MINISTRY OF EDUCATION AND TRAINING
QUY NHON UNIVERSITY

MASTER'S PROGRAM

Level of education: **Master's**

Major: **Physical and Theoretical Chemistry**

Code: **8440119**

Type of education: **Full-time**

Binh Dinh, 2025

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QUY NHON UNIVERSITY

SOCIALIST REPUBLIC OF VIET NAM
Independence - Freedom - Happiness

MASTER'S PROGRAM

(Issued together with Decision No. 488/QĐ-ĐHQN dated February 14, 2025 of the Rector of Quy Nhon University)

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1. PROGRAM OBJECTIVES (POs)

1.1. General objectives

The application-oriented Master's program in Physical and Theoretical Chemistry is designed to prepare graduates with strong ethical standards, a sense of social responsibility, and advanced knowledge in both the theoretical and experimental aspects of the discipline. The program equips students with professional skills, the ability to build on fundamental research findings, apply core technologies in practice, adapt to changing socio-economic conditions, and effectively address scientific and technological problems in Physical Chemistry, Theoretical Chemistry, and related fields.

1.2. Specific objectives

- Knowledge:

PO1: Provide students with advanced knowledge of Chemistry and related disciplines, together with in-depth theoretical and applied knowledge in Physical and Theoretical Chemistry.

- Skills:

PO2: Develop students' ability to identify and solve problems, work effectively in interdisciplinary and multidisciplinary settings, and critically analyze, synthesize, and evaluate data and information in Chemistry in general and in Physical and Theoretical Chemistry in particular.

PO3: Develop students' ability to communicate and share scientific knowledge, and to apply, adapt, and further develop appropriate methods and technologies in Chemistry, especially in Physical and Theoretical Chemistry.

- Autonomy and responsibility:

PO4: Foster professional ethics and academic integrity; personal responsibility to oneself, one's colleagues, and society; adaptability in changing professional contexts; the ability to guide others in professional work; and the capacity to manage, review, and improve work processes in order to enhance professional performance.

2. EMPLOYMENT OPPORTUNITIES AND FURTHER STUDY PROSPECTS

Graduates of the Master's program in Physical and Theoretical Chemistry may:

- Teach at upper secondary schools, vocational institutions, colleges, and universities;
- Work in research institutes, laboratories, and industrial or production settings;
- Pursue doctoral study.

3. LEARNING OUTCOMES

Program Learning Outcomes (PLOs):

- **Knowledge**

PLO1: Apply advanced chemical principles and theories, together with specialized knowledge in Physical and Theoretical Chemistry, to solve problems in Chemistry.

PLO2: Assess results from fundamental research and apply them to practical issues involving chemical processes and the structure and properties of substances and materials.

PLO3: Integrate interdisciplinary knowledge and research methods in order to organize applied research and develop enabling technologies.

- **Skills**

PLO4: Analyze, synthesize, and evaluate data and information in Chemistry, particularly in Physical and Theoretical Chemistry, in order to propose scientifically sound solutions to real-world problems.

PLO5: Communicate scientific knowledge and discuss issues in Chemistry, especially in Physical and Theoretical Chemistry, with both specialist and non-specialist audiences.

PLO6: Demonstrate the ability to carry out, organize, and manage research activities related to the application and development of methods and technologies associated with chemical processes and the structure and properties of substances and materials.

PLO7: Demonstrate foreign language proficiency at Level 4/6 of the Vietnamese Foreign Language Proficiency Framework, or an equivalent standard.

- **Autonomy and responsibility**

PLO8: Demon Demonstrate the ability to conduct both independent and collaborative research; propose scientifically valuable ideas; and manage, evaluate, and

improve professional activities in Chemistry in general and in Physical and Theoretical Chemistry in particular.

PLO9: Demonstrate professional ethics, academic honesty, and responsibility to oneself, one's professional community, and society.

4. ADMISSION REQUIREMENTS

Applicants must:

- hold a bachelor's degree, or an equivalent or higher qualification, in a discipline relevant to Physical and Theoretical Chemistry; and

- meet the foreign language requirement at Level 3 or above under the six-level Vietnamese Foreign Language Proficiency Framework, or hold an equivalent qualification.

Applicants with a directly relevant undergraduate degree:

No.	Master's major	Relevant undergraduate majors	Note
1	Physical and Theoretical Chemistry	- Chemistry Teacher Education - Natural Science Teacher Education - Chemistry - Pharmaceutical Chemistry - Chemical Engineering - Chemical Engineering Technology - Environmental Engineering Technology - Food Technology	

Applicants required to complete prerequisite coursework

The list of majors requiring supplementary knowledge and the supplementary courses required for admission to the master's program in Physical and Theoretical Chemistry include:

No.	Master's major	Undergraduate majors requiring prerequisite coursework	Supplementary courses	Note
1	Physical and Theoretical Chemistry	- Materials Technology - Materials Science - Materials Engineering - Metallurgical and Materials Engineering - Environmental Engineering	- Inorganic Chemistry - Organic Chemistry - Physical and Theoretical Chemistry	The Faculty will determine the number of prerequisite courses required in each specific case.

		- Food Engineering - Environmental Science - Biomedical Engineering *Other majors will be considered on a case-by-case basis*		

5. TARGET APPLICANTS

Admission and training are implemented in accordance with the Master's Degree Admissions and Training Regulations of Quy Nhon University issued under Decision No. 2705/QĐ-ĐHQN dated October 21, 2021, and amended by Decision No. 926/QĐ-ĐHQN dated April 25, 2022.

6. PROGRAM DURATION AND CREDIT REQUIREMENTS

6.1. Standard duration: 02 years

6.2. Total credits required: 60 (including 6 internship credits and 9 credits for the master's thesis)

Program structure	Credits
General Knowledge	**3**
Fundamental and Specialized knowledge	**48**
Compulsory courses	36
Elective courses	12
Master's Project	**9**
Total	**60**

7. TRAINING METHOD, GRADUATION REQUIREMENTS

7.1. Training Method

The program is delivered under the credit-based system in accordance with current regulations of the Ministry of Education and Training and Quy Nhon University.

7.2. Graduation Requirements

To be eligible for graduation, students must:

a) Complete all courses in the program and successfully defend the graduation thesis;

b) Satisfy the foreign language requirement specified in the program learning outcomes before graduation is considered. This requirement must be evidenced by one of the following: a diploma or certificate demonstrating proficiency equivalent to Level 4 of the six-level Vietnamese Foreign Language Proficiency Framework as provided in the Appendix to Quy Nhon University's Master's Degree Admissions and Training Regulations; another equivalent certificate recognized by the Ministry of Education and

Training; a university degree or higher in a foreign language major; or a university degree or higher earned in a program taught entirely in a foreign language;

c) Fulfill all obligations required by Quy Nhon University, and not be subject to criminal prosecution, disciplinary suspension, or enforced withdrawal from study..

8. LEARNING ASSESSMENT, GRADING SCALE

8.1 Grading scale:

A 10-point grading scale is used for all course assessments.

8.2. Assessment methods, criteria, and weighting

- For theoretical courses *and theory-integrated practical courses:*

No	Format	Scoring system
1	**Continuous assessment**	40%
2	**Final examination**	60%

- *For the graduation thesis/project,* assessment is conducted in accordance with Quy Nhon University's Master's Degree Admissions and Training Regulations. Detailed criteria are specified in Course Form M4.

8.3. Assessment Methods

Assessment in the Master's program in Physical and Theoretical Chemistry consists of two main forms: Formative Assessment and Summative Assessment

9. CURRICULUM STRUCTURE

No	Course Code	Course title	Semester	Class Time Schedule				Prerequisite Course Code	Managing Faculty	Note
				Credits	Theory	Practise	Experimental/ Pratical, Tests			
I. General Knowledge				**3**						
Compulsory							3			
1	TNTH501	Philosophy	1		3				FPTLSM	
II. Fundamental and Specialized Knowledge										
II.1. Compulsory				**36**			2			
2	HLLT032	Statistical Analysis of	1	2	15	10	10		FNS	

		Experimental Data in Chemistry								
3	HLLT001	Advanced Inorganic Chemistry	1	3	30	15			FNS	
4	HLLT002	Advanced Organic Chemistry	1	2	30	15			FNS	
5	HLLT004	Professional Research Methodology	1	3	25	5			FNS	
6	HLLT010	Applied Computational Chemistry	1	3	30		30		FNS	
7	HLLT006	Applied Thermodynamics	2	3	30		30	HLLT001 HLLT002	FNS	
8	HLLT007	Applied Chemical Kinetics	2	2	30			HLLT001 HLLT002	FNS	
9	HLLT008	Applied Electrochemistry	2	3	30		30	HLLT001 HLLT002	FNS	
10	HLLT009	Catalysis	2	3	30		30	HLLT001 HLLT002	FNS	
11	HLLT005	Materials Characterization Methods	2	3	30		30	HLLT001 HLLT002	FNS	
12	HLLT011	Multiscale Modeling in Chemistry	2	3	30		30	HLLT001 HLLT002 HLLT004	FNS	
13	HLLT012	Professional Internship 1	3	3			90	HLLT001 HLLT002 HLLT004 HLLT032	FNS	
14	HLLT013	Professional Internship 2	3				90	HLLT001 HLLT002 HLLT004 HLLT032	FNS	
II.2. Electives				**12**			3			
15	HLLT014	Colloid And Surface Chemistry	3	3	30		30	HLLT005 HLLT006 HLLT007	FNS	
16	HLLT015	Orbital and Weak Interactions in Chemistry	3	3	30		30	HLLT001 HLLT002 HLLT010	FNS	
17	HLLT016	Computational Modeling of Materials	3	3	30		30	HLLT010	FNS	
18	HLLT017	Quantum Chemistry and Group Theory in	3	3	30	15		HLLT001 HLLT002	FNS	

		Molecular Spectroscopy						HLLT010		
19	HLLT018	Spectroscopic Methods in Chemistry	3	3	32	8	10	HLLT001 HLLT002	FNS	
20	HLLT019	Materials for Energy and Environmental Applications	3	3	40		10	HLLT001 HLLT002	FNS	
21	HLLT020	Materials for Biomedical Applications	3	3	30		30	HLLT006 HLLT007	FNS	
22	HLLT021	Applied Crystallorgraphy	3	3	30	15		HLLT001	FNS	
23	HLLT022	Computer-Aided Drug Design	3	3	28	2	30	HLLT010 HLLT011	FNS	
24	HLLT023	Machine Learning in Chemical Applications	3	3	30		30	HLLT010 HLLT032	FNS	
25	HLLT024	Pharmaceutical Physical Chemistry and Applications	3	3	30		30	HLLT006 HLLT007 HLLT008	FNS	
26	HLLT025	Physicochemical Methods for Environmental Treatment	3	3	30		30	HLLT006 HLLT007 HLLT008	FNS	
27	HLLT026	Green Chemistry	3	3	30		30	HLLT001 HLLT002	FNS	
28	HLLT027	Application of Chemistry in Agriculture	3	3	30	15		HLLT001 HLLT002	FNS	
29	HLLT028	Physicochemical of Natural Products and Applications	3	3	30		30	HLLT006 HLLT007	FNS	
30	HLLT029	Solid-State Electrochemistry	3	3	30		30	HLLT008	FNS	
31	HLLT030	Surfactants and Applications	3		30		30	HLLT006 HLLT007	FNS	
32	HLLT033	Applied Food Microbiology	3	3	30		30	HLLT001 HLLT002	FNS	
33	HLLT034	Food Fermentation Technology	3	3	30	15		HLLT001 HLLT002	FNS	
III. Master's Project				**9**						
34	HLLT035	Master's Project	4	9				HLLT004 HLLT032	FNS	
Total				**60**						

10. STUDY PLAN

No.	Subject code		Course title	Credit	Study Plan				Teaching staff (proposed)	Managing faculty
	Prefix	Number			Sem 1	Sem 2	Sem 3	Sem 4		
I. General Knowledge (Compulsory)				**3**						
1	TNTH	501	Philosophy	3	3					FPTLSM
II. Foundation Knowledge										
II.1. Compulsory				**13**						
2	HLLT	032	Statistical Analysis of Experimental Data in Chemistry	2	2				Dr. Nguyen Le Tuan Assoc. Prof. Dr. Cao Van Hoang	FNS
3	HLLT	001	Advanced Inorganic Chemistry	3	3				Dr. Truong Thi Cam Mai Dr. Pham Ngoc Thach	FNS
4	HLLT	002	Advanced Organic Chemistry	3	3				Assoc. Prof. Dr. Nguyen Thi Viet Nga Dr. Diep Thi Lan Phuong	FNS
5	HLLT	004	Professional Research Methodology	2	2				Prof. Dr. Vo Vien Assoc. Prof. Dr. Nguyen Tien Trung	FNS
6	HLLT	010	Applied Computational Chemistry	3	3				Assoc. Prof. Dr. Nguyen Tien Trung Dr. Nguyen Ngoc Tri Assoc. Prof. Dr. Vu Thi Ngan	FNS
III. Specialized Knowledge				**35**						
III.1. Compulsory				**23**						
7	HLLT	006	Applied Thermodynamics	3		3			Assoc. Prof. Dr. Nguyen Thi Vuong Hoan Assoc. Prof. Dr. Nguyen Phi Hung Dr. Nguyen Thi To Nu	FNS
8	HLLT	007	Applied Chemical Kinetics	2		2			Prof. Dr. Vo Vien Dr. Nguyen Thi Lan Assoc. Prof. Dr. Nguyen Phi Hung	FNS
9	HLLT	008	Applied Electrochemistry	3		3			Prof. Dr. Vo Vien Dr. Huynh Thi Mien Trung Dr. Huynh Thi Lan Phuong	FNS
10	HLLT	009	Catalysis	3		3			Assoc. Prof. Dr. Nguyen Phi Hung Dr. Nguyen Van Thang	FNS

11	HLLT	005	Materials Characterization Methods	3		3			Dr. Nguyen Van Thang Dr. Le Thi Thanh Lieu	FNS
12	HLLT	011	Multiscale Modeling in Chemistry	3		3			Assoc. Prof. Dr. Vu Thi Ngan Assoc. Prof. Dr. Nguyen Tien Trung	FNS
13	HLLT	012	Professional Internship 1				3		Faculty of Natural Sciences	FNS
14	HLLT	013	Professional Internship 2				3		Faculty of Natural Sciences	FNS
III.2. Electives *(choose 4 courses)*				**12**			**12**			
15	HLLT	014	Colloid and Surface Chemistry	3			3		Assoc. Prof. Dr. Nguyen Thi Vuong Hoan Dr. Huynh Thi Lan Phuong	FNS
16	HLLT	015	Orbital and Weak Interactions in Chemistry	3			3		Assoc. Prof. Dr. Nguyen Tien Trung Dr. Nguyen Ngoc Tri	FNS
17	HLLT	016	Computational Modeling of Materials	3			3		Assoc. Prof. Dr. Nguyen Tien Trung Dr. Nguyen Ngoc Tri	FNS
18	HLLT	017	Quantum Chemistry and Group Theory in Molecular Spectroscopy	3			3		Assoc. Prof. Dr. Vu Thi Ngan Assoc. Prof. Dr. Nguyen Tien Trung	FNS
19	HLLT	018	Spectroscopic Methods in Chemistry	3			3		Dr. Nguyen Le Tuan Dr. Le Canh Dinh	FNS
20	HLLT	019	Materials for Energy and Environmental Applications	3			3		Prof. Dr. Vo Vien Assoc. Prof. Dr. Nguyen Thi Vuong Hoan Assoc. Prof. Dr. Nguyen Thi Dieu Cam	FNS
21	HLLT	020	Materials for Biomedical Applications	3			3		Dr. Nguyen Thi Lan Assoc. Prof. Dr. Nguyen Phi Hung Assoc. Prof. Dr. Nguyen Thi Vuong Hoan	FNS
22	HLLT	021	Applied Crystallography	3			3		Dr. Truong Thi Cam Mai Dr. Le Canh Đinh	FNS
23	HLLT	022	Computer-Aided Drug Design	3			3		Assoc. Prof. Dr. Vu Thi Ngan Assoc. Prof. Dr. Nguyen Tien Trung	FNS
24	HLLT	023	Machine Learning in	3			3		Assoc. Prof. Dr. Vu Thi	FNS

			Chemical Applications						Ngan Dr. Nguyen Van Thang	
25	HLLT	024	Pharmaceutical Physical Chemistry and Applications	3			3		Assoc. Prof. Dr. Nguyen Thi Vuong Hoan Dr. Nguyen Le Tuan	FNS
26	HLLT	025	Physicochemical Methods for Environmental Treatment	3			3		Assoc. Prof. Dr. Nguyen Thi Vuong Hoan Assoc. Prof. Nguyen Thi Dieu Cam	FNS
27	HLLT	026	Green Chemistry	3			3		Prof. Dr. Vo Vien Dr. Nguyen Thi Lan Dr. Nguyen Van Kim	FNS
28	HLLT	027	Application of Chemistry in Agriculture	3			3		Assoc. Prof. Dr. Nguyen Thi Viet Nga Dr. Diep Thi Lan Phuong	FNS
29	HLLT	028	Physicochemical of Natural Products and Applications	3			3		Dr. Nguyen Le Tuan Dr. Diep Thi Lan Phuong	FNS
30	HLLT	029	Solid-State Electrochemistry	3			3		Dr. Huynh Thi Lan Phuong Dr. Dang Thi To Nu	FNS
31	HLLT	030	Surfactants and Applications	3			3		Assoc. Prof. Dr. Nguyen Thi Vuong Hoan Dr. Huynh Thi Lan Phuong	FNS
32	HLLT	033	Applied Food Microbiology	3			3		Dr. Le Duy Thanh Dr. Hoang Duc An	FNS
33	HLLT	034	Food Fermentation Technology	3			3		Dr. Hoang Duc An Dr. Le Duy Thanh	FNS
IV. Master's Project				**9**				4		
34	HLLT	035	Master's Project	**9**				9	Faculty of Natural Sciences	FNS
Total				**60**		**17**	**18**	**9**		

11. GUIDELINES FOR IMPLEMENTATION

- This program applies to Cohort 26B onward for students enrolled in the Master's program in Physical and Theoretical Chemistry.

- Program delivery is based on the approved curriculum, program objectives, target student group, labor market needs, and specific training requirements. For elective courses, the faculty responsible for academic management will advise students on appropriate course selection in light of current disciplinary developments and social needs.

- The Dean or Head of the faculty responsible for academic management shall oversee and guide the development of detailed course syllabi so as to ensure that the objectives, content, and requirements of the program are met, while also responding to the needs of learners and society.

- The program will be reviewed and updated at least once every two years to ensure alignment with developments in the field of Physical and Theoretical Chemistry and with broader socio-economic needs.

Binh Dinh, February 14, 2025

RECTOR

Assoc. Prof. Dr. Doan Duc Tung