

MINISTRY OF EDUCATION AND TRAINING
QUY NHON UNIVERSITY

MASTER PROGRAM

Level: **Master**

English name: **Data science**

Code: **8460108**

Mode of study: **Full-time**

Binh Dinh, 2023

MASTER PROGRAM

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

of the Rector of Quy Nhon University)

Level:	Master
Major:	Data Science
Code:	8460108
Orientation:	Application
Mode of Study:	Full-time

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. JOD OPPORTUNITIES AND PROFESSIONAL DEVELOPMENT

Graduates of the **Master 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 (PLOs)

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.

+ Socialized 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 meet the following criteria:

- 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 of relevant 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.
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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 ACADEMIC WORKLOAD

6.1. Program Duration: 2 years

6.2. Total Credit workload: 60 credits

Curriculum Structure	Number of Credits
General Knowledge	3
Fundamental and Specialized Knowledge	48
Compulsory courses	27
Elective 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 regulations 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	Assessment Methods	Evaluation criteria	Weighting groups
1	Formative assessment	<i>Attendance:</i> Students must attend all required sessions and must not miss more than 20% of the total class hours.	30%, 40%, 50%
		<i>Discussion:</i> Proactiveness, level of preparation, and active participation in classroom activities.	

		<i>Homework:</i> Students complete one or more assignments at home. Instructors assign specific tasks to individual students or groups of students.	
		<i>Midterm Assessment:</i> 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	<i>Summative Assessment</i>	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. - 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	Se m ester	No. of credits			Prere- quisit e Cours e Code	Departmen t/ Faculty in charge
	Letters	Numbers			Number of credits	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 massive 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 forecasting	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	Graduation project	4	9	0	9		Department of

									Mathematics and Statistics
Total credits					60				

10. TENTATIVE TEACHING PLAN

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

5	ADS	89007	Machine learning and data mining	3	3				Dr. Le Xuan Vinh	Department of Technology and Information
									Dr. Le Xuan Viet	
6	ADS	89022	Deep learning and applications	3		3			Dr. Le Xuan Vinh	Department of Technology and Information
									Dr. Le Xuan Viet	
7	ADS	89019	Mining of masive datasets	3		3			Dr. Tran Thien Thanh	Department of Technology and Information
									Dr. Ho Van Lam	
II.2. Specialized Knowledge										
II.2.1. Compulsory Courses										
8	ADS	89006	Programming for data science	3	3				Dr. Le Xuan Vinh	Department of Technology and Information
									Dr. Ho Van Lam	
9	ADS	89026	Data visualization	3		3			Dr. Tran Thien Thanh	Department of Technology and Information
									Dr. Ho Van Lam	
10	ADS	89010	Specialized scientific data analysis	3		3			By Specialization	Department of Technology and Information
II.2.2. Elective Courses										
11	ADS	89005	Databases and information systems	3		3	3		Dr. Nguyen Thanh Binh	Department of Technology and Information
									Dr. Tran Thien Thanh	

12	ADS	89012	Stochastic processes	3		3	3		Dr. Lam Thi Thanh Tam	Department of Mathematics and Statistics
									Dr. Nguyen Dang Thien Thu	
13	ADS	89013	Numerical analysis	3		3	3		Dr. Nguyen Huu Tron	Department of Mathematics and Statistics
									Assoc.Prof.Dr. Huynh Van Ngai	
14	ADS	89014	Statistical modeling with Python	3		3	3		Dr. Nguyen Van Vu	Department of Mathematics and Statistics
									Dr. Tran Ngoc Nguyen	
15	ADS	89015	Statistical analysis with R	3		3	3		Dr. Le Thanh Binh	Department of Mathematics and Statistics
									Dr. Tran Ngoc Nguyen	
16	ADS	89016	Time series analysis and forecasting	3		3	3		Dr. Le Xuan Viet	Department of Technology and Information
									Dr. Dang Quang Vinh	
17	ADS	89021	Forecasting theory	3		3	3		Dr. Le Quang Hung	Department of Technology and Information
									Dr. Pham Van Viet	
18	ADS	89017	Cloud computing and applications	3		3	3		Dr. Le Thanh Binh	Department of Mathematics and Statistics
									Dr. Nguyen Dang Thien Thu	
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	Department of Technology and Information
									Dr. Ho Van Lam	
21	ADS	89020	Robotics and autonomous systems	3		3	3		Dr. Huynh Cong Tu	Department of Engineering and Technology
									Dr. Huynh Nguyen Bao Phuong	
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	Graduation 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 Data Science 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 Data Science and meets socio-economic development needs.

12. DETAILED COURSE OUTLINES (APPENDIX)

Binh Dinh, 31 July, 2023

**BY THE DELEGATION OF
THE RECTOR
VICE-RECTOR**

DEAN OF DEPARTMENT

**HEAD OF TRAINING
OFFICE**

Assoc. Prof. Dr. Le Cong Trinh

Dr. Le Xuan Vinh

Dr. Dinh Anh Tuan