Training Program for Master's Degree Candidates
Chemical Engineering and Technology (0817)

I. Training Objectives

1. Ethics and Professionalism:

Adhere to laws and regulations, uphold strong professional ethics, and demonstrate a high sense of dedication. Maintain a scientific, rigorous, and truth-seeking attitude in academic and professional endeavors, with a commitment to serving society and the nation.

2. Physical and Mental Well-being:

Possess robust physical health and sound psychological qualities to meet the demands of professional work.

3. Expertise and Skills:

Acquire a broad foundation of theoretical knowledge and systematic expertise in chemical engineering and technology. Stay informed of industry standards, current research trends, and advancements. Develop strong experimental and independent research capabilities, enabling graduates to excel in teaching, research, and technical management roles at universities, research institutions, and enterprises.

4. Communication and Scholarship:

Demonstrate proficiency in reading and comprehending professional literature, writing scientific papers, and possessing basic listening and speaking skills in English.

II. Research Directions

1. Chemical Technology

Chemical Technology direction focuses on fundamental theories and key technologies in the synthesis, process design, and optimization of fine chemicals. It investigates structure-performance relationships of functional chemicals and develops green synthesis methods for novel surfactants, functional additives, and other materials. Also, it establishes reaction-membrane separation coupling models to innovate energy-efficient processes for residual chemical removal, achieving self-sustaining energy consumption.

2. Applied Chemistry

Applied Chemistry direction explores the preparation principles, energy conversion

mechanisms, and process technologies for chemical power sources and new energy materials. It develops design methodologies for chemical power sources and key preparation techniques for high-purity electrolytes and ceramic diaphragms. Also, it Studies the synergistic regulation of electrode materials, advances ultrasonic dynamic waveform technology, and supports the development of high-performance power batteries and supercapacitors. Finally, it enhances the structural and functional control of porous materials for applications in hydrogen energy, fuel cells, and related fields.

3. Materials Chemical Engineering

Materials Chemical Engineering direction investigates process optimization, structural control principles, and application-oriented design strategies for multi-scale functional materials. It utilizes mixed-ligand-directed synthesis to enable controllable preparation of multi-component molecular-based materials for light conversion, adsorption, and separation. Also, it develops material gene module assembly techniques and green processes for micro/nano-functional materials (e.g., optoelectronic materials, sensitive materials, composite gels) to achieve scalable production.

4. Industrial Catalysis

Industrial Catalysis direction examines the structural and functional modulation of novel catalysts, catalytic mechanisms, and reaction kinetics. It studies noble/transition metal catalyst synergies for desulfurization, denitrification, and mercury removal to enhance industrial flue gas treatment. It investigates pore structure formation in photocatalytic membranes and integrates photocatalysis, demulsification, and membrane separation for waste gas and wastewater treatment. Supports sustainable production in the nylon spinning industry and promotes green development in large-scale industrial applications.

III. Training Mode and Duration of Study

Duration: Full-time master’s programs typically span 3 to 5 years.

Credit Requirements: A minimum of 32 credits is required, with at least 18 credits from degree courses and 5 credits from compulsory components.

IV. Curriculum Setup and Credit Requirements

Table 1. Curriculum Setup, Compulsory Sections, Class Hours and Credit Allocation (Chemical Engineering and Technology)

Course Category	Course Number	Course Name	Class Hours	Credits	Semester	Offering Unit	Remarks
Degree Course	991018	Intensive English Reading	32	2	1	School of Foreign Languages	Public Elective Course
	991019	English Listening and Speaking	32	2	2	School of Foreign Languages	Public Elective Course
	991009	Probability Theory and Mathematical Statistics	32	2	1	School of Mathematics and Information Science	Public Elective Course
	021209	Chemical Engineering Transfer Process	32	2	2	School of Materials and Chemical Engineering	Public Elective Course
	021295	Advanced Reaction Engineering	32	2	1	School of Materials and Chemical Engineering	Public Elective Course
	021296	Advanced Separation Engineering	32	2	2	School of Materials and Chemical Engineering	Public Elective Course
	021214	Modern Instrumental Analysis	32	2	1	School of Materials and Chemical Engineering	Selective courses according to the research
	021208	Catalysis Principles	32	2	2		

	021201	Advanced Organic Chemistry	32	2	1	g	direction
	021206	Colloid and Interface Chemistry	32	2	2		
	021297	Chemical Informatics	32	2	2		
	021205	Advanced Fine Chemicals and Technology	32	2	2		
	021247	Material Surface and Interface	32	2	2		
	021210	Chemical Engineering Thermodynamics	32	2	2		
	021256	Disciplinary Progress and Frontiers (Lectured by Supervisor)	32	2	2		
	021257	Progress and Frontiers of Chemical Engineering	32	2	2		
Non-degree Course	991014	Introduction to Dialectics of Nature	16	1	1	School of Marxism	Public Compulsory Course
	991016	Postgraduate Career Planning and Employment Guidance	16	1	1	Graduate School	Public Compulsory Course

	021362	Modern Environmental Analysis Technology	32	2	2	School of Materials and Chemical Engineering	Selective courses according to the research direction
	021369	Inorganic Material Processing Technology	32	2	2		
	021342	Composite Materials	32	2	2		
	021332	Modern Organic Analysis	32	2	2		
	021345	Organic Optoelectronic Materials	16	1	2		
	021321	Intelligent Materials	32	2	1		
	021302	Surfactant Technology and Application	32	2	2		
	021315	Principles of Polymer Molding and Processing	32	2	2		
	021338	New Energy Materials	32	2	2		
	021368	Biomaterials and Devices	32	2	2		
	021329	Chemical Engineering Equipment and Process Design	32	2	2		
Compulsory Section		Opening Report of the Thesis		1	3		

		Mid-term Assessment		1	4		
		Scientific Research Exploration Practice		1	3-6		
		Academic Activities		1	3-6		
		Graduation Defense		1	6		

V. Compulsory Components

1. Opening Report of the Thesis

The opening report of the thesis is generally completed within the third semester. Based on the literature review report, the opening report should directly originate from the forefront of the discipline and have application value or production background. An opening report evaluation meeting should be organized. The evaluation panel will conduct demonstration and evaluation on the purpose and significance of the selected topic, research content, implementation plan, technical route, expected results, and planned arrangements, etc., and fill in the evaluation form of the opening report. The postgraduates will earn 1 credit after completing this component.

2. Mid-term Assessment

The mid-term assessment is generally completed in the fifth semester. The assessment content mainly includes: the postgraduate's ideological and moral qualities and professional learning situation, the mastery of professional knowledge and the frontiers of the research direction, the completion of curriculum learning and other compulsory components, the progress of the degree thesis, etc. The postgraduates who fail the mid-term assessment are not allowed to apply for the defense of the degree thesis. The mid-term assessment materials shall be filed for future reference.

3. Scientific Research Exploration Practice (Professional Practice)

The postgraduate practice activities adopt a combination of centralized practice and segmented practice. During the practice process, efforts should be made to cultivate the postgraduate's innovative spirit of being brave in exploration and the innovative ability to solve scientific problems. The practice results should reflect the

achievements made by the postgraduate in terms of innovative ability. Professional practice can take various forms such as curriculum experiments, enterprise practice, subject research, production internships, special investigations, and technical development. After the completion of the professional practice, a summary report should be written (≥3,000 words). The professional practice component will be evaluated based on the completed practice report and the comments from the supervisor group and the practice unit.

4. Academic Activities

Experts with rich practical experience and management experts from well-known domestic and foreign universities and scientific research institutions are invited to give academic lectures. Postgraduates must participate in more than 6 academic activities both on and off campus within three years, among which they should give an academic report at least once. A summary report (≥500 words) should be written for each activity.

5. Graduation Defense

5.1 Eligibility Review for Defense

Postgraduates must complete all the components specified in the training program and obtain the credits specified in the training program before they can apply to participate in the defense of the degree thesis. The college will review the defense eligibility of the postgraduates, and those who pass the review will be allowed to defend.

5.2 Review of the Degree Thesis

The degree thesis should be blindly reviewed by 2 external experts and reviewed by 2 internal experts. The review of the degree thesis should focus on examining the author’s ability to comprehensively apply scientific theories, methods, and technical means to solve scientific problems; examining the technical difficulty and workload of the degree thesis work; examining the new ideas, new methods, and new progress in solving scientific problems; examining the advancement and practicality of the new methods, new technologies, and new designs; and examining the economic and social benefits created.

5.3 Defense

The defense committee should be composed of no less than 5 experts, and among the defense committee members, there should be experts with senior professional and technical titles from scientific research and engineering design departments in the

industry.

VI. Degree Thesis

The topic selection of the degree thesis should originate from the forefront of the discipline and must be independently completed by the postgraduate himself/herself under the guidance of the supervisor. It can be a complete research topic, or it can be the research, development, and manufacturing of technical breakthroughs, new methods, new processes, new materials, new products, etc. It should meet the corresponding technical requirements and have a relatively sufficient workload, reflecting the author’s ability to comprehensively apply scientific theories, methods, and technical means to solve scientific problems. It should be advanced, practical, and have achieved good results.

The writing requirements of the degree thesis should refer to the ‘Handbook for Writing Postgraduate Degree Theses of Zhengzhou University of Light Industry’. The degree thesis must go through such links as topic selection, opening report of the thesis, mid-term inspection, pre-defense of the degree thesis, evaluation of the degree thesis, and defense of the degree thesis.

VII. Graduation and Degree Awarding

If a postgraduate completes the curriculum learning specified in the training program within the specified study period, passes the assessment with qualified scores, obtains the specified credits, and passes the defense of the degree thesis, and meets the graduation requirements, he or she will be granted graduation. If the postgraduate meets the standards for awarding postgraduate degrees of the university, and upon the student's application and the approval of the university's degree evaluation committee, a master's degree will be awarded.

VIII. Compilers

The Graduate Training Program for the Master of Chemical Engineering and Technology degree was compiled by the following faculty members: Xiaojing Zhang, Xuzhao Yang, Yonghui Zhang, Jianbo Zhao, Guanglu Han, Yingying Zhang, Ping Dan, and Yakun Li.