Module description catalog
Program in Mathematics

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- ## General Education
    - ### 1. Marxist philosophy - BAA00101

Module designation	Marxist philosophy
Code, if applicable	BAA00101
Semester(s) in which the module is taught	1st semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	45
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The course equips students with the basic contents of the worldview and the Marxist-Leninist philosophical methodology. Helping students apply knowledge about the worldview, Marxist-Leninist philosophy, and philosophy creatively in cognitive and practical activities, to solve problems that the social life of a country or of the time being set.
Content	Marxist-Leninist philosophy is a course in the Marxist-Leninist knowledge block and Ho Chi Minh Thought. This module equips students with basic, general, and systematic knowledge of the problems of Marxist-Leninist philosophy. From there, learners have a basis and reasonable research and learning methods and apply them to the process of evaluating life phenomena.

Module designation	Marxist philosophy
Code, if applicable	BAA00101
Semester(s) in which the module is taught	1st semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Examination forms	
Study and examination requirements	Presentation: 15% Midterm exam: 20% Discussion: 15% End semester exam: 50%
Reading list	Giáo trình những nguyên lý cơ bản của chủ nghĩa Mác Lê-nin, NXB Chính trị quốc gia. Giáo trình Triết học Mác – Lê nin, NXB Chính trị quốc gia.

2. Marxist-Leninist Political Economy - BAA00102

Module designation	Marxist-Leninist Political Economy
Code, if applicable	BAA00102
Semester(s) in which the module is taught	1st semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	30
Credit points	2
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	Firstly, equip students with basic and core knowledge of Marxist-Leninist political economy in the context of economic development of the country and the world today. Ensure the basic, systematic, scientific, update new knowledge, associate with practice, creativity, skills, thinking, learner quality, connectivity to overcome duplication, enhance integration and reduce the load, reduce content that is no longer relevant or scholastic content for students of non-theoretical colleges and universities. Second, on that basis, forming thinking and analytical skills, assessing and identifying the nature of economic benefit relations in the country's socio-economic development, contributing to helping students build appropriate social responsibility in the job position and life after graduation. Third, contribute to building the stance and ideology of Marxism-Leninism towards students.
Content	The program content consists of six chapters: in which chapter one discusses the objects, research methods, and functions of the Marxist-Leninist Political Economy. Chapters 2 to 6 present the core content of the Marxist-Leninist political economy according to the subject's objectives. Specifically, issues such as goods, markets and the role of actors in the market economy; Producing surplus value in a market economy; Competition and monopoly in the market economy; Socialist-oriented market economy and economic interest relations in Vietnam; Industrialization, modernization, and international economic integration in Vietnam.
Examination forms	
Study and examination requirements	Presentation: 15% Midterm exam: 20% Discussion: 15% End semester exam: 50%
Reading list	Giáo trình kinh tế chính trị Mac – Lê nin dành cho bậc đại học không chuyên kinh tế chính trị.

○ 3. Science socialism - BAA00103

Module designation	Science socialism
Code, if applicable	BAA00103
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	30
Credit points	2
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The subject equips students with the basic contents of scientific socialism (one of the three components constituting Marxism-Leninism). Helping students apply basic knowledge of scientific socialism creatively in cognitive and practical activities, solving problems that affect the social life of a country, of the times being set.
Content	The subject equips students with the basic contents of scientific socialism (one of the three components constituting Marxism-Leninism).Helping students apply basic knowledge of scientific socialism creatively in cognitive and practical activities, solving problems that the social life of a country, of the times being set.

Examination forms	
Study and examination requirements	Presentation: 15% Midterm exam: 20% Discussion: 15% End semester exam: 50%
Reading list	Giáo trình Chủ nghĩa xã hội khoa học, NXB Chính trị quốc gia. Giáo trình Những nguyên lý cơ bản của chủ nghĩa Mác – Lênin, NXB Chính trị quốc gia.

○ 4. History of Vietnamese Communist Party - BAA00104

Module designation	History of Vietnamese Communist Party
Code, if applicable	BAA00104
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	30
Credit points	2
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	In terms of content: providing systematic and basic knowledge about the birth of the Communist Party of Vietnam (1920-1930), the Party's leadership over the Vietnamese revolution during the period of political struggle. government authority (1930-1945), in two resistance wars against French colonialism and American imperialism (1945-1975), in the cause of national construction and defense during the country's transition to socialism. association, conducting the renovation work (1975-2018). Ideologically: Through historical events and experiences on the leadership of the Party to build a sense of respect for objective truths, raise pride and confidence in the Party's leadership cause. About skills: Equipping with scientific thinking methods on history, skills in choosing research materials, studying subjects and the ability to apply historical awareness to practical work, criticizing misconceptions on the history of the Party.
Content	The course provides systematic and fundamental knowledge about the birth of the Communist Party of Vietnam (1920-1930), the Party's leadership for the Vietnamese revolution during the period of struggle for power (1930-1945), during the two resistance wars against the French colonialists and the American imperialists (1945-1975), in the cause of national construction and defense during the period of the whole country's transition to socialism, conducted doi moi (1975-2018). Through historical events and experiences in the leadership of the Party to build a sense of respect for objective truth, heighten pride and confidence in the Party's leadership. Equip scientific thinking methods on history, skills in choosing research materials, studying subjects, and the ability to apply historical awareness to practical work, and criticize misconceptions about the history of the Party.
Examination forms	
Study and examination requirements	Presentation: 15% Midterm exam: 20% Discussion: 15% End semester exam: 50%

Reading list	Chương trình môn học Lịch sử Đảng Cộng sản Việt Nam, BGD Đào tạo ban hành.

5. HoChiMinh's Thoughts - BAA00003

Module designation	HoChiMinh's Thoughts
Code, if applicable	BAA00003
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	30
Credit points	2
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	About knowledge: Equip students with basic knowledge about the concept, origin, the process of formation and development of Ho Chi Minh thought; the basic contents of Ho Chi Minh's thought; the application of the Communist Party of Vietnam in the national-democratic revolution and the socialist revolution, in the current national renewal process. About skills: Helping students to think, analyze, evaluate, and creatively apply Ho Chi Minh's Thoughts to solve problems in real life, study and work. About attitudes: Helping students improve their political bravery, patriotism, loyalty to the goal, the ideal of national independence associated with socialism; aware of the role and value of Ho Chi Minh's thought for the Vietnamese Party and nation; realize their responsibility in studying and training to contribute to the construction and defense of the country.
Content	Description of course content: the subject equips students with basic knowledge about objects, research methods, and learning meanings of Ho Chi Minh's ideology; on the basis, of the process of formation and development of Ho Chi Minh thought; on national independence and socialism; on the Communist Party and the State of Vietnam; on great national and international solidarity; about culture, ethics, people.
Examination forms	
Study and examination requirements	Presentation: 15% Midterm exam: 20% Discussion: 15% End semester exam: 50%
Reading list	Giáo trình Tư tưởng Hồ Chí Minh, NXB Chính trị quốc gia. Tài liệu hướng dẫn học tập Tư tưởng Hồ Chí Minh, ĐHQG - TPHCM

6. Introduction to Vietnamese Law System - BAA00004

Module designation	Introduction to Vietnamese Law System
Code, if applicable	BAA00004
Semester(s) in which the module is taught	1st semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	45
Credit points	3
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	General Objective: By the end of the course, students will be able to understand the basic legal concepts and terms related to the country's legal system and state apparatus; apply legal provisions to solve some simple case studies; help students form and develop some skills such as looking up legal documents, analyzing legal regulations, and working in groups, thereby improving their sense of survival, learning and working following the Constitution and regulations. The law, the right behavior orientation in life. Specific objectives/course output standards: • Knowledge: Present basic legal concepts and terms related to the state apparatus and the Vietnamese legal system; Solve some exercise cases based on the provisions of a law book in the legal system of Vietnam; • Skills: Analyzing legal regulations; Lookup legal documents; Working group • Attitude, diligence: Raise awareness of living, studying, and working following the Constitution and the law.
Content	The module provides knowledge about the structure of the State apparatus as well as the functions, authority, and legal status of agencies in the State apparatus of the Socialist Republic of Vietnam in terms of economic management; Legal nature, and structure of the system of legal documents. From an overview of the system of legal branches in our State's legal system, a course is devoted to studying the basic contents of administrative law, civil law, and criminal law as branches of law. the main law (original branches of law) of the legal system, so that learners can easily access themselves to other branches of law arising from these major branches of law.
Examination forms	
Study and examination requirements	Final exam: 50%
Reading list	Giáo trình Pháp luật đại cương, ĐH Luật TPHCM. Giáo trình Lý luận về nhà nước và pháp luật, Trường ĐH Luật Hà Nội

7. General Economic - BAA00005

Module designation	General Economic
Code, if applicable	BAA00005
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	30
Credit points	2
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	Knowledge: Grasp the basic content of Microeconomics - a part of economics. Specifically : Understand the theory of economic choice, the influence of the law of scarcity, and economic models on economic choice. Understand the theory of supply and demand. Understand the theory of consumer behavior. Understand the theory of producer behavior. Understand the theory of competition and monopoly. Understand the theory of factor markets. Understand the theory of the role of government. Understand the analysis of the influence of factors on the balance of the market, in terms of skills Having the ability to apply the knowledge learned to study the nature of economic phenomena, the laws, and trends of the phenomena, and the laws of the market economy. Ability to apply the knowledge learned in the study of macroeconomics, development economics, and several other economic subjects. Forming and developing (one step) capacity to collect information, skills to synthesize and systematize issues in an overall relationship; skills to compare, analyze, comment, and evaluate micro-economic issues. Develop reasoning and public speaking skills. about attitude Trying to be righteous in recognizing and evaluating the lines, policies, and laws of the State of Vietnam in the development of the market economy with the state's regulation. Other Objectives: Through presentations and problem-solving. Forming and developing collaboration and teamwork skills; Develop skills of creative thinking, discovery, and discovery; Cultivate and develop assessment and self-assessment capacity; Develop public speaking and commenting skills.

Content	The course presents some basic problems of economics; principles of economics, supply and demand patterns and market equilibrium; theory of consumer behavior and business behavior; types of markets; aggregate supply, aggregate demand, and measure national output.
Examination forms	
Study and examination requirements	Homework: 20% Midterm exam: 20% Final exam: 60%
Reading list	Nguyên lý kinh tế học, NXB Thống kê. Kinh tế học vi mô, NXB Giáo dục

8. General Psychology - BAA00006

Module designation	General Psychology
Code, if applicable	BAA00006
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	30
Credit points	2
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	About knowledge - Understand the system of basic concepts of psychological science and research methods in psychology. - Understand the origin, formation and development of psychology and consciousness. - Understand the nature of human psychological processes: perception; emotion - affection; act. - Identify human psychological states. - Understand the psychological attributes that make up the personality structure. Understand the factors affecting the formation and development of personality. About skills Developing the capacity to study documents: Analyze, synthesize, compare, and generalize. Form and develop the ability to identify psychological phenomena, and apply learned knowledge to solve practical problems. Consulting and consulting skills. About attitude: Cultivate a passion for learning and studying subjects. Forming a sense of initiative and positivity in self-study. Form the right motivation in learning. Raise a sense of responsibility for group activities. Other goals: Forming personality qualities in accordance with the requirements of the integration period. Forming communication and behavioral skills in the community. Forming a modern and scientific way of living and working. Forming and developing the ability to think creatively, independently and critically. Skill formation: Reasoning skills; Public speaking skills; Form and develop teamwork skills.
Content	The course of general psychology helps learners to acquire basic knowledge about the nature and characteristics of psychological phenomena and basic psychological laws of humans (perception, emotion, will, etc.) actions and personalities...). On that basis, it helps learners to apply knowledge in practice to identify and distinguish basic psychological phenomena in humans.
Examination forms	

Study and examination requirements	
Reading list	Đề cương bài giảng môn Tâm lý học đại cương, ĐH Luật TPHCM. Giáo trình tâm lý học đại cương, NXB Công an nhân dân

- **9.** Team-working and learning skills

Module designation	TEAM-WORKING AND LEARNING SKILLS
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	30
Credit points	2
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General objectives: ● Specific objectives/subject output standards: Equip students with knowledge and skills about teamwork and study skills. Bringing career orientations to group work practice topics. ● Skills: teamwork, presentation, communication ● Attitude, diligence: serious, diligent, positive
Content	Understand the concept of groups, how to form groups, classify groups, functions and tasks of group members. Know the process of teamwork, the necessary skills when working in groups. Able to plan and execute projects. Understand and apply learning skills.
Examination forms	
Study and examination requirements	Exam: 20%, Exercises : 20%, Projects: 60%
Reading list	Thuật lãnh đạo nhóm, NXB Trẻ. Học tập cũng cần chiến lược, NXB Lao động Xã hội

10. English 1 - BAA00011

Module designation	English 1
Code, if applicable	BAA00011
Semester(s) in which the module is taught	1st semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	Fundamental Knowledge
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	Upon completing this course, learners will enhance their basic knowledge of general English vocabulary and grammar in four skills: Listening, Speaking, Reading and Writing. Here are the objectives in detail: - Learners will be able to understand and use vocabulary in various topics such as leisure activities, important life events, emotion, attitude, physical appearance description, travel plans, presenting dreams, countries, people, and languages. - Learners can understand and use grammar structures at the pre-intermediate level such as basic tenses and other related matters. - Learners will be able to choose the answer that best describes the given picture, choose the correct response to the questions, and understand dialogues and short monologues. - Learners will be able to pronounce single words, word clusters and sentences, describe a given picture, and build basic communications in daily life. - Learners will be able to comprehend 300-500 word passages of familiar topics, and gain more knowledge of different cultures around the world. - Learners can write essays about familiar topics related to daily life, learning activities, entertainment, events, etc.
Content	This course is designed for non-English major students at the University of Science - Vietnam National University - Ho Chi Minh City, using the first eight modules in the book New Cutting Edge (Pre-intermediate). These modules cover vocabulary, grammar, reading, listening, speaking and writing in a wide range of topics such as leisure activities, important life events, feelings and emotions, attitudes, physical appearance descriptions, travel plans, presenting dreams, countries, people, and languages. Students need to complete various tasks, including presentations, debates, role-plays, assignments, tests and so on.
Examination forms	

Study and examination requirements	Mid-term test: 20% Final exam: 80%
Reading list	1.Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). TVew Cutting Edge, pre-intermediate: student's book. Harlow : Pearson Education. 2. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). *New Cutting Edge,* pre-intermediate: workbook. Harlow : Pearson Education.

11. English 2 - BAA00012

Module designation	English 2
Code, if applicable	BAA00012
Semester(s) in which the module is taught	2nd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	Fundamental Knowledge
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	Upon completing this course, learners will enhance their basic knowledge of general English of vocabulary and grammar in four skills: Listening, Speaking, Reading and Writing. Here are the objectives in detail: - Learners will be able to understand and use vocabulary in various topics such as everyday items, important life events, holiday plans, health problems, hobbies and interests, personalities, finance- related issues. - Learners can understand and use grammar structures in pre-intermediate level such as basic tenses and more complex grammatical structures including conditional sentences, passive, and verb patterns. - Learners will be able to choose the correct response for the questions, and understand dialogues and short monologues. - Learners will be able to pronounce words, generate short conversations, discuss real-life familiar topics, understand and quickly respond to generated questions, and improve basic communication skills in daily life. Learners will be able to comprehend 500-700 word passages of familiar topics, and gain more knowledge of different cultures around the world. - Learners can write appropriate responses to written requests or complaints in business and social contexts, applying theories into real life practice.
Content	This course is designed for non-English major students at the University of Science - Vietnam National University - Ho Chi Minh City, using seven modules (modules 09-15) in the book New Cutting Edge (Pre-intermediate). These modules cover vocabulary, grammar, reading, listening, speaking and writing in a wide range of topics such as everyday items, important life events, holiday plans, health problems, hobbies and interests, personalities, and finance-related issues. Students need to complete various tasks, including presentations, debates, role-plays, assignments, tests and so on.
Examination forms	

Study and examination requirements	Mid-term test: 20%, Final exam: 80%
Reading list	1.Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). TVew Cutting Edge, pre-intermediate: student's book. Harlow : Pearson Education. 2. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). *New Cutting Edge,* pre-intermediate: workbook. Harlow : Pearson Education.

12. English 3 - BAA00013

Module designation	English 3
Code, if applicable	BAA00013
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	Intermediate Knowledge
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	Upon completing this course, learners will enhance their basic knowledge of general English of vocabulary and grammar in four skills: Listening, Speaking, Reading and Writing. Here are the objectives in detail: Learners will be able to understand and use vocabulary in various topics such as leisure activities, important life events, emotion, attitude, physical appearance description, travel plans, dreams, countries, people, and languages. Learners can understand and use new language in a natural, communicative way. Learners will be able to present their opinions about some social and cultural issues and understand dialogues and talks. Learners will be able to comprehend 500-700 word passages of familiar topics, and gain more knowledge of different cultures around the world. Learners can write paragraphs about familiar topics related to daily life, learning activities, entertainment, events, etc.
Content	This course is designed for non-English majors at the University of Science - Vietnam National University - Ho Chi Minh City, using the first six modules in the book New Cutting Edge (Intermediate). These modules cover vocabulary, grammar, reading, listening, speaking and writing in a wide range of topics, namely leisure activities, important life events, feelings and emotions, attitudes, physical appearance descriptions, travel plans, presenting dreams, countries, people, and languages. Students need to complete various tasks, including presentations, debates, role-plays, doing homework, tests and so on.
Examination forms	
Study and examination requirements	Mid-term test: 20%, Final exam: 80%
Reading list	1.Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, Intermediate: student's book. Harlow: Pearson Education. 2.Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). New Cutting Edge, Intermediate: workbook. Harlow: Pearson Education. 3. Materials prepared by the lecturer

13. English 4 - BAA00014

Module designation	English 4
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	Intermediate Knowledge
Teaching methods	Do lecturing, teamwork, divide students into groups to solve problems
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Upon completing this course, learners will enhance their intermediate knowledge of general English vocabulary and grammar in four skills: Listening, Speaking, Reading and Writing. Here are the objectives in detail: Learners can understand and use the language needed in more complex real-life situations in a natural, communicative way. Learners will be able to express their own ideas in interviews, mini-talks, problem-solving and storytelling. Learners will be able to comprehend 700-1000 word passages of up-to-date topics of international interest, and learn more about the world and other cultures. Learners can write essays about familiar topics related to daily life, learning activities, entertainment, events, etc.
Content	This course is designed for non-English majors at the University of Science - Vietnam National University - Ho Chi Minh City, using six modules (modules 07-12) in the book *New Cutting Edge* (Intermediate). These modules cover vocabulary, grammar, reading, listening, speaking and writing in a wide range of topics namely *everyday items, important life events, holiday plans, health problems, hobbies and interests, personalities,* and *finance-related issues.* Students need to complete various tasks, including

	presentations, debates, role-plays, doing homework, tests and so on.
Examination forms	
Study and examination requirements	Mid-term test: 20%, Final exam: 80%
Reading list	1. Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). *New Cutting Edge,* Intermediate: student's book. Harlow: Pearson Education. 2.Sarah Cunningham, Peter Moor, Jane Cornyns Carr (2005). *New Cutting Edge,* Intermediate: workbook. Harlow: Pearson Education. 3. Materials prepared by the lecture 4. (2012). Collins Skills for the TOEIC test: Speaking and Writing. Harper Collins UK.

14. Analysis 1A

Module designation	Analysis 1A
Semester(s) in which the module is taught	1
Person responsible for the module	Department of Analysis
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	45
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The objective of the module is to equip students with the basic knowledge of the foundation of calculus as the foundation for specialized modules.
Content	The course covers the basics of real numbers, sequences and series of real numbers.
Examination forms	
Study and examination requirements	
Reading list	[1] Mathematica by example, Academic Press, New York Calculus, Harcourt Brace College Publishers, New York [2] Giáo trình Giải tích 1. Nhà xuất bản Thống Kê, Tp Hồ Chí Minh

15. Calculus 1A

Module designation	CALCULUS 1A
Semester(s) in which the module is taught	1
Person responsible for the module	Department of Analysis
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	45
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The objective of the module is to equip students with the basic knowledge of calculus as the foundation for specialized modules.
Content	The course covers the basics of continuity, limit, derivative, Riemann integral.
Examination forms	
Study and examination requirements	
Reading list	Mathematica by example, Academic Press, New York Calculus, Harcourt Brace College Publishers, New York Giáo trình Giải tích 1. Nhà xuất bản Thống Kê, Tp Hồ Chí Minh

16. Analysis 2A

Module designation	Analysis 2A
Semester(s) in which the module is taught	1
Person responsible for the module	Department of Analysis
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	30
Credit points	2
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- General objective: To introduce the basic concepts and techniques of metric topology for multivariable functions and vectors. - Specific objectives: • Knowledge: know the basic concepts of metrics, closed, open, compact sets, completeness, series in normed space. • Skills: do exercises that demonstrate the above concepts and their applications
Content	This module helps students understand basic topological concepts, understand convergence in multi-dimensional spaces and function spaces. The course introduces metric spaces, normative spaces and Rn . Properties of continuous functions on metric spaces. Completeness of spaces and series on complete normed space. This knowledge forms the basis for all specializations such as analysis, statistics and probability, computer science, optimization, applied mathematics.
Examination forms	
Study and examination requirements	Assignments: 20%, Midterm Exam: 30%, Final Exam: 50%

Reading list	Giáo Trình Giải tích A2, NXB ĐHQG Tp HCM, Đặng Đức Trọng, Đinh Ngọc Thanh, Phạm Hoàng Quân

17. Calculus 2A

Module designation	Calculus 2A
Semester(s) in which the module is taught	2
Person responsible for the module	Department of Analysis
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	45
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- General Objective: To introduce the basic concepts and techniques of differentiable calculus of multivariable vector functions. - Specific objectives: • Knowledge: The theory of series of real numbers. Properties of differentiable functions on Rn. • Skills: be able to do calculation exercises on the above concepts and their applications
Content	This module helps students understand the basic knowledge of differential calculus of multivariable functions, understand bound and unconstrained extremal problems in multidimensional spaces, and understand the concept of series of real numbers. This knowledge forms the basis for all specializations such as analysis, statistics and probability, computer science, optimization, applied mathematics.
Examination forms	
Study and examination requirements	Assignments: 20%, Midterm Exam: 30%, Final Exam: 50%

Reading list	Giải tích A2, NXB ĐHQG Tp HCM, Đặng Đức Trọng, Đinh Ngọc Thanh, Phạm Hoàng Quân

18. Analysis 3A

Module designation	ANALYSIS 3A
Semester(s) in which the module is taught	1
Person responsible for the module	Department of Analysis
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	45
Credit points	3
Required and recommended prerequisites for joining the module	Analysis 1, Calculus 1A, Analysis 2
Module objectives/intended learning outcomes	- General objective: Learners have an understanding of the integral of functions of many variables and the relationships between the differential and integral of functions of many variables. - Specific objectives: • Knowledge: The minimum outcome standard is at the level in J. Stewart's Calculus textbook for science and engineering students. The average level is towards more advanced, more suitable for Mathematics majors, with higher requirements for accuracy and theoretical content. For fairly good students and honor students the course aims for qualifications in the respective sections of classic analysis textbooks such as those of W. Rudin, S. Lang. • Skills: Introduction to computer tools. Exercises include both reasoning and calculation. • Attitude, diligence: Seeing the need to develop generalization and precision, forming an ability to solve new application problems. Having a serious, proactive and self-disciplined learning attitude.
Content	This is a course on Multiple Integration and Vector Calculus. This subject follows the subjects of Calculus 1 and Calculus 2, which is considered a basic knowledge for university level in Science and Technology. A useful course for more advanced investigations of Lebesgue integrals (Measurement and Probability), mathematical models using Integral (in Mechanics, Probability-Statistics, Mathematical

	Equations, Calculus, ...), and mathematical developments (in Analysis, Geometry, ...)
Examination forms	
Study and examination requirements	Assignments: 20%, Midterm Exam: 30%, Final Exam: 50%
Reading list	Bài giảng Tích phân bội và Giải tích Vectơ, Huỳnh Quang Vũ Calculus: Early Transcendentals, James Stewart

19. Analysis 4A

Module designation	ANALYSIS 4A
Semester(s) in which the module is taught	2
Person responsible for the module	Department of Analysis
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	45
Credit points	3
Required and recommended prerequisites for joining the module	Analysis 1, Analysis 2.
Module objectives/intended learning outcomes	- General objective: To introduce basic differential equations and know how to solve basic ordinary differential equations. - Specific objectives/course outcome standards: • Knowledge: Master the course content. • Skills: Ability to calculate with large numbers of calculations • Attitude, diligence: Diligent and serious
Content	This module equips math majors with a minimum of background knowledge before entering narrower specializations. The content of this course includes Differential equations of first order; Existence and uniqueness of solutions of Cauchy problem; Linear differential equations of second and higher order; Introduction to the system of differential equations of first order.
Examination forms	
Study and examination requirements	Midterm Exam: 20%, Final Exam: 80%
Reading list	Bài giảng Giải tích A4, 2012, Nguyễn Thành Long.

	Phép tính vi phân hàm nhiều biến và phương trình vi phân, Nguyễn Thành Long, Nguyễn Công Tâm, Lê Thị Phương Ngọc, Nguyễn Anh Triết

20. Linear Algebra A1

Module designation	Linear Algebra A1
Semester(s) in which the module is taught	2
Person responsible for the module	Department of Algebra
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	45
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- General objectives: To be familiar with advanced mathematics. - Specific objectives/course learning outcomes: · Knowledge: Mastering the knowledge of matrices on number fields and applying them to solving systems of linear equations; determinants and their applications; vector spaces and linear transformations. · Skills: Calculating on matrices; solving system of linear equations; calculating the coordinates of the vector according to a basis in a finite dimensional vector space; changing when changing the base; representing a linear operator by a matrix; finding the image and the kernel of linear operators; using MAPLE software. · Attitude: Attend all classroom sessions; discussions outside of class time.
Content	This course is taught in the first semester, initially introducing students to advanced mathematics. Beside equipping new knowledge that is necessary for freshman, this course also provides the foundation knowledge to help students carry out specialized courses.

Examination forms	
Study and examination requirements	Midterm: 40% Final: 60%
Reading list	[1] *Đại số tuyến tính và ứng dụng, Tập 1,* Bùi Xuân Hải, Trần Ngọc Hội, Trịnh Thanh Đèo, Lê Văn Luyện. [2] *Giáo trình Đại số tuyến tính,* Ngô Việt Trung

21. Higher Algebra

Module designation	HIGHER ALGEBRA
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The goal of the course is to equip students with basic abstract algebraic structures, to help them become familiar with symbols and formal calculations.
Content	The course introduces basic algebraic structures such as groups, rings, integer domains, fields, and polynomial rings on fields. Some special concepts introduced are permutation group, alternating group, cyclic group, polynomial ring on number fields, especially on rational number fields.
Examination forms	
Study and examination requirements	
Reading list	[1] Nguyễn Viết Đông, Trần Ngọc Hội, *Đại số đại cương*, NXB ĐHQG TP HCM 2005.

	[2] Hoàng Xuân Sính, *Đại số đại cương*, NXB GD, Hà Nội 1997. [3] Nguyễn Hữu Việt Hưng, *Đại số đại cương*, NXB GD 1998. [4] My Vinh Quang, *Đại số đại cương*, NXB GD 1998. [5] Bùi Huy Hiền, Nguyễn Hữu Hoan, Phan Doãn Thoại, *Bài tập Đại số và Số học (tập 1, 2)*, NXB GD 1985.

○ 22. Introduction to computer programming

Module designation	INTRODUCTION TO COMPUTER PROGRAMMING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduce to students the basic knowledge and principles of computer programming and the C/C++ programming language
Content	-Basic concepts of algorithms and algorithms. -Describe the skills and fundamentals of computer programming.

	- Introduction to the C programming language.
Examination forms	
Study and examination requirements	
Reading list	[1] Brian W. Kernighan, Dennis. M. Ritchie (1988), *The C Programming Language 2nd*, Prentice Hall PTR. [2] Robert Sedgewick (1994), *Algorithms*, Addison Wesley. [3] Donald E. Knuth (1997), *The Art of Computer Programming – Vol 2 3rd*, Addison Wesley.

○ 23. Linear Algebra Practice

Module designation	Linear Algebra Practice
Semester(s) in which the module is taught	
Person responsible for the module	Department of Algebra
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	
Credit points	1
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General objectives: To help students understand more linear algebra via doing exercise. - Specific objectives/course learning outcomes: · Knowledge: Mastering the knowledge of matrices on numerical fields and applying them to solving systems of linear equations; determinants and their applications; vector spaces and linear transformations. · Skills: Calculating on matrices; solving system of linear equations; calculating the coordinates of the vector according to a basis in a finite dimensional vector space; changing when changing the base; representing a linear operator by a matrix; finding the image and the kernel of linear operators; using MAPLE software. · Attitude: Attend all classroom sessions; discussions outside of class time.

Content	This course is taught in the first year, initially introducing students to advanced mathematics. Beside equipping new knowledge that is necessary for freshman, this course also provides the foundation knowledge to help students carry out specialized courses.
Examination forms	Tests – process score: 30% Midterm exam: 30% Final exam: 40%
Study and examination requirements	
Reading list	[1] Đại số tuyến tính và ứng dụng, Tập 1, Bùi Xuân Hải, Trần Ngọc Hội, Trịnh Thanh Đèo, Lê Văn Luyện. [2] Giáo trình Đại số tuyến tính, Ngô Việt Trung [3] Phạm Huy Điển, **Tính toán, lập trình và giảng dạy toán học trên Maple**, 2009

23. Computational Softwares Laboratory

Module designation	COMPUTATIONAL SOFTWARES LABORATORY
Semester(s) in which the module is taught	1
Person responsible for the module	Ông Thanh Hải, Department of Analysis
Language	Vietnamese
Relation to curriculum	General
Teaching methods	lectures, computer practices
Workload (incl. contact hours, self-study hours)	
Credit points	2
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Students can use computational programming languages to program calculations in mechanics, analysis, numerical analysis, algebra, statistics,…
Content	The course covers basic computational programming knowledge using Matlab,... Applying this knowledge to write programs to solve problems in mechanics, analysis, numerical analysis, algebra,...
Examination forms	
Study and examination requirements	
Reading list	Essential MATLAB ® for Engineers and Scientists, 3rd edition, Elsevier Brian D. Hahn and Daniel T. Valentine,2007

	Numerical methods using Matlab. Third Edition. Prentice Hall J. H. Mathews, K. D. Frink, 1999

○ 24. Higher Algebra Practice

Module designation	HIGHER ALGEBRA PRACTICE
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	1
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General Objective: To equip students with basic computational skills in abstract algebraic structures, formal calculation, giving them a better understanding of these algebraic structures. Use softwares (e.g. GAP) to calculate specific examples and exercises. Specific objectives/course learning outcomes: • Knowledge: Master the theory of basic algebraic structures such as groups, rings, fields, and polynomial rings. Get hands-on with softwares (e.g. GAP) to better understand the structure learned. • Skills: Improve reasoning skill and formal calculation. • Attitude, diligence: Serious, progressive.
Content	The goal is to practice basic computational skills on algebraic structures such as groups, rings, integral domains,

	and fields, and use softwares (e.g. GAP) to better understand the structure of theories learned.
Examination forms	Tests – process score: 30% Midterm exam: 30% Final exam: 40%
Study and examination requirements	
Reading list	[1] *Đại số đại cương,* Nguyễn Viết Đông, Trần Ngọc Hội, 2005 [2] *Đại số đại cương,* Hoàng Xuân Sính 1997 [3] Abstract Algebra in GAP, Alexander Hulpke 2011

25. Environmental Studies

Module designation	ENVIRONMENTAL STUDIES
Code, if applicable	ENV00001
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	2
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	This is a compulsory subject in the general knowledge block in the training program for students of all disciplines. The focus of this module is to provide basic knowledge of Environmental Science: concepts, classification of resources, environment, basic problems and core of the environment. Students are also introduced to measures to protect the environment, conserve resources towards the goal of sustainable development.

Content	Chapter 1: Overview of the Environment 1. General concepts of environment 2. Basic composition of the environment (volumes) Chapter 3: Natural Resources 1. Definition 2. Classification 3. General issues of natural disaster Chapter 4: Human Impact on the environment 4.1 History of human impact on the environment 4.2 Human impact on environmental components Chapter 5: Environmental issues and sustainable development 5.1 Population and environment Chapter 5: Environmental issues and sustainable development 5.2 Environmental pollution Chapter 5: Environmental issues and sustainable development 5.3 Climate change Chapter 5: Environmental issues and sustainable development 5.4 Sustainable development Chapter 6: Environmental management and Environmental Education
Examination forms	
Study and examination requirements	

Reading list	Giáo trình [1] Bài giảng Môi trường đại cương do nhóm Giáng viên biên soạn [2] Lê Văn Khoa (chù biên), 2004. Khoa học Môi trường, NXB Giáo dục Tài liệu tham khảo [3] Lê Văn Khoa, Đoàn Văn Cánh, Nguyễn Quang Hùng, Lâm Minh Triết (2011) Giáo trinh Con người và môi trường, NXB Giáo Dục Việt Nam [4] Goudie, A. (2006) The Human Impact on Natural Environment. 6th Edition. Oxford. Blackwell [5] Lê Thị Thanh Mai (2008), Giáo trình Môi trường và Con người. ĐH QG Tp HCM

26. Earth science

Module designation	Earth science
Code, if applicable	GEO00002
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	2
Required and recommended prerequisites for joining the module	

Module objectives/intended learning outcomes	Earth Science introduces general knowledge about the Earth related to the rights of the Earth, inside and outside the Earth including position and operation of the earth in space; composition and structure of the atmosphere, wind, and weather, climate, climate change; distribution of freshwater in hydrosphere, sea and ocean behavior, El Nino-La Nina phenomena: Geosphere: composition and structure of the earth's crust, weathering, erosion-accumulation, landslides, the internal structure of the earth, earthquakes, volcanoes, plate tectonic activities; learn about the history of the earth through the record of fossil remains. Knowledge of Earth science is a necessary basis for understanding the natural environment of the Earth.
Content	Presentation on deformations of the earth's crust and earthquake, volcanic activities and membrane tectonic mechanism Learn about Earth's history through fossil and stratigraphic records. Apply this knowledge to explain some issues in the main profession Skilled in group discussion, presentation and criticism Attitude, diligence: enthusiasm, honesty in learning; Serious and honest in checking.
Examination forms	
Study and examination requirements	
Reading list	*Earth Science,* DANIELSON, E.W., DENECKE. EJ..Ir..l986 *Foundations of Earth Science,* Lutgens Frederick K. Tarbuck Edward .1, 1997 *Giáo trình Khoa học Trái đất,* LƯU ĐỨC HẢI, 'I RẦN NGHI. 2008 Earth Science Today, MURPHY, B., NANCE, D,, 1999 An introduction to the earth-life system, Cockell Charles...[và những người khác . 2008

27. General Chemistry 1

Module designation	GENERAL CHEMISTRY 1
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	This course is the first Chemistry subject for students of Chemistry and Materials Science. The subject deals with the theoretical foundations of Chemistry related to the basic models of the atomic structure, the periodic changes in the properties of chemical elements, the fundamental forces of interaction in matter, and the influence of chemical elements. their influence on the properties of matter in the solid, liquid, and gaseous states.
Content	Describe the structure of atoms and molecules Explain periodic changes in some properties of chemical elements Identify and distinguish basic types of chemical bonds Identify and explain the relationship between the fundamental forces of interaction in matter and the physical properties of matter

Examination forms	
Study and examination requirements	
Reading list	Giáo trình: [1] Nguyễn Đình Chi (2007). Hóa Học Đại Cương. Hà nội: NXB Giáo dục. [2] Nguyễn Đình Soa (2000). Hóa Đại Cương. Tp. HCM: NXB Đại học quốc gia tp. HCM. [3] Petrucci, R.H; Harwood, W.S; Herring, F.G (2002, 8th Ed.). General Chemistry. USA: Prentice Hall Tài liệu khác: [4] Lê Thị Sở Như. Tóm tắt bài giảng Hóa Đại Cương (tài liệu nội bộ, chưa xuất bản)

28. General Chemistry 2

Module designation	GENERAL CHEMISTRY 2
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	This course is intended to provide first-year students of the Department of Chemistry and the Department of Materials with basic knowledge about chemical processes, the role and contributions of chemistry in everyday life, as well as the relationship between chemistry and chemistry. science and other sciences such as mathematics, biology and the environment
Content	The course deals with the following topics: • Thermal effects accompany chemical and physical changes. • Conditions for the reaction to occur naturally and for chemical equilibrium. • Chemical balance and factors affecting stoichiometry. • Reaction rate and factors affecting it. • types of equilibria in solution: acid-base, precipitation, complexation and redox.

	• Electrochemical battery systems, predicting the direction of redox reactions, corrosive processes in nature.
Examination forms	
Study and examination requirements	
Reading list	Giáo trình: [1] Martin s. Silberberg (2000), Chemistry, The Molecular Nature of Matter and Change, Mcgraw-Hill Higher Education, 2nd Edition. [2] Raymond Chang (2006), Chemistry, Me Graw-Hill, 9th Edition,. [3] Peter Atkins and Loretta Jones [2000/ Chemistry: Molecules, Matter and Change, W.H Freeman, 4th Edition. Tài liệu khác: [4] Hồ Thị Cẩm Hoài. Tóm tắt bài giảng Hóa Đại Cương (tài liệu nội bộ, chưa xuất bàn)

29. General Chemistry Laboratory 1

Module designation	General Chemistry Laboratory 1
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	2
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General Chemistry Practice Course A is the experimental part accompanying the General Chemistry theory module. The purpose of the course is to help students practice using some basic tools and equipment in the laboratory, thereby verifying experimentally the theoretical concepts of general chemistry.
Content	Students are trained to know how to prepare for experiments, how to conduct experiments according to procedures, how to record data, and how to present results scientifically. In this module, students need to perform the following experiments: (1) Uses of equipment in the chemistry laboratory: How to use and record the data obtained. (2) Using a titration device, applicable to the titration of table vinegar (3) Acidic and basic properties of solutions (4) Determine the molar mass of a volatile liquid

	(5) Chemical Equilibrium Survey (6) Determination of thermodynamic parameters of Borax . dissolution process (7) Determine the order of the reaction (8) Determination of electrode potential
Examination forms	
Study and examination requirements	
Reading list	[1] Võ Duy Thanh, Võ Văn Bé (2009). Giáo trình thực tập Hóa đại cương A. Tp HCM: ĐHQG Tp HCM. [2] Võ Duy Thanh, Võ Văn Bé (2009). Bài tường trình thực tập Hóa đại cương A. Tp HCM: ĐHQG Tp HCM.

○ 30. General Chemistry Laboratory 2

Module designation	General Chemistry Laboratory 2
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	2
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General Chemistry Internship 2 is an experimental part accompanying the General Chemistry theory module, for non-Chemistry students, mainly for Chemistry-related disciplines without intensive practice in chemistry. organic and inorganic
Content	The purpose of the course is to help students practice using certain tools. basic equipment in the laboratory, through which experimentally verify the theoretical concepts of general chemistry. Students have the ability to prepare some inorganic and organic substances in the laboratory. Students are trained to know how to prepare for experiments, how to conduct experiments according to procedures, how to record data, and how to present results scientifically. In this module, students need to perform the following experiments: (1) Volumetric method - Determination of density of liquids (2) Determination of acetic acid concentration in vinegar

	(3) Substance of limited quantity (4) Acids, bases, salts (5) Determination of phosphorus in NPK . chemical fertilizers (6) Synthesis of potassium alum KA1(SO4)2.12H2O (7) Properties of organic functional groups (8) Synthetic aspirin (9) Soaps and detergents
Examination forms	
Study and examination requirements	
Reading list	[1] Hoàng Ngọc Cường (2018). Giáo trình thực tập Hóa đại cương 2. Tp HMC: ĐHQG Tp HCM. (Tài liệu lưu hành nội bộ) [2] Hoàng Ngọc Cường (2018). Bài tường trình thực tập Hóa đại cương 2. Tp HMC: ĐHQG Tp HCM. (Tài liệu lưu hành nội bộ)

31. Biology I

Module designation	Biology I
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Provides students with an overview of the basic concepts of biology, the chemical basis of life, the structure and function of cells, the genetic and molecular basis of heredity and variation. heterogeneity, evolution and biodiversity.
Content	Understand basic concepts of biology and methods of studying life Explain the chemical basis of life Distinguish between the structure and function of cells, biological membranes, and organelles Understanding the basis and mechanism of heredity and variation Know some application techniques of modern genetic engineering. Understand the concepts and mechanisms of speciation, evolution, and diversity in organisms.

Examination forms	
Study and examination requirements	
Reading list	1. Bùi Trang Việt (2012). Sinh học tế bào. Nhà Xuất Bản Đại học Quốc Gia TP. Hồ Chí Minh. 2. Phạm Thành Hổ (2011). SINH HỌC ĐẠI CƯƠNG: Tế bào học, Di truyền học và Học thuyết Tiến hóa. Nhà Xuất Bản Đại học Quốc Gia TP. Hồ Chí Minh.

32. Introduction to Biology II

Module designation	INTRODUCTION TO BIOLOGY II
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Provides an overview to students of the basic concepts of biology, with emphasis on the morphology and function of plants and animals and the interaction between organisms and their environment.
Content	Part 1. Plant morphology and function Part 2. Animal morphology and function Part 3. Ecology
Examination forms	
Study and examination requirements	
Reading list	[1] Nguyễn Đình Giậu (1997). *Sinh học Đại cương,* Tủ sách ĐH.KHTN.

	[2] Dương Hữu Thời (1998). *Cơ sở Sinh Thái Học,* Nhà xuất bản Đại học Quốc Gia Hà Nội. [3] Hoàng Kim Ngũ, Phùng Ngọc Lan (1998). *Sinh Thái Rừng,* Nhà xuất bản Nông Nghiệp. [4] Lê Văn Khoa, Nguyễn Văn Cự, Lê Đức, Lưu Đức Hải, Thân Đức Hiền, Trần Khắc Hiệp, Nguyễn Đình Hòe, Phạm Ngọc Hồ, Trịnh Thị Thanh (2001). *Khoa Học Môi Trường.* Nhà xuất bản Giáo dục Việt Nam. Trần Kiên, Hoàng Đức Nhuận, Mai Sỹ Tuấn (2002). *Sinh Thái Học và Môi trường,* Nhà xuất bản Giáo Dục.

33. Lab work on General Biology 1

Module designation	LAB WORK ON GENERAL BIOLOGY 1
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	This is the first practical course in biology, helping students to equip themselves with basic practical knowledge in biology: (1) Using an optical microscope to observe and describe the basic structure of cells and some basic life processes (2) Skills to perform reactions to observe and recognize the chemical components of cells and some basic life processes in organisms (3) Skills recognize and distinguish between groups of animals, plants and microorganisms (4) Skills of group activities and sense of discipline in practical activities.
Content	Perform and observe microscopy

	Perform experiments demonstrating some of the basic life processes: osmosis, enzymatic activity, respiration, and mitosis Be able to perform some qualitative reactions and identify the basic organic components of life Observe and identify major groups of animals, plants, and microorganisms Be able to use basic equipment and tools of the general biology laboratory Teamwork skill Knowledge of compliance with laboratory rules and basic equipment on biosafety knowledge
Examination forms	
Study and examination requirements	
Reading list	Giáo trình (1) Sách, giáo trình chính: Thực tập Sinh học Đại cương 1 (Chủ biên: Bùi Trang Việt, Lê Thị Mỹ Phước), Tủ sách Đại học Khoa học Tự nhiên (2016) (2) Bài giảng dưới dạng ppt file hình ảnh và tóm tắt Tài liệu tham khảo: (3) Dickey Jean (2003) Laboratory investigations for biology (2 edition), The Benjamin/Cummings (4) Phạm Thành Hổ (2011), Sinh học Đại cương, Tủ sách Đại học Khoa học Tự nhiên (5) Bùi Trang Việt (2013), Sinh học Tế bào, Nhà xuất bản Đại học Quốc Gia TP Hồ Chí Minh

34. Lab work on General Biology II

Module designation	LAB WORK ON GENERAL BIOLOGY II
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The practical module is designed to include experiments to illustrate the problems that students learn in General Biology 2, this is the foundation of knowledge for scientific research in biology and technology. later biology.
Content	Distinguish between the types of tissues and organs of monocotyledonous or dicotyledonous plants Understand the qualitative principles of some protective plant pigments and photosynthetic pigments Demonstrate the effect of environmental conditions on photosynthesis in plants Demonstration of respiration, fermentation in plants and the presence of enzymes in this process Demonstrated the effects of environmental conditions on water transport of woody tissues Kindness and recognition of animal tissues Hieu and proved the existence of bioelectricity in the body

	Distinguish the types of vessels in the mesenteric vascular system of frogs; Explain the effect of hormones on the rate of blood flow in the vessels Understand the influence of climate factors on the distribution of some types of ecosystems
Examination forms	
Study and examination requirements	
Reading list	1. Bùi Trang Việt và Phan Ngô Hoang 2009. Giáo trình thực tập Sinh học đại cương II. Trường ĐH KHTN - ĐHQG-HCM. Tài nguyên khác 1. Bài giảng dưới dạng ppt và pdf 2. Phạm Thành Hổ 1998. Sinh học đại cương. Nhà xuất bản giáo dục.

○ 35. General Physics 1 (Mechanics - Thermodynamics)

Module designation	GENERAL PHYSICS 1 (MECHANICS - THERMODYNAMICS)
Semester(s) in which the module is taught	1
Person responsible for the module	Prof. CHAU Van Tao
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Discussion, Debate, Exercise
Workload (incl. contact hours, self-study hours)	135 Hours
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	This course covers the principles of kinematics, dynamics, statics, work, energy, linear momentum, gravitation, and thermodynamics. Students who complete this module could be achieved the following: - Knowledge: Be able to understand and apply laws of mechanics to explain physical phenomena and solve problems; Be able to understand and apply mechanisms of heat transfer, equations of state, the first and the second law of thermodynamics. - Skills: Be able to work at individual level and group work. - Competences: Ability to apply mechanics and thermodynamics knowledge to analyze physical situations. - Attitude: Honest
Content	This module includes the following topics: 1. Physics and measurement 2. Kinematics of particles 3. Force and Newton's laws

	4. Conservation laws in classical mechanics 5. Kinetics of rigid bodies 6. The ideal gas 7. The first law of thermodynamics 8. The first law of thermodynamics
Examination forms	
Study and examination requirements	Assessment method: 1. Paper assignment = 10% 2. Individual activities = 10% 3. Midterm exam = 30% 4. Final exam = 50%
Reading list	Main books: 1. Nguyen Nhat Khanh (2005). Mechanics and thermodynamics lectures. VNUHCM Publishing House, Vietnam. References: 2. Nguyen Thanh Van. (2013) General Physics 1. VNUHCM Publishing House, Vietnam. 3. Raymond A. Serway, John W. Jewett, Sr, (2014). Physics for Scientists and Engineers with Modern Physics. Brooks/Cole Publishing Company, USA. 4. Alan Giambattista, Betty McCarthy Richardson, Robert C. Richardson, (2010). Physics. McGraw-Hill Companies, Inc, USA.

○ 36. General physics 2 (Electromagnetic - Optics)

Module designation	GENERAL PHYSICS 2 (ELECTROMAGNETIC - OPTICS)
Semester(s) in which the module is taught	2
Person responsible for the module	Assoc. Prof. HUYNH Truc Phuong
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Discussion, Debate, Exercise
Workload (incl. contact hours, self-study hours)	135 hours
Credit points	3
Required and recommended prerequisites for joining the module	Calculus 1B, General physics 1
Module objectives/intended learning outcomes	This module provides basic knowledge of electric and magnetic fields and thereby an understanding of the laws and phenomena of light optics. Students who complete this module could be achieved the following: - Knowledge: Be able to understand and apply knowledge of electromagnetism and optics in science and life. - Skills: Be able to work at individual level and teamwork. - Competences: Ability to apply electromagnetism and optics knowledge to analyze physical situations. - Attitude: Honesty and diligence
Content	This module includes the following topics: 1. Electric charge and electric field 2. Conductors in an electric field

	3. Electric current and magnetic field 4. Electromagnetic induction and applications 5. The background of light optics 6. Interference of light 7. Diffraction of light 8. Polarization of light
Examination forms	
Study and examination requirements	Assessment method: 1. Paper assignment = 10% 2. Individual activities = 10% 3. Midterm exam = 30% 4. Final exam = 50%
Reading list	Vật lý đại cương 2, Nguyễn Thành vấn, NXB ĐHQG-HCM, 2015. Quang học, Lê Vũ Tuấn Hùng, NXB ĐHQG-HCM, 2015. Physics for Scientists and Engineers with Modern Physics, Raymond A. Serway, John w. Jewett, Sr, 2014. Physics, Alan Giambattista, Betty McCarthy Richardson, Robert c. Richardson, 2010.

37. Lab work on General Physics

Module designation	LAB WORK ON GENERAL PHYSICS
Semester(s) in which the module is taught	2
Person responsible for the module	HUYNH Thanh Nhan, MsC
Language	Vietnamese
Relation to curriculum	General
Teaching methods	Discussion, Exercise, Practice
Workload (incl. contact hours, self-study hours)	120 hours
Credit points	2
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	This course is a practical subject in the laboratory. This course helps students understand how to measure some physical quantities, experimental errors, analyze and evaluate measurement results. Students who complete this module could be achieved the following: - Knowledge: Be able to describe the process, how to measure fundamental physical quantities in the laboratory. Be able to use instruments and equipment to measure experimental data of physical quantities correctly. Be able to determine (calculate) physical quantities from measured experimental data. Be able to determine the error of experimental measurement of physical quantities. - Skills: Be able to work in individual, group work, self-study, and problem solving. - Competences: Be able to analyze, process and write experimental data reports.

	- Attitude: be honest, responsible, respect for colleagues.
Content	In this module, Students practice 10 of the following 13 experiments: 1. Practice 1: Density of liquid and solids. The private mass of the metals 2. Practice 2: Viscosity. Viscosity is dependence of different temperature 3. Practice 3: Reversible pendulum. The Mathematical pendulum 4. Practice 4: Heat of function for ice. Determination of heat 5. Practice 5: Mechanical equivalent of heat. The heat capacity of metals 6. Practice 6: Wheatstone Bridge. Resistor is dependence of different temperature 7. Practice 7: Voltmeter and Ampemeter DC. Voltmeter and Ampemeter AC 8. Practice 8: AC circuit. RLC circuit 9. Practice 9: Diod characteristics 10. Practice 10: Transistor characteristics 11. Practice 11: Microscope. To measure diameter of other small object 12. Practice 12: Refraction by a prism. Dispersion and resolving power of the prisms 13. Practice 13: Polarization of light Rotatory power
Examination forms	
Study and examination requirements	Assessment method: 1. Practice report = 20% 2. Final practice exam = 80%
Reading list	Main

	1. Đặng văn Liệt, Đồ đình Luyện, Nguyễn văn Nghĩa, Trần thị Kim Phượng, Giáo trình thực tập vật lý đại cương 1 (Lưu hành nội bộ) Reference 1. Lương Duyên Bình. Vật lý đại cương: tập I: cơ - nhiệt, NXB Giáo dục, 1995 2. Cao Long Vân, Vật lý đại cương: tập II: quang học - cơ học lượng từ - vật lý hạt nhãn, NXB Giáo dục, 2008 3. Lương Duyên Bình. Vật lý đại cương: tập III: phần I: quang học - vật lý nguyên tử và hạt nhân, NXB Giáo dục, 1998 4. Dư Trí Công, Nguyễn Hữu Hồ, Lương Duyên Bình, Vật lý đại cương: điện - dao động sóng, NXB Giáo dục, 1998

○ 38. Basic Informatics Skills

Module designation	BASIC INFORMATICS SKILLS
Semester(s) in which the module is taught	
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	General
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	● This course is intended to provide students with a general knowledge of computers as well as the fundamentals of working with the Windows operating system and Internet services. Besides, The course also helps to equip students with the knowledge and skills to: ● Working with popular software on computers ● Drafting text. presentations and data calculations with spreadsheets ● Build electronic information pages.
Content	Basic IT knowledge - Basic knowledge of computers and computer networks - Control access, ensure data safety - Malware (malware) - Some basic legal issues in using IT

	Basic computer use - Windows operating system - Windows Explorer - Control Panel - Compress & decompress data - Type Vietnamese Basic Microsoft Word - Text editor - Text format - Create tables - Processing graphics in documents - Page layout and printing Basic Microsoft Powerpoint - Basic slideshow templates - Create a slideshow - Set effects for the slideshow. Basic Microsoft Excel - Format data in Excel - References in Excel - Basic Excel functions - Print and draw charts Use Internet - Basic knowledge of the Internet - Look for information - Safety information Web image processing - Resize photo frame - light sand - Rotate and flip photos - Increase or decrease the brightness of the light - Adjust the hue of the light Design a website with	

	HTML & CSS3	
Examination forms		
Study and examination requirements		
Reading list	Tài liệu Microsoft Office MOS. IIG Việt Nam. Fahasa Tài liệu IC3 Spark. IIG Việt Nam. Fahasa	

- # Foundational Professional Education

1. Measure Theory and Probability

Module designation	MEASURE THEORY AND PROBABILITY
Semester(s) in which the module is taught	
Person responsible for the module	Đặng Đức Trọng
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lectures, group work, small group solving exercises
Workload (incl. contact hours, self-study hours)	75
Credit points	4
Required and recommended prerequisites for joining the module	Analysis A1, Analysis A2
Module objectives/intended learning outcomes	The objective of the module is to equip students with the basic knowledge of the foundation of measure theory and theory of the integral, and application of the measure theory in probability theory.
Content	1. Elementary probability theory, abstract measure theory. 2. Integration with respect to probability measures, expectation and variance 3. Random variables, Law of large numbers and limit theorems. 4. Changes of measures and the Radon-Nikodym Theorem. 5. Conditional expectations, filtrations and martingales.
Examination forms	
Study and examination requirements	Exercises 20%, Mid-term 30%, Final exam 50%.

Reading list	1. Đặng Đức Trọng, Đinh Ngọc Thanh, Giáo trình lý thuyết độ đo và xác suất, NXB ĐHQG Tp HCM, 2014. 2. K. L. Chung, A course in probability theory, 3rd edition, Academic Press, 2001. 3. D. M. Đức, Lý thuyết độ đo và tích phân, NXB Đại Học Quốc Gia Tp. HCM, 2006. 4. P.H. Quân, Đ.N. Thanh, Xác suất thống kê, NXBGD, 2011

2. Algebra A2

Module designation	ALGEBRA A2
Semester(s) in which the module is taught	
Person responsible for the module	Trần Ngọc Hội
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisite courses: Linear Algebra Course requirements: Mastery of systems of linear equations, vector spaces, linear transformations
Module objectives/intended learning outcomes	General objective: To equip students with basic knowledge of advanced linear algebra, as a foundation for specialized courses in Mathematics. Specific objectives course learning outcomes: • Knowledge: Master the diagonalization and Jordanization of linear operators on finite-dimensional vector spaces, the structure of Euclidean spaces, bilinear forms and quadratic forms. • Skills: Diagonalization and Jordanization of matrices on numeric fields, computation in Euclidean space, quadratic transformations. • Attitude, diligence: Serious, progressive.
Content	This course introduces the basic knowledge of linear operator reduction (diagonalization, Jordan canonical form), Euclidean space, bilinear form, and quadratic form.
Examination forms	Essay Exam
Study and examination requirements	Tests – process score: 50% Final exam: 50%
Reading list	[1] Đại số tuyến tính và Ứng dụng, Tập 2, Bùi Xuân Hải, Trần Ngọc Hội, Lê Văn Luyện, 2017

	[2] Giáo trình Đại số tuyến tính, Ngô Việt Trung, 2001 [3] Đại số tuyến tính, Nguyễn Hữu Việt Hưng, 2004

3. Functional Analysis

Module designation	FUNCTIONAL ANALYSIS
Semester(s) in which the module is taught	2
Person responsible for the module	Bùi Lê Trọng Thanh
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures, practice sessions
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Analysis 1, 2, 3.
Module objectives/intended learning outcomes	• General Objective: Functional analysis is where students get their first basic understanding of infinite-dimensional spaces. This knowledge is indispensable for many specializations in both theoretical and applied mathematics. This is one of the first courses where the ability to acquire and use abstract and precise mathematical reasoning is trained and tested. • Specific objectives/course outcomes standards: o Knowledge: understand and apply in specific situations some basic concepts and results about Euclidean spaces, l^p, L^p spaces, bounded functions spaces, space of continuous linear mappings, Hilbert space. o Skills: systematically understanding the above objects, grasping the relationships between concepts and results. Distinguish and criticize arguments that do not meet the exact requirements of mathematics. o Attitude, diligence: Seeing the need for generalized development, thereby helping to solve application problems, thereby having a serious, proactive and self-disciplined learning attitude.

Content	Metric space, normed space, continuous linear mapping between two normed spaces and their fundamental theorems, Hilbert space. This subject is considered as the basic knowledge for university level Mathematics. An essential and useful course for mathematical models using function spaces and infinite dimensional spaces (in Algebra, Optimization, Probability-Statistics, Partial Differential Equations, Analysis, Mathematical Methods in Physics, Computer Science, ...).
Examination forms	Writing
Study and examination requirements	Assignments: 50%; Final Exam: 50%
Reading list	[1] Bài giảng Giải tích hàm, Đinh Ngọc Thanh, Huỳnh Quang Vũ. [2] Giải tích hàm, Dương Minh Đức, 2005 [3] Giải tích hàm, Đinh Ngọc Thanh, Đặng Đức Trọng, 2011

4. Mathematical Statistics

Module designation	MATHEMATICAL STATISTICS
Semester(s) in which the module is taught	
Person responsible for the module	Hoàng Văn Hà
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	45 (theoretical course) + 30 (practical lessons in laboratory)
Credit points	3
Required and recommended prerequisites for joining the module	Measure theory and probability, Analysis A1
Module objectives/intended learning outcomes	This course provides foundations of statistical inference. Students will be able to make inferences from data, making decisions and prediction. Students can apply statistical techniques to practical problems using R or SPSS.
Content	1. Descriptive statistics. Sampling distributions. 2. Point estimations: definition, estimators and estimates. Unbiasedness, efficiency, consistency. Method of moments, method of maximum likelihood, Bayes estimators. Minimum variance unbiased estimator, Cramer-Rao lower bound.

	3. Confidence interval: CI for means, variances and proportions. 4. Hypothesis testing: basic concepts, null and alternative hypotheses, simple and compound hypotheses, type I and II errors, critical region, size and power of a test, p-value. Neyman - Pearson lemma. Likelihood Ratio tests. z-tests and t-tests. Goodness of fit-test. 5. Linear Regression.
Examination forms	Writing
Study and examination requirements	Homework exercises: 10% Computing exercises: 20% Mid-term: 20% Final exam: 50%
Reading list	1. Casella, George, and Roger L. Berger. *Statistical inference*. Cengage Learning, 2021. 2. Lehmann, Erich Leo, Joseph P. Romano, and George Casella. *Testing statistical hypotheses*. Vol. 3. New York: Springer, 2005. 3. Montgomery, Douglas C., and George C. Runger. *Applied statistics and probability for engineers*. John Wiley & Sons, 2010.

5. Data Structure & Algorithm

Module designation	DATA STRUCTURE & ALGORITHM
Semester(s) in which the module is taught	
Person responsible for the module	Hà Văn Thảo
Language	Vietnamese
Relation to curriculum	Optional
Teaching methods	Using a projector. Learning materials provide full for students at first lessons including: Slide lectures, seminar topics, theory and practice exercises. Students self-study, homework, practice and seminars in groups. Students attend full lectures and practice.
Workload (incl. contact hours, self-study hours)	

Credit points	4
Required and recommended prerequisites for joining the module	Introduction to programming Visual C programming
Module objectives/intended learning outcomes	Present a number of basic knowledge of the data structure and algorithms, how to re-perform data according to problem purposes. Two basic methods of searching and eleven arrangements algorithms are presented in the second part. Chapter Three and Four will present the basic data structures. *Specific objectives / course learning outcomes:* Knowledge: understanding clearly algorithms, search methods, arrangements and dynamic data structures Skills: analyzing algorithms, generalize data, algorithm settings Attitudes, specialized: have attitudes, views and proper perception of subjects
Content	Introduction of algorithms, analyzing the algorithms and generalizing data. Search methods and arrangement in arrays. Basic dynamic data structure: single and double linked lists, binary search trees.
Examination forms	Writing
Study and examination requirements	Mid-term: 30 % Final exam: 70%
Reading list	1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, 1997 2. Nhập môn cấu trúc dữ liệu và thuật toán, Trần Hạnh Nhi, Dương Anh Đức, 2003 3. Data structures and C programs, Christopher J Van Wyk, 1990

6. Discrete Mathematics

Module designation	DISCRETE MATHEMATICS
Semester(s) in which the module is taught	
Person responsible for the module	Lê Văn Hợp
Language	Vietnamese
Relation to curriculum	Optional

Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General objectives: providing basic knowledge for information technology students. Specific objectives / course learning outcome: Knowledge: Mastering logical issues, set- mapping, relations on sets. Skills: Strict and accurate presentation of professional issues, good implementation of counting problems, solution of recursion, integer algorithms, solving equations on Zn, minimal polynomial algorithms for Boole functions. Attitude, diligence: serious and positive learning, participating in discussions, asking questions and responding to comments, completing the lecturers' learning requirements.
Content	The subject is within scientific knowledge. It provides very necessary knowledge (about logic, discrete structures, related algorithms, ...) for information technology students. This knowledge supports a lot for students to absorb their grassroots and specialized subjects.
Examination forms	writing
Study and examination requirements	Mid-term: 30 % Final exam 70 %
Reading list	1. Bài giảng Toán rời rạc, Lê Văn Hợp 2. Toán rời rạc, Nguyễn Hữu Anh, 1999 3. Discrete Mathematics And Its Application, Kenneth H. Rosen, 2012 4. Discrete Mathematics, Richard Johnsonbaugh, 2005 5. Méthodes Mathématiques Pour L'informatique, Jacques Vélu, 2005

7. Object Oriented Programming

Module designation	OBJECT ORIENTED PROGRAMMING
Semester(s) in which the module is taught	
Person responsible for the module	Nguyễn Ngọc Long
Language	Vietnamese
Relation to curriculum	Optional
Teaching methods	The document provides students at the first session including: summary lectures, lectures with slides, references. Students attend theoretical lectures and practice, participate in discussion, self-study, and major assignments.
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Data structure and Algorithm
Module objectives/intended learning outcomes	Introducing students the basic principles of object-oriented methodology and object-oriented programming techniques as a basis for building later applications.
Content	• The principles of object-oriented methodology. • The principles for building object classes, data identification and manipulation, establishing relations between classes, especially inheritance relation and polymorphism. • Design, build classes, definition operations and operations in C ++. • Install specific relations between layers, inheritance, polymorphism in C ++.
Examination forms	
Study and examination requirements	• Mid-term practice or major assignment. • Writing for final exam
Reading list	1. Bjarne Stroustrup, ***The C++ programming language***, 3rd Edition, AT&T, 1997. 2. James O. Coplien, ***Advanced C++ Programming Styles and Idioms***, Addison-Wesley Longman, 1991. 3. Scott Robert Ladd, ***C++ Kỹ Thuật và Ứng Dụng***, NXB Khoa Học Kỹ Thuật, 1992.

	4. J Rumbaugh, M Blaha, W Premerlani, F Eddy, W Lorensen, ***Object-Oriented Modeling and Design***, Prentice Hall, 1991.

8. Methods of Teaching Mathematics I

Module designation	METHODS OF TEACHING MATHEMATICS I
Semester(s) in which the module is taught	
Person responsible for the module	Nguyễn Viết Đông
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General objectives: - Presenting basic scientific knowledge; The foundation knowledge of mathematics and high school mathematics methods, education and theory of teaching, ages pedagogical psychology, teaching methods, class control and evaluation organizations - Recognizing the close relationship between the theoretical bases learned, the theory with reality problems - Recognize the powers and privileges of society for teachers as well as teachers' responsibility to help learners benefit themselves, communities and the environment. - Application of professional knowledge to address the requirements set out in learning as well as practical issues in the future. - Choose flexible high school math methods, teaching and evaluation methods, interactive skills & class controls,

	modern tools to teach with the spirit of learning learners as a center - Develop logical thinking, thinking thinking, creative thinking and problem solving capacities. - Identity is the role and responsibility of learners and future teachers Specific objectives /learning outcome: Knowledge: - Overview of Algebraic Knowledge - Identify issues in teaching recently - Describe math teaching methods Skill: - Select the appropriate theoretical basis to solve the corresponding exercises - Actively help learners understand the value of learning, on that basis to benefit themselves, communities and the environment - Application of arithmetic and logical knowledge in the process of developing mathematical thinking for students - Applying fundamental mathematical knowledge into practice - Choose advanced math knowledge to solve practical problems - Select the appropriate tools to teach math - Forming a new teaching idea suitable for each student object Attitude, specialist: - Improve the professional ethics
Content	The course refers to the issues of statements, sets, functions, equations, algebraic inequality, limits, continuous functions and derivative of functions
Examination forms	Writing
Study and examination requirements	Mid-term: 40 % Final exam: 60 %
Reading list	1. Đại số lớp 10, oàn Quỳnh, Nguyễn Huy Đoan, Nguyễn Xuân Liêm, Đặng Hùng Thắng, Trần Văn Vuông, 2006 2. Đại số và Giải tích lớp 11, Đoàn Quỳnh, Nguyễn Huy Đoan, Nguyễn Xuân Liêm, Nguyễn Khắc Minh, Đặng Hùng Thắng, 2006 3. Thực hành giải toán sơ cấp tập 1, E. E. Veresova, N. S. Denisova, T. N. Poliakova, Người dịch: Hoàng Thị Thanh Liêm, Nguyễn Thị Ninh, Nguyễn Văn Quyết, Vũ Thụ, 1986

9. Methods of Teaching Mathematics II

Module designation	METHODS OF TEACHING MATHEMATICS II
Semester(s) in which the module is taught	
Person responsible for the module	Lê Bá Khánh Trình
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	**General objective:** Presenting basic scientific knowledge; Foundational knowledge of Mathematics and methods of solving high school math problems, education and teaching theory, age psychology and pedagogy, teaching methods, organization of classroom control and assessment - Apply professional knowledge to solve academic requirements as well as practical problems in future careers. - Flexible choice of high school math problem solving methods, teaching and assessment methods, interaction & organization skills, modern tools for student-centered teaching - Develop logical thinking, critical thinking, creative thinking and problem solving abilities - Determine the roles and responsibilities of learners and future teachers **Specific objectives/course learning outcomes:** Knowledge: General knowledge of basic mathematical geometry. Skill: Applying the teaching methods and assessment in the process of organizing and controlling the classroom. Applying elementary math knowledge to teaching high school math. Applying elementary math knowledge to teaching high school math. Applying basic knowledge of Arithmetic and Logic in the process of developing mathematical thinking for students.

	Apply basic math knowledge in practice. Identify supporting tools for teaching Mathematics. Explain logical relationships between objects and phenomena. Forming self-study capacity and ability to work independently. Attitude, Diligence: - Be aware of the influence of new teaching methods for mathematics. - Recognize the benefits of the teaching profession.
Content	The course refers to the vector problems, the coordinates in the plane.
Examination forms	Writing
Study and examination requirements	Mid-term: 40% Final exam: 60%
Reading list	4. Hình học lớp 10, Đoàn Quỳnh, Văn Như Cương, Phạm Vũ Khuê, Bùi Văn Nghị, 2006 5. Hình học lớp 11, Đoàn Quỳnh, Văn Như Cương, Phạm Khắc Ban, Tạ Mân, 2007 6. Bài tập hình học lớp 10, Văn Như Cương, Phạm Hữu Khuê, Trần Hữu Nam, 2007 7. Tài liệu bồi dưỡng giáo viên thực hiện chương trình, sách giáo khoa lớp 10 THPT, môn Toán học, 2006 8. Tài liệu bồi dưỡng giáo viên thực hiện chương trình, sách giáo khoa lớp 11, môn Toán học, 2007

● Foundation in Concentration by Specialization

○ Mechanics

1. Elementary Numerical Analysis

Module designation	ELEMENTARY NUMERICAL ANALYSIS
Semester(s) in which the module is taught	
Person responsible for the module	Ông Thanh Hải
Language	Vietnamese
Relation to curriculum	Compulsory

Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General Objective: To introduce the basic concepts and approximation methods of numerical analysis, and to provide students with the tools to find approximate solutions to problems involving equations and systems of equations. By finding algorithms to solve the problems posed, this module aims to equip students with knowledge to solve real problems based on theoretical math knowledge and the means of computations. The course helps students to understand the following knowledge: understand the concept of approximation and types of errors. Understand the most basic approximation methods and their applications. Application of computational software in numerical calculations.
Content	The content of the course includes in the approximate theories and their application to find the approximate solutions of the single variable equations and the system of linear equations, and the approximate derivative, integral... These methods which are applied into the physical problems, are used by the MATLAB program to simulate.
Examination forms	
Study and examination requirements	
Reading list	1. Numerical Analysis. Ninth Edition. Brooks, Burden and Faires, 2010 2. Numerical Analysis. Pearson, Sauer, 2006 3. Numerical Analysis. Brooks/Cole Publishing Company, Kincaid, W. Cheney, 1991 4. Numerical methods using MATLAB. Third Edition. Prentice Hall, J. H. Mathews, K. D. Frink, 1999

2. Equations Of Mathematical Physics

Module designation	EQUATIONS OF MATHEMATICAL PHYSICS
Semester(s) in which the module is taught	
Person responsible for the module	Nguyễn Thành Long
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduce the basic mathematical physics equations and know how to find classical solutions by Fourier's method of separation of variables.
Content	Linear ordinary differential equations of the second order. Wave equations; Heat equations; Laplace equations.
Examination forms	
Study and examination requirements	
Reading list	1. Bài giảng phương trình toán lý, Nguyễn Thành Long, 2020 2. Phương Trình Vật lý - Toán nâng cao, Nguyễn Công Tâm, 2002 3. Partial Differential Equations, An introduction, David Colton, 1988 4. Partial Differential Equations, L.C. Evans, 1998 5. Fundamentals of differential equations and boundary value problems, R. Kent Nagle, Edward B. Saff, 1993

3. Theoretical mechanics

Module designation	Theoretical mechanics
Semester(s) in which the module is taught	
Person responsible for the module	Trịnh Anh Ngọc
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Knowing calculus and linear algebra.
Module objectives/intended learning outcomes	General Objective: To provide basic knowledge of Newtonian mechanics. Help students know how to set and solve basic mechanical problems. Know how to analyze and explain mechanical phenomena on the basis of Newton's laws. The course introduces mathematical modeling of real-world processes. Specific objectives/course learning outcomes: • Knowledge: Newton's laws and their consequences. • Know how to build mathematical models describing mechanical phenomena. Know how to solve some mechanical problems. • Attitude, diligence: Positive and dynamic.
Content	This can be considered as a subject on mathematical modeling methods, which plays a central role in all applied mathematical research. In this course, students will gain a better understanding of calculus, how to solve differential equations, and also the nature of optimization theory.
Examination forms	essay or question and answer
Study and examination requirements	Tests – process score: 40% Final exam: 60 %

Reading list	1. Bài giảng Cơ học lý thuyết, Trịnh Anh Ngọc, 2018 2. Nhập môn cơ học, Đặng Đình Áng, Trịnh Anh Ngọc, Ngô Thành Phong, 2003 3. Classical Mechanics, Douglas Gregory, 2006 4. Classical Mechanics Solutions manual, Douglas Gregory, 2006

4. Continuum mechanics

Module designation	Continuum mechanics
Semester(s) in which the module is taught	
Person responsible for the module	Bùi Xuân Thắng
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Knowing calculus and linear algebra.
Module objectives/intended learning outcomes	General Objective: To provide students with fundamental knowledge of continuums in mechanics and mathematical modeling for continuums. Introduce students to in-depth research directions on continuous environmental objects: Deformed solids, Fluids. Specific objectives/course output standards: • Knowledge: Understand the concept of continuum, the laws of physics. Apply concepts and laws to mathematically model continuum. • Skills: Apply concepts and laws to mathematically model continuums such as elastic solid bodies, fluids.

	• Attitude, diligence: After the course, students will understand and be interested in the direction of mathematical research in continuum mechanics.
Content	This course introduces and provides the foundation knowledge for the modules of Deformed Solid Mechanics, Fluid Mechanics, Fracture Mechanics, Composite Materials, and Mechanics Seminar.
Examination forms	Essay exam
Study and examination requirements	Tests – process score: 35% Final exam: 65 %
Reading list	1. Continuum Mechanics, George E. Mase, 1970 2. Cơ học môi trường liên tục, Đào Huy Bích, 2002

5. Finite element method

Module designation	FINITE ELEMENT METHOD
Semester(s) in which the module is taught	
Person responsible for the module	Trịnh Anh Ngọc
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Know how to program in Matlab
Module objectives/intended learning outcomes	General Objective: To provide basic knowledge of the finite element method. Help students know how to apply the finite element method to solve boundary problems, boundary-value problems appearing in mechanics and physics Specific objectives/course learning outcomes: • Knowledge: Master the concepts and procedures in the finite element method • Skills: Know how to apply finite element method to numerically solve boundary problems, boundary-first value problems (from finite element discretization to Matlab programming) • Attitude, diligence: Positive and dynamic
Content	The subject of Finite Element Methods is aimed at solving numerically the equations that appear in the subjects of the education program in the Faculty. In this course students are taught how to discretize boundary problems, boundary-initial value problems and numerically solve them using Matlab. Students will see how knowledge of linear algebra is applied.
Examination forms	Essay exam

Study and examination requirements	Tests – process score: 40% Final exam: 60 %
Reading list	1. Bài giảng Phương pháp phần tử hữu hạn, Trịnh Anh Ngọc, 2018 2. Finite element Analysis, Flaherty J.E., 2000 3. The finite element method in engineering, Rao S.S., 1989.

6. Complex Variable Functions

Module designation	COMPLEX VARIABLE FUNCTIONS
Semester(s) in which the module is taught	
Person responsible for the module	Lý Kim Hà
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Compulsory courses in Analysis, from Analysis 1 to Analysis 4
Module objectives/intended learning outcomes	Equip with basic knowledge of complex numbers, elementary complex functions and necessary complex analysis knowledge to be able to apply in the specializations of numerical analysis, partial differential equations, digital signal processing, statistics and probability.
Content	Basis properties of complex numbers and complex functions. Analytic functions, the power expansion, line integral and the theory of residues.
Examination forms	
Study and examination requirements	
Reading list	1. Complex analysis, Theodore Gamelin, 2001

	2. Complex variables with applications, David Wunsch, 2005 3. Complex analysis, V. Ahlfors, 1966 4. Théorie élémentaire des fonctions analytiques d'une ou plusieurs variables complexes, Henri Cartan, 1961

7. Solid mechanics

Module designation	SOLID MECHANICS
Semester(s) in which the module is taught	
Person responsible for the module	Vũ Đỗ Huy Cường
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Continuum Mechanics
Module objectives/intended learning outcomes	General Objective: To provide students with basic concepts of the laws of behavior of solid bodies. Present some basic laws and theorems related to many practical problems of Deformed Solid Mechanics. Provide students with methods of modelling, solving problems and numerical simulation by computers. Specific objectives/course output standards: • Knowledge: Students understand the basic concepts of the laws of behavior of solid bodies. Students develop methods of modeling, solving problems and numerical simulation by computers.

Content	The subject plays an important role in providing basic knowledge and opening up in-depth research directions in the Deformed Solid Mechanics. The basic knowledge that can be mentioned is the stress-strain relationship in elastic, viscoelastic and elastoplastic theories... In-depth research directions that can be mentioned are the analysis of the behavior of the plate, shell, composite materials, fracture mechanics... This subject inherits a lot of knowledge from the subject of Continuum Mechanics and is also a prerequisite for Finite Element Method, Fracture Mechanics, and Stability and Vibration…
Examination forms	Report/Essay exam
Study and examination requirements	Tests – process score: 35% Final exam: 65 %
Reading list	1. Lý thuyết đàn hồi, Đào Xuân Bích, 2010 2. Elasticity, M. H. Sadd, 2009 3. Cơ học môi trường liên tục, Xêđôp L. I., 1978 4. Nonlinear analysis and continuum mechanics, Giuseppe Buttazzo, 1998

8. Fluid mechanics

Module designation	Fluid mechanics
Semester(s) in which the module is taught	
Person responsible for the module	Trịnh Anh Ngọc
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisite subjects: Theoretical mechanics.
Module objectives/intended learning outcomes	General Objective: To provide basic knowledge of fluid mechanics. Help students know how to set up mathematical models and numerically solve some problems in fluid mechanics. Specific objectives/course output standards: • Knowledge: Mastering the concepts and laws of fluid mechanics. • Skills: Know how to set up mathematical problems describing fluid mechanics phenomena. Know how to numerically solve some problems in fluid mechanics. • Attitude, diligence: Positive and dynamic
Content	Fluid Mechanics is the main subject in the three main research directions of mechanics (solid mechanics, fluid mechanics and vibrations). In this subject, students can apply the results of theoretical math (ordinary differential equations, partial differential equations, theory of complex variable functions) to study problems of fluid mechanics.
Examination forms	Essay or Question and Answer

Study and examination requirements	Tests – process score: 35% Final exam: 65 %
Reading list	1. Bài giảng Cơ học chất lỏng lý thuyết, Trịnh Anh Ngọc, 2018 2. Introduction to fluid mechanics, Fay J.A., 1998 3. Fluid dynamics Theory, Computation, and Numerical simulation, Pozrikidis C., 2001

- **Algebra**

1.Homological Algebra

Module designation	HOMOLOGICAL ALGEBRA
Semester(s) in which the module is taught	
Person responsible for the module	Nguyễn Văn Thìn (A)
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisite course: Higher Algebra
Module objectives/intended learning outcomes	General objective: To equip students with basic knowledge of Homological Algebra, help students to use their tools in research and study topics on Groups, Commutative Algebra, Algebraic Topology. Specific objectives/ course learning outcomes: ● Knowledge: Understand the functors Hom, Tensor, Tor, Ext. ● Skills: Solve basic problems of Hom, Tensor, Tor, Ext functors ● Attitude, diligence: Actively participate in classwork.
Content	The course introduces the basic concepts of homology algebra, focusing on four functors in algebra: Hom, Tensor, Tor, and Ext and the singular homology of topological spaces.
Examination forms	Essay exam
Study and examination requirements	Tests – process score: 30% Final exam: 70%

Reading list	5. Đại số đồng điều, Nguyễn Viết Đông, Trần Huyên, 2006 6. Homological Algebra, Cartan, H and Eilenberg,S , 1956 7. Homology, Mac Lane,1963 8. Homotopy theory, Hu Sze-Tsen, 1959

2.Commutative algebra

Module designation	COMMUTATIVE ALGEBRA
Semester(s) in which the module is taught	
Person responsible for the module	Trần Ngọc Hội
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisite subjects: Higher Algebra Course requirements: Mastery of basic algebraic structures such as groups, rings, integral domains, and fields.
Module objectives/intended learning outcomes	General Objective: To equip students with higher knowledge of commutative rings, the foundation for the study of algebraic geometry and algebraic number theory. Specific objectives/course learning outcomes: • Knowledge: Mastery of primary decomposition in commutative Noetherian rings, quotient rings, chain conditions on modules, Noetherian and Artinian rings, ring extension. • Skills: Improve reasoning and computation in commutative rings. • Attitude, diligence: Serious, dynamic, and progressive.
Content	To introduce further properties of commutative rings such as primary decomposition, quotient rings, chain conditions of modules, Noetherian and Artinian rings, ring extension.
Examination forms	Essay exam

Study and examination requirements	Tests – process score: 50% Final exam: 50%
Reading list	1. A Course in Commutative Algebra, Ash, R. B., 2003 2. Steps in Commutative Algebra, Sharp, R. I., 2000 3. Introduction to Commutative Algebra, Atiyah, M. F. and Macdonald, I. G., 1969 4. Commutative Ring Theory, Matsumura, H., 1986

3.Ring Theory

Module designation	RING THEORY
Semester(s) in which the module is taught	
Person responsible for the module	Nguyễn Văn Thìn (A)
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisite course: Higher Algebra
Module objectives/intended learning outcomes	General Objective: To equip students with basic knowledge of ring theory and Module theory. Specific objectives/course learning outcomes: ● Knowledge: Understand the concepts of prime, semi-prime, local rings, commutative semi-locals, localization, chain conditions on modules, Jordan-Holder theorem. ● Skills: Solve basic problems of prime rings, semiprime rings, local rings, commutative semi-locals, localization, chain conditions on modules. ● Attitude, diligence: Serious, dynamic, and progressive.

Content	The course introduces the basic concepts of ring theory and Module theory. Focus on introducing the concepts of direct sums and products, prime rings, semi-prime, local rings, commutative semi-locals, quotient ring of a commutative ring. Introduce the chain conditions on modules, free modules, and projective modules.
Examination forms	Essay exam
Study and examination requirements	Tests – process score: 30% Final exam: 70%
Reading list	1. Nhập Môn Lý Thuyết Vành và Môđun, Nguyễn Văn Thìn, 2012 2. Algebra, Hungerford Thomas W., 1974 3. Algebra: Vol II: Rings, Luthar I.S. , Passi I.B.S., 2002 4. Algebra: Vol III : Modules, Luthar I.S. , Passi I.B.S., 2002

4.Modern Algebra

Module designation	MODERN ALGEBRA
Semester(s) in which the module is taught	
Person responsible for the module	Bùi Xuân Hải
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisite course: Algebra
Module objectives/intended learning outcomes	The goal of the course is to equip students with deeper knowledge of basic algebraic structures
Content	The course includes the following two sections: ● Group theory: group isomorphism theorems; Sylow's theorems on finite groups; the free Abel groups; solvable groups and nilpotent groups. ● Ring theory: ring isomorphism theorems; some finite conditions; polynomial rings on commutative rings; PID, UFD and Dedekind integral domains.
Examination forms	Essay exam
Study and examination requirements	Tests – process score: 30% Final exam: 70%
Reading list	1. Bùi Xuân Hải (Chủ biên), Trịnh Thanh Đèo, *Đại số hiện đại*, NXB ĐHQG Tp. Hồ Chí Minh 2002. 2. Joseph J. Rotman, *An Introduction to the Theory of Groups*, Four Edition, Springer- Verlag, 1994. 3. S. Lang, *Algebra,* Addison-Wesley Publishing Company, 1965. 4. Algebra : Vol III : Modules, Luthar I.S. , Passi I.B.S., 2002

5.Fields And Galois Theory

Module designation	Fields and Galois Theory
Semester(s) in which the module is taught	
Person responsible for the module	Bùi Xuân Hải
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisite courses: Higher Algebra, Modern Algebra Course requirements: Mastery of basic algebraic structures such as groups, rings, and fields.
Module objectives/intended learning outcomes	General Objective: To introduce the theory of field extension and basic ideas of Galois theory. Specific objectives/course learning outcomes: ● Knowledge: finite extensions, algebraic extensions, splitting fields, normal extensions, separable extensions, Galois correspondence..., basic ideas of Galois theory leading to Galois fundamental theorem and its application in proving the fundamental theorem of algebra and many other applications; conditions for an algebraic equation to be solved by radicals. ● Skill: Finding Galois groups of the finite extensions; describing the intermediate subfields; computing Galois group of a polynomial. ● Attitude, diligence: Fully participate in class sessions; discussions outside class time.
Content	This course aims to equip the foundation knowledge of field extension theory; Galois correspondences; application of Galois theory to various problems of modern mathematics.
Examination forms	

Study and examination requirements	Tests – process score: 30% Final exam: 70%
Reading list	1. Trường và Lý thuyết Galois, Bùi Xuân Hải, 2013 2. Lý thuyết Galois, Ngô Việt Trung, 2005 3. Đại số hiện đại, Bùi Xuân Hải (chủ biên), Trịnh Thanh Đèo, 2013

- **Analysis**

1. Real Analysis

Module designation	Real Analysis
Semester(s) in which the module is taught	1
Person responsible for the module	Dương Minh Đức, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisites: Analysis 1, 2, Functional Analysis
Module objectives/intended learning outcomes	
Content	We construct spaces of functions Lp, Wm,p and study Fourier's transformation.
Examination forms	
Study and examination requirements	
Reading list	1. Analyse Fonctionnelle : Théorie et applications, H. Brezis. 1987

2. Elementary Numerical Analysis

Module designation	ELEMENTARY NUMERICAL ANALYSIS
Semester(s) in which the module is taught	1
Person responsible for the module	Ông Thanh Hải, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General Objective: To introduce the basic concepts and approximation methods of numerical analysis, and to provide students with the tools to find approximate solutions to problems involving equations and systems of equations. By finding algorithms to solve the problems posed, this module aims to equip students with knowledge to solve real problems based on theoretical math knowledge and the means of computations. The course helps students to understand the following knowledge: understand the concept of approximation and types of errors. Understand the most basic approximation methods and their applications. Application of computational software in numerical calculations.
Content	The content of the course includes in the approximate theories and their application to find the approximate solutions of the single variable equations and th system of linear equations, and the approximate derivative, integral... These methods which are applied into the physical problems, are used by the Matlab program to simulate.
Examination forms	
Study and examination requirements	
Reading list	1. Numerical Analysis. Ninth Edition. Brooks, Burden and Faires, 2010 2. Numerical Analysis. Pearson, Sauer, 2006

	3. Numerical Analysis. Brooks/Cole Publishing Company, Kincaid, W. Cheney, 1991 4. Numerical methods using Matlab. Third Edition. Prentice Hall, J. H. Mathews, K. D. Frink, 1999

3. Qualitative Theory of Differential Equations

Module designation	QUALITATIVE THEORY OF DIFFERENTIAL EQUATIONS
Semester(s) in which the module is taught	1
Person responsible for the module	Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisites: Analysis 1, 2, 3, 4, Linear Algebra
Module objectives/intended learning outcomes	
Content	Basic theorems (Gronwall-Bellman lemma, existence, uniqueness, theorems on existence interval and dependence on initial conditions). System of differential equations (forms of the system and methods of integration, methods of solving ODEs). Other types of ODEs (slow differential equations, random equations, complex ODEs, functional ODEs, ODEs in Banach space, ODEs on manifolds, differential envelopes). Experimental properties (dynamics, stability, branching, topological equivalence)
Examination forms	
Study and examination requirements	
Reading list	1. Phương trình Vi phân, Nguyễn Đình Phư, NXB ĐHQG TP HCM, 2002 2. Những chương bổ sung phương trình vi phân, Arnold V, NXB Nauka, 1978 3. Ordinary Differential Equations, Hartman Ph., John Wiley and Sons, New York, 1964 4. Phương trình vi phân, Hoàng Hữu Đường , Võ Đức Tôn, Nguyễn Thế Hoàn, NXB Đại học và Trung học chuyên nghiệp Hà Nội 1970.

4. Complex Variable Functions

Module designation	COMPLEX VARIABLE FUNCTIONS
Semester(s) in which the module is taught	2
Person responsible for the module	Lý Kim Hà, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Compulsory courses in Analysis, from Analysis 1 to Analysis 4
Module objectives/intended learning outcomes	Equip with basic knowledge of complex numbers, elementary complex functions and necessary complex analysis knowledge to be able to apply in the specializations of numerical analysis, partial differential equations, digital signal processing, statistics and probability.
Content	Basis properties of complex numbers and complex functions. Analytic functions, the power expansion, line integral and the theory of residues.
Examination forms	
Study and examination requirements	
Reading list	1. Complex analysis, Theodore Gamelin, 2001 2. Complex variables with applications, David Wunsch, 2005 3. Complex analysis, V. Ahlfors, 1966 4. Théorie élémentaire des fonctions analytiques d'une ou plusieurs variables complexes, Henri Cartan, 1961

5. Equations Of Mathematical Physics

Module designation	EQUATIONS OF MATHEMATICAL PHYSICS
Semester(s) in which the module is taught	1
Person responsible for the module	Nguyễn Thành Long, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduce the basic mathematical physics equations and know how to find classical solutions by Fourier's method of separation of variables.
Content	Linear ordinary differential equations of the second order; Wave equations; Heat equations; Laplace equations.
Examination forms	
Study and examination requirements	
Reading list	1. Bài giảng phương trình toán lý, Nguyễn Thành Long, 2020 2. Phương Trình Vật lý - Toán nâng cao, Nguyễn Công Tâm, 2002 3. Partial Differential Equations, An introduction, David Colton, 1988 4. Partial Differential Equations, L.C. Evans, 1998 5. Fundamentals of differential equations and boundary value problems, R. Kent Nagle, Edward B. Saff, 1993

6. Partial Differential Equations

Module designation	PARTIAL DIFFERENTIAL EQUATIONS
Semester(s) in which the module is taught	2
Person responsible for the module	Đặng Đức Trọng, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisites: Real Analysis, Functional Analysis
Module objectives/intended learning outcomes	General objective: To equip students with some knowledge of qualitative theory of partial differential equations for further study in the field of research on partial differential equations or in applied mathematics.
Content	Study the existence of solutions of Elliptic, Hyperbolic, Parabolic equations on Sobolev spaces.
Examination forms	
Study and examination requirements	Assignments: 50%, Final Exam: 50%
Reading list	1. Functional Analysis, Sobolev spaces and partial differential equations, Heim Brezis, 2011 2. Applied partial differential equations, Paul Duchateau, David Zachman, 1989 3. An introduction to semilinear evolution equations, Thierry Cazenave, Alain Haraux, 1998 4. Partial differential equations, Lawrence C. Evans, 2010 5. Partial differential equations, Mikhailov, 1977

7. Finite Element Analysis

Module designation	FINITE ELEMENT ANALYSIS
Semester(s) in which the module is taught	2
Person responsible for the module	Ông Thanh Hải, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Functional analysis, Introduction to numerical analysis.
Module objectives/intended learning outcomes	General objectives: Introduces the basic concepts and approximation methods of numerical analysis and provides students with the tools to find approximate solutions to problems involving partial differential equations using finite element analysis. The course helps students to acquire the following knowledge: understand the concept of the best approximation with different spatial standards and how to find these best approximations. Understand the concept of weak and classical solutions to elliptic problems with boundary conditions. Understand the concept of a two-dimensional partial polynomial approximation and obtain an analytic error assessment of this approximation. There is an evaluation of simulation computational problems for the diffusion problem.
Content	The course includes approximation theories and applications to find numerical solutions to linear elliptic partial differential problems using the finite element method. This method has been used to solve real problems corresponding to physical phenomena, such as diffusion, convection, elasticity... Besides, we emphasize the accuracy evaluation, stability of approximate solutions using a priori, stable and posterior evaluation techniques. Finally, we use the Matlab programming language to simulate the finite element method in the diffusion and elasticity problem.
Examination forms	

Study and examination requirements	
Reading list	1. Numerical Approximation of Partial Differential Equations, Alfio Quarteroni, 1996 2. The Finite Element Method, C. Zienkiewicz and R. L. Taylor, 2000 3. The Finite Element Method, Philippe G. Ciarlet, 1978 4. Functional Analysis, Approximation Theory and Numerical Analysis, John M. Rassias, 1994 5. The Finite Element Method using Matlab, Young W. Kwon and Hyochoong Bang, 1997 6. Giải Tích Hàm, Dương Minh Đức

8. Topology

Module designation	TOPOLOGY
Semester(s) in which the module is taught	1
Person responsible for the module	Huỳnh Quang Vũ, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Required: Functional Analysis
Module objectives/intended learning outcomes	General Objective: The course aims to provide students with basic concepts, languages, methods, and results of Topology, which are commonly used in mathematics. The subject is first and foremost useful for students of theoretical mathematics, especially Analysis, in addition to Algebra and Optimization. On the other hand, recently some contents of Topology have been applied to computation, so students of computer science can also learn useful things. In addition to knowledge, this subject is a very suitable place to practice thinking at a high level of abstraction, generality and precision. Specific objectives/course learning outcomes: ● Knowledge: understand and apply basic concepts and results of general topology. Do some topological

	reasoning. For good students lay the foundation and impetus for further research on topology. ● Skills: achieve the ability to absorb and implement some reasoning at a high level of generalization and abstraction. ● Attitude, diligence: Seeing the need to develop generalization and abstraction, thereby helping to investigate new problems, under a new perspective, from which to have a serious, proactive and self-disciplined learning attitude.
Content	The content of this course includes general topology, also known as point set topology including: topological space, continuous mapping, homeomorphisms, connectedness, separation, convergence, compactness, Tikhonov's theorem, Alexandroff's compactification, Urysohn's theorem, space of continuous functions, quotient topology, ...
Examination forms	written, may include a project
Study and examination requirements	Assignments: 50%, Final Exam: 50%
Reading list	1. Lecture notes on Topology, Huỳnh Quang Vũ, available freely online. 2. Topology: A first course, James R. Munkres, 2000 3. Introduction to Topology: Pure and Applied, Colin Adams, Robert Fransoza, 2009

- **Numerical Analysis**

1. Elementary numerical analysis

Module designation	ELEMENTARY NUMERICAL ANALYSIS
Semester(s) in which the module is taught	2
Person responsible for the module	Ông Thanh Hải, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General Objective: To introduce the basic concepts and approximation methods of numerical analysis, and to provide students with the tools to find approximate solutions to problems involving equations and systems of equations. By finding algorithms to solve the problems posed, this module aims to equip students with knowledge to solve real problems based on theoretical math knowledge and the means of computations. The course helps students to understand the following knowledge: understand the concept of approximation and types of errors. Understand the most basic approximation methods and their applications. Application of computational software in numerical calculations.
Content	The content of the course includes in the approximate theories and their application to find the approximate solutions of the single variable equations and the system of linear equations, and the approximate derivative, integral... These methods which are applied into the physical problems, are used the Matlab program to simulate.
Examination forms	
Study and examination requirements	

Reading list	1. Numerical Analysis. Ninth Edition. Brooks, Burden and Faires, 2010 2. Numerical Analysis. Pearson, Sauer, 2006 3. Numerical Analysis. Brooks/Cole Publishing Company, Kincaid, W. Cheney, 1991 4. Numerical methods using Matlab. Third Edition. Prentice Hall, J. H. Mathews, K. D. Frink, 1999

2. Partial differential equations

Module designation	PARTIAL DIFFERENTIAL EQUATIONS
Semester(s) in which the module is taught	2
Person responsible for the module	Đặng Đức Trọng, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisites: Real Analysis, Functional Analysis
Module objectives/intended learning outcomes	General objective: To equip students with some knowledge of qualitative theory of partial differential equations for further study in the field of research on partial differential equations or in applied mathematics.
Content	Study the existence of solutions of Elliptic, Hyperbolic, Parabolic equations on Sobolev spaces.
Examination forms	
Study and examination requirements	Assignments: 50%, Final Exam: 50%
Reading list	1. Functional Analysis, Sobolev spaces and partial differential equations, Heim Brezis, 2011 2. Applied partial differential equations, Paul Duchateau, David Zachman, 1989 3. An introduction to semilinear evolution equations, Thierry Cazenave, Alain Haraux, 1998 4. Partial differential equations, Lawrence C. Evans, 2010 5. Partial differential equations, Mikhailov, 1977

3. Finite element analysis

Module designation	FINITE ELEMENT ANALYSIS
Semester(s) in which the module is taught	2
Person responsible for the module	Ông Thanh Hải, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Functional analysis, Introduction to numerical analysis.
Module objectives/intended learning outcomes	General objectives: Introduces the basic concepts and approximation methods of numerical analysis, and provides students with the tools to find approximate solutions to problems involving partial differential equations using finite element analysis. The course helps students to acquire the following knowledge: understand the concept of the best approximation with different spatial standards and how to find these best approximations. Understand the concept of weak and classical solutions to elliptic problems with boundary conditions. Understand the concept of a two-dimensional partial polynomial approximation and obtain an analytic error assessment of this approximation. There is an evaluation of simulation computational problems for the diffusion problem.
Content	The course includes approximation theories and applications to find numerical solutions to linear elliptic partial differential problems using the finite element method. This method has been used to solve real problems corresponding to physical phenomena, such as diffusion, convection, elasticity... Besides, we emphasize the accuracy evaluation, stability of approximate solutions using a priori, stable and posterior evaluation techniques. Finally, we use the Matlab programming language to simulate the finite element method in the diffusion and elasticity problem.
Examination forms	

Study and examination requirements	
Reading list	1. Numerical Approximation of Partial Differential Equations, Alfio Quarteroni, 1996 2. The Finite Element Method, C. Zienkiewicz and R. L. Taylor, 2000 3. The Finite Element Method, Philippe G. Ciarlet, 1978 4. Functional Analysis, Approximation Theory and Numerical Analysis, John M. Rassias, 1994 5. The Finite Element Method using Matlab, Young W. Kwon and Hyochoong Bang, 1997 6. Giải Tích Hàm, Dương Minh Đức

4. Real analysis

Module designation	Real Analysis
Semester(s) in which the module is taught	1
Person responsible for the module	Dương Minh Đức, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Prerequisites: Analysis 1, 2, Functional Analysis
Module objectives/intended learning outcomes	
Content	We construct spaces of functions Lp, Wm,p and study Fourier's transformation.
Examination forms	
Study and examination requirements	
Reading list	1. Analyse Fonctionelle : Théorie et Applications, H. Brezis. 1987

5. Numerical methods on linear algebra

Module designation	NUMERICAL METHODS ON LINEAR ALGEBRA
Semester(s) in which the module is taught	1
Person responsible for the module	Nguyễn Thanh Bình, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General objectives: This course provides basic concepts and algorithms related to linear algebraic computations on computers. This is an important foundation for computational science and engineering problems such as image and signal processing, computational finance, mechanics,... Intended learning outcomes: Knowledge: Basic concepts in applied linear algebra such as calculating matrices, solving systems of equations, matrix analysis method (Singular Value decomposition, Eigenvalue decomposition, LU decomposition, QR decomposition),.. QR decomposition method. Least Squares Problem. How to solve a system of linear equations on a computer. Evaluate the accuracy and stability of the algorithm. Analytical method of matrix eigenvalues.
Content	Linear algebra problems appear from many practical applications in physics, biology, mathematics, and computer science. The course includes theory and methods to solve these problems on computers. In addition to related concepts, the course introduces basic algorithms to solve calculations on matrices. The course also emphasizes the evaluation of the complexity and stability of algorithms. Finally, students use Matlab language to install on computers.

Examination forms	
Study and examination requirements	
Reading list	1. Numerical Linear Algebra, Lloyd N. Trefethen, David Bau, 1997 2. Matrix Computation, Gene H. Golub and Charles F. Van Loan, 1996 3. Giải Tích Hàm, Dương Minh Đức 4. MATLAB. 2011

6. Hyperbolic systems of Conservations laws

Module designation	Hyperbolic Systems of Conservation Laws
Semester(s) in which the module is taught	1
Person responsible for the module	Nguyễn Tấn Trung, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Linear Algebra, Introduce to finite volume methods and their applications Subject requirements: basic programming skills.
Module objectives/intended learning outcomes	General objectives: The hyperbolic Systems of Conservation laws describe a large number of physics problems in fields as diverse as: fluid dynamics, solid mechanics, astrophysics,... The introductory concept of hyperbolic Systems of Conservation laws, is also a continuation of the course "Introduction to finite volume methods and applications". Thereby, students gain an initial background of several research directions in academia as well as industry. Intended learning outcomes: • Knowledge: Hyperbolic Systems of Conservation laws simulate real problems.

	Mathematical basis of forming a conserved hyperbolic system. Linear and nonlinear hyperbolic partial differential equations. Initial value problem. Riemann problem and how to find exact solutions in some specific problems. Linear advection equations, linear aerodynamics, Burgers equations,... Apply the finite volume method to find the numerical solution of the hyperbolic partial differential equation. • Skill:… • Attitude, Diligence:…
Content	The theory of hyperbolic partial differential equations have a large role in numerical analysis and its applications cover almost all fields such as: fluid dynamics, aerodynamics, elastic theory, optics. The course provides students with the necessary knowledge about the theory of linear and nonlinear hyperbolic partial differential equations as well as numerical methods to find exact solutions (in some problems) and approximations of these equations. The actual computation on the machine is done in one of the following programming languages: Scilab / Matlab / C++ (recommended) / Fortran.
Examination forms	
Study and examination requirements	
Reading list	1. Finite Volume Methods, R. Eymard, T. Gallouet and R. Herbin, 2000 2. Explicit staggered schemes for compressible flows, Nguyễn Tấn Trung, 2013 3. Hyperbolic Systems of Conservation Laws, E. Godlewski and P.-A. Raviart, 1991

7. Introduction to finite volume methods and their applications

Module designation	INTRODUCTION TO FINITE VOLUME METHODS AND THEIR APPLICATIONS.
Semester(s) in which the module is taught	2
Person responsible for the module	Nguyễn Tấn Trung, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Subject requirements: basic programming skills.
Module objectives/intended learning outcomes	General objectives: In industrial problems in the form of partial differential equations, it is common to find problem solving tools based on volumetric and/or finite element methods. Thereby, these problems, for the most part, are either solved directly, or are reduced to algebraic equations for processing by the built-in tools of computational linear algebra. This course is considered as one of the prerequisites for students to study number theory or work in an industrial environment. Intended learning outcomes: • Knowledge: The partial differential equations simulate real problems. How to create a grid for discretization by spatial variables. Compare the differential and finite volume methods. The schema is implicit and explicit. Solve and simulate on Matlab/Scilab elliptic, parabolic and hyperbolic partial differential equations. Classical finite volume method and variations. Evaluate the convergence and error of the methods. • Skill:… • Attitude, Diligence:…

Content	The finite volume method is widely used in numerical simulation of real problems in the form of partial differential equations such as nuclear safety, oil and gas exploitation, astronomy, geology, etc.. The course provides students with the necessary knowledge in digitizing different forms of partial differential equations (elliptic, parabolic and hyperbolic) using the finite volume method. The focus of the course is equally divided into both theoretical and practical parts of one of the following programming languages: Scilab / Matlab / C++ (recommended) / Fortran.
Examination forms	
Study and examination requirements	
Reading list	1. Finite Volume Methods, R. Eymard, T. Gallouet and R. Herbin, 2000 2. Explicit staggered schemes for compressible flows, Nguyễn Tấn Trung, 2013 3. Giải Tích Hàm, Dương Minh Đức

8. Finite difference method

Module designation	FINITE DIFFERENCE METHOD
Semester(s) in which the module is taught	1
Person responsible for the module	Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	MATLAB, Functional analysis, Linear Algebra.
Module objectives/intended learning outcomes	General objectives: The module provides students with an overview of numerical analysis applied in industrial problems. This subject can be considered as a premise for students to get acquainted with mathematical models, numerical analysis and computational science. Moreover, the course is considered as a complement to two important subjects of the major of numerical analysis: finite volume methods and finite element method. Intended learning outcomes: • Knowledge: The partial differential equations simulate real problems. Classical mathematical models for industrial problems. Finite difference method. Solve and simulate solutions of heat equations and convective equations on a computer. Evaluation of experimental results obtained through numerical methods. • Skill:… • Attitude, Diligence:…

Content	Partial differential equations are a main part of industrial problems. However it is not easy to solve these problems. So this course introduces to students basic steps of numerical schemes to solve industrial problems from discretizing the simple partial differential equations such as: heat equation or diffusion equation. The key of the course includes two parts: theory and practice.
Examination forms	
Study and examination requirements	
Reading list	1. Finite Difference Schemes and Partial Differential Equations, J. C. Strikwerda, 1989 2. Finite Difference Methods for Ordinary and Partial Differential Equations, R. J. LeVeque, 2007 3. Numerical Solution of Partial Differential Equations, K. W. Morton and D. F. Mayers, 1995 4. MATLAB, 2011

9. Numerical optimization

Module designation	NUMERICAL OPTIMIZATION
Semester(s) in which the module is taught	1
Person responsible for the module	Nguyễn Thị Thu Vân, Department of Analysis
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	lectures
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Analysis 1, Analysis 2, Analysis 3. Subject requirements: basic programming skills.

Module objectives/intended learning outcomes	• Knowledge: The course is designed for students majoring in Analysis. We will equip students with the basics of convex analysis, linear programming, and nonlinear programming. Some typical optimization methods, easy to understand, easy to install will be selected to introduce to students. After completing this course, students are expected to have mastered the basics of convex analysis, optimal conditions for unconstrained and unconstrained convex optimization problems, mathematical foundations and fundamental algorithms. basis for solving linear and nonlinear programming. • Skills: basic equipment for students about matlab programming.
Content	Optimization is an important area of study in applied mathematics. We can understand the optimization problem to determine the best value of the objective function over a given domain. In this course, we will introduce students to some typical numerical methods for solving linear programming, unconstrained and constrained optimization problems. At the same time, students can practice using MATLAB to illustrate some academic examples.
Examination forms	
Study and examination requirements	Check – evaluate the process: weighted 50% Final exam score: weighted 50%
Reading list	1. Convex Analysis and Minimization Algorithms, Volumes I and II, Hiriart-Urruty, J.B. and Lemaréchal, C., Springer, Berlin (1993) 2. Giáo trình Quy hoạch tuyến tính, Phan Quốc Khánh và Trần Huệ Nương, NXB Giáo dục (2000) 3. Giáo trình Các phương pháp Tối ưu – Lý thuyết và Thuật toán, Nguyễn Thị Bạch Kim, NXB Bách Khoa –Hà nội (2008) 4. Convex Analysis, Rockafellar R. Tyrrell, Princeton University Press (1970) 5. Numerical methods for unconstrained optimization and nonlinear equations, Schnabel Robert B. and Dennis J. E., SIAM (1996) 6. Giáo trình Giải tích Lồi và Tối ưu, Tạ Quang Sơn, NXB Giáo dục Việt Nam (2017) 7. Numerical Optimization, Strodiot J.J, [Lecture notes, 2010] 8. A first course in optimization theory, Sundaram Rangarajan K., Cambridge University Press (1996)

- **Mathematical Finance**

1. Elementary Financial Mathematics

Module designation	ELEMENTARY FINANCIAL MATHEMATICS
Semester(s) in which the module is taught	5,6,7,8
Person responsible for the module	Nguyen Huu Toan, Phan Thi Phuong
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Statistical system theory, financial basics
Module objectives/intended learning outcomes	Equip students with the basic knowledge of finance and financial mathematics for discrete non-random models.
Content	Including the theory of interest rates, money chains, forms of borrowing, appraisal of investment projects, valuation of bonds and stocks.
Examination forms	Essay Exam
Study and examination requirements	Midterm: 30%, Final: 70%

Reading list	1. Toán tài chính căn bản, Đinh Ngọc Thanh, Phạm Thị Thu Hồng, Đặng Đức Trọng. 2. Risk and financial management : mathematical and computational methods, Tapiero Charlas

2. Forecasting

Module designation	FORECASTING
Semester(s) in which the module is taught	Dinh Ngoc Thanh
Person responsible for the module	5,6,7,8
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Statistical system theory, financial basics
Module objectives/intended learning outcomes	Provide knowledge and skills to build quantitative models, simulations in economics. Combine with computers to build computational models for forecasting problems.
Content	Forecasting models and methods. Regression models. Time series.

Examination forms	Essay Exam
Study and examination requirements	Midterm: 30%, Final: 70%.
Reading list	1. Time series : theory and methods, Davis Richard A , Brockwell Peter J. 2. Phương pháp luận dự báo, Thống kê, 2008, Trịnh Thị Long Hương.

3. Financial Modeling

Module designation	Financial Modeling
Semester(s) in which the module is taught	5, 6, 7, 8
Person responsible for the module	Nguyen Dang Minh
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Statistical system theory, financial basics

Module objectives/intended learning outcomes	Knowledge: • Consolidate basic and advanced knowledge of probability theory to apply to solving problems in insurance and finance • Consolidate knowledge about financial markets and financial instruments as the foundation for building financial models to solve practical problems. • Basic introduction to decision making theory. • Building financial risk management models. • Set up several pricing models. Skill: • Applying theory to build models suitable to reality, reflecting the nature of relationships in business-finance. • Using computer software to support calculations in the subject. Study attitude: attend school fully and do homework, ensure self-study time at home.
Content	This course introduces basic financial models to help students understand and apply financial knowledge to solve fundamental financial problems such as decision making, risk assessment, valuation. … in a way that has a clear scientific basis.
Examination forms	Essay Exam
Study and examination requirements	Midterm: 30%, Final: 70%.
Reading list	1. Phương pháp mô phỏng số Monte Carlo, Nguyễn Quý Hỷ. 2. Phương pháp Monte- Carlo và các vấn đề liên quan Ermakov X. M

4. Financial and Monetary Theory

Module designation	FINANCIAL AND MONETARY THEORY
Semester(s) in which the module is taught	5, 6, 7, 8
Person responsible for the module	Nguyen Huu Toan, Phan Thi Phuong
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General Objective: This course explores issues related to interest rates, how financial markets and financial institutions work. This course is divided into 5 parts. Part 1 provides an overview of the financial system, how interest rates are calculated, and how interest rates are structured. Part 2 explores how the debt securities market works. Part 3 learns about the stock market. Part 4 explores the derivatives market. Section 5 explores the activities of commercial banks and non-banks.
Content	Overview of the financial system and financial institutions. Debt stock market. Market share. Derivatives stock market. Commercial banks and non-banking organizations.
Examination forms	Essay Exam

Study and examination requirements	Midterm: 30%, Final: 70%.
Reading list	1. Chiến tranh tiền tệ, Song Hongbing. 2. Vấn đề đổi mới chính sách Tài chính- Tiền tệ, kiểm soát lạm phát ở Việt Nam và kinh nghiệm của Nhật Bản, Nhà xuất bản chính trị quốc gia

5. Advanced Financial Mathematics

Module designation	Advanced Financial Mathematics
Semester(s) in which the module is taught	5, 6, 7, 8
Person responsible for the module	Dang Duc Trong
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with advanced knowledge of finance and financial mathematics for discrete stochastic and continuous models.
Content	Covers the basic theory of market derivatives, forwards, options, and swaps.

Examination forms	Essay Exam
Study and examination requirements	Midterm: 30%, Final: 70%
Reading list	1. Toán tài chính nâng cao, Đinh Ngọc Thanh, Phạm Thị Thu Hồng, Đặng Đức Trọng. 2. An introduction to options and futures, The Dryden, 1989, Chance Don M.

- **Optimization**

1. Operations Research

Module designation	OPERATIONS RESEARCH
Semester(s) in which the module is taught	3, 5, 7
Person responsible for the module	Nguyen Van Thuy
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Linear Programming, Linear Algebra
Module objectives/intended learning outcomes	Provide students with knowledge and applications of linear programming problems in the form of graphs, networks and some practical applications.
Content	- Basic concepts of graphs and trees; - Algorithms of network problems; - Network diagram methods; - Concepts of transport problems and algorithms.
Examination forms	Essay Exam
Study and examination requirements	Midterm test: 40%, Final test: 60%

Reading list	- Vận trù học, NXB Giáo Dục, P.Q. Khanh, 2004. - Quy hoạch tuyến tính, NXB Giáo Dục, P.Q. Khanh, T. H.Nuong, 2003.

2. Nonlinear Programming

Module designation	NONLINEAR PROGRAMMING
Semester(s) in which the module is taught	3, 5, 7
Person responsible for the module	Nguyen Le Hoang Anh
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Analysis 1, Analysis 2, Calculus 1, Calculus 2
Module objectives/intended learning outcomes	Provide students with basic knowledge about the nonlinear programming and optimality conditions of this problem.
Content	- Concepts of differentiability in normed spaces. -Important theorems in nonlinear analysis: implicit functions, inverse functions, Hahn-Banach, convex set separation theorem, open mapping theorem. - Minimum existence theorems -Optimality conditions, necessary conditions, sufficient conditions, Lagrange multiplier rules. - Duality theorem, saddle point.
Examination forms	Essay Exam
Study and examination requirements	Midterm test: 40%, Final test: 60%.
Reading list	-Nonlinear programming : sequential unconstrained minimization techniques, SIAM, McCormick Garth P. , Fiacco Anthony V, 1990. -Nonlinear programming and variational inequality problems : a unified approach, Springer, Patriksson M, 2013.

3. Optimization Models in Economics

Module designation	OPTIMIZATION MODELS IN ECONOMICS
Semester(s) in which the module is taught	4, 6, 8
Person responsible for the module	Nguyen Le Hoang Anh
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	75
Credit points	4
Required and recommended prerequisites for joining the module	Calculus 1, Calculus 2, Linear Algebra
Module objectives/intended learning outcomes	Provides students with the basic concepts of mathematical modeling in economics.
Content	- Closed and open Leontief model, direct and indirect costs - Labor theory of value, substitution theorem; - Linear optimal model, producible set, efficient production, production constraints, consumption; - Nonlinear optimization model, modern theory of demand, extended theory of production; -Equilibrium in the market economy, budget constraints, Walras-Wald model, Arrow-Debreu-Mckenzie model.
Examination forms	Essay Exam
Study and examination requirements	Midterm test: 50%, Final test: 50%.
Reading list	-Introduction to Mathematical Economics, Schaum's Outline Series, Dowling Edward T, 2012. -Lý thuyết mô hình toán kinh tế, ĐH Kinh tế Quốc dân, Hoàng Đình Tuấn, 2007.

4. Linear Programming

Module designation	LINEAR PROGRAMMING
Semester(s) in which the module is taught	4, 6, 8

Person responsible for the module	Nguyen Le Hoang Anh
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	75
Credit points	4
Required and recommended prerequisites for joining the module	Linear Algebra
Module objectives/intended learning outcomes	Provide students with the tools to solve the linear programming problem, distinguish the types of problems, the original monomorphic, dual, and synthetic methods. How to build models from real problems.
Content	Objective function, constraint, sign constraint, vocabulary, basis solution, extreme point, primal simplex method, duality.
Examination forms	Essay Exam
Study and examination requirements	Midterm test: 50%, Final test: 50%.
Reading list	-Quy hoạch tuyến tính, NXB Giáo Dục, P.Q.Khánh, T.T.H. Nương, 2003. -Linear Programming, NewYork, V. Chvatal, 1983

5. Numerical Method in Optimization

Module designation	NUMERICAL METHOD IN OPTIMIZATION
Semester(s) in which the module is taught	4, 6, 8
Person responsible for the module	Vo Si Trong Long
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	75
Credit points	4

Required and recommended prerequisites for joining the module	Calculus 1, Calculus 2, Linear Algebra
Module objectives/intended learning outcomes	Provide students with knowledge and methods to solve constrained and unconstrained optimization problems.
Content	-Basic properties and concepts of algorithms, Direct/Indirect line search method for unconstrained optimization problem - Deep reduction method, gradient method and conjugate gradient method - Newton and quasi-Newton methods -The least squares problem. Kuhn-Tucker Optimality Conditions.
Examination forms	Essay Exam
Study and examination requirements	Midterm test: 40%, Final point: 60%
Reading list	-Optimization: algorithms and consistent approximations, Springer, Polak Elijah, 1997. -Optimisation numérique, Springer, J . Frédéric Bonnans, 1997. -Numerical methods for unconstrained optimization and nonlinear equations, SIAM, Schnabel Robert B, 1996.

6. Introduction To Convex Analysis And Convex Programming

Module designation	INTRODUCTION TO CONVEX ANALYSIS AND CONVEX PROGRAMMING
Semester(s) in which the module is taught	3, 5, 7
Person responsible for the module	Vo Si Trong Long
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Analysis 1, Analysis 2, Calculus 1, Calculus 2
Module objectives/intended learning outcomes	Provide students with knowledge about convex analysis.
Content	- Convex set, affine set, Caratheodory's Theorem. - Convex function, quasi-convex function, lower and upper semicontinuous, continuous, Lipschitz continuous, Karamardian theorem, local minima. - Hahn-Banach theorem, separation form. - Convex programming. - Optimal conditions. - Duality theorem.
Examination forms	Essay Exam
Study and examination requirements	Midterm test: 40%, Final test: 60%
Reading list	-Convex Analysis, Princeton University Press, Princeton, New Jersey, R.T. Rockafellar, 1970 -An Easy Path to Convex Analysis and Applications, Morgan & Claypool Publishers, Boris S. Mordukhovich and Nguyen Mau Nam, 2013.

- **Probability and Statistics**

1. Advanced Probability

Module designation	Advanced probability
Semester(s) in which the module is taught	5, 7
Person responsible for the module	
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Measure theory and probability, Analysis A1, Analysis A2
Module objectives/intended learning outcomes	The course provides a deeper understanding of the foundations of probability theory, such as probability theory from a measure-theoretic perspective, convergence of distributions and probability measures, Borell-Cantelli lemma, Radon-Nikodym theorem, Fubini theorem, and general central limit theorems.
Content	Probability space; axiomatics. Random variables and vectors; probability distribution; mathematical expectation, integrability, monotone and dominated convergence. Moments and inequalities. Characteristic function, positive definiteness; the Parseval relation; continuity theorem. Independence (classes, sequences, …); the zero – and – one law. Strong law of large number Conditional expectation and distribution. Central limit theorems.
Examination forms	Writing
Study and examination requirements	Midterm: 30%, Final: 70%
Reading list	[1] Nguyễn Bác Văn, Xác suất và xử lý số liệu thống kê, TP Hồ Chí Minh, NXB Giáo dục 1997.

	[2] Billingsley, P. (1968). Convergence of Probability Measures. Wiley. [3] William Feller, An Introduction to Probability Theory and Its Applications, Vol. II, 2nd ed., New – York, Wiley, 1971. [4] Michel Loève, Probability Theory, 3rd. Ed., New – York, Van Nostrand, 1963.

2. Mathematical Statistics

Module designation	MATHEMATICAL STATISTICS
Semester(s) in which the module is taught	5, 7
Person responsible for the module	Hoàng Văn Hà
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Advanced probability, Analysis A1, A2
Module objectives/intended learning outcomes	
Content	Statistical structure. General density function. Sufficient statistics; conditional distribution given sufficient statistics; the factorization criterion; improvement of estimates through sufficient statistics. Statistical estimation; Rao-Crammer inequality; Fisher's information. Efficient estimate. Asymptotic estimators. Estimation methods. Likelihood. Hypothesis testing; Neyman-Pearson lemma. Composite alternative; uniformly most powerful test. Monotone likelihood ratio family. Confidence sets.
Examination forms	Writing
Study and examination requirements	Homework exercises: 10% Mid-term: 30% Final exam: 60%

Reading list	[1] S.Zacks, The theory of Statistical inference, New-York, Wiley, 1971. [2] C.R.Rao, Linear statistical inference and its applications, New-York, Wiley, 1973. [3] E.lehmann, Testing statistical hypotheses, New-York, Wiley, 1959. [4] Nguyễn Bác Văn, Xác suất và xử lý số liệu thống kê, TP. Hồ Chí Minh, NXB Giáo dục, 1997.

3. Multivariate Statistical Analysis

Module designation	MULTIVARIATE STATISTICAL ANALYSIS
Semester(s) in which the module is taught	6, 8
Person responsible for the module	Nguyen Thi Mong Ngoc
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, do exercises, group work
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Linear algebra, Mathematical statistics
Module objectives/intended learning outcomes	Equip students with the knowledge base of multidimensional statistical system processing. Apply multivariate skills and "hands-on" techniques using R ou Python software in analyzing real data.
Content	Multivariate normal distribution, Inference about a mean vector (Hotelling's T^2 and Likelihood Ratio Tests, Confidence regions and simultaneous comparisons of Component Means, multivariate quality Control Charts, …); comparisons of several multivariate means (Comparing Mean Vectors from two population, One-Way MANOVA, Two-Way MANOVA, Testing for Equality of Covariance Matrices), Principal Components Analysis (PCA). Apply multivariate skills and "hands-on" techniques using R (ou Python) software in analyzing real data.
Examination forms	Writing
Study and examination requirements	Mid-term: 50%, Final exam: 50%.
Reading list	[1] Applied Multivariate Statistical Analysis, Richard A. Johnson, Dean W. Wichern , 2007. [2] An Introduction to Multivariate Statistical Analysis, T. W. Anderson, 2003. [3] Applied Multivariate StatisticalAnalysis, Wolfgang Härdle · Léopold Sima, 2007. [4] Applied Multivariate Statistics with R, Daniel Zelterman, 2015. [5] An R and S-PLUS Companion to Multivariate Analysis, Everitt, B.S. 2005

4. Stochastic Processes

Module designation	STOCHASTIC PROCESSES
Semester(s) in which the module is taught	6, 8
Person responsible for the module	Lê Thị Xuân Mai
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	60
Credit points	4
Required and recommended prerequisites for joining the module	Probability and measure theory, Mathematical statistics, Analysis A1,
Module objectives/intended learning outcomes	Stochastic processes have wide applications in statistical physics, communication and control, time series analysis, population growth, and management sciences. This module will give students some basic knowledge about probability and stochastic processes and their characteristics such as Poisson processes, discrete and continuous Markov chains, Brownian motions and some applications in physics, biology
Content	Chapter 1. Introduction to stochastic processes Chapter 2. Poisson process Chapter 3. Discrete time Markov chains Chapter 4. Continuous time Markov chains Chapter 5. Brownian motion.
Examination forms	Writing
Study and examination requirements	Mid-term: 40% Final exam: 60%
Reading list	[1] Henk C. Tijms. A first course in stochastic models. Wiley, 2003. [2] An Introduction to Stochastic Modelings, M. Pinsky and S. Karlin [3] Theory of Probability and Random Processes , L. Koralov, and Y. Sinai [4] Ross Sheldon M. - Introduction to Probability Models (7th ed. 2007)

- **Data Science**

1. Introduction To Database Systems

Module designation	INTRODUCTION TO DATABASE SYSTEMS
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduce students to basic concepts of databases; data models; database design standards and standard forms.
Content	- Basic concepts of databases. - Linked entity data model, relational data model. - Operations on the relational data model. - SQL query language. - Standard forms and normalization algorithms for databases.
Examination forms	
Study and examination requirements	Mid-term: 30%, Final exam: 70%
Reading list	[1] R. Elsmari, S. Navathe. Fundamentals of Database Systems 4th edition, Addison Wesley, 2004. [2] Nguyễn Kim Anh. Nguyên lý của các hệ cơ sở dữ liệu, NXB ĐHQG Hà Nội, 2004.

2. Artificial Intelligence

Module designation	ARTIFICIAL INTELLIGENCE
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The course provides some basic knowledge of artificial intelligence science. The main content includes: Problem solving methods and applications. Focus on heuristic methods. Present some knowledge representation methods and some knowledge processing techniques. The problem of approximate reasoning. Introduction to some knowledge systems. Introduce some other models and methods. Ontology and Agent Concepts. At the same time, the course also introduces soft computing techniques such as Fuzzy, Neural Networks, Genetic Algorithms.
Content	Overview of the science of AI • State space and search problem • Knowledge representation • Introduction to machine learning and knowledge discovery • Introduction of Ontology and Intelligent Agent • Introduction to Genetic Algorithms (GA) • Introduction to Fuzzy Logic • Neuron Network
Examination forms	
Study and examination requirements	Midterm: 30%, Final exam: 70%
Reading list	[1]. Trí tuệ nhân tạo: các phương pháp giải quyết vấn đề và kỹ thuật xử lý tri thức, Nguyễn Thanh Thủy, 1996, NXB Giáo Dục [2]. Giải một bài toán trên máy tính thư thế nào (1, 2, 3), Hoàng Kiếm, 2004, NXB Giáo Dục

	[3]. Trí tuệ nhân tạo, Đinh Mạnh Tường, 2002, NXB Khoa học và kỹ thuật [4]. Máy học, Nguyễn Đình Thúc, 2002, NXB Lao động xã hội

3. Introduction to Machine Learning

Module designation	INTRODUCTION TO MACHINE LEARNING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Probability and Statistics, Linear algebra
Module objectives/intended learning outcomes	Students will be provided with basic knowledge of Machine Learning including: decision trees, artificial neural networks, genetic algorithms, statistical theory of hypothesis testing and Bayes, ... From that students can learn more deeply about machine learning models such as association classifiers, clustering, Bayesian networks, ... These are necessary knowledge to serve the scientific research work of students in the future.
Content	a. Closed and open Leontief model, direct and indirect costs b. Labor theory of value, substitution theorem c. Linear optimal model, producible set, efficient production, production constraints, consumption d. Nonlinear optimization model, modern theory of demand, extended theory of production e. Equilibrium in the market economy, budget constraints, Walras-Wald model, Arrow-Debreu-Mckenzie model f. Equilibrium growth in dynamic economic model, Leontief model, Von Neumann model, equilibrium growth model
Examination forms	
Study and examination requirements	Project: 15%, Final exam: 75%.

Reading list	Tom Mitchell, Machine Learning, McGraw Hill, Second Edition.

4. Statistical Data Processing

Module designation	STATISTICAL DATA PROCESSING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Probability and Statistics
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	General objective: Equip students with basic knowledge about handling statistical data in a basic way, so that they can more easily approach problems in Data Analysis, Computer Vision. - Specific objectives/course output standards: • Knowledge: Know the form of digital data, audio, images... • Skills: Can use software to manipulate data on… • Attitude, diligence: go to class and complete all assignments, self-study, self-practice...
Content	The course helps students to handle basic data in dataframe, image, video and audio waveforms with libraries in Python such as pandas, open cv, seaborn,... Some subjects are related in the program: Multidimensional statistics, Big data, Image processing,...
Examination forms	
Study and examination requirements	Midterm: 30%, Final exam: 70%
Reading list	Applied Multivariate, Statistical Analysis, Wolfgang Härdle, Léopold Simar Pandas: powerful Python data analysis toolkit, Wes McKinney & PyData Development Team

5. Data Mining

Module designation	DATA MINING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Basic programming
Module objectives/intended learning outcomes	After successfully completing this course, students will be able to: • Analyze data and carry out the steps of the data mining process • Understand and apply data mining algorithms and tools that can be used to assist data analysts and data mining application developers • Explain common data mining tasks such as regression, classification, clustering, and association rule mining • Participate in advanced research to improve existing algorithms for each specific problem in data mining.
Content	This course is intended to introduce the knowledge mining process, concepts, technologies, and applications of data mining. In addition, this course also covers data preprocessing problems, data mining tasks, algorithms, and data mining tools that can be used to assist data analysts and analysts. Data mining application development. Subject-specific topics include: overview of data mining, data mining problems, data preprocessing problems, data regression, data classification, clustering data mining, association rule mining, data mining application development, and advanced research topics in data mining.
Examination forms	
Study and examination requirements	Midterm: 30%, Final exam: 70%

Reading list	[1] Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers, 2012. [2] David Hand, Heikki Mannila, Padhraic Smyth, "Principles of Data Mining", MIT Press, 2001 [3] David L. Olson, Dursun Delen, "Advanced Data Mining Techniques", Springer-Verlag, 2008. [4] Graham J. Williams, Simeon J. Simoff, "Data Mining: Theory, Methodology, Techniques, and Applications", Springer-Verlag, 2006.

6. Python for Data Science

Module designation	PYTHON FOR DATA SCIENCE
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	Python programming
Module objectives/intended learning outcomes	- General objective: To present basic knowledge of python programming for data science for multidimensional signal data processing in data classification or object recognition, data mining, data analysis. , statistics, machine learning, …. The main content of the program will present the basis for students to be able to program in python in data science. Then students will apply the knowledge to solve large problems. - Specific objectives/course output standards: • Knowledge: Master the basics of python programming • Skills: analyzing and applying algorithms in practice • Attitude, diligence: have the right attitude, opinion and awareness about the subject
Content	
Examination forms	

Study and examination requirements	Midterm: 30%, Final exam: 70%
Reading list	Python Tutorial, Guido van Rossumand the Python development team. Tensorflow, tensorflow.org

● Didactics and Methodology of Mathematics Teaching

1. Pedagogical Psychology

Module designation	PEDAGOGICAL PSYCHOLOGY
Semester(s) in which the module is taught	
Person responsible for the module	Department of Mathematical Education
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with basic psychological knowledge about teachers and learners, problem-solving skills, teamwork skills and apply them to teaching.

Content	- Research the psychological problems of managing the teaching-learning process. -Determine the conditions to ensure intellectual development in the teaching-learning process. -Describe the formation and cultivation of the teacher's personality as well as the psychological development of the learner.
Examination forms	
Study and examination requirements	Mid-term: 30%, Final exam: 70%
Reading list	1. Lê Văn Hồng, Lê Ngọc Lan và Nguyễn Văn Thàng, Tâm lý học lứa tuổi và tâm lý học sư phạm, Hà Nội, 1995. 2. Hoàng Anh & Vũ Kim Thanh, Giao tiếp sư phạm, Hà Nội, 1995. 3. Trần Thị Hương, Nguyễn Thị Bích Hạnh, Hồ Văn Liên & Ngô Đình Qua, Giáo dục học đại cương, Đại Học Sư Phạm TP. Hồ Chí Minh, 2009. 4. Trần Thị Hương, Võ Thị Bích Hạnh, Hồ Văn Liên, Vũ Thị Sai, Võ Thị Hồng Trước, Giáo dục học phổ thông, Đại Học Sư Phạm TP. Hồ Chí Minh, 2009. 5. Nguyễn Xuân Thức (chủ biên), Tâm lý học đại cương, Đại Học Sư Phạm TP. Hồ Chí Minh, 1995. 6. Peter Filene, The Joy of Teaching: A Practical Guide for New College Instructors, the University of North Carolina Press, 2005. 7. Ken Bain, What the Best College Teachers Do, Harvard University Press, 2004. 8. Rainer Zwisler, Einführung in die Pädagogische Psychologie, 4. Auflage, Weinheim und München, Psychologische Verlags Union Beltz, 1994. 9. J. Zumbach und H. Mandl (Hrsg.), Paedagogische Psychologie in Theorie und Praxis, Verlag Hogrefe, 2008.

2. Optimal Teaching and Learning Methods

Module designation	Optimal teaching and learning methods
Semester(s) in which the module is taught	
Person responsible for the module	Department of Mathematical Education
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Students learn about the method of presenting the thesis, the active learning process, how to evaluate the teaching-learning process, the use of modern techniques in the teaching-learning process, and the design of the teaching environment.
Content	-Help students become familiar with optimal teaching and learning methods. -Develop cognitive and thinking abilities through group discussions and self-assessment in the learning process. -Create conditions for students to achieve the perfect application of learned methods to scientific research. -Help students get a basic foundation of teaching methods after graduation
Examination forms	

Study and examination requirements	Mid-term: 30% Final exam: 70%
Reading list	1. Meyer, H. L., Trainingsprogramm zur Lernzielanalyse. Kronberg: Athenaeum, 1976. 2. Jennewein, K., Didaktik und Curriculumsentwicklung (script). Magdeburg, 2004. 3. Klafi, W., Studien zur Bildungstheorie und Didaktik. Weinheim: Beltz, 1975. 4. Watzlawik, P., Die 5 Kommunikationsaxiome. In: Kommunikation und Selbstsicherheit, Interaktionsspiel für Schule, Jugendarbeit und Erwachsenenbildung. Muelheim, 1995. 5. Grant, C.D., Dickson, B.R., New methods of teaching and learning for industry-based professionals. Strathclyde Univ., Glasgow, UK, 2002. 6. Robert S. Feldman, Power Learning. McGraw Hill. USA, 2003. 7. Jeffrey S. Lantis, Lynn M. Kuzma, John Boehrer, The New International Studies Classroom - Active Teaching, Active Learning, Lynne Rienner Publishers, United State, 2000. 8. Faculty of Arts Griffith University, Guide to Referencing, 2007. 9. Ho Chi Minh City Teacher – Training College, Bulletin of Science and Education. HCMC – VNU Publishing House, 2005. 10. Pol Dupont, Marcelo Ossandon, Nền Sư Phạm Đại Học, NXB thế giới. Hà Nội, 2002. 11. Đặng Thành Hưng, Tương Tác Hoạt Động Thầy – Trò Trên Lớp Học. NXB giáo dục, 2007. 12. PGS. Hoàng Anh, PTS. Vũ Kim Thanh, Giao Tiếp Sư Phạm, Hà Nội, 1995. 13. Uỷ Ban Khoa Học Về Hành Vi – Xã Hội và Giáo Dục, Phương Pháp Học Tối Ưu (translation of How Peope Learn: Brain, Mind, Experience, and School – Expanded Edition). NXB tổng hợp TP Hồ Chí Minh, 2007. 14. Bộ Giáo Dục & Đào Tạo, Tài liệu dành cho thi nâng ngạch từ giảng viên lên giảng viên chính. Hà Nội, 2007.

3. General Education

Module designation	GENERAL EDUCATION
Semester(s) in which the module is taught	
Person responsible for the module	Department of Mathematical Education
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with basic pedagogical knowledge, learning outcomes and how to apply them to teaching.
Content	- The concepts of education, learning outcomes. - Personality and specific description in the learning outcomes. - Aims and objectives, levels of learning outcomes. - Educational paths.
Examination forms	
Study and examination requirements	Mid-term: 30% Final exam: 70%

Reading list	1. Nguyễn Thị Bích Hồng và Võ Văn Nam, Giáo dục học đại cương, Giáo trình ĐHSP Tp. HCM, 2004. 2. Nguyễn An, Giáo dục học đại cương, Giáo trình ĐHSP Tp. HCM, 1997. 3. Hà Thế Ngữ và Đặng Vũ Hoạt, Giáo dục học, tập 1, NXB Giáo Dục, 1988. 4. Đặng Vũ Hoạt (chủ biên), Giáo dục học, tập 2, NXB Giáo Dục, 1995. 5. Phạm Viết Vượng, Giáo dục học, NXB ĐHQG Hà Nội, 2000. 6. Nguyễn Thị Bích Hạnh và Trần Thị Hương, Lý luận dạy học, Giáo Trình ĐHSP TP. HCM, 2004. 7. Peter Filene, The Joy of Teaching, University of North Carolina Press, 2005. 8. Ken Bain, What the best college teachers do, Harvard University Press, 2004. 9. E. F. Crawley, J. Malmqvist, S. Oslund, D. R. Brodeur, Rethinking Engineering Education: The CDIO Approach, Springer Science+Business Media, 2007.

4. Didactics of teaching

Module designation	Didactics of teaching
Semester(s) in which the module is taught	
Person responsible for the module	Department of Mathematical Education
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	

Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with the basic knowledge of the principles of the theory of learning, determine the learning outcome, prepare syllabus, lesson plans, classroom instruction and types of assessment.
Content	-The concept in didactics of teaching . - The basic principles of learning. - Integrate learning outcomes into teaching content. - Teaching methods. - Evaluation methods.
Examination forms	
Study and examination requirements	Mid-term: 30% Final exam: 70%
Reading list	1. Nguyễn Thị Bích Hạnh và Trần Thị Hương, Lý luận dạy học, Giáo Trình ĐHSP TP. HCM, 2004. 2. Peter Filene, The Joy of Teaching, University of North Carolina Press, 2005. 3. Ken Bain, What the best college teachers do, Harvard University Press, 2004. 4. Committee on Developments in the Science of Learning, How people learn: Brain, Mind, Experience, and School, National Academy of Sciences, 2000. 5. E. F. Crawley, J. Malmqvist, S. Oslund, D. R. Brodeur, Rethinking Engineering Education: The CDIO Approach, Springer Science+Business Media, 2007. 6. Alexander W. Astin, Assessment for Excellence, American Council on Education, Series on Higher Education, Oryx Press, 1993.

5. Elementary Number Theory And Mathematical Logic

Module designation	ELEMENTARY NUMBER THEORY AND MATHEMATICAL LOGIC
Semester(s) in which the module is taught	
Person responsible for the module	Department of Mathematical Education
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with basic knowledge of arithmetic and mathematical logic.
Content	Help students have knowledge to solve arithmetic problems in high school curriculum, have reasoning skills in mathematical proofs, know how to express problems concisely, coherently and standardly.
Examination forms	
Study and examination requirements	Mid-term: 30% Final exam: 70%

Reading list	[1] Nguyễn Hữu Anh,Toán rời rạc, NXB GD, 1999. [2] G.Polya, Toán học và những suy luận có lý, NXB GD,1995. [3] Hoàng Chúng, Số học – Bà chúa của Toán học, NXB GD, 1997. [4] K.H.Rosen, Elementary Number Theory And Its Applications, Addison – Wesley Publishing Company, 1993.

6. Teaching Method In Mathematics 1

Module designation	TEACHING METHOD IN MATHEMATICS 1
Semester(s) in which the module is taught	
Person responsible for the module	Department of Mathematical Education
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with the ability to solve, classify exercises, present textbooks, code the automatic solutions (in C, Matlab, Maple) in Elementary Mathematics (Algebra section), help students to be able to teach high-school Mathematics

Content	Chapter 0: Methods of preparation of lesson plan and exercises Chapter 1: Statements-set-functions 1.1. Statements and mathematical reasonings 1.2. Sets 1.3. Functions Chapter 2: Equations, inequations, and system of equations 2.1. Linear equation. 2.2. Linear inequation, quadratic inequation in one variable. 2.3. System of linear equations. 2.4. Other systems of equations. 2.5. High order equation. Chapter 3: Absolute value equations, inequations. 3.1. Absolute value equations. 3.2. Absolute value inequations. Chapter 4: Radical equations, inequations. 4.1. Radical equations. 4.2. Radical inequations. Chapter 5: Inequalities 5.1. Inequalities. 5.2. Basic inequalities. 5.3. Applications. Chapter 6: Combinatorics, Probability. 6.1. Combinatorics 6.2. Probability Chapter 7: Sequences and progression. 7.1. Induction. 7.2. Sequences 7.3. Arithmetic and geometry progression. 7.4. Limit of sequences Chapter 8: Limit of functions, continuous functions. 8.1. Limit of functions. 8.1. Continuous functions. Chapter 9: Derivative of functions. 9.1. Definition of derivative. 9.2. Application of derivative.
Examination forms	
Study and examination requirements	Mid-term: 30% Final exam: 70%

Reading list	1. Đoàn Quỳnh, Nguyễn Huy Đoan, Nguyễn Xuân Liêm, Đặng Hùng Thắng, Trần Văn Vuông, Đại số lớp 10, NXB Giáo dục 2006. 2. Đoàn Quỳnh, Nguyễn Huy Đoan, Nguyễn Xuân Liêm, Nguyễn Khắc Minh, Đặng Hùng Thắng, Đại số và Giải tích lớp 11, NXB Giáo dục 2006. 3. E. E. Veresova, N. S. Denisova, T. N. Poliakova, Thực hành giải toán sơ cấp tập 1, NXB Giáo Dục, 1986. Người dịch: Hoàng Thị Thanh Liêm, Nguyễn Thị Ninh, Nguyễn Văn Quyết, Vũ Thụ.

7. Teaching Method In Mathematics 2

Module designation	TEACHING METHOD IN MATHEMATICS 2
Semester(s) in which the module is taught	
Person responsible for the module	Department of Mathematical Education
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with the ability to solve, classify exercises, present textbooks, to be able to teach high-school Mathematics.

Content	Chapter 0: Methods of preparation of lesson plan and exercises Chapter 1: Vector 1.1. Vector and vector operations 1.2. Coordinate and coordinate system. CHAPTER 2: The scalar product and applications 2.1. The scalar product of two vectors. 2.2. Identities in a triangle. CHAPTER 3: Coordination method in plane 3.1. Equation of a line. 3.2. Distance and angle. 3.3. Quadratic line. 3.4. Three conic sections. Chapter 4: Transformation and similarity in plane 4.1. Transformations. 4.2. Homogeneity spells. CHAPTER 5: Parallel in space 5.1. Outline of lines and planes. 5.2. Two parallel lines. 5.3. Line parallel to the plane. 5.4. Two parallel planes. 5.5. Parallel projection. CHAPTER 6: Vector in space, perpendicular 6.1. Vector in space. 6.2. Two perpendicular lines. 6.3. The line is perpendicular to the plane. 6.4. Two perpendicular planes. 6.5. Distance. CHAPTER 7: Polyhedron and their volumes 7.1. The concept of polyhedron 7.2. Cross-plane symmetry and equality of polyhedra. 7.3. Dilation and similarity of polyhedra. Regular polyhedron. 7.4. The volume of the polyhedron. CHAPTER 8: Spheres, Cylinder, Cones. 8.1. Sphere. 8.2. The concept of a rotating surface. 8.3. Cylinder 8.4. Cones
Examination forms	
Study and examination requirements	Mid-term: 30% Final exam: 70%

Reading list	1. Đoàn Quỳnh, Văn Như Cương, Phạm Vũ Khuê, Bùi Văn Nghị. Hình học lớp 10. NXB Giáo dục, 2006. 2. Đoàn Quỳnh, Văn Như Cương, Phạm Khắc Ban, Tạ Mân. Hình học lớp 11. NXB Giáo dục, 2007. 3. Đoàn Quỳnh, Văn Như Cương, Phạm Khắc Ban, Lê Huy Hùng, Tạ Mân. Hình học lớp 12. NXB Giáo dục, 2008. 4. Văn Như Cương, Phạm Hữu Khuê, Trần Hữu Nam. Bài tập hình học lớp 10. NXB Giáo dục, 2006. 5. Văn Như Cương, Phạm Khắc Ban, Tạ Mân. Bài tập hình học lớp 11. NXB Giáo dục, 2007. 6. Văn Như Cương, Phạm Khắc Ban, Lê Huy Hùng, Tạ Mân. Bài tập hình học lớp 12. NXB Giáo dục, 2008. 7. Tài liệu bồi dưỡng giáo viên thực hiện chương trình, sách giáo khoa lớp 10 THPT, môn toán học. NXB Giáo dục, 2006. 8. Tài liệu bồi dưỡng giáo viên thực hiện chương trình, sách giáo khoa lớp 11, môn toán. NXB Giáo dục, 2007. 9. Hướng dẫn thực hiện chương trình, sách giáo khoa lớp 12, môn toán. NXB Giáo dục, 2008.

8. Pedagogical Practice

Module designation	PEDAGOGICAL PRACTICE
Semester(s) in which the module is taught	
Person responsible for the module	Department of Mathematical Education
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	

Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The subject deals with the pedagogical practice process, specifically the work of homeroom teacher and teaching at high schools, teaching organization and classroom management, activities related to attendance and writing internship reports. Facilitate students to gain a lot of knowledge, skills and experience during the pedagogical practice process.
Content	Chapter 1: General overview of the pedagogical practice process 1.1 Requirements for a pedagogical practice process 1.2 Pedagogical practice process Chapter 2: Homeroom teacher role practice 2.1 Homeroom teacher work 2.2 Prepare lesson plan and class management Chapter 3: Teaching practice 3.1 Teaching work 3.2 Attending time & preparing lesson plans 3.3 Teaching organization
Examination forms	
Study and examination requirements	Homeroom teacher role practice: 20% Teaching practice: 50% Internship report: 20%
Reading list	

- **Mathematical Methods in Computer Science**

1. Image Processing And Analysis

Module designation	IMAGE PROCESSING AND ANALYSIS

Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduction to image processing and analysis. Presenting from the most basic concepts of image processing to processing methods in gray and color images, such as noise filtering methods, edge highlighting, morphological operations, wavelets, image segmentation, find edges and polygons and describe them. And the methods of image compression as well as basic watermarking techniques.
Content	- An overview and basic knowledge of digital images - Intensity Transformation and Filtering - Filtering in the frequency domain - Restoration and reconstruction of image - Color image processing - Wavelet transform and multi-resolution processing - Image Compression - Image processing using morphological math - Image Segmentation - Performance and description
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises in groups (30%). - Seminar (20%). - Final exam (50%).
Reading list	[1].Luong Ba Manh and Nguyen Thanh Thuy, Introduction to Anh Number, Science and Technology Publishing House, 1999. [2].Ngo Dien Tap, Processing English by Computer, Science and Technology Publishing House, Hanoi 1997. [3].Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, Third Edition 2007. [4].William K. Pratt, Digital Image Processing, Fourth Edition, John Wiley and Sons Ltd, 2007. [5].John C. Russ, The Image Processing Handbook, Third Edition, CRC Press, 1999. [6].Maria Petrou and Panagiota Bosdogianni, Image Processing the Fundamentals, John Wiley and Sons Ltd, 1999.

	[7].S. Marchand-Maillet and Y. M. Charaiha, Binary Image Processing, Academic Press, 2000. [8].Loannis Pitas, Digital Image Processing Algorithm, Prentice Hall, 1993. [9].Scott.E.Umbaugh, "Computer Vision and Image Processing", Prentice Hall, 1997.

2. Introduction To Artificial Intelligence

Module designation	INTRODUCTION TO ARTIFICIAL INTELLIGENCE
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	The course provides some basic knowledge of artificial intelligence science. The main content includes: Problem solving methods and applications. Focus on heuristic methods. Presenting some knowledge representation methods and some knowledge processing techniques. The problem of approximate reasoning. Introduction to some knowledge systems. Introduce some other models and methods. Ontology and Agent Concepts. At the same time, the course also introduces soft computing techniques such as Fuzzy, Neural networks, genetic algorithms.
Content	- Overview of the science of AI - State space and the search problem - Knowledge demonstration - Introduction to machine learning and knowledge discovery - Introducing Ontology and Intelligent Agent - Introduction to Genetic Algorithms (GA) - Introducing Fuzzy Logic - Neural Network
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises (40%). - Final exam (60%).
Reading list	[first]. Artificial intelligence: problem solving methods and knowledge processing techniques, Nguyen Thanh Thuy, 1996, Education Publishing House [2]. How to solve a math problem on a computer (1, 2, 3), Hoang Kiem, 2004, Education Publishing House [3]. Artificial Intelligence, Dinh Manh Tuong, 2002, Science and Technology Publishing House

[4]. Machine Learning, Nguyen Dinh Thuc, 2002, Social Labor Publishing House

[5]. Evolutionary Programming, Nguyen Dinh Thuc, 2001, Education Publishing House

[6]. Noron network methods and applications, Nguyen Dinh Thuc, 2000, Education Publishing House

[7]. Fuzzy control theory, Phan Xuan Minh, Nguyen Doan Phuoc, Science and Technology Publishing House

[8]. Fuzzy and Applied Logic, Dang Thanh Ha, B. Bouchon Meunier, Ho Thuan, 2007, Hanoi National University Publishing House

[9]. Agent-oriented software engineering, Le Tan Hung, Tu Minh Phuong, Huynh Quyet Thang, 2006, Science and Technology Publishing House

[10].

[11]. Artificial Intelligence A Modern Approach, Stuart J. Russell, Peter Norvig, 1995, Prentice Hall

[12]. Problem – Solving and Articifial Intelligent, Jean – Louis Laurière, 1990, Prentice Hall

[13]. An Introduction to Genetic Algorithms, Melanie Mitchell, 1999, MIT Press

[14]. Practical genetic algorithms, Randy L. Haupt, Sue Ellen Haupt, 2004, John Wiley & Sons, Inc., Hoboken, New Jersey

[15]. C++ Neural Networks and Fuzzy Logic, Valluru B. Rao, 1995, M&T Books, IDG Books Worldwide, Inc

[16]. Introduction to fuzzy sets, fuzzy logic, and fuzzy control systems , Guanrong Chen,Trung Tat Pham, 2001, CRC Press LLC

[17]. Discovering Knowledge in Data: An Introduction to Data Mining, Daniel T. Larose, 2004, John Wiley & Sons Inc

[18]. First course on fuzzy theory and applications, Kwang H. Lee, 2005, Springer-Verlag Berlin Heidelberg

[19]. Fuzzy logic: a practical approach / F. Martin McNeill, Ellen Thro, 1994 by Academic Press

[20]. Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms: Industrial Applications, Lakhmi C. Jain; N.M. Martin, 1998, CRC Press

[21]. Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering, Nikola K. Kasabov, 1998, MIT Press

3. Introduction To Cryptography

Module designation	INTRODUCTION TO CRYPTOGRAPHY
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- Equip students with basic knowledge about: classical cryptographic theory, modern symmetric cryptography, public cryptography, cryptographic hash function, digital signature, key exchange protocol. - At the same time, students are strengthened: programming skills through exercises on installing algorithms; skills in research and presentation of open topics; skills in using security software.
Content	- Basic concepts of classical cryptographic theory. - Common symmetric cryptosystems: DES, AES. - Common cryptographic hash functions: MD5, SHA1. - Common public cryptosystems: RSA, ElGamal, ECC. - Diffie-Hellman key exchange protocol - Digital signatures: RSA, DSA, ECC. - Using software: PGP, SSH, Cryptool
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises in groups (30%). - Seminar (20%). - Final exam (50%).
Reading list	[1] Douglas R. Stinson, *Cryptography: Theory and Practice* , 3rd. ed., Chapman & Hall/CRC, 2006. [2] Alfred J. Menezes, Paul C. van Oorsczyk and Scott A. Vanstone, *Handbook of Applied Cryptography* , CRC Press, 2001. [3] Pham Huy Dien, Ha Huy Khoai, *Information Coding: Mathematical foundations and applications* , National University Publishing House, Hanoi, 2003.

4. Digital Signal Processing

Module designation	DIGITAL SIGNAL PROCESSING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduction to the mathematical basis of digital signal processing, frequency representation of a signal as a linear combination of basis functions, classical (Fourier) and modern (wavelet) frequency representations.
Content	- Frequency analysis of signals – general theory. - Fourier analysis. - Wavelet expansion.
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises in groups (30%). - Seminar (20%). - Final exam (50%).
Reading list	[1] Lawrence R. Rabiner, Bernard Gold, Theory and Application of Digital Signal, Prentice Hall, 1975. [2] Gilbert Strang, Truong Nguyen, Wavelet and Filter bank, SIAM, 1996. [3] James H. McClellan, MA Yoder, Mark Yoder, DSP First: A Multimedia Approach, Prentice Hall, 1998.

5. High Performance Computing

Module designation	HIGH PERFORMANCE COMPUTING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Present some basic knowledge in building parallel computational models. Several parallel computing programming methods are based on the MPI and PVM standards.
Content	- Basic concept - Optimization - Parallelization - GPU
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises in groups (40%). - Seminar (20%). - Final exam (40%).
Reading list	[first]. Bertsekas D. & Tsitskilis J., Parallel and Distributed Computation, Prentice Hall 1989. [2]. Quinn M., Parallel Computing – Theory and Practice, McGraw Hill, 1994. [3]. Joseph JaJa, An Introduction to Parallel Algorithms, Addison – Wesley Publ. 1992. [4]. MPI & PVM Standards (Internet).

6. Algorithmic Number Theory

Module designation	ALGORITHMIC NUMBER THEORY
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with basic knowledge and programming skills of algorithmic arithmetic: prime numbers, congruences, continuous fractions, arithmetic functions, squared remainders, elliptic curves, algorithms deterministic and probabilistic primes testing, integer analysis, and discrete logarithms.
Content	- Recall the basics of algorithms and complexity. - Integer representation, prime numbers, Euclidean division algorithm, Chinese remainder theorem, Fermat's theorem, and continuous fractions - Euler nonfunctions, Mersenne primes, primitive roots - Squared residuals, Legendre notation, Jacobi . notation - Prime number checking algorithms, prime number analysis - Elliptic curves over real numbers and over finite fields - Apply arithmetic to cryptographic theory: Caesar cipher system, RSA, ElGamal. - Algorithm to calculate discrete logarithms.
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises in groups (20%). - Midterm written exam (15%). - Group presentation seminar (15%) - Final written exam (50%).
Reading list	[1] Ha Huy Khoai – Pham Huy Dien, *Algorithmic Arithmetic* , National University Publishing House, Hanoi, 2003.

	[2] Menezes, Oorschot and Vanstone, Handbook of Applied Cryptography, CRC Press, 2001. [3] Allen Downey, Think Python, http://www.thinkpython.com

7. Algorithm Analysis

Module designation	ALGORITHM ANALYSIS
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Equip students with knowledge and programming skills to evaluate the complexity of algorithms, correctness of algorithms, generating functions and applications; permutations and applications; evaluate some commonly used algorithms.
Content	- Overview of the algorithm and its complexity. - Generating functions and applications. - Evaluate the complexity of some common algorithms.
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises in groups (30%). - Midterm written exam (20%). - Final written exam (50%).
Reading list	[1] Kenneth H. Rosen, *Discrete Mathematics and Its Application* , McGraw-Hill, 1998. [2] Herbert S.Wilf, Algorithm Complexity, Internet Edition 1994. [3] Herbert S.Wilf, Generating Functionology, Internet Edition 1994. [4] Ian Parberry, Lecture Notes on Algorithm Analysis and Computational Complexity, Internet Edition 2001.

● Applied Mathematical Computer Science

1. Object-Oriented Software Development

Module designation	OBJECT-ORIENTED SOFTWARE DEVELOPMENT
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- Provide students with in-depth knowledge related to the main subjects in the field of object-oriented software engineering (technology processes, implementation techniques, tools and deployment environments). software,…).
Content	- Basic concepts of object-oriented software development. - Object model, state model, functional model. - System design, object design, interface design. - Use IDEs and source code management tools.
Examination forms	
Study and examination requirements	- Analytical and design skills (30%). - Skills in implementation, implementation and testing (30%). - Document design skills (20%) - Presentation skills (20%)
Reading list	[1] James Rumbaugh, Michael Blaha, William Premerlani, Frederick Eddy, William Lorensen. Object-Oriented Modeling and Design, Prentice-Hall International Editions, 1991. [2] Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides. Design Patterns, Addison-Wesley, 1995. [3] d. Martin Fowler. UML Distilled, 3rd edition, Addison-Wesley, 2004.

2. System And Network Administration

Module designation	SYSTEM AND NETWORK ADMINISTRATION
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Provides knowledge about network services and principles of network administration in general. Equip students with skills in installing and configuring network services on Unix/Linux server environments. After studying, students can take on a part of Unix/Linux server network administration in large companies or manage the entire Unix/Linux network for a small and medium-sized business.
Content	Chapter 1: In this module, students will have more in-depth knowledge on the Unix/Linux operating system environment. Students know how to partition and install a server using Unix/Linux operating systems to get the most out of it. In addition, students will learn about software package installation and management methods. Also learn how to compile and optimize software features from source code. Chapter 2: Focuses on user administration principles and practices. Administer system startup and shutdown mechanism. Administration of the file system and administration of some basic services. System log management. Set up an automatic data backup mechanism. Chapter 3: Focus on configuring network parameters, learn some commands to look up network information, then learn network security knowledge by firewall. Chapter 4: Understanding the role of services on the internet. Conduct research and test software such as bind, vsftp, apache, postfix, courier, openssh. Chapter 5: Learn the role of services on the intranet to set up a Workgroup network, a Domain Controller network to manage and share resources in the intranet. Manage access to internet resources. Conduct research and test software samba, dhcp, squid. Chapter 6: Introduction to directory services, configure settings, and prepare sample databases for directory services. Then proceed to integrate the services on the LDAP directory service.

Examination forms	
Study and examination requirements	- Diligence: 10% Midterm exam: 10% Project: 50% Final exam: 30%
Reading list	[1] Lars Wirzenius, Joanna Oja, Unix/Linux System Administrator's Guide. [2] Matt Welsh, Unix/Linux Installation and Getting Started. [3] Steve Frampton, Unix/Linux System Administration Made Easy. [4] Olaf Kirch, Terry Dawson, Unix/Linux Network Administrator's Guide, O'Reilly, 2000 [5] Matthias Kalle Dalheimer, Matt Welsh, Running Unix/Linux, Fifth Edition, O'Reilly, 2005 [6] Kho tài liệu về Unix/Linux, http://www.tldp.org/

3.Net Programming

Module designation	.NET PROGRAMMING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Develop application programming skills with C# on the integrated programming environment Visual Studio .NET.
Content	Using the Visual Studio 2005 environment: design interfaces, perform application tasks, create software components... based on .NET, check for traps, handle errors, and deploy applications.
Examination forms	
Study and examination requirements	- Submit Project No. 1 (25%). - Submit Project No. 2 (25%). - Final exam (multiple choice) (50%).
Reading list	[1] Outline of .Net Programming of Faculty of Information Technology - Hanoi National University of Education. [2] Outline of .Net Programming of Faculty of Information Technology - Ton Duc Thang Semi-Public University. [3] Developing Window Based Applications With Microsoft.Net MCAD_MCSD [4] Course Microsoft 70-316

4. Computer Networking

Module designation	COMPUTER NETWORKING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	- Basic knowledge of computer networks such as: distinguishing between different types of networks, understanding communication and data transmission bases in networks, and understanding the functions and services that operate at each layer of the OSI and TCP models. /IP. - Students will learn skills in using software tools to capture and analyze data at each floor. Use popular services like web, file transfer, email, domain name, firewall. Configure the router device.
Content	Chapter 1: Introduction to the overview of computer networks and the applications of computer networks in practice. Classify the types of computer networks and network operating systems. A brief introduction to the OSI and TCP/IP protocol stack. Chapters 2, 3, 4, 5: Introduce in detail the functions and services of the application, transport, network, and data link layers. The content taught in these chapters follows top-down approaches that will make it easy for students to acquire knowledge about networks. Chapter 6: Introduction to network security and basics such as encryption methods, authentication methods, understanding some types of network attacks and preventions to ensure network data integrity .
Examination forms	
Study and examination requirements	- Diligence: 10% Midterm exam: 10% -Practice: 30% Final exam: 50%
Reading list	1. JF Kurose, Computer Networking, A Top-Down Approach Featuring the Internet, 3rd edition, Addison Wesley, 2004.

	2. Fred Halsall, Computer Networking and the Internet, Fifth edition, addison-wesley, 2005 3. Nguyen Thuc Hai, Computer Networks and Open Systems, Education Publishing House, 1997. 4. Andrew S. Tanenbaum, Computer Network, 4th edition, Prentice Hall, 2003.

5. Introduction to Database Systems

Module designation	INTRODUCTION TO DATABASE SYSTEMS
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduce students to basic concepts of databases; data models; database design standards and standard forms.
Content	- Basic concepts of databases. - Linked entity data model, relational data model. - Operations on the relational data model. - SQL query language. - Standard forms and normalization algorithms for databases.
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises (30%). - Final examination (70%).
Reading list	[1] R. Elsmari, S. Navathe. Fundamentals of Database Systems 4th edition, Addison Wesley, 2004. [2] Nguyen Kim Anh. Principles of database systems, National University Publishing House, Hanoi, 2004.

6. Unix Operating System

Module designation	UNIX OPERATING SYSTEM
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Helps students have an overview of computer operating systems in general and in-depth knowledge of Unix/Linux operating systems in particular. Students will be equipped with skills in operating system installation, software package installation/compile, use of utilities and programming (shell, system) on Unix/Linux operating systems. The course will orient students to pursue a career in network system administration or software programming for embedded systems.
Content	● Unix/Linux OS installation process. ● Use Unix/Linux to serve end users. ▪ Unix/Linux external architecture overview. ▪ Basic utility programs in Unix/Linux. ▪ Install/compile software packages in Unix/Linux. ▪ Computer system administration. ● Using Unix/Linux to serve shell programmers: ▪ Do the basics with Shells. Introduction of themes and corresponding usage scripts. ▪ Shell programming. Work with the Shells Script programming language and build application programs. ● Using Unix/Linux to serve system programmers (C programmers): ▪ An overview of how to build and compile C programs in Unix/Linux. ▪ Overview of the internal architecture of the Unix/Linux OS (Unix/Linux Internal). ● Introduce OS components such as file system, Process manager, and write demonstration programs to better understand OS working principle.
Examination forms	
Study and examination requirements	- Attendance: 10% - Midterm exam: 10% - Practice: 40%

Reading list	1. Graham Glass, King Ables, Linux for Programmers and Users, Prentice Hall, 2006. 2. Bill McCarty, Learning Red Hat Linux, 3rd Edition, O'Reilly, 2003. 3. Brian Ward, How Linux Works: What Every Super-User Should Know, No Starch Press, 2004. 4. Matthias Kalle Dalheimer, Matt Welsh, Running Linux, 5th Edition, O'Reilly, 2005. 5. Stephen G. Kochan, Patrick Wood, Unix® Shell Programming, Third Edition, Sams Publishing, 2003 6. Cameron Newham, Learning the bash Shell, 3rd Edition, O'Reilly, 2005. 7. Sams Publishing, Sams Teach Yourself Shell Programming in 24 Hour, 1999. 8. Ellie Quigley, UNIX® Shells by Example Fourth Edition, Prentice Hall PTR, 2004 9. Richard Stevens, Sam Advanced Unix Programming, Sams Publishing, 1999. 10. Neil Matthew, Richard Stones, Beginning Linux® Programming, 4th Edition, Wiley Publishing Inc., 2008.

7. Software Project Management

Module designation	SOFTWARE PROJECT MANAGEMENT
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduce students to the basics of planning, organizing, and managing software projects.
Content	- Basic concepts of software project management. - GANTT, PERT chart. - Software standards, document standards. - Risks in the software. - Software configuration. - Software price estimation model.
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises in groups (30%). - Projects, seminars (70%).
Reading list	[1] P. Jalote. *Software Project Management in Practice* , Addison Wesley, 2002. [2] I. Somerville. *Software Engineering* , Addison Wesley, 1996. [3] WA Randolph. *Effective Project Planning and Management* , Prentice Hall, 1998.

8. Analysis and design of information systems

Module designation	ANALYSIS AND DESIGN OF INFORMATION SYSTEMS
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	4
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Introduce students to classical design and analysis methods used in functional analysis, data analysis, dynamic analysis, and systems design.
Content	Basic system concepts. - Method of surveying the current situation and understanding the needs. - Structured analysis (SA). - Linked entity data model, relational data model. - SART method. - SD method.
Examination forms	
Study and examination requirements	- Do theoretical and practical exercises in groups (30%). - Projects, seminars (70%).
Reading list	[1] Nguyen Van Ba. *Analysis and design of information systems* , National University Publishing House, Hanoi, 2005. [2] Hawryczkiewycz IT. *Introduction to System Analysis and Design* , Prentice Hall New Delhi, 1989.

9. Java Programming

Module designation	JAVA PROGRAMMING
Semester(s) in which the module is taught	
Person responsible for the module	Department of Computer Science
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	
Workload (incl. contact hours, self-study hours)	
Credit points	3
Required and recommended prerequisites for joining the module	
Module objectives/intended learning outcomes	Students will acquire basic to advanced knowledge and skills in Java programming including: basic programming, object-oriented programming, interface programming. From there, students can learn more about J2EE technology such as programming applications for network and web environments, programming with databases, distributed programming, etc. become a programmer on J2EE technology in the future.
Content	In this module, students will learn an overview of software development technology using Java. In chapter 2, students will learn purely about Java programming language such as data types, keywords, variables, operators, control structures, loops... similar to C programming language. Chapter 3, will introduce the concepts and how to create classes (both internal and abstract), objects and features in object-oriented programming such as inheritance, polymorphism. In particular, a concept of "interface" programming is introduced to solve the problem of multiple inheritance (the trouble encountered when using C/C++ language for object-oriented programming). Besides, we will introduce some available classes provided by Sun. Chapter 4 introduces error management and garbage collection in Java. Students will learn about the concept of "exception", creating exceptions and how to use them in programming. Understand the "try - catch - finally" and "throw - throws" error mechanism. Chapter 5 introduces how to work with streams - stream data. Students will learn about working with binary

	and character input and output streams provided in the java.io package. Learn about the System class and working with standard I/O streams. Chapters 6,7,8 introduce the graphical user interface builds provided in the AWT library. Students will learn how to handle events that occur on the mouse and keyboard to allow users to control functions on the software interface. Chapter 9, introduces the concept of threading, multi-threaded programming in general and in Java in particular. Students will have skills to work with threads - Threads in Java such as setting state, priority and data synchronization between threads. Deadlock problem, Wait-aware mechanism.
Examination forms	
Study and examination requirements	- Attendance: 10% - Midterm exam: 10% - Practice: 30% - Final exam: 50%
Reading list	1. James Gosling - *The Java Language Specification - 2005 (3 rd edition)* 2. Ken Arnold, James Gosling - *The Java Programming Language* 3. Tran Tien Dung - *Java theory and exercises - 1999*