MINISTRY OF EDUCATION AND TRAINING
QUY NHƠN UNIVERSITY

MASTER'S PROGRAM

Level of education:	**Master's**
Major:	**Algebra and number theory**
Code:	**8460104**
Training orientation:	**Research**
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. 1297/QĐ-ĐHQN dated April 29, 2025 of the Rector of Quy Nhon University)

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1. PROGRAM OBJECTIVES (POs)

1.1. General objectives

The program aims to develop learners who possess strong political qualities and professional ethics; demonstrate solid professional competence and mastery of knowledge in Algebra and number theory; and exhibit critical thinking along with the capacity for independent, in-depth research to acquire new knowledge. Graduates will be prepared to pursue doctoral studies and will have the ability to apply mathematics to solve practical issues arising from teaching and mathematical research activities.

1.2. Specific objectives

Graduates with a Master's degree in Algebra and number theory (research-oriented) shall possess the following capabilities:

- **PO1:** Acquire solid knowledge of political science and Marxist-Leninist Philosophy to apply effectively in professional activities and daily life.

- **PO2:** Gain advanced knowledge of fundamental mathematics within the field of Algebra and Number Theory as a foundation for specialized study and higher-level education.

- **PO3:** Possess deep and broad specialized knowledge in specific areas of Algebra and Number Theory to solve problems in mathematics teaching at universities, colleges, and high schools in alignment with the new general education curriculum in Mathematics.

- **PO4:** Demonstrate skills in applying advanced mathematical knowledge to address practical issues arising from mathematics pedagogy.

- **PO5:** Develop skills in critical thinking, analysis, and synthesis; maintain the capacity for self-study and in-depth research to acquire new knowledge.

- **PO6:** Master skills for independent work, teamwork, and team leadership; demonstrate proficiency in self-study and literature review to identify and resolve problems through lifelong learning.

- **PO7:** Exhibit self-awareness regarding the vital role of autonomous study and research in problem-solving, professional development, and continuous academic growth.

- **PO8:** Uphold professional ethics; demonstrate personal and collective responsibility, as well as accountability towards the community, society, professional tasks, and the environment.

2. EMPLOYMENT OPPORTUNITIES AND FURTHER STUDY PROSPECTS

Graduates of the Research-oriented Master's program in Algebra and Number Theory are qualified to:

- **Teaching:** Teach at high schools, middle schools, universities, and colleges nationwide.

- **Management:** Serve as specialized officers or academic managers at educational and training institutions, as well as education management agencies.

- **Research:** Work as mathematical researchers at research institutes, specialized centers, universities, and colleges.

- **Doctoral Studies:** Pursue further education in Doctoral (Ph.D.) programs.

- **International Education:** Continue advanced studies abroad through international postgraduate programs.

3. LEARNING OUTCOMES

The program is designed to ensure that graduates achieve the following learning outcomes:

- **PLO1:** Understand and apply knowledge of political science and Marxist-Leninist Philosophy to professional activities and daily life.

- **PLO2:** Demonstrate broad understanding and application of fundamental knowledge in Mathematical Analysis, Algebra, Number Theory, Geometry, Optimization, and Probability to support in-depth study and adapt to frequent changes in the new general education curriculum in Mathematics, teaching, and mathematical research.

- **PLO3:** Master and gain a comprehensive understanding of Algebra and Number Theory; apply specialized knowledge to solve problems in mathematics teaching at universities, colleges, and high schools following the new general education curriculum.

- **PLO4:** Synthesize foundational and specialized knowledge with personal expertise to perform professional tasks: coaching gifted students, teaching specialized mathematics classes, conducting in-depth research on school and elementary mathematics, and participating in continuing professional development and seminars for teachers.

- **PLO5:** Apply skills in critical thinking, analysis, synthesis, and evaluation of data and information using advanced scientific methods; demonstrate effective teamwork to achieve common goals.

- **PLO6:** Apply skills to identify and utilize mathematical knowledge for teaching and conducting in-depth research in the field of Algebra and Number Theory.

- **PLO7:** Utilize skills in mathematical research, innovation, and creativity, while effectively employing relevant technologies in the field of Mathematics.

- **PLO8:** Proficiently and creatively apply skills to disseminate mathematical knowledge to learners and guide students in completing academic tasks.

- **PLO9:** Work competently, either independently or in teams, under changing conditions; take personal and collective responsibility; and effectively instruct and supervise learners in their academic duties.

- **PLO10:** Demonstrate self-orientation and adaptability to changing educational environments; draw professional conclusions and defend personal perspectives; possess the ability to plan, coordinate, and manage resources, as well as evaluate and improve professional efficiency; maintain the capacity for lifelong learning through self-study or by pursuing Doctoral programs at domestic and international institutions.

4. ADMISSION REQUIREMENTS

Applicants must meet the following criteria:

- Academic Qualifications: Have graduated or be eligible for graduation from a Bachelor’s degree program (or equivalent or higher) with a Minimum classification of "Good" (Upper Second Class) or above; or possess published scientific research related to the field of Mathematics.

- Language Proficiency: Demonstrate a foreign language proficiency of Level 3 or higher according to the 6-level Foreign Language Proficiency Framework for Vietnam (VSTEP).

List of eligible undergraduate majors

No	Target Master's Major	Eligible Undergraduate Majors	Note
1	Algebra and number theory	- Mathematics Education (7140209) - Mathematics (7460101) - Applied Mathematics (7460112) - Computational Science (7460107) - Data Science (7460108) - Mathematics and Informatics (7460117) - Mathematics and Mechanics (7460115)	

List of undergraduate majors requiring supplemental knowledge and corresponding courses:

No	Target Master's Major	Majors requiring supplemental knowledge	Supplemental courses (No. of credits)	Note
1	Algebra and number theory	- Statistics (7460201); - Computer Science Education (7140210) - Other majors: Case-by-case review	- Linear algebra (3 credits) - Abstract algebra (3 credits) - Calculus of Several Variables (3 credits) - Measure Theory and Integration (3 credits) - Functional analysis (3 credits)	Based on the candidate's Bachelor's degree and academic transcripts, the faculty council will review and request the Dean to propose whether the

				candidate is required to complete supplemental courses and specify the appropriate subjects. Required supplemental courses may be considered for replacement by equivalent certificates issued by reputable educational institutions.

5. ADMISSION TARGETS

In accordance with the current Regulations on Admission and Master's level training issued by Quy Nhon University and the Ministry of Education and Training.

6. PROGRAM DURATION AND TOTAL CREDITS

6.1. Program duration: 2 years

6.2. Total credits: **60** credits, including **12** credits of research topics and **12** credits of the master's thesis.

Program structure	Credits
General Knowledge	**3**
Fundamental and specialized knowledge	**45**
Compulsory courses	27
Optional courses	6

Reseach topics	12
Master's Thesis	**12**
Total	**60**

7. TRAINING METHOD, GRADUATION REQUIREMENTS

7.1. Training method

The program is conducted under a credit-based system, in compliance with the current regulations of the Ministry of Education and Training and Quy Nhon University.

7.2. Graduation requirements

In accordance with the current Regulations on Admission and Master's level training of Quy Nhon University and the Ministry of Education and Training:

a) Successfully complete all courses within the training program and achieve a passing grade on the Master's thesis defense;

b) Meet the foreign language proficiency requirements as specified in the program's learning outcomes prior to graduation. This must be evidenced by one of the following:

- A diploma or certificate equivalent to Level 4 according to the 6-level Foreign Language Proficiency Framework for Vietnam (as prescribed in the Appendix of the current Regulations of Quy Nhon University) or other equivalent certificates recognized by the Ministry of Education and Training.

- A Bachelor's degree (or higher) in a foreign language major.

- A Bachelor's degree (or higher) in another major where the medium of instruction was entirely in a foreign language.

c) Fulfill all administrative and financial obligations as per Quy Nhon University regulations; not be under criminal investigation or subject to disciplinary action or academic suspension.

7.3. Degree Awarded

Vietnamese: BẰNG THẠC SĨ ĐẠI SỐ VÀ LÝ THUYẾT SỐ

English: THE DEGREE OF MASTER IN ALGEBRA AND NUMBER THEORY

8. ASSESSMENT METHODS, GRADING SCALE

8.1. Grading scale

A 10-point scale is used for all forms of assessment within the course.

8.2. Format, evaluation criteria, and scoring system

- Assessment of theoretical courses

No	Format	Evaluation criteria	Weighting
1	***Progress assessment***	*Attendance:* Students must attend all required sessions and must not miss more than **20%** of the total class hours.	40%, 30%
		Discussion: Proactiveness, level of preparation, and active participation in classroom activities.	
		Homework: Students complete one or more assignments at home. Instructors assign specific tasks to individual students or groups of students.	
		Mid-term Assessment: Choose one of the following forms and evaluation criteria: - In-class Test: Students complete a test in class; the instructor will specify the detailed evaluation criteria. - Seminar or Capstone Project: Students conduct a seminar or complete a major assignment (capstone project) as required by the course instructor. Evaluation criteria for reports, seminars, and projects will be specified by the instructor.	
2	***Final examination***	Evaluation criteria are based on the selection of one of the following examination formats: - **Written Examination:** Students complete a final written exam. The instructor will specify the content and evaluation criteria within the **answer key and grading scheme** of the final exam. - **Oral Examination:** Evaluation criteria are determined by the **examining board** based on the student's attitude and the quality of their responses. - **Term Paper (Essay):** Evaluation criteria are based on the content and quality of the **submitted report**.	60%, 70%

- Assessment of Research topics

Evaluation criteria are specified in the **detailed syllabus** of each research topic.

- Assessment of Master's Thesis

Conducted in accordance with the current Regulations on Admission and Master's Level Training of Quy Nhon University.

8.3. Assessment methods

The assessment methods used in the Master's program in Algebra and Number Theory are categorized into two main types: Formative Assessment (Progress assessment) and Summative Assessment (Final assessment). Specific assessment methods are prescribed in the Program Specification for Algebra and Number Theory.

The following table details the description of these assessment methods:

Mapping of Assessment Methods and Program Learning Outcomes (PLOs)

Assessment methods	**Program learning outcomes (PLOs)**									
	1	2	3	4	5	6	7	8	9	10
I. Progress assessments										
1. Attendance Assessment									x	x
2. Assignment assessment		x	x	x	x	x	x		x	x
3. Presentation Assessment	x	x	x	x		x		x	x	x
II. Summative assessment										
4. Written examination	x	x	x	x	x	x	x	x	x	x
5. Defense and Oral Examination	x	x	x	x	x	x	x	x	x	x
6. Report	x	x	x	x	x	x	x	x	x	x

9. PROGRAM CONTENT

No	Course Code		Course name	Semester	No. of credits			Prerequisite Course Code	Managing Faculty	Note
	Letters	Numbers			Total	Theory, Practice	Experimental/ Pratical/Discussional			
I. General knowledge										
I.1. Philosophy										
1	TNTH	501	Philosophy	1	3	3			Faculty of Political Theory, Law, and State Management	
II. Fundamental and specialized knowledge										
II.1. Compulsory										
2	CSBB	502	Advanced linear algebra	1	3	3			Mathematics and Statistics	
3	CSBB	503N	Modern algebra	1	2	2			Mathematics and Statistics	
4	CSBB	504	Real analysis	1	3	3			Mathemat	

									ics and Statistics	
5	CSBB	505N	Probability theory	1	2	2			Mathematics and Statistics	
6	CSBB	506N	Introduction to Algebraic geometry	2	2	2			Mathematics and Statistics	
7	CSBB	507N	Applied functional analysis	2	2	2			Mathematics and Statistics	
8	CSBB	508N	Complex analysis and applications	2	2	2			Mathematics and Statistics	
9	CSBB	509	Optimization theory	2	3	3			Mathematics and Statistics	
10	ĐSBB	510N	Group theory	2	2	2			Mathematics and Statistics	
11	ĐSBB	511N	Algebraic number theory	3	2	2			Mathematics and Statistics	
12	ĐSBB	512N	Field and Galois theory	3	2	2			Mathematics and Statistics	
13	ĐSBB	513N	Rings and modules theory	3	2	2			Mathematics and Statistics	
II.2. Optional (select 03/9 courses)										
14	ĐSTC	514	Groebner basis	3	2	2			Mathematics and	

									Statistics	
15	ĐSTC	515	Homological algebra	3	2	2			Mathematics and Statistics	
16	ĐSTC	516	Algebraic topology	3	2	2			Mathematics and Statistics	
17	ĐSTC	517	Category theory	3	2	2			Mathematics and Statistics	
18	ĐSTC	518	Matrix computation	3	2	2			Mathematics and Statistics	
19	ĐSTC	519	Group representation theory	3	2	2			Mathematics and Statistics	
20	ĐSTC	520	Real algebraic geometry	3	2	2			Mathematics and Statistics	
21	ĐSTC	521	Morse theory	3	2	2			Mathematics and Statistics	
22	ĐSTC	522	Singularity theory	3	2	2			Mathematics and Statistics	
II.3. Other research topics										
23	ĐSCĐ	523	Research topic 1	1	3		3		Mathematics and Statistics	
24	ĐSCĐ	524	Research topic 2	2	3		3		Mathematics and Statistics	

25	ĐSCĐ	525	Research topic 3	3	3		3		Mathematics and Statistics	
26	ĐSCĐ	526	Research topic 4	4	3		3		Mathematics and Statistics	
III. Master's thesis										
27	ĐSLV	527	Master's Thesis	4			12		Mathematics and Statistics	
Total					**60**					

10. TENTATIVE TEACHING PLAN

No	Course code	Course name	No. of credits	Tentative teaching plan (Semester)				Proposed lecturers	Managing Faculty
				1	2	3	4		
I. General knowledge			**3**	**3**	**0**	**0**	**0**		
1	TNTH501	Philosohpy	3	3				Faculty of Political Theory, Law, and State Management	Faculty of Political Theory, Law, and State Management
II. Fundamental and specialized knowledge			**45**	**13**	**14**	**15**	**3**		
II.1. Compulsory			**27**	**10**	**11**	**6**	**0**		
2	CSBB502	Advanced linear algebra	3	3				Dr. Lê Thanh Hiếu Dr. Trần Đình Lương	Mathematics and Statistics
3	CSBB503N	Modern algebra	2	2				Dr. Phạm Thùy Hương	Mathematics and

								Assoc. Prof. Dr. Lê Công Trình	Statistics
4	CSBB504	Real analysis	3	3				Assoc. Prof. Dr. Lương Đăng Kỳ Dr. Mai Thành Tấn	Mathematics and Statistics
5	CSBB505N	Probability theory	2	2				Dr. Lâm Thị Thanh Tâm Dr. Cao Tấn Bình Dr. Lê Quang Thuận Dr. Nguyễn Đặng Thiên Thư	Mathematics and Statistics
6	CSBB506N	Introduction to Algebraic geometry	2		2			Assoc. Prof. Dr. Lê Công Trình Dr. Phạm Thùy Hương Dr. Nguyễn Bin	Mathematics and Statistics
7	CSBB507N	Applied functional analysis	2		2			Assoc. Prof. Dr. Thái Thuần Quang Assoc. Prof. Dr. Huỳnh Minh Hiền	Mathematics and Statistics
8	CSBB508N	Complex analysis and applications	2		2			Assoc. Prof. Dr. Thái Thuần Quang Dr. Nguyễn Văn Đại	Mathematics and Statistics

9	CSBB509	Optimization theory	3		3			Assoc. Prof. Dr. Sci. Huỳnh Văn Ngãi Dr. Nguyễn Hữu Trọn Dr. Nguyễn Văn Vũ Dr. Trần Ngọc Nguyên	Mathematics and Statistics
10	ĐSBB510N	Group theory	2		2			Dr. Trần Đình Lương Dr. Lê Thanh Hiếu	Mathematics and Statistics
11	ĐSBB511N	Algebraic number theory	2			2		Assoc. Prof. Dr. Lê Công Trình Dr. Trần Đình Lương	Mathematics and Statistics
12	ĐSBB512N	Field and Galois theory	2			2		Dr. Lê Thanh Hiếu Dr. Trần Đình Lương	Mathematics and Statistics
13	ĐSBB513N	Rings and modules theory	2			2		Dr. Lê Thanh Hiếu Dr. Phạm Thùy Hương	Mathematics and Statistics
II.2. Optional (select 03/9 courses)			**6**	**0**	**0**	**6**	**0**		
14	ĐSTC514	Groebner basis	2			2		Dr. Nguyễn Bin Dr. Phạm Thùy Hương	Mathematics and Statistics
15	ĐSTC515	Homolog	2			2		Dr. Trần Đình	Mathemat

		ical algbra						Lương Assoc. Prof. Dr. Lê Công Trình	ics and Statistics
16	ĐSTC516	Algebraic topology	2			2		Dr. Thái Trung Hiếu Assoc. Prof. Dr. Nguyễn Sum	Mathematics and Statistics
17	ĐSTC517	Category theory	2			2		Assoc. Prof. Dr. Lê Công Trình Dr. Trần Đình Lương	Mathematics and Statistics
18	ĐSTC518	Matrix computation	2			2		Dr. Lê Thanh Hiếu Assoc. Prof. Dr. Lê Công Trình	Mathematics and Statistics
19	ĐSTC519	Group representation theory	2			2		Dr. Trần Đình Lương Assoc. Prof. Dr. Lê Công Trình	Mathematics and Statistics
20	ĐSTC520	Real algebraic geometry	2			2		Assoc. Prof. Dr. Lê Công Trình Dr. Lê Thanh Hiếu	Mathematics and Statistics
21	ĐSTC521	Morse theory	2			2		Assoc. Prof. Dr. Lê Công Trình Dr. Phạm Thuỳ Hương	Mathematics and Statistics
22	DSTC522	Singularity theory	2			2		Dr. Phạm Thùy Hương Assoc. Prof. Dr. Lê Công Trình	Mathematics and Statistics

II.3 Research topics			**12**	**3**	**3**	**3**	**3**		
23	ĐSCĐ523	Research topic 1		3				Faculty Group in Algebra, Number Theory, and Geometry	Mathematics and Statistics
24	ĐSCĐ524	Research topic 2			3			Faculty Group in Algebra, Number Theory, and Geometry	Mathematics and Statistics
25	ĐSCĐ525	Research topic 3				3		Faculty Group in Algebra, Number Theory, and Geometry	Mathematics and Statistics
26	ĐSCĐ526	Research topic 4					3	Faculty Group in Algebra, Number Theory, and Geometry	Mathematics and Statistics
III. MASTER'S THESIS			**12**				**12**		
27	ĐSLV527	Master's Thesis	12				12	Lecturers' from Facaulty of Mathematics and Statistics; Invited lecturers outsite of Quy Nhon university	Mathematics and Statistics

TOTAL	**60**	**16**	**14**	**15**	**15**		

11. GUIDELINES FOR PROGRAM IMPLEMENTATION

- **Applicability:** This training program applies to Master's students majoring in Algebra and Number Theory (Research-oriented curriculum) at Quy Nhon University, starting from the 2025 intake.

- **Online Instruction:** Certain courses within the program may be delivered via online learning, provided they do not exceed 30% of the total program workload and are proposed by the Managing Faculty.

- **Training Process:** The training process is based on the designed curriculum, educational objectives, target learners, human resource requirements, and specific training needs. For elective courses, the Managing Faculty will advise students on selecting appropriate modules based on current trends and societal demands.

- **Management Responsibility:** The Dean of the Managing Faculty is responsible for organizing and guiding the principles for program development and detailed course syllabi to ensure that objectives, content, and requirements are met, while satisfying the needs of learners and society.

- **Program Review and Update:** The training program shall be reviewed, evaluated, and updated in accordance with the current regulations of the Ministry of Education and Training and Quy Nhon University. This ensures the program remains aligned with the advancements in Algebra and Number Theory and meets socio-economic development needs.

Binh Dinh, April 29, 2025

RECTOR

Assoc. Prof. Dr. Doan Duc Tung