4
	required	School of Energy and Materials	b2014018	Mechanics and structural design of composite materials	non-test	2	32	32		Spring 3
	Subtotal(Required Professional Course)					21	336	336		
Selective 2 Credit	School of Energy and Materials	b2014061	Low-Carbon Nanomaterials Technology	test	2	32	32		Autumn 3	
	School of Energy and Materials	b20140612	Green Semiconductor materials	test	2	32	32		Autumn 3	
Selective 2 Credit	School of Energy and Materials	b2014017	Technical English for Composites	non-test	2	32	32		Autumn 3	
	School of Energy and Materials	b2014058	English Literature on Composite Materials	non-test	2	32	32		Autumn 3	
Selective 2 credits	School of Energy and Materials	b2014019	Advanced resin matrix composite automated manufacturing technology	test	2	32	32		Spring 3	
	School of Energy and Materials	b2011366	Composite processing technology	non-test	2	32	24	8	Spring 3	
Selective 2 credits	School of Energy and Materials	b2014020	Cutting-edge courses in composites	non-test	2	32	32		Autumn 4	
	School of Energy and Materials	b2011319	Introduction to aerospace	non-test	2	32	32		Autumn 3	
	Subtotal (Selective Professional Course)					8	128	120	8	
Subtotal (Professional Course)						27	432	432		

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 Energy and Materials	b4013052	Inorganic chemistry experiments	non-test	1	24		24	Autumn 1
	required	School of Energy and Materials	b4013043	Organic chemistry experiments	non-test	1	24		24	Spring 1
	required	Engineering Training	b4090003	Basic Engineering Training C	non-test	2	48		48	Summer 1
	required	School of Energy and Materials	b4013076	Cognitive Placement	non-test	1	24		24	Summer 1
	required	School of Energy and Materials	b4011223	Computer Aided Design (CATIA)	non-test	2	48		48	Summer 1
	required	School of Energy and Materials	b4013035	Physical chemistry experiments	non-test	1	24		24	Autumn 2
	required	School of Energy and Materials	b4014009	Polymer chemistry experiments	non-test	1	24		24	Spring 2
	required	School of Energy and Materials	b4011286	Practice in Corporate	non-test	2	48		48	Summer 2
	required	School of Intelligent Manufacturing and Control Engineering	b4011225	Mechanical Principles and Design Course Design	non-test	2	48		48	Summer 2
	required	School of Energy and Materials	b4011244	Academic Lectures	non-test	1	24		24	Summer 2
	required	School of Energy and Materials	b4014010	Polymer physics experiments	non-test	1	24		24	Autumn 3
	required	School of Energy and Materials	b4014011	Materials analysis and testing experiments	non-test	1	24		24	Autumn 3
	required	School of Energy and Materials	b4014012	Composite material preparation and performance testing experiments	non-test	2	48		48	Spring 3
	required	School of Energy and Materials	b4014013	Comprehensive Experiment - Preparation and Testing of Functional Composites	non-test	4	96		96	Spring 3
	required	School of Energy and Materials	b4000023	the Program of Composites Manufacturing Engineering Innovation and Entrepreneurship	non-test	2	48		48	Spring 3

	required	School of Energy and Materials	b4013087	Labour Education B	non-test	0.5	16		16	Spring 3
	required	School of Energy and Materials	b4014014	Comprehensive Practice	non-test	3	72		72	Summer 3
	required	School of Energy and Materials	b4014015	Composite molding mould design	non-test	3	72		72	Summer 3
	required	School of Energy and Materials	b4014016	Composites Manufacturing Engineering Graduation Internship and Graduation Design (Thesis)	non-test	12	288		288	Spring 4
Subtotal(Professional Practice)						42.5	1024		1024	
Extracurricular Class	required	Others	b5110001	Extracurricular Class	non-test	1	-	-	-	Autumn, Spring, Summer
Total						168	3152	2032	1120	

Explanation of the relevance of professional certificates to the course:

Students will be able to take the Computer Aided Design (CATIA) course and will be able to take the vocational qualification assessment related to this subject: CATIA Intermediate Certificate; CATIA Advanced Certificate.

Students who have obtained a CATIA Intermediate Certificate or above are eligible to apply for exemption and credit for the Computer Aided Design (CATIA) course.

Students will learn analytical chemistry, analytical chemistry experiments, materials analysis and testing, and materials structure characterization, and will be able to sit for the vocational qualification examinations related to this subject: chemical analyst, chemical examiner, and materials composition examiner.

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 competitiveness in the job market. Details are specified in Students' Manual.