MINISTRY OF EDUCATION AND TRAINING
QUY NHƠN UNIVERSITY

MASTER'S PROGRAM

Level of education: **Master's**
Major: **Solid State Physics**
Specicality (if any): …….
Code: **8440104**
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. 486/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 Master's program in Solid State Physics, with an application-oriented approach, aims to equip students with strong political awareness and professional ethics; a solid foundation of knowledge and specialized skills in solid state physics; and the capability to teach and conduct research at higher education institutions and vocational education institutions. Graduates are expected to develop the ability to work and conduct research independently and creatively, as well as the competence to identify and solve problems in physics in general and solid state physics in particular. This enables them to pursue research and professional work at research institutes, Departments of Science and Technology, specialized laboratories, industrial enterprises, factories, and technology companies. Furthermore, the program aims to foster the ability to further develop fundamental research outcomes and apply core technologies to create technological solutions and products that meet diverse societal needs.

1.2. Specific objectives

Graduates of the Master's program in Solid State Physics are expected to achieve the following:

Knowledge

+ PO1: Possess advanced and up-to-date knowledge in solid state physics to meet practical requirements in teaching and scientific research, and to be capable of undertaking professional roles as specialists in the field of solid state physics. Graduates also acquire integrated knowledge of law, management, and environmental protection relevant to the field of training.

Skills

+ PO2: Demonstrate the ability to work independently in order to develop and test new solutions and emerging technologies in the field of solid state physics.

+ PO3: Demonstrate the capability to complete complex, non-routine, and unpredictable tasks related to the trained specialization.

+ PO4: Possess foreign language proficiency sufficient to comprehend, disseminate knowledge, and critically discuss professional issues within the field of specialization.

Autonomy and Responsibility

+ PO5: Demonstrate the ability to identify and solve scientific and technological problems in the field of solid state physics.

+ PO6: Demonstrate the ability to self-direct professional development and adapt to changing professional environments; the capacity to lead and promote collective intelligence in management and professional activities; the ability to apply critical thinking, defend and take responsibility for professional conclusions; the capacity to propose scientifically valuable recommendations in the specialized field; and the ability to manage, evaluate, and improve professional activities within the field.

2. EMPLOYMENT OPPORTUNITIES AND FURTHER STUDY PROSPECTS

2.1. Employment opportunities

Graduates of the Master's program in Solid State Physics may pursue the following career positions:

- Lecturers and teachers at higher education institutions and vocational education and training institutions.
- Researchers at research institutes.
- Specialists, officers, technicians, and researchers at research centers, research institutes, specialized laboratories, factories, industrial plants, and enterprises.
- Specialists and officers at governmental agencies responsible for science and technology management.
- Consultants and technology transfer specialists in fields related to solid state physics and materials science.

2.2. Further study prospects

Graduates of the Master's program in Solid State Physics may continue their studies at the doctoral level, not only in the same specialization but also in other related disciplines within the field of Physics, at universities and research institutions both domestically and internationally.

3. LEARNING OUTCOMES

The program is designed to ensure that graduates achieve the following Program Learning Outcomes (PLOs):

3.1. Knowledge

PLO1: Analyze and further develop fundamental knowledge of solid state physics in teaching and research within the fields of natural sciences and technology to address practical problems.

PLO2: Apply interdisciplinary knowledge to teaching practice, scientific research, and technological development in the field of physics in general and solid state physics in particular.

PLO3: Apply specialized knowledge, research methodologies, and knowledge of political, social, managerial, and environmental issues in orienting, planning, and organizing professional activities.

3.2. Skills

PLO4: Demonstrate the ability to analyze, synthesize, and evaluate data and information in the field of solid state physics in order to propose scientifically grounded solutions to problems.

PLO5: Demonstrate effective teamwork, collaboration, and knowledge communication skills with students, colleagues, and experts.

PLO6: Demonstrate the ability to conduct research and development, and creatively apply theories and technologies in the field of solid state physics.

PLO7: Achieve foreign language proficiency in accordance with current training regulations; demonstrate the ability to use a foreign language to comprehend, disseminate knowledge, and critically discuss professional issues in the field of study.

3.3. Autonomy and Responsibility

PLO8: Demonstrate the ability to identify and solve problems and generate significant innovations in the field of specialization.

PLO9: Demonstrate the ability to adapt, self-direct professional development, and guide others in the specialized field.

PLO10: Demonstrate the ability to draw scientifically meaningful conclusions and make valuable recommendations in physics in general and solid state physics in particular, contributing to improving the quality of scientific research and physics education at various educational levels.

PLO11: Demonstrate the ability to manage, evaluate, and improve professional activities in the specialized field.

PLO12: Demonstrate critical thinking skills, and the ability to defend and take responsibility for professional conclusions.

Mapping of Program Objectives (POs) and Program Learning Outcomes (PLOs)

Program Objectives (POs)	Program Learning Outcomes (PLOs)							
	1	2	3	4	5	6	7	8
PO1	x	x						
PO2			x	x	x			

PO3			x			x	x	
PO4								x

4. ADMISSION REQUIREMENTS

Applicants to the Master's program in Solid State Physics must satisfy the following requirements:

- Have graduated from a bachelor's degree program (or possess an equivalent or higher qualification) in a field relevant to Solid State Physics.

- Possess a foreign language proficiency at Level 3 or higher according to the Vietnamese 6-Level Foreign Language Proficiency Framework, or an equivalent certification.

- Applicants holding undergraduate degrees in the following disciplines are considered eligible for direct admission to the Master's program in Solid State Physics:

No.	Master's Program	Relevant Undergraduate Degrees	Notes
1	Solid State Physics	- Bachelor's degree in Physics - Engineering degree in Physics (Engineering Physics) - Bachelor's degree in Physics Education - Bachelor's degree in Physics–Industrial Engineering Education - Bachelor's degree in Materials Science	

- University graduates in fields requiring supplementary knowledge: The list of fields requiring supplementary knowledge and the courses that need to be taken to supplement this knowledge includes:

No.	Master's Program	Undergraduate Majors Requiring Bridging Courses	Bridging Courses	Notes
1	Solid State Physics	- Natural Science Education - Engineering Physics - Atomic and Nuclear Physics - Astronomy - Mechanics	- Quantum Mechanics - Solid State Physics - Introduction to Materials Science - Experimental Methods in Solid State Physics	Depending on specific cases, the Faculty will determine the appropriate number of bridging

		- Bachelor's degrees in Chemistry, Earth Sciences, Environmental Science - Industrial Technical Education - Materials Technology - Materials Engineering - Electrical Engineering - Electronic Engineering – Telecommunications - Biomedical Engineering Other related majors will be considered on a case-by-case basis.	- Mathematical Methods for Physics	courses to be completed.

5. ADMISSION APPLICANTS

Admission applicants shall comply with the current Regulations on Master's Degree Admission and Training of Quy Nhon University.

6. PROGRAM DURATION AND TOTAL CREDITS

6.1. Program Duration: 02 years

6.2. Total credits: 60 credits *(including 6 credits for internship and 9 credits for the Master's graduation project).*

Program structure	Credits
General Knowledge	**03**
Fundamental and Specialized Knowledge	**48**
- Compulsory	28
- Optional	20
- Master's Graduation Project	09
Total	**60**

7. TRAINING METHOD, GRADUATION REQUIREMENTS

7.1. Training Method

The program is implemented under the credit-based system, in accordance with the current regulations of the Ministry of Education and Training (MOET) and the academic regulations of Quy Nhon University.

7.2. Graduation Requirements:

Graduation requirements shall comply with the current regulations of the Ministry of Education and Training and Quy Nhon University, including the following:

a) Successfully complete all courses in the training program and defend the Master's graduation project with satisfactory results.

b) Meet the foreign language proficiency requirement according to the program's learning outcomes prior to the time of graduation consideration. This must be demonstrated by one of the following:

- A diploma or certificate demonstrating proficiency equivalent to Level 4 of the Vietnamese 6-Level Foreign Language Proficiency Framework, as specified in the Appendix of the Regulations on Master's Admission and Training of Quy Nhon University; or
- Other equivalent foreign language certificates recognized and announced by the Ministry of Education and Training; or
- A bachelor's degree or higher in a foreign language major; or
- A bachelor's degree or higher in another discipline where the program was fully delivered in a foreign language.

c) Fulfill all obligations in accordance with the regulations of Quy Nhon University; not be subject to criminal prosecution and not be under any disciplinary action or academic suspension at the time of graduation consideration.

8. ASSESSMENT METHODS AND GRADING SCALE

8.1 Grading scale

A 10-point grading scale is used for all forms of assessment in each course.

8.2. Format and scoring system.

a. Theoretical courses

No	Format	weight
1	Progress Assessment	40%
2	Final Exam	60%

b. Practical courses

- Continuous Assessment (40%): Based on preparation and active participation in discussions during laboratory sessions.
- Final Assessment (60%): Calculated as the average score of all laboratory experiments conducted during the semester.

c. Internship Course

No	Format	weight
1	Progress Assessment	40%
2	Final Exam	60%

d. Master's Graduation Project

Assessment and evaluation are conducted in accordance with the Regulations on Master's Admission and Training of Quy Nhon University.

8.3. Assessment Methods

The assessment methods used in the Master's program in Solid State Physics are classified into two main categories: formative assessment and summative assessment. These methods are specified in detail in the program specification of the training program.

9. PROGRAM CURRICULUM FRAMEWORK

No	Course Code	Course Name	Semester	Number of credits				Prerequisite Course Code	Managing Faculty	Note
				Total	Theory	Practise	Experimental/ Practical			
I. General Knowledge				**3**						
Compulsory										
Philosophy										
1.	TNTH 501	Philosophy	1	3	3	0	0		Faculty of Political Theory, Law and Public Administration	
II. Fundamental and Specialized Knowledge				**48**						
II.1. Compulsory				**28**						
2.	VLCR 502	Occupational Safety	1	2	2	0	0		Faculty of Natural Sciences	
3.	VLCR 503	Advanced Quantum Mechanics	1	2	1.5	0.5	0		Faculty of Natural Sciences	
4.	VLCR 504	Advanced Solid State Physics	1	3	2.5	0.5	0	VLCR 503	Faculty of Natural Sciences	
5.	VLCR 505	Nanomaterials Physics and Technology	1	3	3	0	0	VLCR 504	Faculty of Natural Sciences	

No	Course Code	Course Name	Semester	Number of credits				Prerequisite Course Code	Managing Faculty	Note
				Total	Theory	Practise	Experimental/ Practical			
6.	VLCR 506	Crystal Structure and Morphology Characterization Methods	2	2	2	0	0	VLCR 504 VLCR 505	Faculty of Natural Sciences	
7.	VLCR 507	Solid State Physics Laboratory I	2	2	0	0	2	VLCR 502 VLCR 504	Faculty of Natural Sciences	
8.	VLCR 508	Semiconductor Materials and Devices	2	3	2	0.5	0.5	VLCR 504 VLCR 505	Faculty of Natural Sciences	
9.	VLCR 510	Spectroscopic Techniques for Solid State Studies	2	2	2	0	0	VLCR 504 VLCR 505	Faculty of Natural Sciences	
10.	VLCR 511	Solid State Physics Laboratory II	3	3	0	0	3	VLCR 506 VLCR 507 VLCR 508 VLCR 510	Faculty of Natural Sciences	
11.	VLCR 527	Specialized Internship	3	6	0	0	6	VLCR 511	Faculty of Natural Sciences	
II.2. Optional (20/35 credits)				**20**						
12.	VLCR 513	Advanced Scientific Research Methods	1	2	2	0	0		Faculty of Natural Sciences	
13.	VLCR 514	Electronic Structure and Chemical Bonding in Molecules and Solids	1	2	1.5	0.5	0		Faculty of Natural Sciences	
14.	VLCR 515	Group Theory and Applications in Solid State Physics	1	2	1.5	0.5	0		Faculty of Natural Sciences	
15.	VLCR 517	Optical Materials and Applications	2	3	2.5	0.5	0	VLCR 503 VLCR 504	Faculty of Natural Sciences	
16.	VLCR 518	Smart Materials and Applications	2	3	3	0	0	VLCR 504 VLCR 505	Faculty of Natural Sciences	
17.	VLCR 522	Fundamentals of Computational Physics	2	3	2	0	1	VLCR 503	Faculty of Natural Sciences	
18.	VLCR 521	Magnetic Materials and Applications	3	3	2.5	0.5	0	VLCR 504	Faculty of Natural Sciences	
19.	VLCR 528	Semiconductor Device Fabrication and Packaging Technology	3	3	3	0	0	VLCR 508	Faculty of Natural Sciences	

No	Course Code	Course Name	Semester	Number of credits				Prerequisite Course Code	Managing Faculty	Note
				Total	Theory	Practise	Experimental/ Practical			
20.	VLCR 523	Sensors and Applications	3	3	3	0	0	VLCR 508	Faculty of Natural Sciences	
21.	VLCR 524	Renewable Energy	3	3	3	0	0	VLCR 504 VLCR 508 VLCR 505	Faculty of Natural Sciences	
22.	VLCR 519	Microelectronics Technology	3	2	2	0	0	VLCR 508	Faculty of Natural Sciences	
23.	VLCR 520	Optical Communications	3	2	1.5	0.5	0	VLCR 508	Faculty of Natural Sciences	
24.	VLCR 525	Environmental Physics	3	2	2	0	0	VLCR 505	Faculty of Natural Sciences	
25.	VLCR 529	Vacuum Techniques and Thin Film Technology	3	2	1	0.5	0.5		Faculty of Natural Sciences	
III. Master's Graduation Project				**9**						
26.	VLCR 526	Master's Project	4	9	0	0	9	VLCR 511 VLCR 527	Faculty of Natural Sciences	
Total				**60**						

10. STUDYING PLAN

No	Course code	Course name	Number of credits	STUDYING PLAN (Semester)				Proposed Lecturers	Managing Faculty
				1	2	3	4		
I. General Knowledge				**3**					
1	TNTH 501	Philosophy	3	3				Faculty of Political Theory, Law and Public Administration	Faculty of Political Theory, Law and Public

No	Course code	Course name	Number of credits	STUDYING PLAN (Semester)				Proposed Lecturers	Managing Faculty
				1	2	3	4		
									Administration
II. Fundamental and Specialized Knowledge			**48**						
II.1. *Compulsory*			**28**	**10**	**11**	**7**			
2	VLCR 502	Occupational Safety	2	2				Dr. Nguyen Van Nghia Assoc. Prof. Dr. Hoang Nhat Hieu	Faculty of Natural Sciences
3	VLCR 503	Advanced Quantum Mechanics	2	2				Assoc. Prof. Dr. Nguyen Thi Xuan Huynh Assoc. Prof. Dr. Nguyen Minh Vuong	Faculty of Natural Sciences
4	VLCR 504	Advanced Solid State Physics	3	3				Dr. Nguyen Van Nghia Assoc. Prof. Dr. Hoang Nhat Hieu	Faculty of Natural Sciences
5	VLCR 505	Nanomaterials Physics and Technology	3	3				Assoc. Prof. Dr. Phan Thanh Hai Dr. Nguyen Van Nghia	Faculty of Natural Sciences
6	VLCR 506	Crystal Structure and Morphology Characterization Methods	2		2			Assoc. Prof. Dr. Le Thi Ngoc Loan Assoc. Prof. Dr. Hoang Nhat Hieu	Faculty of Natural Sciences
7	VLCR 507	Solid State Physics Laboratory I	2		2			Dr. Nguyen Van Nghia Assoc. Prof. Dr. Nguyen Minh Vuong	Faculty of Natural Sciences
8	VLCR 508	Semiconductor Materials and Devices	3		3			Assoc. Prof. Dr. Nguyen Minh Vuong Assoc. Prof. Dr. Tran Nam Trung	Faculty of Natural Sciences

No	Course code	Course name	Number of credits	STUDYING PLAN (Semester)				Proposed Lecturers	Managing Faculty
				1	2	3	4		
9	VLCR 510	Spectroscopic Techniques for Solid State Studies	2		2			Assoc. Prof. Dr. Tran Nam Trung Assoc. Prof. Dr. Phan Thanh Hai	Faculty of Natural Sciences
10	VLCR 511	Solid State Physics Laboratory II	3		2			Assoc. Prof. Dr. Hoang Nhat Hieu Assoc. Prof. Dr. Nguyen Minh Vuong Dr. Nguyen Van Nghia Assoc. Prof. Dr. Tran Nam Trung	Faculty of Natural Sciences
11	VLCR 527	Specialized Internship	6			3		Assoc. Prof. Dr. Nguyen Minh Vuong Assoc. Prof. Dr. Hoang Nhat Hieu Assoc. Prof. Dr. Phan Thanh Hai Assoc. Prof. Dr. Le Thi Ngoc Loan	Faculty of Natural Sciences
II.2. Optional (20/35 credits)			**20**	4	**6**	**10**			
13	VLCR 513	Advanced Scientific Research Methods	2	2				Assoc. Prof. Dr. Nguyen Thi Xuan Huynh Assoc. Prof. Dr. Le Thi Ngoc Loan	Faculty of Natural Sciences
14	VLCR 514	Electronic Structure and Chemical Bonding in Molecules and Solids	2	2				Assoc. Prof. Dr. Phan Thanh Hai Assoc. Prof. Dr. Nguyen Minh Vuong	Faculty of Natural Sciences

No	Course code	Course name	Number of credits	STUDYING PLAN (Semester)				Proposed Lecturers	Managing Faculty
				1	2	3	4		
15	VLCR 515	Group Theory and Applications in Solid State Physics	2	2				Assoc. Prof. Dr. Nguyen Thi Xuan Huynh Assoc. Prof. Dr. Tran Nam Trung	Faculty of Natural Sciences
16	VLCR 517	Optical Materials and Applications	3		3			Dr. Le Thi Thao Vien Assoc. Prof. Dr. Nguyen Minh Vuong	Faculty of Natural Sciences
17	VLCR 518	Smart Materials and Applications	3		3			Dr. Nguyen Van Nghia Assoc. Prof. Dr. Phan Thanh Hai	Faculty of Natural Sciences
	VLCR 522	Fundamentals of Computational Physics	3		3			Assoc. Prof. Dr. Nguyen Thi Xuan Huynh Assoc. Prof. Dr. Phan Thanh Hai	Faculty of Natural Sciences
	VLCR 521	Magnetic Materials and Applications	3			3		Assoc. Prof. Dr. Hoang Nhat Hieu Assoc. Prof. Dr. Phan Thanh Hai	Faculty of Natural Sciences
	VLCR 528	Semiconductor Device Fabrication and Packaging Technology	3			3		Assoc. Prof. Dr. Nguyen Minh Vuong Assoc. Prof. Dr. Tran Nam Trung	Faculty of Natural Sciences
	VLCR 523	Sensors and Applications	3			3		Assoc. Prof. Dr. Nguyen Minh Vuong Assoc. Prof. Dr. Tran Nam Trung	Faculty of Natural Sciences
	VLCR 524	Renewable Energy	3			3		Assoc. Prof. Dr. Le Thi Ngoc Loan Dr. Tran Thanh Thai Assoc. Prof. Dr. Tran Nam Trung	Faculty of Natural Sciences

No	Course code	Course name	Number of credits	STUDYING PLAN (Semester)				Proposed Lecturers	Managing Faculty
				1	2	3	4		
	VLCR 519	Microelectronics Technology	2			2		Assoc. Prof. Dr. Tran Nam Trung Assoc. Prof. Dr. Nguyen Minh Vuong	Faculty of Natural Sciences
	VLCR 520	Optical Communications	2			2		Dr. Le Thi Thao Vien Assoc. Prof. Dr. Nguyen Minh Vuong	Faculty of Natural Sciences
	VLCR 525	Environmental Physics	2			2		Dr. Nguyen Van Nghia Assoc. Prof. Dr. Hoang Nhat Hieu	Faculty of Natural Sciences
	VLCR 529	Vacuum Techniques and Thin Film Technology	2			2		Assoc. Prof. Dr. Hoang Nhat Hieu Assoc. Prof. Dr. Tran Nam Trung Assoc. Prof. Dr. Nguyen Minh Vuong	Faculty of Natural Sciences
III. Master's Graduation Project			**9**						
26	VLCR 526	Master's Project	9				9		Faculty of Natural Sciences
Total			**60**	**17**	**15**	**19**	**09**		

GUIDELINES FOR PROGRAM IMPLEMENTATION

- This training program applies from the 28th enrollment intake (enrollment year 2025) for graduate students majoring in Solid State Physics.

- The training process is based on the designed curriculum, training objectives and target learners, human resource requirements, and specific requirements for the training program. For elective courses, depending on the actual development trends and social needs, the responsible department will advise students in selecting appropriate courses.

- The Head of the specialized department is responsible for organizing and guiding the principles for developing detailed course syllabi to ensure that the objectives, contents, and requirements are met, while also satisfying the needs of learners and society.

- The training program will be reviewed and updated at least once every two years to meet the development of the field of Solid State Physics and to be consistent with socio-economic development needs.

Binh Dinh, December 14, 2025

RECTOR

Assoc. Prof. Dr. Doan Duc Tung