MINISTRY OF EDUCATION AND TRAINING

LAC HONG UNIVERSITY

POSTGRADUATE PROGRAMME SPECIFICATION

Field of Study:	**INFORMATION TECHNOLOGY**
Program Code:	**8480201**
Level of Training:	**Master's Degree**
Training Orientation:	**Research**
Applicable Cohort:	**2024**

Dong Nai, 2023

TABLE OF CONTENT

MINISTRY OF EDUCATION AND TRAINING
LAC HONG UNIVERSITY

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness

POSTGRADUATE TRAINING PROGRAM

A. INTRODUCTION

The Master's Programme in Information Technology at Lac Hong University is modernly designed with a research-oriented approach that places learners at the center. The programme integrates a variety of teaching methods such as Problem-Based Learning, Project-Based Learning, real-world research, and Blended Learning, aiming to foster learners' proactiveness and problem-solving skills in the complex field of information technology.

A key innovation of the programme is its emphasis on developing research capacity and the ability to adapt to emerging technologies. Students are equipped not only with core and advanced knowledge in areas such as Artificial Intelligence, Big Data, Data Mining, Machine Learning, and Knowledge-Based Systems, but also with the essential skills to take on leadership roles or pursue doctoral studies. The use of diverse assessment methods helps cultivate critical thinking, communication skills, and independent research competence.

B. STRUCTURE AND CONTENT OF PROGRAMME

Field of Study: **Information Technology**

Program Code: **8480201**

Level of Training: **Master's Degree**

Training Orientation: **Research**

Applicable Cohort**: 2024**

(Issued together with Decision No. .../QD-ĐHLH, day ... month ... year ... by the Rector of Lac Hong University)

1. Training duration: 24 months

2. Admission requirements

- Graduated from or eligible for graduation from a bachelor's program (or higher) in a relevant field as listed in Table 1. In cases outside those fields, supplemental coursework covering the topics in Table 2 of the corresponding undergraduate curriculum at Lac Hong University is required

- Foreign language proficiency at Level 3 under Vietnam's Six-Level Foreign Language Proficiency Framework or equivalent

3. List of relevant fields

Table 1. *List of Relevant Fields*

No.	Program Code	Relevant Field Name
1	7480201	Information Technology
2	7480202	Information Security

No.	Program Code	Relevant Field Name
3	7480101	Computer Science
4	7480102	Computer Networks and Data Communications
5	7480103	Software Engineering
6	7480104	Information Systems
7	7480106	Computer Engineering
8	7480107	Artificial Intelligence
9	7480108	Computer Engineering Technology
10	7140209	Mathematics Education
11	7140210	Informatics Education
12	7340122	E-Commerce
13	7340405	Management Information Systems
14	7460107	Computational Science
15	7460108	Data Science
16	7460112	Applied Mathematics
17	7460117	Mathematical Informatics

For applicants holding a bachelor's degree in other fields, they must complete three supplementary modules (9 credits) listed in Table 2. The exact number of courses is determined based on the undergraduate transcript, with each module carrying at least 3 credits.

Table 2. *Supplementary Knowledge Modules*

Names of Supplementary Knowledge Modules	Credits
1. Database Management Systems	3
2. Algorithm Analysis and Design	3
3. Programming Techniques	3

4. Programme Objectives and Learning Outcomes

4.1. Programme educational objectives-PEOs

Graduates of the Master of Information Technology programme, within 3–5 years after graduation, are expected to

PEOs	Educational Objective
PEO1	Develop the ability to explore new knowledge and have in-depth thinking about systems, recognize existing problems, and propose solutions to address them
PEO2	Enhance professional competence to advance personal career development in leadership roles or pursue further studies at the doctoral level.

4.2. Program learning outcomes – PLOs

Using Bloom's taxonomy across Knowledge, Skills, and Attitudes, each PLO statement begins with an action verb reflecting the expected competency level.

Learning Outcome		PEO1	PEO2
PLO1	Evaluate IT projects based on various criteria to identify technical requirements, resources, opportunities, and risks during implementation	✓	
PLO2	Propose optimization and integration solutions to enhance various aspects of IT projects, from requirements analysis, system design, to implementation and performance management.	✓	✓
PLO3	Adapt to changes in diverse contexts to execute complex IT projects effectively	✓	
PLO4	Communicate knowledge effectively in a managerial role to various audiences in both technical and non-technical environments, based on a profound understanding of the research field		✓
PLO5	Enhance research capabilities to support lifelong learning		✓

5. Structure and Curriculum

5.1. Structure

General Knowledge		Foundation Knowledge		Major Knowledge		Thesis
6 credits	➡	Compulsory **7** credits Elective **3** credits	➡	Compulsory **20** credits Elective **9** credits	➡	**15** credits

5.2. Curriculum

No.	Course Code	Course Name	Number of Credits			Year
			Total	Theory	Practical/ Lab/ Discussion	
I	**General Knowledge**		**6**	**6**	**0**	**1**
1	900802	Philosophy	3	3	0	
2	900804	English	3	3	0	
II	**Foundation Knowledge**		**10**	**6**	**4**	
	Compulsory		**7**	4	3	
3	937801	Research Methodology	4	2	2	
4	937822	Graph Theory And Its Applications	3	2	1	

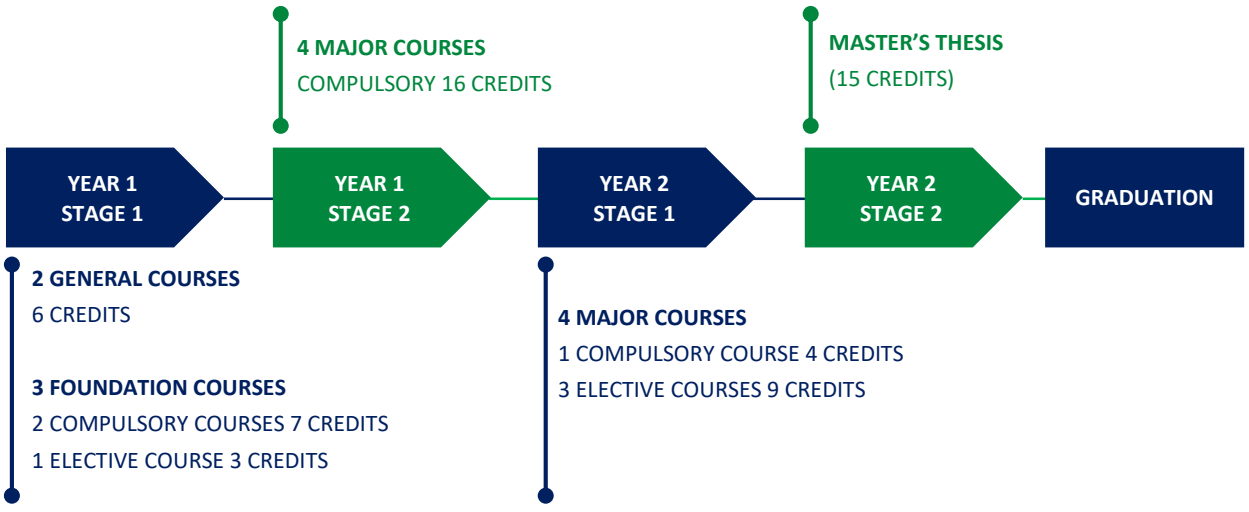
	Elective (Select 1 out of 2)		**3**	**2**	**1**	
5	937804	Advanced Programming Techniques	3	2	1	
6	937823	Statistics and Applying for Computer Science	3	2	1	
III	**Major Knowledge**					
	Compulsory		**20**	**15**	**5**	
7	937824	Data Mining and Applications	4	3	1	
8	937825	Methods of Computing Mathematics	4	3	1	
9	937809	Machine Learning and Its Applications	4	3	1	
10	937826	Data Analytics and Big Data	4	3	1	
11	937811	Image Processing and Its Applications	4	3	1	
	Elective (Select 3 out of 8)		**9**	**6**	**3**	
12	937812	Natural Language Processing	3	2	1	
13	937813	Fuzzy Logic and Its Applications	3	2	1	
14	937814	Computer Network Security Assessment	3	2	1	
15	937815	Knowledge – Based Systems	3	2	1	**2**
16	937816	Deductive Database	3	2	1	
17	937817	Decision Support System	3	2	1	
18	937818	Computer Graphics	3	2	1	
19	937819	Combinatorial Optimization and Its Applications	3	2	1	
IV	**Graduation**		**15**	**0**	**15**	
20	937800	Master's Thesis	15	0	15	
Total			**60**	**33**	**27**	

6. Mapping CLOs to PLOs

Course	**Program Learning Outcomes (PLOs)**				
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**
Philosophy				CLO1	CLO2
English				CLO1	CLO2
Research Methodology			CLO1		CLO2
Graph Theory And Its Applications	CLO1	CLO2			
Advanced Programming Techniques	CLO1		CLO2		
Statistics and Applying for Computer		CLO1			CLO2

Course	Program Learning Outcomes (PLOs)				
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**
Science					
Data Mining and Applications	CLO1	CLO2			
Methods of Computing Mathematics		CLO1	CLO2		
Machine Learning and Its Applications	CLO1		CLO2		
Natural Language Processing	CLO1			CLO2	
Fuzzy Logic and Its Applications			CLO1		CLO2
Computer Network Security Assessment		CLO1			CLO2
Knowledge – Based Systems		CLO1		CLO2	
Deductive Database	CLO1			CLO2	
Decision Support System		CLO1		CLO2	
Computer Graphics	CLO1	CLO2			
Combinatorial Optimization and Its Applications		CLO1		CLO2	
Natural Language Processing			CLO2		CLO2
Fuzzy Logic and Its Applications	CLO1		CLO2		
Master's Thesis	CLO1		CLO2		CLO3

7. Roadmap



8. Teaching Methods

8.1. Mapping Teaching Methods to PLOs

Code	Teaching Methods	PLO1	PLO2	PLO3	PLO4	PLO5
T1	Self-Directed Learning	✓	✓	✓		✓
T2	Group discussion		✓	✓	✓	✓

Code	Teaching Methods	PLO1	PLO2	PLO3	PLO4	PLO5
T3	Problem-Based Learning	✓	✓	✓		
T4	Blended Learning			✓	✓	✓
T5	Project-Based Learning	✓	✓		✓	✓
T6	Case Study Analysis	✓	✓	✓	✓	
T7	Real-world exercises and research	✓	✓	✓	✓	✓

8.2. Mapping Modules to Teaching Methods

Course	Teaching Methods						
	T1	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**
Philosophy		✓		✓		✓	
English		✓		✓	✓		
Research Methodology	✓	✓	✓		✓	✓	✓
Graph Theory And Its Applications	✓		✓		✓		✓
Advanced Programming Techniques		✓	✓		✓	✓	
Statistics and Applying for Computer Science	✓	✓		✓			
Data Mining and Applications	✓		✓		✓		✓
Methods of Computing Mathematics	✓	✓	✓	✓			
Machine Learning and Its Applications	✓		✓		✓		✓
Natural Language Processing	✓	✓	✓	✓	✓		
Fuzzy Logic and Its Applications	✓	✓		✓			
Computer Network Security Assessment		✓		✓	✓	✓	✓
Knowledge – Based Systems	✓		✓		✓	✓	
Deductive Database	✓	✓	✓	✓	✓	✓	
Decision Support System		✓	✓	✓	✓	✓	✓
Computer Graphics	✓		✓		✓	✓	✓
Combinatorial Optimization and Its Applications	✓		✓	✓	✓	✓	✓
Natural Language Processing	✓		✓		✓		
Fuzzy Logic and Its Applications	✓		✓		✓	✓	
Master's Thesis	✓		✓		✓	✓	✓

9. Assessment Methods

9.1. Mapping Assessment Methods to PLOs

Code	Assessment methods	PLO1	PLO2	PLO3	PLO4	PLO5
A1	Group Assessment	✓	✓	✓	✓	
A2	Interviews and Defense Assessments	✓		✓	✓	✓
A3	Written test	✓	✓	✓	✓	✓
A4	Presentations and Proposals		✓	✓	✓	✓
A5	Project Reports / Essays	✓	✓	✓	✓	✓

9.2. Mapping Course to Assessment Methods

Course	Assessment methods				
	A1	**A2**	**A3**	**A4**	**A5**
Philosophy		✓	✓		
English		✓	✓		
Research Methodology	✓			✓	
Graph Theory And Its Applications			✓		✓
Advanced Programming Techniques	✓			✓	
Statistics and Applying for Computer Science			✓		
Data Mining and Applications			✓		✓
Methods of Computing Mathematics					✓
Machine Learning and Its Applications			✓		✓
Natural Language Processing			✓		
Fuzzy Logic and Its Applications			✓		
Computer Network Security Assessment				✓	✓
Knowledge – Based Systems			✓		✓
Deductive Database		✓		✓	
Decision Support System	✓			✓	
Computer Graphics			✓		✓
Combinatorial Optimization and Its Applications				✓	✓
Natural Language Processing			✓		✓
Fuzzy Logic and Its Applications			✓		✓
Master's Thesis		✓		✓	✓

10. Thesis Defense Requirements

a) Has completed all courses in the training program and achieved a cumulative course average of at least 5.5 out of 10;

b) Has submitted the thesis defense registration dossier by the deadline announced by the Faculty of Postgraduate Studies;

c) Has no complaints or allegations regarding the scientific content of the thesis at the time of review;

d) Meets the master's thesis formatting and presentation requirements as stipulated by the University;

e) Has fulfilled all tuition fee obligations as required by the University.

11. Graduation Requirements

a) Has completed all required coursework of the training program and successfully defended the thesis;

b) Has submitted to the Faculty of Postgraduate Studies an electronic copy of the fully revised thesis for use as reference material in the library and for archival purposes;

c) Has submitted a bound hard copy of the thesis, together with a revision report detailing changes made according to the committee's feedback, certified by the supervisor and the Committee Chair as compliant with the committee's conclusions;

d) Has met the foreign language proficiency requirement specified by the program's exit standards prior to graduation review, evidenced by one of the following: A diploma or certificate at a level equivalent to Level 4 of the Vietnamese 6-level Foreign Language Proficiency Framework, or another equivalent certificate recognized by the Ministry of Education and Training; A bachelor's degree or higher in a foreign language; A bachelor's degree or higher in another field in which the entire program was conducted in a foreign language.

12. Graduate Career Opportunities

Upon graduation, students will be capable of:

- Serving in enterprise leadership or technical roles (e.g., CTO, CIO, CEO, Senior Engineer, etc.);
- Conducting research in research & development departments;
- Developing plans and project proposals, and organizing, directing, and managing IT projects in organizations and enterprises;
- Performing effectively in R&D roles;
- Teaching at universities specializing in Information Technology;

C. COURSE DESCRIPTION

900802 – Philosophy

Understand the history of philosophy, the fundamental content of doctrines that have influenced the life of the Vietnamese people, the advanced content of Marxist-Leninist philosophy, and selected topics in the fields of nature and science and technology. Grasp the philosophical methodology in perceiving and researching subjects in the fields of natural science and technology. Recognize the philosophical theoretical foundations of the

Vietnamese revolutionary path, especially the strategy for the development of science and technology in Vietnam.

Learning Outcomes

- **CLO1: Demonstrate** the philosophical theoretical foundations of Vietnam's revolutionary path, with a special focus on the strategy for developing science and technology in Vietnam
- **CLO2: Integrate** philosophical principles into scientific research activities

900804 – English

Understand and apply vocabulary and terminology related to construction, materials, etc., to answer questions in spoken form. Be able to read and comprehend articles, reports, and documents in the construction field, and use them to respond to topic-related questions verbally. Demonstrate an awareness of gradually improving specialized vocabulary at increasing levels of complexity

Learning Outcomes

- **CLO1: Assist** drafting activities, including presentations and scientific papers
- CLO2: **Maintain** foreign language proficiency for continued advanced study

937801- Research Methodology

Equip learners with methodological foundations in scientific research, enabling them to independently develop a proposal for an applied research topic, a master's thesis, and orient themselves toward designing higher-level research outlines in the fields of natural sciences and engineering. Additionally, guide learners on how to construct a scientific paper following standard formats; familiarize them with global indexing systems for scientific publications. Moreover, help learners develop academic writing skills appropriate for scientific works, as well as presentation skills for research projects at scientific conferences and thesis defenses before academic committees.

Learning Outcomes

- CLO1**: Establish** responsibility and a commitment to uphold ethical standards in scientific research, proactively learn and apply research skills to contribute positively to scientific projects
- CLO2: **Act** a systematic scientific research process, from identifying the problem and collecting and analyzing data to presenting results in a logical and scholarly manner

937822 - Graph Theory And Its Applications

This course revisits foundational knowledge in logic and graph theory previously studied at the undergraduate level, while also introducing new concepts with a focus on developing graph-related problems and algorithms for applications. The following topics are covered to support this goal:

- Propositional logic, predicate logic, and their applications in knowledge representation
- Graph theory and methods for representing graphs on computers
- Trees and spanning trees of graphs
- Graph traversal algorithms

- Applications of computer science based on graph theory

In addition to providing knowledge and skills in applying graph theory, the course also equips learners with:

- Techniques for representing graphs on computers
- Programming graph traversal algorithms

Learning Outcomes

- CLO1**: Evaluate** real-world problem requirements and model them as graphs to optimize implementation cost
- CLO2: **Design** optimal solutions for complex practical problems such as shortest-path, maximum-flow, computer networks, social networks, decision trees, resource allocation, traffic management, etc

937804 - Advanced Programming Techniques

This course revisits programming knowledge acquired at the undergraduate level and introduces advanced programming concepts, with a focus on developing problem-solving skills through programming. The following topics are covered to support this objective:

- Basic Python programming and object-oriented programming
- Creating and working with graphical user interfaces (GUIs)
- Utilizing open-source libraries, Python, and machine learning techniques
- Analysis and evaluation of algorithms, growth rate, and computational complexity

Learning Outcomes

- CLO1**: Evaluate** algorithms and their computational complexity, then propose optimal solutions to enhance the project's performance and quality
- CLO2: **Adapt** to new situations

937823 - Statistics And Applying For Computer Science

This course revisits set theory, combinatorics, probability theory, and statistics previously studied at the undergraduate level, while introducing advanced concepts to focus on probability-statistics applications and algorithmic relevance. Key topics include:

- Sets and combinatorial analysis
- Introduction to statistics, data types, data sampling, data aggregation and visualization, frequency distributions
- Events and probability, expectation, variance, median, and standard deviation
- Discrete probability distributions (e.g., Binomial, Poisson), continuous distributions (e.g., Normal, Standard Normal), sampling distributions, estimation tools, Central Limit Theorem, binomial-to-normal approximation
- Statistical parameter estimation, hypothesis testing, correlation, and regression analysis

Learning Outcomes

- CLO1: **Develop** solutions for real-world problems such as computing expectation and variance, estimating population parameters, and performing hypothesis tests
- CLO2: **Enhance** the ability to synthesize and analyze problem requirements based on knowledge of set theory, combinatorics, and probability–statistics

937824 - Data Mining and Applications

This course provides fundamental knowledge of data mining (DM), the knowledge discovery process, the main stages of data mining, and several widely used data mining techniques. In addition, it introduces learners to current research trends and challenges in the field of data mining. Learners will be equipped with and practice key DM techniques such as data preprocessing, frequent itemsets and association rules, classification, clustering, and text mining. Through hands-on exercises and seminars, learners will deepen their understanding of theoretical concepts and develop the ability to use data mining tools effectively. Furthermore, students will work on a group project to solve a real-world data mining problem

Learning Outcomes

- CLO1: **Evaluate** the effectiveness of data mining algorithms
- CLO2: **Propose** suitable data mining models using techniques such as frequent itemset mining and association rule learning, sequential pattern mining, data classification, data clustering, and text mining, and apply them to real-world problems

937825 - Methods of Computing Mathematics

This course aims to systematize and reinforce foundational mathematical knowledge frequently used in computer science during the era of data science and artificial intelligence. It enhances learners' understanding of how observational data (datasets) are represented, clarifies the concept of models, and explores learning mechanisms. The following topics are covered:

- Mathematical foundations such as linear algebra, analytic geometry, vector calculus, and matrix decomposition
- Least squares method
- Principal Component Analysis (PCA) for dimensionality reduction
- Probability distributions and probability estimation using Gaussian Mixture Models (GMM)
- Support Vector Machines (SVM) for classification tasks

In addition to mathematical and conceptual knowledge, the course also equips learners with the skills to design high-performance computing systems by leveraging multi-core, multi-processor, and distributed computing environments. Topics include:

- Analysis, design, and evaluation of parallel algorithms
- Parallel programming on shared-memory computers and distributed systems

Learning Outcomes

- CLO1**:** **Develop** parallel algorithms on computing systems, including shared-memory architectures and distributed clusters
- CLO2**:** **Adapt** to new technologies in the field of machine learning to solve problems such as regression, classification, dimensionality reduction, and probability estimation

937809 - Machine Learning and Its Applications

This course provides learners with knowledge of machine learning from fundamental to advanced levels, along with its applications in modern practice. Key theoretical concepts covered include:

- Supervised and unsupervised learning

- Core learning algorithms such as: Linear Regression, K-Means, Decision Tree, Artificial Neural Networks, Bayes, Support Vector Machines, Hidden Markov Models, and Genetic Algorithms
- Deep learning models for computer vision: CNN, R-CNN, Fast R-CNN, Faster R-CNN, YOLO, SSD
- Deep learning models for sequential data: RNN, LSTM, Transformer

Learning Outcomes

- CLO1**: Evaluate** the performance of machine learning models
- CLO2**: Adapt** to modern machine learning architectures to address problems across domains such as classification, clustering, anomaly detection, natural language processing, and other applications

937826 - Data Analytics and Big Data

This course provides foundational knowledge and concepts related to Big Data, including how it works and its real-world applications. It also introduces popular data analysis methods used today. The following topics are covered to support this learning objective:

- What is Big Data?
- How Big Data systems operate
- Common data analysis methods
- The use of R and Python in data analysis
- Clustering techniques
- The K-means algorithm for data clustering

Learning Outcomes

- CLO1**: Evaluate** big data processing methods to extract insights from complex datasets, and accordingly propose effective solutions for practical applications
- CLO2**: Demonstrate** analysis results by visualizing information from complex datasets using R and Python

937811 - Image Processing and Its Applications

This course introduces fundamental concepts in image processing, image properties, image transformations, methods for image analysis and preprocessing, as well as image compression techniques. It equips learners with foundational knowledge of mathematical models used in image processing, techniques for analyzing and processing digital images, conceptual understanding of real-world applications, and programming skills for implementing relevant algorithms.
Topics covered include:

- **Overview of image processing**: definition, fundamental problems, key concepts, image acquisition and representation, enhancement and transformation, image analysis, recognition, compression, and application domains.
- **Image representation**: visual perception, color representation, color spaces (RGB, CMY, HIS, YCbCr), image acquisition, storage, and common image formats.
- **Image enhancement**: statistical operations, gray-level transformations, histogram techniques, multi-image operations, spatial domain techniques, convolution and templates, average filtering, k-element average filtering, median filtering.
- **Segmentation and edge detection**: edge detection methods (Gradient, Laplace, Canny), image segmentation techniques (thresholding, region-based segmentation, texture-based segmentation).

- **Morphological operations**: basic morphology (binary erosion, dilation, opening, closing), skeletonization techniques (with and without thinning).
- **Image compression**: compression methods such as Run Length Encoding, Huffman coding, LZW, and JPEG compression.
- **Applications**: object detection, Hough transform and its uses, content-based image retrieval, character recognition, and deep learning-based image processing

Learning Outcomes

- CLO1: **Integrate** advanced image enhancement, segmentation, edge detection, morphological operations (dilation and erosion), skeletonization, and image compression techniques to support solving real-world problems.
- CLO2: **Develop** and deploy applications to tackle a variety of practical tasks, including object detection, Hough transform, image retrieval, character recognition, and medical image analysis using Deep Learning methods.

937812 - Natural Language Processing

This course aims to consolidate knowledge of artificial intelligence acquired at the undergraduate level and introduce methods for applying AI to the analysis, recognition, and synthesis of natural language. It serves as a foundation for various directions such as language understanding, machine translation, speech processing, text summarization, and information extraction. The course also introduces the specific characteristics of the Vietnamese language in the context of computational processing

Learning Outcomes

- CLO1: **Design** applications for machine translation, text summarization, information extraction, and speech processing.
- CLO2: **Enhance** analytical capabilities—such as syntax, production rules, and inference trees—to apply to new real-world problem domains: pragmatic analysis, sentiment analysis, discourse processing, etc.

937813 - Fuzzy Logic and Its Applications

This course provides learners with foundational mathematical knowledge of fuzzy sets, fuzzy logic, operations, and relationships within fuzzy set theory. It introduces fuzzy reasoning to solve problems such as fuzzy association rule mining, fuzzy control, and fuzzy clustering—serving as a basis for exploring the field of Computational Intelligence.
The course covers the following topics:

- Fuzzy sets as a generalization of classical set theory
- Operations on fuzzy sets
- The concept of fuzzy relations interpreted as fuzzy sets
- Fuzzy composition and fuzzy implications
- Applications in control systems
- Solving fuzzy control problems using Python
- Clustering as an organization of elements into fuzzy sets
- Applications of fuzzy clustering algorithms
- Applications of fuzzy association rules

Learning Outcomes

- CLO1: **Design** a solution for a real-world problem based on membership functions and fuzzy inference systems in fuzzy logic

- CLO2: **Demonstrate** the fuzzy inference systems and the operations in fuzzy set theory

937814 - Computer Network Security Assessment

This course is designed for the master's level and builds upon undergraduate knowledge in subjects such as Computer Networks and Network Security. It focuses on providing foundational knowledge of computer network security to raise awareness of network protection for both administrators and users. The course helps learners understand the processes of network security assessment and how to develop such processes for specific network environments.
Key topics covered include:

- Fundamentals of computer networks and networking protocols
- Classification and analysis of network security vulnerabilities
- Security requirements for data and network services, including confidentiality, integrity, availability, user authentication, message authentication, and digital signatures
- Procedures for assessing the security of various network services and overall network environments
- Common types of network attacks and corresponding defense strategies
- Tools used in cybersecurity attacks and network security assessments

Learning Outcomes

- CLO1: **Evaluate** incoming server requests to identify threats and implement security measures—such as establishing DMZ zones, firewalls, IDS, and IPS—to prevent unauthorized access to the system
- CLO2: **Advise** on data and network service security issues, including the CIA triad (Confidentiality – Integrity – Availability), user authentication, data authentication, and organizational digital signatures

937815 - Knowledge – Based Systems

Knowledge-based systems, also known as knowledge systems, are a representation of artificial intelligence aimed at solving complex problems. Therefore, this course introduces fundamental models and languages for knowledge representation, including those used for uncertain and imprecise knowledge. Additionally, it provides principles and algorithms of machine learning.
Main topics include:

- Basic models and languages for knowledge representation
- Models and languages for representing uncertain and imprecise knowledge
- Principles and algorithms in machine learning

Learning Outcomes

- CLO1: **Design** a system based on algorithms such as decision trees, Bayesian learning methods, neural networks, and genetic algorithms
- CLO2: **Demonstrate** the components related to knowledge representation, including rules, graphs, and models for representing uncertain and imprecise knowledge

937816 - Deductive Database

This course consolidates foundational knowledge of databases acquired at the undergraduate level and provides advanced knowledge on methods for inferring information from databases, various approaches to building deductive databases, and selected practical applications

Learning Outcomes

- CLO1: **Evaluate** the performance of information queries on a database
- CLO2: **Build** an inference database using propositional logic, predicate logic, Datalog, deduction rules, forward chaining, backward chaining, etc

937817 - Decision Support System

This course provides an overview of decision support systems (DSS), enabling learners to more easily absorb the rapidly evolving and expanding body of knowledge in the field of computer science and information technology

Learning Outcomes

- CLO1: **Design** a decision support system, including its database, user interface, and model base
- CLO2: **Demonstrate** the components of a decision support system

937818 - Computer Graphics

This course introduces fundamental topics in computer graphics such as drawing algorithms, geometric transformations, projections, color, and lighting. Additionally, it covers the VRML language, modeling techniques, and animation techniques

Learning Outcomes

- CLO1: **Integrate** VRML, modeling techniques, and animation techniques in the development of interactive virtual reality applications
- CLO2: **Develop** new variations based on geometric transformations to address emerging real-world problem scenarios.

937819 - Combinatorial Optimization and Its Applications

Optimization aims to “achieve the best possible outcome with available resources,” and this course introduces the foundational knowledge of this applied science field. However, the course focuses specifically on combinatorial optimization problems for two main reasons:

- These problems are closely associated with the discrete approaches of computer science, and
- They have numerous practical applications in engineering and management.

More specifically, the course provides fundamental knowledge of combinatorial optimization and its practical applications. Upon completing the course, students will be able to:

- Understand the practical significance of combinatorial optimization
- Apply mathematical optimization tools to model real-world problems
- Understand and use numerical and computational methods to solve and analyze optimization models
- Interpret computed results in a practical, real-world context

Learning Outcomes

- CLO1: **Evaluate** the differences between linear models and combinatorial optimization
- CLO2: **Integrate** computational methods with appropriate integer linear programming models to formulate and model real-world optimization problems (e.g., network design and scheduling problems)

937800 – Master's Thesis

All Master of Information Technology students are required to complete a master's thesis after finishing all coursework. The thesis, whether in applied science or academic research, must align with the major approved by the Scientific Council. Specifically, it focuses on:
Analyzing problems, evaluating implementation methods, proposing optimal solutions, and presenting research results for IT-related projects that contribute to the scientific community. In addition, the thesis requires students to demonstrate professional working styles and ethical conduct.
Students are required to have a clear thesis implementation plan and regularly report their progress to the supervising instructor according to a mutually agreed schedule

Learning Outcomes

- CLO1: **Evaluate** research works and methodologies to apply them in solving practical problems
- CLO2: **Integrate** research methods and technologies for analysis and modeling in order to propose optimal solutions to complex issues in the field of Information Technology
- CLO3: **Develop** standards of research ethics, demonstrating responsibility and integrity throughout the execution and presentation of the thesis

DEAN **RECTOR**