MINISTRY OF EDUCATION AND TRAINING

QUY NHON UNIVERSITY

MASTER'S PROGRAM

Level of education**: Master's**

Major**: Data Science**
Code: **8460108**

Training orientation: **Application**

Type of education: **Full-time**

Binh Dinh, 2023

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QUY NHON UNIVERSITY

SOCIALIST REPUBLIC OF VIET NAM
Independence - Freedom – Happiness

MASTER'S PROGRAM

(Issued together with Decision No. 2016/QĐ-ĐHQN dated July 31,2023

of the Rector of Quy Nhon University)

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1. PROGRAM OBJECTIVES (POs)

1.1. General objectives

The program aims to train **high-quality human resources in Data Science** to meet the current demands of society.

1.2. Specific objectives

Graduates of the **Master's program in Data Science** are expected to achieve the following:

- Knowledge

+ PO1: Demonstrate understanding and application of knowledge in political science, Ho Chi Minh Thought, and Marxist–Leninist Philosophy, and apply this knowledge in professional activities and daily life.

+ PO2: Apply advanced knowledge of modeling, algorithm development, numerical methods, and statistical methods in data analysis.

+ PO3: Possess knowledge of programming and information technology to implement and solve real-world data science problems.

+ PO4: Possess in-depth disciplinary knowledge in Data Science to address practical professional issues in the field, including the development and exploitation of big data analytics software, and the effective integration of machine learning with statistical methods and mathematical models for data synthesis, analysis, and predictive modeling.

- Skills

+ PO5: Demonstrate skills in collecting, analyzing, and processing data in technological and quantitative domains; possess the ability to exploit and interact with large-scale data repositories stored on cloud computing platforms.

+ PO6: Demonstrate skills in modeling, algorithm development, and programming to implement and solve real-world Data Science problems.

+ PO7: Demonstrate entrepreneurial and leadership skills; the ability to work independently and collaboratively in teams; the ability to organize teamwork; and the ability to engage in self-directed learning, problem identification, and problem solving, as well as lifelong learning and research.

+ PO8: Demonstrate the ability to use foreign languages in professional and specialized activities and possess effective communication skills.

- Autonomy and Responsibility

PO9: Demonstrate self-awareness of the importance of independent learning and continuous knowledge acquisition; uphold professional ethics; take personal and team responsibility; and demonstrate responsibility toward the community, society, workplace, and environment.

2. EMPLOYMENT OPPORTUNITIES AND FURTHER STUDY ROSPECTS

Graduates of the **Master's program in Data Science** may pursue the following career positions:

- Data Mining and Modeling Specialist
- Data Analyst
- Data Architect
- Statistical Analyst
- Business Data Analyst
- Data Analytics Manager
- Consultant for Big Data Software Design and Development

Graduates may also pursue higher academic studies or research at the doctoral level in related fields.

3. LEARNING OUTCOMES

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

3.1. Knowledge

+ Fundamental Knowledge

- PLO1: Demonstrate understanding and application of knowledge in political science, Ho Chi Minh Thought, and Marxist–Leninist Philosophy in professional and social contexts.

- PLO2: Demonstrate understanding and creative application of mathematical knowledge, including Linear Algebra, Statistics, Optimization, and Numerical Methods.

+ Secialized Knowledge of the Discipline

- PLO3: Demonstrate understanding and application of knowledge in programming, databases, machine learning, and data mining.

- PLO4: Creatively apply integrated knowledge in data organization, data collection and management, applied data analytics, technologies and tools for Data Science, and Data Science applications across specific domains.

3.2. Skills

+ General Skills

- **PLO5**: Demonstrate the ability to critically evaluate, analyze, synthesize, and assess data and information using scientific and advanced approaches; effectively collaborate in teams to achieve common work objectives.

+ Professional Skills

- PLO6: Apply skills in identifying and modeling real-world problems in Data Science.

- **PLO7**: Apply skills in utilizing information technology techniques and tools to solve practical Data Science problems.

3.3. Autonomy and Responsibility

- **PLO8:** Demonstrate the ability to work independently or collaboratively in changing work environments; take personal and team responsibility; and supervise and guide others in performing assigned tasks.

- PLO9: Demonstrate the ability to self-direct and adapt to evolving work environments, make professional judgments, and defend personal viewpoints; possess the ability to plan, coordinate, and manage resources, evaluate and improve professional performance; and engage in independent learning and research.

4. ADMISSION REQUIREMENTS

Applicants must satisfy the following conditions:

- Hold a Bachelor's degree (or equivalent) in a discipline relevant to data science (application-oriented).
- Possess foreign language proficiency at level 3/6 or higher according to the Vietnamese 6-level Foreign Language Proficiency Framework or an equivalent certification.

Applicants holding a bachelor's degree in a relevant field:

No.	Intended Master's Major	Relevant Undergraduate Major	Note
1	Data science	- Applied Mathematics (7460112) - Data Science (7460108) - Mathematics and Computer Science (7460117) - Statistics (7460201) - Computer Science (7480101) - Artificial Intelligence (7480107) - Computer Networks and Data Communications (7480102) - Software Engineering (7480103) - Information Technology (7480201) - Computer Science Education (7140210) - Information Systems (7480104) - Computer Engineering (7480106) - Computer Engineering Technology (7480108) - Information Security (7480202)	

Applicants whose undergraduate majors require supplementary knowledge: The list ofrelevant majors and the required supplementary courses is as follows:

No.	Intended Master's Major	Majors Requiring Supplementary Courses	Supplementary Courses (Number of Credits)	Note
1	Mathematical Analysis	- Mathematics education (7140209); - Mathematics (7460101);	- Linear algebra (2 credits) - Calculus (2 credits) - Probability and statistics (2 credits) - Database management systems (2 credits) - Introduction to programming (2 credits)	Depending on the specific case, the department will determine the number of required

		- Other majors will be considered on a case-by-case basis	- Introduction to algorithms (2 credits) - Introduction to data science (2 credits)	supplementary courses.

5. ADMISSION REQUIREMENTS

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 CREDIT REQUIREMENTS

6.1. Program Duration: 2 years

6.2. Total Credit Requirements: 60 credits

Curriculum Structure	Number of Credits
General Knowledge	**3**
Fundamental and Specialized Knowledge	**48**
Compulsory courses	27
Optional courses	15
Project-Based Internship	6
Graduation project	**9**
Total credits	**60**

7. TRAINING METHOD, GRADUATION REQUIREMENTS

7.1. Training method

The training is organized under the credit-based system in accordance with the current egulations of the Ministry of Education and Training and of Quy Nhon University.

7.2. Graduation Requirements

In accordance with the current regulations of the Ministry of Education and Training and of Quy Nhon University:

a) Having completed all courses in the training program and successfully defended the master's thesis;

b) Meeting the foreign language proficiency requirement according to the program's learning outcomes before the time of graduation consideration; this must be evidenced by one of the following: a diploma or a foreign language certificate equivalent to Level 4 of the Vietnamese 6-level Foreign Language Proficiency Framework specified in the Appendix of this Regulation, or other equivalent certificates 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 major whose program was conducted entirely in a foreign language;

c) Having fulfilled all responsibilities prescribed by Quy Nhon University; not being subject to criminal prosecution and not being under disciplinary action or suspension from study.

7.3. Degree Awarded

Vietnamese: BẰNG THẠC SĨ KHOA HỌC DỮ LIỆU

English: THE DEGREE OF MASTER IN DATA SCIENCE

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.	30%, 40%, 50%
		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.	70%, 60%, 50%

- Project-based internship and professional internship courses:

50% progress assessment (supervisor); 50% oral examination (the evaluation committee for the oral examination is established by decision of the Department).
Assessment criteria: Specified in detail in the course syllabus.

Assessment criteria: Specified in detail in the course syllabus.

- Graduation project course:

The graduation project is implemented in accordance with the Regulations on Admission and Training for Master's Programs of Quy Nhon University**.**

8.3. Assessment methods

The assessment methods used in the Master's program in Data Science 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 Data Science.

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**	**Sem**	**No. of credits**	**Prere-quisite Cours**	**Managing Faculty**

				est er				eCode	
	Letters	**Numbers**			**Total**	**The-ory/ Pract ise**	**Experi mental /Practi cal**		
I. General Knowledge									
I.1. Philosophy									
1	TNTH	501	Philosophy	1	3	3			Department of Political Theory, Law, and Public Administrati on
2	ADS	89001	Applied statistics	1	3	2	1		Department of Mathematics and Statistics
3	ADS	89002	Optimization theory	2	3	2	1		Department of Mathematics and Statistics
4	ADS	89003	Numerical methods for linear algebra	1	3	2	1		Department of Mathematics and Statistics
5	ADS	89007	Machine learning and data mining	1	3	2	1		Department of Information Technology
6	ADS	89022	Deep learning and applications	2	3	2	1		Department of Information Technology
7	ADS	89019	Mining of masive datasets	1	3	2	1		Department of Information Technology

II.2. Specialized Knowledge									
II.2.1. Compulsory									
8	ADS	89006	Programming for data science	1	3	2			Department of Information Technology
9	ADS	89026	Data visualization	3	3	2			Department of Information Technology
10	ADS	89010	Specialized scientific data analysis	2	3	2			Department of Information Technology
11	ADS	89005	Databases and information systems	2	3	2	1		Department of Information Technology
12	ADS	89012	Stochastic processes	3	3	2	1		Department of Mathematics and Statistics
13	ADS	89013	Numerical analysis	3	3	2	1		Department of Mathematics and Statistics
14	ADS	89014	Statistical modeling with Python	3	3	2	1		Department of Mathematics and Statistics
15	ADS	89015	Statistical analysis with R	3	3	2	1		Department of Mathematics and Statistics
16	ADS	89016	Time series analysis and forcasting	3	3	2	1		Department of

									Information Technology
17	ADS	89017	Forecasting theory	3	3	2	1		Department of Mathematics and Statistics
18	ADS	89018	Cloud computing and applications	3	3	2	1		Department of Information Technology
19	ADS	89020	Big data management in the Internet of things	3	3	2	1		Department of Engineering and Technology
20	ADS	89021	Text data mining	3	3	2	1		Department of Information Technology
21	ADS	89023	Robotics and autonomous systems	3	3	2	1		Department of Engineering and Technology
22	ADS	89027	Cryptography and data security	3	3	2	1		Department of Mathematics and Statistics
23	ADS	89028	Project-based internship	4	6	0	6		Department of Mathematics and Statistics
III. Graduation Project									
24	GTLV	530	Master's Project	4	9	0	9		Department of Mathematics and Statistics

Total credits		**60**					

10. TENTATIVE TEACHING PLAN

No	Course code		Course name	Number of credits	Study plan (Semester)				Proposed lecturers	Managing faculty
	Letters	Numbers			1	2	3	4		
I. General Knowledge				**3**	**3**	**0**	**0**	**0**		
1	TNTH	501	Philosophy	3	3				Assoc.Prof.Dr. Doan The Hung Dr. Nguyen Thi Ngoc Thuy	Faculty of Political Theory, Law, and State Management
II. Fundamental and Specialized Knowledge										
II.1. Fundamental Knowledge										
II.1.1. Compulsory										
2	ADS	89001	Applied statistics	3	3				Dr. Lam Thi Thanh Tam Dr. Le Thanh Binh	Department of Mathematics and Statistics
3	ADS	89002	Optimization theory	3		3			Dr. Nguyen Van Vu Assoc.Prof.Dr. Tran Ngoc Nguyen	Department of Mathematics and Statistics
4	ADS	89003	Numerical methods for linear algebra	3	3				Assoc.Prof. Dr. Le Cong Trinh Dr. Le Thanh Hieu	Department of Mathematics and Statistics
5	ADS	89007		3	3				Dr. Le Xuan Vinh	Department of

			Machine learning and data mining						Dr. Le Xuan Viet	Technology and Information
6	ADS	89022	Deep learning and applications	3		3			Dr. Le Xuan Vinh Dr. Le Xuan Viet	Department of Technology and Information
7	ADS	89019	Mining of masive datasets	3		3			Dr. Tran Thien Thanh Dr. Ho Van Lam	Department of Technology and Information
II.2. Specialized Knowledge										
II.2.1. Compulsory										
8	ADS	89006	Programming for data science	3	3				Dr. Le Xuan Vinh Dr. Ho Van Lam	Department of Technology and Information
9	ADS	89026	Data visualization	3		3			Dr. Tran Thien Thanh Dr. Ho Van Lam	Department of Technology and Information
10	ADS	89010	Specialized scientific data analysis	3		3			By Specialization	Department of Technology and Information
II.2.2. Optional										
11	ADS	89005	Databases and information systems	3		3	3		Dr. Nguyen Thanh Binh Dr. Tran Thien Thanh	Department of Technology and Information

12	ADS	89012	Stochastic processes	3		3	3		Dr. Lam Thi Thanh Tam Dr. Nguyen Dang Thien Thu	Department of Mathematics and Statistics
13	ADS	89013	Numerical analysis	3		3	3		Dr. Nguyen Huu Tron Assoc.Prof.Dr. Huynh Van Ngai	Department of Mathematics and Statistics
14	ADS	89014	Statistical modeling with Python	3		3	3		Dr. Nguyen Van Vu Dr. Tran Ngoc Nguyen	Department of Mathematics and Statistics
15	ADS	89015	Statistical analysis with R	3		3	3		Dr. Le Thanh Binh Dr. Tran Ngoc Nguyen	Department of Mathematics and Statistics
16	ADS	89016	Time series analysis and forcasting	3		3	3		Dr. Le Xuan Viet Dr. Dang Quang Vinh	Department of Technology and Information
17	ADS	89021	Forecasting theory	3		3	3		Dr. Le Quang Hung Dr. Pham Van Viet	Department of Technology and Information
18	ADS	89017	Cloud computing and applications	3		3	3		Dr. Le Thanh Binh Dr. Nguyen Dang Thien Thu	Department of Mathematics and Statistics
19	ADS	89023	Big data management in	3		3	3		Dr. Huynh Cong Tu	Department of

			the Internet of things						Dr. Huynh Nguyen Bao Phuong	Engineering and Technology
20	ADS	89018	Text data mining	3		3	3		Dr. Tran Thien Thanh Dr. Ho Van Lam	Department of Technology and Information
21	ADS	89020	Robotics and autonomous systems	3		3	3		Dr. Huynh Cong Tu Dr. Huynh Nguyen Bao Phuong	Department of Engineering and Technology
22	ADS	89027	Cryptography and data security	3		3	3		Assoc.Prof.Dr. Le Cong Trinh	Department of Mathematics and Statistics
II.2.3. Practical training and internship				4				6		
23	ADS	89028	Project-based internship							Department of Mathematics and Statistics
III. Graduation project				**4**						
24	ADSDA	89025	Master Project					9		Department of Mathematics and Statistics
Total				**60**	**15**	**15**	**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.

12. DETAILED COURSE OUTLINES (APPENDIX)

Binh Dinh, July 31, 2023

RECTOR

Assoc. Prof. Dr. Do Ngoc My