Module Handbook

Bachelor of Science in Physics

Faculty of Physics and Engineering Physics

University of Science, VNU-HCM

Table of contents

1. **Philosophy Marx-Lenin - BAA00101**

Module designation	**Philosophy Marx-Lenin**
Code, if applicable	BAA00101
Semester(s) in which the module is taught	1st semester
Person responsible for the module	None
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
ECTS	4.5
Required and recommended prerequisites for joining the module	None
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.
Examination forms	None
Study and examination requirements	Projects: teamwork, oral presentation: 15% Midterm test: 20% Quizzes: 15% Final test: 50%
Reading list	Textbook of basic principles of Marxism-Leninism, National Political Publishing House of Vietnam. Textbook of Marxist-Leninist Philosophy, National Political Publishing House of Vietnam.

2. Marxist-Leninist Political Economic - BAA00102

Module designation	**Marxist-Leninist Political Economic**
Code, if applicable	BAA00102
Semester(s) in which the module is taught	1st semester
Person responsible for the module	None
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
ECTS	3
Required and recommended prerequisites for joining the module	None
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	None
Study and examination requirements	Projects: teamwork, oral presentation: 15% Midterm test: 20% Quizzes: 15% Final test: 50%
Reading list	Mac-Leninist political economy textbook for undergraduates who are not majoring in political economy.

3. **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	None
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
ECTS	4.5
Required and recommended prerequisites for joining the module	None
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	None
Study and examination requirements	Projects: teamwork, oral presentation: 15% Midterm test: 20% Quizzes: 15% Final test: 50%
Reading list	General Law Syllabus, Ho Chi Minh City University of Law Textbook of Theory of State and Law, Hanoi University of Law

4. Integral Calculus 1B - MTH00003

Module name:	Integral Calculus 1B
Module level, if applicable	General Education
Code, if applicable	MTH00003
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	None
Person responsible for the module	Ong Thanh Hai
Lecturer	None
Language	Vietnamese
Relation to curriculum	Compulsory
Type of teaching, contact hours	lecture
Workload	45
Credit points	3
ECTS	4.5
Requirements according to the examination regulations	Attendance: at least 80% of class time
Recommended prerequisites	None
Module objectives/intended learning outcomes	Introduction to Calculus, with two major contents of differential and integral calculus. - Knowledge: visual, quantitative, conceptual understanding of essential definitions, theorems, and properties in calculus - Skills: understanding of concepts, ability of using calculus in practical problems, ability to solve calculus problems, ability to use computer computation software's - Attitude: diligence
Content	The course provides basic knowledge of calculus for non-majors, including IT, physics, electronics and telecommunications, material science, oceanology, meteorology and hydrology, ... , helping students to acquire necessary background for professional study. Content includes: real numbers, sequences and series of numbers, continuity, convergence, derivative, Riemannian integral of functions of one real variable.
Study and examination requirements and forms of examination	Assignment: 30% Final Test (written): 70%
Media employed	None
Reading list	1. Calculus, J. Stewart, 2012 2. Calculus Textbook 1, Duong Minh Duc, 2006 3. Advanced engineering mathematics, K.A. Stroud and D.J. Booth, 2001

5. Practice for Integral Calculus 1B - MTH00081

Module name:	**Practice for Integral Calculus 1B**
Module level, if applicable	General Education
Code, if applicable	MTH00081
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	None
Person responsible for the module	Nguyen Vu Huy
Lecturer	None
Language	Vietnamese
Relation to curriculum	Compulsory
Type of teaching, contact hours	lecture
Workload	30
Credit points	1
ECTS	1.5
Requirements according to the examination regulations	Attendance: at least 80% of class time
Recommended prerequisites	None
Module objectives/intended learning outcomes	General Objective: Students are guided through exercises on differential calculus and integral calculus of functions of one variable, in order to understand and apply these concepts. Detail Goal: Knowledge: Students practice calculating problems to understand and apply definitions, theorems and properties in calculus. Skills: understand and do exercises in applied calculus in practical problems, solve calculus problems, know how to use calculation software. Attitude and Diligence: Students need to fully participate in class hours, be able to ask questions they don't understand, and answer questions and assignments from lecturers.
Content	The subject plays the role of providing basic knowledge of differential mathematics for the fields of Information Technology, Electronics and Telecommunications, Physics, Oceanography-Meteorology and Hydrology, Materials Science to help students have a background Math foundation for specialized subjects. Knowledge will equip students: Sets of real numbers, Sequences and series of real numbers, Continuity, Limits, Derivatives and Reimann integrals of one-variable real functions, Differential equations, Matlab applications for calculation calculus.
Study and examination requirements and forms of examination	Assignment: 30% Final test (written): 70%
Media employed	None
Reading list	1. Calculus, J. Stewart, 2012 2. Calculus Textbook 1, Duong Minh Duc, 2006 3. Advanced engineering mathematics, K.A. Stroud and D.J.

	Booth, 2001

6. General Physics 1 (Mechanics and Thermodynamics) - PHY00001

<table>
<tr><td>Module name:</td><td colspan="4">General Physics 1 (Mechanics and Thermodynamics)</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">General</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY00001</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">1st semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Prof. CHAU Van Tao</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. DANG Hoai Trung
Dr. PHAN Trung Vinh
Dr. VO Thi Ngoc Thuy
Dr. LE Van Anh Cuong
Dr. TRINH Hoa Lang
Dr. LE Thuy Thanh Giang
Dr. LE Tran</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework at class and home (20%),
● Mid semester exam (30%),
● End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">Calculus 1B</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course covers the principles of kinematics, dynamics, statics, work, energy, linear momentum, gravitation, and thermodynamics.</td></tr>
</table>

	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
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 10% 2. Quizzes and Projects (teamwork) = 10% 3. Midterm exam = 30% 4. Final exam = 50%
Media employed	Text books and slides (power points)
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.

7. Introduction to Physics - PHY00010

Module name:	**Introduction to Physics**			
Module level, if applicable	General			
Code, if applicable	PHY00010			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	1st semester			
Person responsible for the module	Assoc. Prof. HUYNH Van Tuan			
Lecturers	Assoc. Prof. HUYNH Van Tuan MSc. HUYNH Thanh Nhan MSc. VO Hoang Thuy Tien			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	5	Discussion, Exercise, Practice, Course projects	Lectures: 5 hours x 3 times Practice: 5 hours x 12 times	75
			Preparation and Follow up 6 hours x 12 times	60
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Project (20%) ● Mid semester report (20%) ● Finally report (60%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This is the first course that gives an overview of the discipline, helping learners to have basic concepts to understand the discipline as well as its position concerning other disciplines. At the same time, this module helps			

	students to initially visualize the jobs after completing the course. In addition, this course initially equips students with practical skills and basic communication skills, as a foundation to continue to accumulate skills, and practice in the next learning process. Students who complete this module could be achieved the following: - *Knowledge: Be able to apply knowledge to determine the position of the profession in society and the position of oneself working after completing the field of study.* - *Skills: Be able to communicate, interact between individuals in a collective, and to study and do projects.* - *Competences: Be able to understand the basic themes of the discipline and its range of applications.* - *Attitude: be honest, responsible, respect for colleagues.*
Contents	This module includes the following topics: 1. Teamwork, presentation, and reporting skills 2. Physicist - Who are you? 3. The relationship between Physics with life, and the nature sciences 4. The relationship between Physics with branch of knowledge sciences 5. The effects of Physics on the environment, and people 6. The current research directions at the Faculty of Physics - Engineering Physics, University of Science Ho Chi Minh City
Study and examination requirements and forms of examination	Assessment method: 1. Projects: teamwork, oral presentation = 20% 2. Midterm test = 20% 3. Final test = 60%
Media employed	Text books and slides
Reading list	Main text books: 1. History of Physics, Dao Van Phuc, Education Publisher, 1999. 2. An Introduction to Physical Science, James T. Shipman, Jerry D. Wilson, Charles A. Higgins, Jr, Omar Torres,14th Edition

8. 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	None
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	3
ECTS	5
Required and recommended prerequisites for joining the module	None
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, 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 passage 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 - HoChiMinh 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	None
Study and examination requirements	Mid-term test: 20% Final test: 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.

9. GENERAL CHEMISTRY 1 - CHE00001

Module designation	**GENERAL CHEMISTRY 1**
Code, if applicable	CHE00001
Semester(s) in which the module is taught	2nd semester
Person responsible for the module	None
Language	Vietnamese
Relation to curriculum	General
Teaching methods	None
Workload (incl. contact hours, self-study hours)	None
Credit points	3
ECTS	4.5
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	This subject 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 the 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	None
Study and examination requirements	Midterm test: 30% Final test: 70%

Reading list	Textbooks: [1] Nguyen Dinh Chi (2007). General chemistry. Hanoi Education Publishing House [2] Nguyen Dinh Soa (2000). General chemistry. Ho Chi Minh City National University Publishing House [3] Petrucci, R.H; Harwood, W.S; Herring, F.G (2002, 8th Ed.). General Chemistry. USA: Prentice Hall Others: [4] Le Thi So Nhu. Summary of General Chemistry lecture - internal documents (For internal circulation only)

10. Integral Calculus 2B - MTH00004

Module name:	Integral Calculus 2B
Module level, if applicable	General Education
Code, if applicable	MTH00004
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	None
Person responsible for the module	Ong Thanh Hai
Lecturer	None
Language	Vietnamese
Relation to curriculum	Compulsory
Type of teaching, contact hours	lecture
Workload	45
Credit points	3
ECTS	4.5
Requirements according to the examination regulations	Attendance: at least 80% of class time
Recommended prerequisites	Calculus 1B
Module objectives/intended learning outcomes	Introduction to Calculus, with two major contents of differential and integral calculus of functions of several variables. - Knowledge: visual, quantitative, conceptual understanding of essential definitions, theorems, and properties in calculus - Skills: understanding of concepts, ability of using calculus in practical problems, ability to solve calculus problems, ability to use computer computation softwares - Attitude: diligence, ask questions
Content	The course provides basic knowledge of calculus for non-majors, including IT, physics, electronics and telecommunications, material science, oceanology, meteorology and hydrology, ... , helping students to acquire necessary background for professional study. Content includes: The set of R^n, functions of several real variables, continuity, partial derivatives, extrema, multiple integrals, line integrals, Green theorem, surface integrals, Stokes and Gauss–Ostrogradski theorem, differential equations.
Study and examination requirements and forms of examination	Assignment: 30% Final test (written): 70%
Media employed	None
Reading list	1. Calculus, J. Stewart, 2012 2. Calculus Textbook 1, Duong Minh Duc, 2006 3. Advanced engineering mathematics, K.A. Stroud and D.J. Booth, 2001

11. Linear Algebra - MTH00030

Module name:	Linear Algebra
Module level, if applicable	General Education
Code, if applicable	MTH00030
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	None
Person responsible for the module	Bui Xuan Hai
Lecturer	None
Language	Vietnamese
Relation to curriculum	Compulsory
Type of teaching, contact hours	lecture
Workload	45
Credit points	3
ECTS	4.5
Requirements according to the examination regulations	Attendance: at least 80% of class time
Recommended prerequisites	None
Module objectives/intended learning outcomes	Introduction to higher mathematics. - Knowledge: solid grasp of knowledge on matrices on number fields and applications to solving systems of linear equations; determinants and applications; vector spaces and linear maps. - Skills: computation on matrices; solving systems of linear equations; computing coordinates of vectors in a linear basis; change of coordinates following change of bases; presentation of linear operators by matrices; computing images and kernels of linear operators; using MAPLE computation software. - Attitude: diligence, participating in discusions
Content	The course leads first year students to higher mathematics. Aside from fundamental knowledge for all students, the course lays foundation for later study for all majors.
Study and examination requirements and forms of examination	Assignment: 10% Midterm test: 20% Final test (written): 70%
Media employed	None
Reading list	1. Linear algebra and its applications, Volume 1, Bui Xuan Hai, Tran Ngoc Hoi, Trinh Thanh Deo, Le Van Luyen, 2009 2. Textbook of Linear Algebra, Ngo Viet Trung, 2001 3. Linear Algebra, Nguyen Huu Viet Hung, 2004

12. General Physics 2 (Electromagnetism - Optics) - PHY00002

<table>
<tr><td>Module name:</td><td colspan="4">General Physics 2 (Electromagnetism - Optics)</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">General</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY00002</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">2nd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. HUYNH Truc Phuong</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. HUYNH Truc Phuong
Assoc. Prof. LE Cong Hao
Dr. LE Van Anh Cuong
Dr. NGUYEN Nhat Kim Ngan
Dr. DO Duc Cuong
MSc. DAO Anh Tuan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework at class and home (20%),
● Mid semester exam (30%),
● End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Calculus 1B, General physics 1</td></tr>
<tr><td>Related Course</td><td colspan="4">Linear algebra</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of electric and magnetic fields and thereby an understanding of the laws and phenomena of light optics.</td></tr>
</table>

	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
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 10% 2. Projects: teamwork, oral presentation = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Nguyen Thanh Van. (2015) General Physics 2. VNUHCM Publishing House, Vietnam. References: 1. Le Vu Tuan Hung (2015) Optics. VNUHCM Publishing House, Vietnam. 2. Raymond A. Serway, John W. Jewett, Sr (2014). Physics for Scientists and Engineers with Modern Physics. Ninth Edition. BROOK/COLE, USA. 3. Alan Giambattista, Betty McCarthy Richardson, Robert C. Richardson (2010). Physics. Second Edition. McGrawHill, USA.

13. General Physics 3 (Mechanics – Thermodynamics) - PHY00003

Module name:	**General Physics 3 (Mechanics – Thermodynamics)**			
Module level, if applicable	General			
Code, if applicable	PHY00003			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	2nd semester			
Person responsible for the module	Dr. PHAN Trung Vinh			
Lecturers	Prof. CHAU Van Tao Dr. PHAN Le Hoang Sang Dr. PHAN Trung Vinh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	Calculus 1B, General physics 1			
Related Course	Linear algebra			
Module objectives/intended learning outcomes	This module provides students with basic knowledge of relativistic mechanics, fluid mechanics, fundamental characteristics of real gases, liquid, transport phenomena of gases, and thermodynamic potentials. After completing this module, students can achieve the following:			

	- *Knowledge: Be able to understand and apply knowledge of advanced mechanics and thermodynamics in science activities.* - *Skills: Be able to work in individual, group work, and problem solving.* - *Competences: Ability to apply advanced mechanics and thermodynamics knowledge to analyze physical situations.* - *Attitude: Honesty and diligence*
Content	This module includes the following topics: 1. Relativistic mechanics 2. Fluid mechanics 3. Real gases 4. Transport phenomena of gases 5. Liquid 6. Thermodynamic potentials
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 10% 2. Projects: teamwork, oral presentation = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (PowerPoints)
Reading list	Main books: 1. Nguyen Nhat Khanh, Chau Van Tao (2007) Mechanics. VNUHCM Publishing House, Vietnam. 2. Nguyen Nhat Khanh, Chau Van Tao (2012), Thermology and Thermodynamics, VNUHCM Publishing House, Vietnam. References: 1. Luong Duyen Binh (2003) General Physics. Education Publishing House, Vietnam. 2. David Halliday, Robert Resnick, Jearl Walker (2009), Fundamental of Physics, Education Publishing House, Vietnam.

14. Lab Work on General Physics – PHY00081

Module name:	**Lab Work on General Physics**
Module level, if applicable	General
Code, if applicable	PHY00081
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	2nd semester

<table>
<tr><td>Person responsible for the module</td><td colspan="5">HUYNH Thanh Nhan, MsC</td></tr>
<tr><td>Lecturers</td><td colspan="5">HUYNH Thanh Nhan, HUA Thi Hoang Yen, PHAN Nguyet Thuan, NGUYEN Thi Truc Linh</td></tr>
<tr><td>Language</td><td colspan="5">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td colspan="2">Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching, Discussion, Practice</td><td colspan="2" rowspan="2">5</td><td rowspan="2">Discussion, Exercise, Practice</td><td>Lectures: 5 hours x 2 times
Practice: 5 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="5">120 Hours</td></tr>
<tr><td>Credit points</td><td colspan="5">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="5">4 ECTS</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Practice reports (20%)
● Final practice exam (80%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">None</td></tr>
<tr><td>Related Course</td><td colspan="5">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">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.</td></tr>
</table>

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 Amperemeter DC. Voltmeter and Amperemeter AC 8. Practice 8: AC circuit. R_LC circuit 9. Practice 9: Diode 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
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment (Practice report) = 20% 2. Final test = 80%
Media employed	Text books and Laboratory instruments
Reading list	Main text books: Dang van Liet, Do Dinh Luyen, Nguyen Van Nghia, Tran Thi Kim Phuong, "**General Physics Experiments**", University of Science, -VNUHCM, 2008

15. Introduction to Informatics - CSC00003

Module designation	**Introduction to Informatics**
Code, if applicable	CSC00003
Semester(s) in which the module is taught	2nd semester
Person responsible for the module	None
Language	Vietnamese
Relation to curriculum	General
Teaching methods	None
Workload (incl. contact hours, self-study hours)	None
Credit points	4
ECTS	6
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	This course provides 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 common software on computers • Prepare text. presentation and data calculation with calculators • Building 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 Microsoft Word for sale - Compose and remove text - Text format - Create blasphemy - Processing graphics in documents - Page layout and printing Basic Microsoft PowerPoint - Basic presentation templates - Create a slideshow - Set effects for the slide show. Microsoft Excel for sale - Format data in Excel - References in Excel - Basic Excel functions - Print and draw charts Using the Internet - Basic knowledge of the Internet - Look for information - Safety information Web image processing - Resize photo frame - light sand - Spin and flip - Increase the brightness of the light - Correction of the hue of the light Design a website with HTML & CSS3
Examination forms	None

Study and examination requirements	Midterm test: 30% Final test: 70%
Reading list	Microsoft Office MOS Document. IIG Vietnam. Fahasha IC3 Spark Document. IIG Vietnam. Fahasha

16. 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	None
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	3
ECTS	5
Required and recommended prerequisites for joining the module	None
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 - HoChiMinh 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	None
Study and examination requirements	Mid-term test: 20%, Final test: 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.

17. Scientific Socialism - BAA00103

Module designation	**Scientific Socialism**
Code, if applicable	BAA00103
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	None
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
ECTS	3
Required and recommended prerequisites for joining the module	None
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 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	None
Study and examination requirements	Projects: teamwork, oral presentation: 15% Midterm test: 20% Assignment: 15% Final test: 50%
Reading list	Textbook of Scientific Socialism, National Political Publishing House of Vietnam. The Basic Principles of Marxism-Leninism, National Political Publishing House of Vietnam

18. 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	None
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
ECTS	3
Required and recommended prerequisites for joining the module	None
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 cause. Equip with 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	None
Study and examination requirements	Projects: teamwork, oral presentation: 15% Midterm test: 20% Assignment: 15% Final test: 50%
Reading list	Curriculum of the History of the Communist Party of Vietnam, Issued by the Ministry of Education and Training.

19. HoChiMinh’s Ideology - BAA00003

Module designation	**HoChiMinh’s Ideology**
Code, if applicable	BAA00003
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	None
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
ECTS	3
Required and recommended prerequisites for joining the module	None
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	None
Study and examination	Projects: teamwork, oral presentation: 15%

requirements	Midterm test: 20% Assignment: 15% Final test: 50%
Reading list	Textbook of Ho Chi Minh's Thoughts, National Political Publishing House of Vietnam Study Guide for Ho Chi Minh's Thoughts, Ho Chi Minh City National University Publishing House

20. Probability and Statistics - MTH00040

Module name:	**Probability and Statistics**
Module level, if applicable	General Education
Code, if applicable	MTH00040
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	None
Person responsible for the module	Dang Duc Trong
Lecturer	None
Language	Vietnamese
Relation to curriculum	Compulsory
Type of teaching, contact hours	lecture
Workload	45
Credit points	3
ECTS	4.5
Requirements according to the examination regulations	Attendance: at least 80% of class time
Recommended prerequisites	None
Module objectives/intended learning outcomes	The course provides basic knowledge of the theory of probability and mathematical statistics. The theory of probability studies random phenomena, while the theory of mathematical statistics proposes general models and statistical decisions. - Knowledge: the course provides the most basic knowledge and notions of probability and statistics to be background knowledge for later courses. - Skills: employs probability and statistics to solve some real-world problems related to analysis and presentation of data. - Attitude: the course helps students acquire initial knowledge of probability and statistics, and recognition of the role of probability and statistics in science and in life, from which an enthusiasm for science can be formed, then a serious and proactive attitude in study.
Content	Basic notions on probability, random variables, common probability distributions, hypothesis checking, regression.
Study and examination requirements and forms of examination	Projects: teamwork, oral presentation: 10% Midterm test: 20% Assignment: 10% Final test (written): 60%
Media employed	None
Reading list	1. Probability Statistics, Nguyen Thi Mong Ngoc (editor), 2018 2. Statistical probability exercises and practice, Nguyen Thi Mong Ngoc (editor), 2018 3. Textbook of probability theory and mathematical statistics, Tran Tuan Diep, Ly Hoang Tu, 1979 4. Probability Theory and Mathematical Statistics exercises, Hoang Huu Nhu, Nguyen Van Huu, 1978 5. Statistical theory, Dang Duc Trong (editor),2016

	6. Statistical Theory Exercises and Practices, Dinh Ngoc Thanh (editor),2016 7. Probability and Statistics: Theory and Applications, Gunnar Blom, 1989 8. Statistics Applications for Environmental Science, Stacey J. Shaefer, Louis Theodore, 2007 9. Applied Statistics and Probability for Engineers, 5ed, Douglas C. Montgomery, George C. Runger, 2011

21. Modern Physics - PHY00004

<table>
<tr><td>Module name:</td><td colspan="4">Modern Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">General</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY00004</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">3rd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. HUYNH Truc Phuong</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. HUYNH Truc Phuong
Assoc. Prof. TRAN Thien Thanh
Assoc. Prof. TRAN Duy Tap
Dr. HOANG Thi Kieu Trang</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework at class and home (20%),
● Mid semester exam (30%),
● End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Calculus 1B, General physics 1, General physics 2</td></tr>
<tr><td>Related Course</td><td colspan="4">Linear algebra</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides students with fundamental knowledge of quantum optics, atomic and nuclear physics.
Students who complete this module could be achieved the following:</td></tr>
</table>

	- *Knowledge: Be able to understand quantum optics, atoms and nuclei in the discovery and study of matter. Be able to apply quantum optics, atoms and nuclei in science activities.* - *Skills: Be able to work in individual, group work, and problem solving.* - *Competences: Ability to apply modern physics knowledge to analyze new physical situations.* - *Attitude: Honesty and diligence*
Content	This module includes the following topics: 1. Wave-particle duality of light 2. Waves of matter 3. Fundamentals of quantum mechanics 4. Fundamentals of atomic physics 5. Fundamentals of nuclear physics
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 10% 2. Projects (Individual activities) = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Huynh Truc Phuong, Truong Thi Hong Loan, Chau Van Tao (2015). Quantum – Atomic - Nuclear. For internal circulation only, University of Science, VNUHCM, Vietnam. References: 1. Raymond A. Serway, John W. Jewett, Sr (2014). Physics for Scientists and Engineers with Modern Physics. Ninth Edition. BROOK/COLE, USA. 2. Alan Giambattista, Betty McCarthy Richardson, Robert C. Richardson (2010). Physics. Second Edition. McGrawHill, USA.

22. 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	None
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
ECTS	3
Required and recommended prerequisites for joining the module	None
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	None
Study and examination requirements	Homework Assignment: 20% Midterm test: 20% Final test: 60%
Reading list	Principles of economics, Statistical Publishing House. Microeconomics, Education Publishing House

23. 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	None
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
ECTS	3
Required and recommended prerequisites for joining the module	None
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	None
Study and examination requirements	Midterm test: 30% Final test: 70%
Reading list	Syllabus of General Psychology course, Ho Chi Minh City University of Law. General Psychology Textbook, People's Public Security Publishing House

24. Innovative Methodology - BAA00007

Module name:	Innovative Methodology
Module level, if applicable	General Education
Code, if applicable	BAA00007
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	None
Person responsible for the module	Vuong Huynh Minh Triet
Lecturer	None
Language	Vietnamese
Relation to curriculum	Compulsory
Type of teaching, contact hours	lecture
Workload	45
Credit points	3
ECTS	4.5
Requirements according to the examination regulations	Attendance: at least 80% of class time
Recommended prerequisites	None
Module objectives/intended learning outcomes	Introduction to higher mathematics. - Knowledge: solid grasp of knowledge on matrices on number fields and applications to solving systems of linear equations; determinants and applications; vector spaces and linear maps. - Skills: computation on matrices; solving systems of linear equations; computing coordinates of vectors in a linear basis; change of coordinates following change of bases; presentation of linear operators by matrices; computing images and kernels of linear operators; using MAPLE computation software. - Attitude: diligence, participating in discusions
Content	After completing the course, students can apply concepts and subject knowledge to the following specific benefits: - Provide a system of ways of looking at things - Increase observation, curiosity, creativity - Analyze and logically explain existing creative solutions - Increase the agility of absorbing and assessing the value of information - See the unified similarity between seemingly very different systems - Overcoming psychological inertia - Helps to discover available reserves in the system, especially free and easy to use heavenly reserves - Give and choose an appropriate approach to solve the problem - Play out ideas for improving a given system - Forecasting the development trend of a given system in the future - Help detect, place and select problems to be solved - Used to practice developing creative imagination

	- Used to improve yourself, build your style, think and work scientifically and creatively - Contributing to building system-dialectical thinking
Study and examination requirements and forms of examination	Assignment: 10% Midterm test: 20% Final test (written): 70%
Media employed	None
Reading list	1. Phan Dung (2000): Textbook summary: Methodology of creative science - technique of problem solving and decision making (beginner program). 2. Phan Dung (2000). Introduction: Methodology of Creativity and Innovation (book one of the "Creativity and Innovation" series). Science and Technology Innovation Center. Ho Chi Minh City 2004. Youth Publishing House, 2010. Ho Chi Minh National University Publishing House, 2012. 3. Phan Dung (2000). The world inside the creative person (book two of the series "Creativity and innovation Science and Technology Innovation Center. Ho Chi Minh City 2004. Youth Publishing House, 2010. Ho Chi Minh National University Publishing House, 2012 4. Phan Dung (2000). Logical, Dialectical and Systematic Thinking (the third book of the "Creativity and Innovation" series). Science and Technology Innovation Center. Ho Chi Minh City 2004. Youth Publishing House, 2010. Ho Chi Minh National University Publishing House, 2012 5. Phan Dung (2000). Basic tricks (principles) Part 1 (book four of the "Creativity and Innovation" series). Science and Technology Innovation Center. Ho Chi Minh City 2004. Youth Publishing House, 2010. Ho Chi Minh National University Publishing House, 2012 6. Phan Dung (2000). Basic tricks (principles) Part 2 (book four of the "Creativity and Innovation" series). Science and Technology Innovation Center. Ho Chi Minh City 2004. Youth Publishing House, 2010. Ho Chi Minh National University Publishing House, 2012

25. Earthscience - GEO00002

Module designation	**Earthscience**
Code, if applicable	GEO00002
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	None
Language	Vietnamese
Relation to curriculum	General
Teaching methods	None
Workload (incl. contact hours, self-study hours)	None
Credit points	2
ECTS	3
Required and recommended prerequisites for joining the module	None
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 fresh water 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	None
Study and examination requirements	Midterm test: 30% Final test: 70%
Reading list	*Earth Science,* DANIELSON, E.W., DENECKE. EJ..Ir..l986 *Foundations of Earth Science,* Lutgens Frederick K. Tarbuck Edward .1, 1997 *Earth Science Textbook,* LUU DUC HAI, TRAN NGHI. 2008 Earth Science Today, MURPHY, B., NANCE, D,, 1999 An introduction to the earth-life system, Cockell Charles...[and others] . 2008

26. Fundamental of Environmental Science - ENV00001

Module designation	**Fundamental of Environmental Science**
Code, if applicable	ENV00001
Semester(s) in which the module is taught	3rd semester
Person responsible for the module	None
Language	Vietnamese
Relation to curriculum	General
Teaching methods	None
Workload (incl. contact hours, self-study hours)	None
Credit points	2
ECTS	3
Required and recommended prerequisites for joining the module	None
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	None
Study and examination requirements	Midterm test: 30% Final test: 70%
Reading list	Textbooks: [1] Lecture on General Environment, compiled by the group of teachers [2] Le Van Khoa (Editor),2004. Environmental science, Education Publishing House. References [3] Le Van Khoa, Doan Van Canh, Nguyen Quang Hung, Lam Minh Triet (2011). Textbook of People and the Environment, Education Publishing House. [4] Goudie, A. (2006) The Human Impact on Natural Environment. 6th Edition. Oxford. Blackwell [5] Le Thi Thanh Mai (2008), Textbook of People and the Environment. National University of Ho Chi Minh City.

27. Functions of a Complex Variable - PHY10001

Module name:	**Functions of a Complex Variable**
Module level, if applicable	General
Code, if applicable	PHY10001
Subtitle, if applicable	None

Courses, if applicable	None			
Semester(s) in which the module is taught	2nd semester			
Person responsible for the module	MSc. Nguyen Thi Huyen Nga			
Lecturers	MSc. Nguyen Thi Huyen Nga Dr. Vo Quoc Phong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	Calculus 1B			
Related Course	Linear algebra			
Module objectives/intended learning outcomes	This module provides the basics for solving a number of physics problems. These methods are concerned with complex integrals, complex series expansions and integral transformations as well as the theory of residues. Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and apply knowledge of functions of a complex variable and Complex integrals.* - *Skills: Be able to work in individual, group work.* -*Competences: Using functions of a complex variable to solve real and complex integration problems and differential equations in Physics.*			

	- *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. Complex numbers and their properties. 2. Functions of complex variable 3. Basic Complex Functions 4. Integration of functions of complex variable. 5. Residue theorems 6. Fourier transform and Laplace transform 7. Using complex variable functions to solve differential equations.
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 10% 2. Projects: Individual activities = 10% 3. Midterm test = 35% 4. Final test = 45%
Media employed	Text books and slides (power points).
Reading list	Main books: 1. W. Kaplan, Introduction to analytic functions, Addison Wesley Company Inc., 1966. References: 2. Nguyen Kim Dinh, Complex functions and applications (in Vietnamese), VNUHCM Publishing House, Vietnam, 2012. 3. A. David Wunsch, Complex Variables with applications, Pearson; 3rd edition, 2004. 4. Richard A. Silverman, Introductory complex analysis, Prentice-hall Inc. Englewood Cliffs N.J., 1967.

28. Lab of Fundamental Physics - PHY10002

Module name:	**Lab of Fundamental Physics**
Module level, if applicable	General
Code, if applicable	PHY10002
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	3th semester
Person responsible for the module	Dr. NGUYEN Huynh Tuan Anh

<table>
<tr><td>Lecturers</td><td colspan="4">Dr. NGUYEN Huynh Tuan Anh</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Practice</td><td rowspan="2">5</td><td rowspan="2">Discussion,
Exercise,
Practice</td><td>Lectures: 5 hours x 12 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">120 hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4 ECTS</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Practice reports (20%)
• Final practice exam (80%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Lab work on General Physics, General Physics 1</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge experiment of mechanics, acoustics, thermodynamics, electricity and magnetism, light and optics, modern physics.
Students who complete this module could be achieved the following:
- Knowledge: Be able to understand and apply knowledge of mechanics, acoustics, thermodynamics, electricity and magnetism, light and optics, modern physics in science and life.
- Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving.
- Competences: Be able to design a higher experiment involving mechanics, acoustics, thermodynamics, electricity and magnetism, light and optics, modern physics. Have the capacity to learning in the next periods.</td></tr>
<tr><td>Content</td><td colspan="4">This module includes the following topics:
1. Interference of light
2. Diffraction of light
3. Magnetic field of paired coils in Helmholtz arrangement
4. Planck’s “quantum of action” from photoelectric effect (line separation by interference filters)
5. Two-electron spectra with the prism spectrometer
6. Polarization of light
7. Heat capacity of gas</td></tr>
</table>

	8. Characteristic curves of a solar cell 9. Black Body Radiation: Determination of Stefan's Constant 10. Determining the Curie Temperature of Iron and Nickel 11. Moment and angular momentum
Study and examination requirements and forms of examination	Assessment method: 1. Assignment (Practice report) = 20% 2. Final test = 80%
Media employed	Text books and Laboratory instruments
Reading list	Main books: 1. Nguyen Huynh Tuan Anh, General physics practice textbook 2 References: 1. Luong Duyen Binh, *General Physics: volume I: Mechanics – Heat*, Education Publishing House, 1995 2. Nguyen Thanh Van, *General Physics: volume I: mechanics – heat,* Ho Chi Minh City National University Publishing House*, 2013.* 3. Nguyen Thanh Van, *Electromagnetic - Optical ,* Ho Chi Minh City National University Publishing House*, 2015.*

29. 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	None
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	3
ECTS	5
Required and recommended prerequisites for joining the module	None
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 - Hochiminh 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	None
Study and examination requirements	Mid-term test: 20%, Final test: 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

30. Computational Mathematics - PHY10003

<table>
<tr><td>Module name:</td><td colspan="4">Computational Mathematics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">General</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10003</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">4th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">NGUYEN Chi Linh</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. NGUYEN Chi Linh</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">6</td><td rowspan="2">Discussion,
Exercise,
Practice.

.</td><td>Lectures: 3 hours x 10 times
Practice: 3 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">150 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Assignment (10%),
• Practice (30%),
• Mid exam (20%)
• Final exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Calculus 1, 2</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course focus on describing the computational methods which students can applied in physics and engineering problems.
Students who complete this module could be achieved the following:</td></tr>
</table>

	- *Knowledge: Be able to use the numerical methods for studying computational problems.* - *Skills: Be able to work and discuss in group.* - *Competences: Be able to set up a numerical program for solving engineering physics* - *Attitude and Ethics:Be able to become honest in studying to produce reliable result..*
Content	This module includes the following topics: 8. Number System and Errors in the Approximation 9. Solving Equation and number of equations 10. Interpolation 11. Numerical differentiation and integration 12. Linear Algebraic Equations and Eigenvalues 13. The least Squares and the Spline Interpolation 14. Differental Equations and Boundary Value Problems 15. Difference Method for Partial Differential Equations
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 10% 2. Practice = 30% 3. Project = 20% 4. Final exam = 40%
Media employed	Text books and slides (power points)
Reading list	Main books: • V.L.Dang, Numerical analysis (2004), VNUHCM Publishing House, Vietnam References: • Steven C. Chapra Raymond P. Canale (2009), Published by McGraw-Hill

31. Mathematical Methods for Physics - PHY10004

Module name:	**Mathematical Methods for Physics**			
Module level, if applicable	General			
Code, if applicable	PHY10004			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	4th Semester			
Person responsible for the module	Dr. NGUYEN Huu Nha			
Lecturer	Ass. Prof, Dr. LA Thi Cang Dr. NGUYEN Huu Nha			
Language	Vietnamese			
Relation to curriculum	compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate	3	Discussion, Debate, Exercise	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total Workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment and presence (30%), mid semester exam (30%), and end semester exam (40%))			
Recommended prerequisites	Calculus 1B&2B, Linear Algebra, Functions of Complex Variables			
Related Course	Quantum Mechanics 1, Theoretical Mechanics, Electrodynamics			
Module objectives/intended learning outcomes	*These lectures provide an introduction to Fourier Series. The emphasis is on showing how these are useful for solving the wave equation, the heat equation and Laplace's equation. Moreover, the course introduces the idea of Dirac delta function which is useful in Quantum Mechanics and Electrodynamics, and the calculus of variation which is the basis for Theoretical mechanics. The last one is how to solve second order ordinary differential equation by using the power series method and apply to some special functions such as Legendre function, Hermite function, Bessel function, Laguerre function. Detailed analysis will mostly be avoided. The lectures are aimed at second year undergraduates.*			

	• Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below: - Logical thinking, problem solving. - Communication. - Self-study, lifelong self-study. - Using specialized English terminology. - Responsibility, be honest; growth mindset; open-mindedness.
Content	1. Fourier series 2. Partial differential equations: the wave equation, the heat equation and Laplace's equation 3. Dirac delta function 4. Calculus of variation 5. Special functions: Legendre function, Hermite function, Bessel function, Laguerre function
Study and examination requirements and forms of examination	Assessment method: 1. Homework Assignment = 20 % 2. Midterm test = 30% 3. Final test = 50%
Media employed	Text books, slides (power points)
Reading list	Main books: • La Thi Cang, Mathematical methods - part 1 (in Vietnamese), VNUHCM Publishing House, Vietnam, 2014 • Kusse B.R., Westwig E.A., Mathematical Physics - Applied Mathematics for Scientists and Engineers, 2ed, Wiley-VCH, 2006: chapter 5. • Boas, Mathematical Methods in the Physical Sciences, 3ed, Wiley, 2005: chapters 7, 9, 13. References: • Arfken, Mathematical methods for physicists _ a comprehensive guide, 7ed, Elsevier, 2012. • Riley, Essential Mathematical Methods for the Physical Sciences, CUP, 2011 • Chow, Mathematical methods for physicists, CUP, 2000

32. Basic Electronics - PHY10005

Module name:	**Basic Electronics**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10005			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	4^{th} semester			
Person responsible for the module	Assoc. Prof. HUYNH Van Tuan			
Lecturers	Dr. NGUYEN Chi Nhan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	4	Discussion, Exercise, Practice, Course projects	Lectures: 3 hours x 10 times Practice: 3 hours x 10 times	60
			Preparation and Follow up 10 hours x 12 times	120
Total workload	180 Hours			
Credit points	3 Credits			
ECTS	3 (Lecture) + 2 (Practice) = 5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework (10%), • Practice (30%), • Mid exam (30%) • Final exam (30%)			
Recommended prerequisites	General Physics			
Related Course	None			
Module objectives/intended learning outcomes	This module aims to provide students with basic knowledge of the field of electronics, basic electronic circuits. Students learn the basics of semiconductor devices such as P-N junction, diode, bipolar junction			

	transistor (BJT), field effect transistor (FET) and basic knowledge of ICs. Students who complete this module could be achieved the following: - *Knowledge: Be able to apply knowledge in basic electronics.* - *Skills: Be able to work in individual to present technical reports in basic electronics problems.* - *Competences: Be able to design basic electronic circuits.* - *Attitude: be honest, responsible, respect for colleagues.*
Contents	This module includes the following topics: 1 Introduction 2 The laws of electronic circuits 3 PN junction 4 Diode 5 Transistor 6 Small signal amplifier 7 Feedback amplifier 8 Operational amplifier 9 Power Amplifier 10 Oscillator circuit
Study and examination requirements and forms of examination	Assessment method: 1. Homework Assignment = 10% 2. Assignment (Practice) = 30% 3. Midterm test = 30% 4. Final test = 30%
Media employed	Text books and slides
Reading list	Main text books: • Huynh Van Tuan, Nguyen Chi Nhan, Electronic lecture: Basic Electronics, Faculty of Engineering Physics, University of Science, VNU-HCM. • Basic Electronics Practical Textbook, authored group of Faculty of Physics and Engineering, University of Science, VNU-HCM. References: Microelectronics Circuit Analysis and Design 3rd Edition, Donald A.Neamen, McGraw Hill, 2007

33. Theoretical Mechanics - PHY10006

<table>
<tr><td>Module name:</td><td colspan="4">Theoretical Mechanics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">General</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10006</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">4th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. DANG Hoai Trung
Dr. VO Quoc Phong</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. DANG Hoai Trung
Dr. VO Quoc Phong</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Calculus 1B; General Physics 1</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course introduces the Lagrangian and Hamiltonian formulism of mechanics for solving complex problems in mechanics.
Students who complete this module could be achieved the following:
- Knowledge: Understanding motion and constraints, generalized coordinates, variational calculus, Hamilton's principle, Lagrangian formulation, Hamilton's canonical equations, Poisson bracket formulation Liouville's theorem and Hamilton Jacobi theory.</td></tr>
</table>

	- Skills: Be able to apply Euler-Lagrange equations and Hamilton canonical equations to the independent coordinates and find the equations of motion of some systems. *- Competences: Be able to understand issues and solve problems in nonlinear dynamics, rigid bodies and electrodynamics; be able to do research in contemporary physics and other sciences; be able to have the capacity to learning in the next periods.*
Content	This module includes the following topics: 1 The equations of motion 2 Conservation laws 3 Integration of the equations of motion 4 Collisions between particles 5 Small oscillations 6 Motion of a rigid body 7 The canonical equations
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 10% 2. Projects: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Textbooks and slides (power points)
Reading list	Main books: • Le Quang Toai (2007). Theoretical mechanics. VNUHCM Publishing House, Vietnam. • Le Quang Toai (2007). Problems on Theoretical mechanics. VNUHCM Publishing House, Vietnam. References: 1. John R. Taylor (2005). Classical Mechanics, Edwards Brothers, Inc., United States of America. 2. Herbert Goldstein, Charles P. Poole, John L. Safko. (2002). Classical Mechanics. Addison-Wesley Longman, USA. 3. Landau L.D., Lifshits E.M. (1977). Mechanics, Volume 1, Pergamon Press, UK.

34. Quantum Mechanics 1 - PHY10007

<table>
<tr><td>Module name:</td><td colspan="4">Quantum Mechanics 1</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">General</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10007</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4"></td></tr>
<tr><td>Courses, if applicable</td><td colspan="4"></td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">4nd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Lecturer</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures).
• Score: Homework (20%), Midterm exam (30%), End semester exam (50%).</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Calculus 1B&2B, Linear algebra, Functions of Complex Variable, General Physics, Mathematical Methods for Physics</td></tr>
<tr><td>Related Course</td><td colspan="4">Quantum Mechanics II, Theory of Solid State, Quantum Field Theory</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course is aimed to introduce basic concepts and ideas on Quantum Mechanics: The Schrödinger equation, the wave function, operators, the mathematical formulations of quantum mechanics. Students will be able to solve the time-independent Schrödinger equation (TISE) for a variety of potentials in one and three dimensions, and apply TISE to the hydrogen atom and some simple problems of n-particle system. We will</td></tr>
</table>

	discuss the eigenvalue problems for energy, angular momentum, spin. Course Learning Outcomes: 1. Show a basic understanding of wave mechanics in one dimension (the Schrödinger, wave function and its statistical interpretation, observables and operators, the uncertainty principle), and the formalism of quantum mechanics. 2. Solve the time-independent Schrödinger equation for simple potentials in 1D and 3D; describe the structure of the hydrogen atom. 3. Identify and relate the eigenvalue problems for energy, momentum, angular momentum, spin, and n-particle system; explain the idea of spin and solve the eigenvalue problems for particle of spin 1/2. ● Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below: - Logical thinking, critical thinking and problem solving. - Communication. - Self-study, lifelong self-study. - Using specialized English terminology. - Responsibility, be honest; growth mindset; open-mindedness.
Content	This module includes the following topics: 1. Origins and the important role of Quantum Physics 2. The Wave Function 3. Time-Independent Schrödinger Equation 4. Formalism of Quantum Mechanics 5. Quantum Mechanics in Three Dimensions 6. Identical Particles
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Paper assignment (20%) 2. Midterm test (30%) 3. Final test (50%)
Media employed	Text books and slides (power points)
Reading list	Main books: 1. D. J. Griffiths, D. F. Schroeter, *Introduction to Quantum Mechanics*, 2nd Ed., Cambridge University Press, 2018. References: 1. D. A. Fleisch, *A Student's Guide to the Schrödinger Equation*, Cambridge University Press, 2020. 2. J. J. Sakurai, J. Napolitano, *Modern Quantum Mechanics*, 2nd Ed., Cambridge University Press,

	2017. 3. R. Shankar, *Principles of Quantum Mechanics*, Plenum Press, 1994.

35. General Nuclear Physics - PHY10008

Module name:	**General Nuclear Physics**			
Module level, if applicable	General			
Code, if applicable	PHY10008			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	4th semester			
Person responsible for the module	Prof. CHAU Van Tao			
Lecturers	Prof. CHAU Van Tao Dr. TRINH Hoa Lang Dr. LE Hoang Chien MSc. NGUYEN Tri Toan Phuc MSc. NGUYEN Duy Thong MSc. CHAU Thanh Tai MSc: LE Hoang Minh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Labwork, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures), • Midterm exam (20%), • Final exam (50%)			
Recommended prerequisites	General physics 1, General physics 2, Modern Physics, Calculus 1B, Calculus 2B, Lab work on General Physics			
Related Course	Analytical Mathematics, Linear algebra			
Module objectives/intended learning outcomes	This module provides basic knowledge of nuclear physics Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand and explain concepts and some phenomena involving the nuclear physics.* Apply fundamental and in-depth knowledge of physics and mathematical formulation - *Skills: Be able to work in individual, group work, self-study, problem solving, and English reading skills.* Lifelong self-study skills - *Competences: Be able to apply the knowledge in radiation measurements. Have the capacity to learning in the next periods.* -*Attitude and Ethics: Professional ethics and professional responsibility*
Content	This module includes the following topics: 1 Nuclear properties 2 Nuclear model 3 Nuclear reaction 4 Radioactivity 5 Interaction of radiation with matter 6 Radiation detection and measurement
Study and examination requirements and forms of examination	Assessment method: 1. Homework Assignment = 18% 2. Projects: Individual activities at class = 12% 3. Midterm test = 20% 4. Final test = 50%
Media employed	Textbooks and slides (power points)
Reading list	Main books: • Chau Van Tao (2014). General Nuclear Physics. VNUHCM Publishing House, Vietnam. References: • A. Das and T. Ferbel (2003). Introduction to nuclear and Particle Physics. Second Edition. World Scientific Publishing Co Pte Ltd, Singapore. • G.F. Knoll (1989). Radiation detection and measurement. Second Edition. John Willey & Sons Inc, USA. • J.R. Lamarsh and A.J. Baratta (2001). Introduction to Nuclear Engineering. Third Edition. Prentice Hall Inc, USA. • W. R. Leo (1994). Techniques for Nuclear and Particle Physics Experiments. Second Edition. Springer-Verlag Berlin Heidelberg, Germany.

36. Electrodynamics - PHY10009

Module name:	**Electrodynamics**			
Module level, if applicable	Basic			
Code, if applicable	PHY10009			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	4th semester			
Person responsible for the module	Dr. Le Van Ngoc			
Lecturers	Dr. Phan Thi Kieu Loan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Mid semester exam (30%), ● End semester exam (70%)			
Recommended prerequisites	Calculus 1B, General physics			
Related Course	Linear algebra			
Module objectives/intended learning outcomes	This module provides knowledge about electromagnetic fields. Learners' expectations after completing this course are: Knowledge: Provides learners with a broader understanding of the relationship between electromagnetic fields and the distribution of charges			

	and currents. In this module, we also repeat the two parts static electric field and static magnetic field, but using advanced mathematical tools, including vector analysis. From there, learners can explain electromagnetic phenomena, optics and beyond to solve problems in physics and engineering physics. Skill: Learners see more clearly the unity of electric and magnetic fields. A new perspective of the electromagnetic field. From the basic knowledge provided, learners are able to deduce the system of Maxwell's equations and this is considered the core basis of electrodynamics. Competences: The consequences from Maxwell's equations show that the electromagnetic field has a different mode of existence in space without the need for the distribution of electric charges and currents. From the new perception of the unity of electric and magnetic fields, learners have a new perception and see more clearly about the existence of matter. This is also a prerequisite for learners to participate in advanced and in-depth studies in some of physics specialties. Attitude and ethics: To pass this course, learners need to have the spirit of self-study, effort in thinking and a sense of self-discipline to complete the tests.
Content	This module includes the following topics: 1. Static electric field. 2. Static magnetic field. 3. Time-varying electromagnetic field. 4. Electromagnetic waves.
Study and examination requirements and forms of examination	Assessment method: 1. Midterm test = 30% 2. Final test= 70%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Nguyen Huu Chi. (2003) Electrodynamics. HCMUS Publishing House, Vietnam. References: 1. Nguyen Kim Dinh, Nguyen Thanh Van (2004) Electromagnetic field. VNUHCM Publishing House, Vietnam.

37. Solid State Physics - PHY10010

Module name:		**PHY10010 - Solid State Physics**			
Module level, if applicable		General			
Code, if applicable		**PHY10010**			
Semester(s) in which the module is taught		5th Semester			
Person responsible for the module		Trần Quang Trung			
Lecturer		Lê Thụy Thanh Giang			
Language		Vietnamese			
Relation to curriculum		Compulsory			
Types of teaching and learning	Class Size:	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate		3	Discussion, Debate, Exercise	Lectures: 3 hours x 15 times	45
				Preparation and Follow up 6 hours x 15 times	90
Total Workload		135 Hours			
Credit points		3 Credits			
ECTS		4.5			
Requirements according to the examination regulations		• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (30%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites		None			
Related Course		None			
Module objectives/intended learning outcomes		This subject provides students with basic knowledge about solid state physics such as structure, bonding, oscillation, phonon, free electron gas in metals, energy band theory, thermal and electrical properties of solids, especially Semiconductor and its properties Students who complete this module could be achieved the following **About knowledge:** *Understanding crystal structure* *Understanding bonding in crystal solids* *Understanding lattice oscillation* *Understanding the thermal properties of solids* *Understanding the free electron gas in metals* Understanding the energy band theory Know Semiconductor Crystals **About skills:** *- Improve the process of self-study and self-receiving information from lectures and documents to answer questions and do required*			

	exercises. *- Speaking, presentation and discussion skills during the seminar.* *- Use some English terms in the field of solid-state physics and start reading English documents* **About competences** *- Effective communication in science* **About attitude and ethics:** *- Believe in the practical value of subject knowledge.* *- Be ethical and honest in studying, testing and taking exams.* *- The spirit of progressive learning*.
Content	This module includes the following topics: 1. Crystal structure 2. Bonding in crystalline solids 3. Lattice Oscillation 4. Thermal properties of solids 5. Free electron gas in metals 6. Energy band theory 7. Semiconductor crystal
Study and examination requirements and forms of examination	Assessment method: 1. Homework Assignment = 10% 2. Projects: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books, slides (power points), and films
Reading list	Main books: Le Khac Binh, Nguyen Nhat Khanh, ***Solid State Physics***, VNUHCM Publishing House, Vietnam., 2002. References: Charles Kittel, ***Fundermental of Solid State Physics***, Science & Technology Publishing, Hanoi, Vietnam, 1970. Vu Dinh Cu, ***Solid State Physics***, Science & Technology Publishing, Hà Nội, Vietnam, 1997. Đao Tran Cao, ***Fundermental of Solid State Physics***, Hanoi, VNU Publishing House, Vietnam, 2007.

38. Statistical Physics - PHY10011

Module name:	**Statistical Physics**			
Module level, if applicable	General			
Code, if applicable	PHY10011			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th semester			
Person responsible for the module	Assoc. Prof. Nguyen Nhat Khanh			
Lecturers	Assoc. Prof. Nguyen Nhat Khanh Dr. Phan Hong Khiem Dr. Nguyen Huu Nha Dr. Vo Quoc Phong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework at class and home (20%), ● Mid semester exam (30%), ● End semester exam (50%)			
Recommended prerequisites	Theoretical Mechanics; General physics 2,3			
Related Course	Electrodynamics			
Module objectives/intended learning outcomes	This module presents the statistical theory of many-particle physical systems. The course presents four principles of thermodynamics, thermodynamic functions. The important parts of the module are			

	classical and quantum distributions and their applications. Students who complete this module could be achieved the following: - *Knowledge: be able to understand the statistics of many-particle systems; analyze the classical and quantum distributions; microcanonical, canonical, and grand canonical ensembles.* - *Skills: group work, self-study.* - *Competences: have the basic methods and apply them in many-particle systems, Classical and Quantum thermodynamics systems.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. Basic principles of statistical physics 2. Thermodynamic quantities 3. Classical statistical distributions 4. Quantum statistical distributions 5. The fluctuations of thermodynamic quantities 6. Some applications of statistical physics
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 10% 2. Projects: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Mehran Kardar, Statistical Physics of Particles, Cambridge University Press; 1st edition, 2007 References: 2. F. Reif, Fundamentals of Statistical and Thermal Physics, Waveland Pr Inc; 56946th edition, 2008. 3. Charles Kittel, Elementary Statistical Physics, Dover Publications; Illustrated edition, 2004.

	4. Charles Kittel and Herbert Kroemer, Thermal Physics, W. H. Freeman; Second edition, 1980. 5. Mehran Kardar, Statistical Physics of fields, Cambridge University Press; 1st edition, 2007.

39. Atomic Physics - PHY10012

Module name:	**Atomic Physics**			
Module level, if applicable	General			
Code, if applicable	PHY10012			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	3rd semester			
Person responsible for the module	Dr. NGUYEN Huynh Tuan Anh			
Lecturers	Dr. NGUYEN Huynh Tuan Anh Dr. DO Duc Cuong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 2 hours x 15 times	60
Total workload	Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework at class and home (20%), ● Mid semester exam (30%), ● End semester exam (40%)			
Recommended prerequisites	Calculus 1B, General physics 1			
Related Course	Linear algebra			
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 atomic phýics in science and life.*			

	- Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving. *- Competences: Be able to design a simple experiment involving electromagnetism and optics. Have the capacity to learn in the next period.*
Content	This module includes the following topics: 1. Introduction 2. Many-body problems, systems of identical particles 3. Basic concepts of quantum mechanics 4. Elementary Atomic spectra 5. Atoms in Strong Fields, Zeeman effect
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 10% 2. Projects: Individual activities = 10% 3. Midterm test = 20% 4. Final test = 60%
Media employed	Text books and slides (power points)
Reading list	**Main books:** 1. Nguyen Minh Thuy, Atomic Physics, University of Education, 2011. 2. Lim Yung-Kuo, Atomic, nuclear and elementary particle physics exercises and solutions, Education Publishing House, 2008 **References:** 1. Luong Duyen Binh,… General Physics: Volume III, Education Publishing House, 1998 2. J. Yarwood, Atomic physics, Tutorial Press, 2000 3. J. B. Rajam, Atomic physics, Schand & Company LTD, 2007.

40. English 4 - BAA00014

Module designation	**English 4**
Code, if applicable	BAA00014
Semester(s) in which the module is taught	4th semester
Person responsible for the module	None
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	3
ECTS	5
Required and recommended prerequisites for joining the module	None
Module objectives/intended learning outcomes	Upon completing this course, learners will enhance their intermediate knowledge of general English of 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	None
Study and examination requirements	Mid-term test: 20%, Final test: 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.

41. Embedded Programming Techniques - PHY10101

Module name:	**Embedded Programming Techniques**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10101			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	MSc NGUYEN Thi Le Linh			
Lecturers	MSc NGUYEN Hoang Quan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise, Presentation	Lectures: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 15 times	90
Total workload	120 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (10%), • Homework at class and home for both lectures and lab (10%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This module provides basic knowledge of Embedded Programming Techniques included: Know how to use keywords, names, statements, and comments; Know how to declare data types, library functions; Use branching and looping statements. write a program that uses functions, global and local variables, pointers, 1-dimensional arrays, two-dimensional arrays, structured			

	data types, character strings depending on each problem and specific requirements. Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and apply basic knowledge of math, informatics, C programming techniques and apply knowledge about the electronic engineering to solve problems in engineering physics.* - *Skills: Be able to work in individual and lifelong self-study skills, logical thinking, scientific research and practice experiment in the field of IoTs and embedded , group work, self-study, lifelong learning, problems solving and presentation.* - *Competences: ability in planning, organization and communication.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 16. Embedded systems and embedded programming languages. 17. Basic embedded programming techniques with C 18. Basic C commands 19. Function 20. Array 21. Pointer 22. String 23. Struct 24. Microcontroller programming with C language 25. IoTs application on Tiva Board with C language
Study and examination requirements and forms of examination	Assessment method: 1. Quizzes: 10% 2. Homework assignment: 10% 3. Mid-term test: 30% 4. Final test: 50%
Media employed	Text books and slides (power points)
Reading list	Main books: *1.* Mark Siegesmund (2015), *Embedded C programming: Techniques and application of C and PIC MCUS, 1st Edition* References: • Pham Van At (2017). *C programming techniques* • Vu Duc Lung (2016). *Embedded System* • Hoang Trang (2016). *Embedded system programming*

42. Electronic Engineering - PHY10102

Module name:	**Electronic Engineering**			
Module level, if applicable	Specialization (Physics and Electronic Engineering)			
Code, if applicable	PHY10102			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6^{th} semester (Bachelor program)			
Person responsible for the module	Assoc. Prof. NGUYEN Van Hieu			
Lecturers and Assistant Lecturers	Assoc. Prof. NGUYEN Van Hieu Dr. HO Thanh Huy NGUYEN Hoang Quan, MSc			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 3 hours x 15 times	45
Total workload	90 hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Midterm semester exam (30%), • Final semester exam (50%)			
Recommended prerequisites	Semiconducting devices, Basic Electronics, Basic Electronics Lab.			
Related Course	Electronic Instrumentation and Sensing			
Module objectives/intended learning outcomes	This course provides students with basic knowledge of analog and digital electronics. Students can use Protus software to design and simulate the operation of applied electronic circuits and make the PCB layout to for the real circuits. Moreover, the knowledge of passive electronic			

	components and the laws of electrical circuits are mentioned to support the knowledge of applied circuits. Student s' group must do a small project with a applied specific electronic circuit to evaluate the results of this course. Students who complete this module could be achieved the following: *- Knowledge: Be able to understand and apply knowledge of electronic devices (analog and digital IC) to make some applied circuits.* *- Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving with project group.* *- Competences: Be able to study other relatied subjects/modules in 6th, 7th, 8th semesters and their graduate thesis in bachelor program in Electronic Engineering.* *- Attitute and Ethics: Applications of electronic circuits; Can be explaned the priniciple operation of basic electronic circuits, be honest, and community service.*
Contents	This module includes the following topics: 1. Passive electronic devices and the law of circuits. 2. Logic gates and Boolean algebra 3. Flip Flop sequencer and shift write 4. Counter circuits 5. Timing circuits 6. Encryption and Decryption 7. ADC and DAC converter circuits 8. Proteus software for simulating circuits
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 10% 2. Homework assignment = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	**Main books:** 1.Nguyen Van Hieu (2017) Electrononic Engineering Circuits (Vietnamese), VNUHCM Publishing House, Vietnam. **References:** 1. Nguyen Huu Phuong (2000), Digital Circuits (Vietnamese), Thong Ke Publishing House 2. Nguyen Tan Phuoc (2008), Electronic Devices (Vietnamese), Hong Duc Publishing House

	3. Mike Rooley (2006), Electronic Circuits: Fundamentals and Applications, Elsevier and Newnes. 4. Tong Van On (2007), Digital Circuits (Vietnamese): Theory and Exercise, Social Labor Publishing House.

43. Computer Architecture - PHY10103

<table>
<tr><td>Module name:</td><td colspan="4">Computer Architecture</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10103</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PhD NGUYEN Chi Nhan</td></tr>
<tr><td>Lecturers</td><td colspan="4">PhD NGUYEN Chi Nhan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Optional</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (10%)
• Homework (20%)
• Mid semester exam (20%)
• End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Basic Electronic (PHY10005)
Computer science 1 (CSC00003)</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of computers components and architecture include: ROM/RAM memory, CPU, Bus system, Interrupt. This module also provide programming knowledge of Assembly language and 8255 microprocessor.
Students who complete this module could be achieved the following:</td></tr>
</table>

	- *Knowledge: Be able to understand and apply basic knowledge of informatics and in-depth knowledge computer architecture, physics and electronic engineering such as: assembly, 8255 microprocessor.* - *Skills: Be able to work in problems solving, programming and including skills such as logical thinking.* - *Competences: Ability to apply physics and lectronic engineering knowledge and experience to conceptualize, analyze and design in computer architecture.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Intro to Computer Architecture. 2 Information Data 3 Processor (CPU) Structure 4 Memory Structure 5 Data Communication 6 ASM Programming 7 Communication with 8255 Microprocessor
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Mid-term test = 20% 3. Final test = 50% 4. Quizzes = 10%
Media employed	Text books and slides (power points)
Reading list	Main books: Nguyen Chi Nhan. Computer Architecture course's slide. References: • Nguyen Minh Tuan (2007). Computer Architecture Curriculum, Faculty of Information Technology, University of Science - VNUHCM • Nguyen Xuan Minh (2009). Computer Architecture Curriculum, Faculty of Information Technology, University of Technologies - VNUHCM

44. Embedded System Design - PHY10104

<table>
<tr><td>Module name:</td><td colspan="4">Embedded System Design</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10104</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PhD NGUYEN Chi Nhan</td></tr>
<tr><td>Lecturers</td><td colspan="4">PhD NGUYEN Chi Nhan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Optional</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) Diligence (10%)
• Mid semester exam (40%)
• End semester (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Basic Electronic (PHY10005)
Computer science 1 (CSC00003)</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of embedded system and applications, hardware and software architecture of embedded systems. Design an embedded systems using Arduino, Raspberry board and Internet of Things application.
Students who complete this module could be achieved the following:
- Knowledge: Be able to understand and apply basic knowledge of informatics and in-depth knowledge of</td></tr>
</table>

	embedded system, physics and electronic engineering to design and program a system using tools and software. - *Skills: Be able to work in problems solving, programming, including skills such as logical thinking and communication skills.* - *Competences: Ability in teamwork and effective communication.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Intro to Embedded System. 2 Hardware components of embedded system 3 Software components of embedded system 4 Design an embedded system using Arduino board 5 Design an embedded system using Raspberry board
Study and examination requirements and forms of examination	Assessment method: 1. Mid-term test = 40% 2. Final test (seminar report) = 50% 3. Quizzes = 10%
Media employed	Text books and slides (power points)
Reading list	**Main books:** Nguyen Chi Nhan. Embedded System Design course's slide. **References:** • Ho Thanh Huy, Nguyen Chi Nhan, Tran Le Thien Thuy (2015). Practices in electronic, Vol 1, VNUHCM Publishing House. • Ngo Dien Tap (2003). AVR microcontroller technology, Sciences and Technies Publishing House

45. Integrated Microelectronic Devices - PHY10105

Module name:	**Integrated Microelectronic Devices**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10105			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th semester			
Person responsible for the module	PhD BUI Trong Tu			
Lecturers	PhD BUI Trong Tu			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 10 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Mid semester exam (30%) • End semester exam (70%)			
Recommended prerequisites	Basic Electronic (PHY10005)			
Related Course	None			
Module objectives/intended learning outcomes	This module provides basic knowledge about structure and principle of MOSFET and other microelectronic devices. Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and apply knowledge of microelectronic device structure and principle*			

	- *Skills: Be able to work in problems solving, programming, including skills such as logical thinking and communication skills.* - *Competences: Ability to apply physics and lectronic engineering knowledge and experience to conceptualize, analyze and design in computer architecture.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 MOSFET structure and principle 2 MOSFET IV characteristic 3 Signal amplify circuits 4 CMOS logic gates
Study and examination requirements and forms of examination	Assessment method: 1. Mid-term test = 30% 2. Final test = 70%
Media employed	Text books and slides (power points)
Reading list	**Main books:** Bui Trong Tu. Integrated Microelectronic Devices course's slide. **References:** • Behzad Razavi. Design of Analog CMOS Intergrated Circuits, McGraw-Hill • R. Jacob Baker (2010). CMOS Circuit Design, Layout, and Simulation, 3rd Edition, Wiley – IEEE Press.

46. Electronic Instrumentation and Sensing - PHY10106

<table>
<tr><td>Module name:</td><td colspan="4">Electronic Instrumentation and Sensing</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">General</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10106</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">2nd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. Ho Thanh Huy</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. Ho Thanh Huy</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 90% (Absences must not exceed 2 times for the entire duration of the lectures)
• Homework at class and home (0%),
• Mid semester exam (30%),
• End semester exam (70%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Calculus 1B, General physics 1</td></tr>
<tr><td>Related Course</td><td colspan="4">Electronics</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of physical effect in measurement, the measurement principle of nonelectrical parameters such as: optics, temperature, position, movement, Force, mass, pressure…
Moreover, this module provides structures, operation principle, circuit, technical specification, and application of sensor in industry.</td></tr>
</table>

	Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and apply knowledge of sensor and measurmenet systems in science and industry.* - *Skills: Be able to design a simple experiment involving measurement and control systems* - *Competences:Be able to work in individual, group work, self-stud, and problem solving.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Basics 2 Optica sensor 3 Temperature sensor 4 Position and movement sensor 5 Polarization of light 6 Force sensor 7 Pressure sensor 8 Flow sensor 9 Smart sensor
Study and examination requirements and forms of examination	Assessment method: 1. Midterm test = 30% 2. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	**Main books:** 1. Phan Quoc Pho, Sensors, Science and Technics Publishing House, 2006 **References:** 1. Lê Van Doanh, Sensor in measurement and control, Science and Technics Publishing House, 2006

47. Practice in Embedded Programming Techniques - PHY10107

Module name:	**Practice in Embedded Programming Techniques**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10107			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	MSc NGUYEN Thi Le Linh			
Lecturers	MSc NGUYEN Hoang Quan MSc HA Minh Khue			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise, Presentation	Lab: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 15 times	90
Total workload	120 Hours			
Credit points	1 Credits			
ECTS	2			
Requirements according to the examination regulations	• Minimum attendance at Lab is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (10%), • Homework at class and home (30%), • End semester exam for lab (60%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	In this module, students will practice on computers to solve problems. Apply knowledge learned in programming techniques, loop statements, branching, functions, pointers, 1-dimensional arrays, 2-dimensional arrays, character strings, structure types depending on the requirements of each problem. Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and apply basic knowledge of math, informatics, C programming*			

	techniques and apply knowledge about the electronic engineering to solve problems in engineering physics. *- Skills: Be able to work in individual and lifelong self-study skills, logical thinking, scientific research and practice experiment in the field of IoTs and embedded , group work, self-study, lifelong learning, problems solving and presentation.* *- Competences: ability in teamwork, planning, organiztion and communication.* *- Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Write a program for the problem using the branch statement. 2 Write a program for the problem using the loop statement 3 Write a program for the problem using function 4 Write a program for problems using 1D arrays 5 Write a program for problems using 2D arrays 6 Write a program for string processing problems 7 Write a program for problems using the struct type 8 Practice embedded programming on the Tiva board
Study and examination requirements and forms of examination	Assessment method: 1. Quizzes: 10% 2. Homework assignment: 30% 3. Final test: 60%
Media employed	Text books and slides (power points)
Reading list	**Main books:** *2.* Mark Siegesmund (2015), *Embedded C programming: Techniques and application of C and PIC MCUS, 1st Edition* **References:** • Pham Van At (2017). *C programming techniques* • Vu Duc Lung (2016). *Embedded System* • Hoang Trang (2016). *Embedded system programming*

48. Practice in Electronic Instrumentation and Sensing - PHY10108

Module name:	**Practice in Electronic Instrumentation and Sensing**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10108			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	MSc NGUYEN Huy Hoang			
Lecturers	MSc NGUYEN Hoang Quan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise, Presentat ion	Lab: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 15 times	90
Total workload	120 Hours			
Credit points	1 Credits			
ECTS	2			
Requirements according to the examination regulations	• Minimum attendance at Lab is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (10%), • Homework at class and home (30%), • End semester exam for lab (60%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This module includes knowledge of basic logic gates, encoders - decoders, flip flops - shift registers, investigation of active filter circuits, algorithmic amplifier circuits; Application of a number of sensors such as: infrared transceiver sensor, temperature sensor, photoresistor-optical sensor Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and apply knowledge of electronic instrumentation circuits and sensors solve problems in engineering physics.*			

	- Skills: Be able to work in individual and lifelong self-study skills, logical thinking, scientific research and practice experiment about electronic circuits and sensors, group work, self-study, lifelong learning, problems solving and presentation. *- Competences: ability in teamwork, planning, organiztion, communication and analyze and evaluate experimental results about electronic circuits.* *- Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Examination of basic logic gates 2 Encoder and decoder circuits. 3 Flip-lop circuits and shift registers 4 Survey of algorithmic amplifier circuit 5 Survey of impact filter circuit 6 Application of infrared transceiver sensor 7 Applications of temperature sensor 8 Applications of photoresistor-optical sensor
Study and examination requirements and forms of examination	Assessment method: 1. Quizzes: 10% 2. Homework assignment: 30% 3. Final test: 60%
Media employed	Text books and slides (power points)
Reading list	**Main books:** *3.* Ho Thanh Huy, Nguyen Chi Nhan, Tran Le Thien Thuy (2017), *Practice in electronic special subject,* VNUHCM Publishing House *4.* Nguyen Van Hieu (2015)*, Applied Electronic Engineering,* VNUHCM Publishing House

49. Signals, Systems and Circuit Analysis - PHY10109

<table>
<tr><td>Module name:</td><td colspan="4">Signals, Systems and Circuit Analysis</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10109</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">M.Sc TRAN Xuan Tan</td></tr>
<tr><td>Lecturers</td><td colspan="4">M.Sc TRAN Xuan Tan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Mandatory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Exercises in class and homework (40%)
• End semester exam (60%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides general knowledge of analyzing and systemizing electronic circuits.
Students who complete this module could be achieved the following:
- Knowledge: Be able to understand and apply knowledge of electrical principles and calculus into analyzing and evaluating circuits.
- Skills: Be able to self-study, lifelong learning, problems solving.</td></tr>
</table>

	- Competences: Be able to work in individual and team work, systemize circuits to evaluate and diagnosis designed performance. *- Attitude and Ethics: Professional culture, ethics and responsibility*
Content	This module includes the following topics: 1 Intro to Signals 2 Fourier Transform and Laplace Transform 3 Electrical Principles 4 System response time-variant 5 System response frequency-variant 6 Transferring System
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Exercises in class and homework = 40% 2. Final test = 60%
Media employed	Text books and slides (power points)
Reading list	**Main books:** Phuong Xuan Nhan, Ho Anh Tuy (2008). Circuits theory vol 1, Sciences and Technic Publishing House. Phuong Xuan Nhan, Ho Anh Tuy (2007). Circuits theory vol 2, Sciences and Technic Publishing House. **References:** • MIT OCW. • John Okyere Attia (1999). Electronic and Circuit Analysis using MATLAB, CRC Press LLC.

50. Power Electronics - PHY10110

<table>
<tr><td>Module name:</td><td colspan="4">Power Electronics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10110</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">NGUYEN Xuan Vinh, Ph.D</td></tr>
<tr><td>Lecturers</td><td colspan="4">NGUYEN Xuan Vinh, Ph.D</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Mandatory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise,
Presentat
ion</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Group assignment (40%)
• End semester exam for lectures (60%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Electronic Engineering (PHY10102)</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides general knowledge of structure and characteristic of power electronics for selecting devices, analyzing and designing featured power electronic circuits and applications.
Students who complete this module could be achieved the following:
- Knowledge: Be able to understand and apply knowledge of power electronic device and applied circuit.</td></tr>
</table>

	- *Skills: Be able to self-study, lifelong learning, problems solving and presentation.* - *Competences: Be able to work in individual, team work. Be able to calculate, design and build a power electronic circuit.* - *Attitude and ethics: Professional culture, ethics and responsibility.*
Content	This module includes the following topics: 1 Intro to Power Electronic 2 Rectifier 3 DC – DC Converter 4 Inverter 5 AC – AC Converter 6 Calculation for design and protection of power electronics devices and circuits.
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 40% 2. Final test = 60%
Media employed	Text books and slides (power points)
Reading list	**Main books:** Pham Quoc Hai, Tran Trong Minh, Vo Minh Chinh (2005). Power Electronic, Science and Technics Publishing House, Vietnam. **References:** • Do Xuan Tung, Truong Thi Ngo (1999). Electrical Engineering, Constructing Publishing House, Vietnam. • John G Kassakian, George C Verghese, Martin F Schlecht (1991). Principles of power electronics, Massachusetts: Addison – Wesley. • Muhamad H. Rashid (2011). Power electronics: circuits, devices, and applications.

51. Biomedical Electronics - PHY10111

<table>
<tr><td>Module name:</td><td colspan="5">Biomedical Electronics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5">Specialization (Physics and Electronic Engineering)</td></tr>
<tr><td>Code, if applicable</td><td colspan="5">PHY10111</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="5">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="5">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="5">6th semester (Bachelor program)</td></tr>
<tr><td>Person responsible for the module</td><td colspan="5">Assoc. Prof. NGUYEN Van Hieu</td></tr>
<tr><td>Lecturers and Assistant Lecturers</td><td colspan="5">Assoc. Prof. NGUYEN Van Hieu
Phan Thien Luan, MSc
Mr. Nguyen Hoang Long</td></tr>
<tr><td>Language</td><td colspan="5">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Mandatory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Total workload</td><td colspan="5">60 hours</td></tr>
<tr><td>Credit points</td><td colspan="5">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="5">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Midterm semester exam (30%),
• Final semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Basic Electronics, Basic Electronics Lab, Electronic Engineering Circuits.</td></tr>
<tr><td>Related Course</td><td colspan="5">Electronic Instrumentation and Sensing</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">This course of Biomedical Electronics provides basic knowledge on advanced techniques and medical investigation methods and the principle of biomedical sensors. In it, a number of electronic devices used in diagnosis and treatment of diseases are explained in detail in terms of device principles, electrical circuits and</td></tr>
</table>

	operation. Moreover, the group of students will make some simple medical tests at hospital to check their health and practice some of the knowledge they have learned Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and know about* X-ray imaging, ultrasound, electrocardiogram, magnetic nanoparticle method, ultraviolet LED for micro-disinfection bacteria, energy-based treatments (laser, radiation and magnetic fields) and biosensors. - *Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving with project group.* -*Competences: Be able to study other relatied subjects/modules in 6^{th}, 7^{th}, 8^{th} semesters and their graduate thesis in bachelor program in Electronic Engineering.* - *Attitute and Ethics: Applications of biosensor for health care; Can be explaned the priniciple operation of biosensors, be honest, and community service.*
Contents	This module includes the following topics: 1.Overview about biomedical electronics 2. X-ray 3. Ultrasound 4.Electrocardiogram 5. Magnetic nanoparticle 6. Ultraviolet LED for micro-disinfection bacteria 7.Energy-based treatments (laser, radiation and magnetic fields) 8. Biosensors 9. Tests at the hospital
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Exercise (at class, group) = 10% 2. Homework assignment = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	**Text books and slides (power points)**
Reading list	Main Curriculum 1.Nguyen Van Hieu (updated 2021) Biomedical Electronics: Circuits and Equipments (Vietnamese), Dept. of Physics and Electronic Engineering, VNUHCM-US, Vietnam. **References:** 1. Huynh Thu and Ho Trung My (2005): Biomedical Electronics (Vietnamese), VNUHCM Publishing House.

	2. Neil Townsend, Lecture: Medical Electronics, Department of Engineering Science, Oxford Robotics Institute (UK). **3. Body 2.0: The Engineering Revolution in Medicine by Sara Latta:** https://www.thomasnet.com/articles/other/best-biological-and-biomechanical-engineering-books/

52. Microcontroller and Application - PHY10112

Module name:	**Microcontroller and Application**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10112			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th Semester			
Person responsible for the module	PhD NGUYEN Chi Nhan			
Lecturers	PhD NGUYEN Chi Nhan			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 10 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (10%) • Homework (20%) • Mid semester exam (20%) • End semester exam (50%)			
Recommended prerequisites	Basic Electronic (PHY10005) Embedded Programming Techniques (PHY10101)			
Related Course	None			
Module objectives/intended learning outcomes	This module provides knowledge of AVR microcontroller architecture (RISC architecture). Embedded programming for AVR microcontroller in C language. Using modules in AVR microcontroller include: Interrupt, 8-bit and 16-bit Timer/Counter, UART, Analog to Digital Converter (ADC), … Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to design of communication modules with microcontroller and control module for DC motor, stepper motor, servo motor. Developing specific applications in fields such as: automation in industry, automatic control, robot, ...* - *Skills: Be able to work in problems solving, programming and including skills such as logical thinking.* - *Competences: Ability to apply physics and lectronic engineering knowledge and experience to conceptualize, analyze and design in computer architecture.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Overview of microcontroller 2 Architecture of AVR microcontroller 3 Programming for AVR microcontroller 4 Communication between AVR and peripherals 5 Interrupt and Timer/Counter of AVR microcontroller 6 Communication with AVR microcontroller
Study and examination requirements and forms of examination	Assessment method: 1 Homework assignment = 20% 2 Mid-term test = 20% 3 Final test = 50% 4 Quizzes = 10%
Media employed	Text books and slides (power points)
Reading list	**Main books:** Nguyen Chi Nhan. Microcontroller and Application course's slide. **References:** • Nguyen Van Hieu (2015). Electronic Engineering, VNUHCM Publishing House • Ho Thanh Huy, Nguyen Chi Nhan, Tran Le Thien Thuy (2015). Practices in electronic, Vol 1, VNUHCM Publishing House. • Ngo Dien Tap (2003). AVR microcontroller technology, Sciences and Technies Publishing House

53. Practice in Microcontroller and Application - PHY10113

Module name:	**Practice in Microcontroller and Application**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10113			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	Researcher HA Minh Khue			
Lecturers	Researcher HA Minh Khue			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 10 times	30
			Preparation and follow up 6 hours x 15 times	60
Total workload	90 Hours			
Credit points	1 Credits			
ECTS	2			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Weekly laboratory (30%), • Mid semester exam (30%), • Final project seminar (40%)			
Recommended prerequisites	"Computer architecture", "Embedded Programming Techniques", "Signals, Systems and Circuit Analysis"			
Related Course	Communication and Signal Processing			
Module objectives/intended learning outcomes	This module provides basic knowledge of embedded system and interface programming for AVR microcontrollers. Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand and apply knowledge of electronics, C programming in embedded systems.* - *Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving.* - *Competences: Be able to design and implement a simple embedded project involving interfacing with peripheral devices. Have the capacity to learn in the next period.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1. I/O Control and LCD interface 2. Analog to digital converter 3. External interrupt 4. Timer and counter 5. Keypad interface and EEPROM 6. UART interface 7. Pulse width modulation 8. I2C and Real-time clock
Study and examination requirements and forms of examination	Assessment method: 1. Weekly lab assignment = 30% 2. Midterm test = 30% 3. Final test (group project) = 40%
Media employed	Textbooks and slides (power points)
Reading list	**Main books:** 1. Nguyen Chi Nhan, "Lecture Note: Microcontroller and applications" **References:** 1. Ho Thanh Huy, Nguyen Chi Nhan, Tran Le Thien Thuy, "Electronics Laboratory – Part 1", VNU-HCM, 2015 2. ATMega128 Datasheet

54. Communication and Signal Processing - PHY10114

Module name:	**Communication and Signal Processing**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10114			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	MSc TRAN Le Thien Thuy			
Lecturers	MSc NGUYEN Hoang Quan MSc HA Minh Khue			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise, Presentation	Lectures: 3 hours x 10 times	30
			Lab: 3 hours x 10 times	30
Total workload	60 Hours			
Credit points	3 Credits			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (10%), • Homework at class and home for both lectures and lab (10%), • Mid semester exam (20%), • End semester exam for lectures (40%) • End semester exam for lab (20%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This module provides basic knowledge of signal processing included: classification of signals, Analog to Digital Converters and otherwise, characteristic of discrete-time signal and system, Fourier Transform and z-Transform analysis and design of FIR and IIR filters. Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand and apply basic knowledge of math, informatics and in-depth knowledge of mathematical formulation to support solving problems of signal processing, such as image, audio…processing, design a digital system or filter for practical applications.* - *Skills: Be able to work in individual and lifelong self-study skills, logical thinking, scientific research and practice experiment in the field of signal processing, group work, self-study, lifelong learning, problems solving and presentation.* - *Competences:. ability in teamwork, planning, organiztion and communication.* *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: - Lectures: 1 Signal and Discrete-time System 2 Sampling and Reconstruct Signal 3 Convolution and Transfer Function 4 z-Transform 5 Fourier Transform (DFT & FFT) 6 Design of FIR filter 7 Design of IIR filter - Labs: 1. Introduction to MATLAB. 2. Analysis of Discrete-time Signal 3. Design filters with tools and code.
Study and examination requirements and forms of examination	Assessment method: 1. Quizzes:10% 2. Homework assignment: 10% 3. Mid-term test: 20% 4. Final test: 40% 5. Final lab exam: 20%
Media employed	Text books and slides (power points)
Reading list	Main books: Sophocles J. Orfanidis, Introduction to Signal Processing, Rutgers University References: • Nguyen Huu Phuong (2003). Digital Signal Processing, Vietnam. • Guideline of Digital Processing, Posts and Telecommunications Institute of Technology (Hanoi). • Nguyen Van Hieu, Nguyen Thi Le Linh. Communication and Signal Processing course

	slide.

55. Computer Vision - PHY10115

Module name:	**Computer Vision**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10115			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	MSc HUYNH Quoc Thinh			
Lecturers	MSc NGUYEN Hoang Quan MSc HA Minh Khue			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise, Presentation	Lectures: 3 hours x 10 times	30
			Lab: 3 hours x 10 times	30
Total workload	60 Hours			
Credit points	3 Credits			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) Diligence (10%), • Homework at class and home for both lectures and lab (10%), • Mid semester exam (20%), • End semester exam for lectures (40%) • End semester exam for lab (20%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This module provides an overview of computer vision systems, knowledge of digital images, basic and advanced processing algorithms for today's computer vision systems. image feature extraction, image search, comparison and recognition, etc.). The course also introduces the OpenCV library for computer vision systems, thereby helping students build basic systems			

	using programming languages such as C++, Python or Matlab. Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and apply basic knowledge of math, informatics and in-depth knowledge of mathematical formulation to support solving problems in the field of computer vision, such as image processing, positioning…* - *Skills: Be able to work in individual and lifelong self-study skills, logical thinking, scientific research and practice experiment in the field of computer vision, group work, self-study, lifelong learning, problems solving and presentation.* - *Competences: ability in teamwork, planning, organiztion and communication.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Introduction to Computer Vision and its applications. Create and acquire images. Introduction to OpenCV . library Sampling and Reconstruct Signal 2 Image processing 3 Feature detection and matching 4 Photo segment 5 Introduction to some computer vision systems and applications. Distributing and guiding topics 6 Calibration based on characteristics 7 Identification 8 Follow the movement Optical flow
Study and examination requirements and forms of examination	Assessment method: 1. Quizzes:10% 2. Homework assignment: 10% 3. Mid-term test: 20% 4. Final test: 40% 5. Final lab exam: 20%
Media employed	Text books and slides (power points)
Reading list	Main books: *Computer Vision: Algorithms and Applications*, by Richard Szeliski, Springer, 2010. *Learning OpenCV: Computer Vision with the OpenCV library*, Gary Bradski and Adrian Kaehler, O'Reilly, 2008 References: • *Computer Vision: A Modern Approach (2nd Edition),* by David A. Forsyth and Jean Ponce, 2011. • Computer Vision System Toolbox (Matlab)

56. Programmable Logic Controller and Production Lines - PHY10116

<table>
<tr><td>Module name:</td><td colspan="4">Programmable Logic Controller and Production Lines</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10116</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">M.Sc PHAM Xuan Hien</td></tr>
<tr><td>Lecturers</td><td colspan="4">M.Sc PHAM Xuan Hien</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Mandatory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise,
Presentat ion</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Attitude and attendance (10%)
• Exercises in class and homework (20%)
• Mid semester exam (15%)
• End semester exam (55%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Microcontroller and Application (PHY10112)
Electronic Instrumentation and Sensing (PHY10106)</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of Omron PLC kit features and programming PLC skill.
Students who complete this module could be achieved the following:
- Knowledge: Be able to understand and apply knowledge of PLC programming.</td></tr>
</table>

	- *Skills: Be able to self-study, lifelong learning, problems solving and PLC programming.* - *Competences: Be able to analyze and program a PLC application, work in individual and team work,* - *Attitude and Ethics: Professional attitude and responsibility.*
Content	This module includes the following topics: 1 Intro to Industrial Automation 2 Programmable Logic Controller 3 PLC Programming 4 PLC command library 5 Programming automation system
Study and examination requirements and forms of examination	Assessment method: 3. Quizzes= 10% 4. Assignment (Exercises in class and homework) = 20% 5. Mid-term test= 15% 6. Final test= 55%
Media employed	Text books and slides (power points)
Reading list	Main books: Pham Xuan Hien (2009). PLC – Production lines course's slides and documents. References: • Le Van Doanh (2006). Sensors in measurement and controlling, Sciences and Technics Publishing House. • Savant, Clement J (1965). Control system design, McGraw-Hill. • Tran The San (2016). PLC design and programming, Sciences and Technics Publishing House.

57. Practice in Programmable Logic Controller - PHY10117

<table>
<tr><td>Module name:</td><td colspan="4">Practice in Programmable Logic Controller</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10117</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PHAM Xuan Hien</td></tr>
<tr><td>Lecturers</td><td colspan="4">PHAM Xuan Hien</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and follow up 6 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">120 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">4 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">2</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework at class and home (30%),
● Mid semester exam (15%),
● End semester exam (55%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module applies knowledge of PLC programming (Ladder programming language) to combine the use of industrial electrical equipment (relay, contactor, timer, counter, motor, servo...) into a simple system which performs a certain task (conveyor belt, sorting, boxing, machine arm, etc.) helps students get acquainted with real-life conditions.
Students who complete this module could be achieved the following:</td></tr>
</table>

	- *Knowledge: Be able to understand and apply knowledge of PLC in science and life.* - *Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving.* - *Competences: Be able to design a simple experiment involving PLC and production line. Have the capacity to learn in the next period.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1. Introduction to Autogem 2. Introduction to CX-Program 3. Introduction of devices, actuators, how to draw diagrams to connect devices to PLC 4. Hand-on laboratory on models
Study and examination requirements and forms of examination	Assessment method: 1. Assignment (Homework at class and home) = 30% 2. Mid-term test= 15% 3. Final test = 55%
Media employed	Textbooks and slides (power points)
Reading list	References: 1. Le Van Doanh, "Sensors in measurement and control engineering", Science and technology, 2006 2. Savant, Clement J, Control system design, McGraw-Hill Book Co, 1965. 3. Tran The San, "Circuit design and PLC programming", Science and technology, 2016.

58. Electrical Engineering - PHY10118

<table>
<tr><td>Module name:</td><td colspan="4">Electrical Engineering</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10118</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PhD NGUYEN Xuan Vinh</td></tr>
<tr><td>Lecturers</td><td colspan="4">PhD NGUYEN Xuan Vinh</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Mandatory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise,
Presentat
ion</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Group assignment (40%)
• End semester exam for lectures (60%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Electronic Engineering (PHY10102)</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of electrical machines and electrical switching devices (electrical instruments) included: principles, characteristic, classification, industrial applications. Also, this module introduces basic electrical safety principles and guidelines.
Students who complete this module could be achieved the following:</td></tr>
</table>

	- *Knowledge: Be able to understand and apply knowledge of electrical machines and industrial circuits and electrical safety.* - *Skills: Be able to self-study, lifelong learning, problems solving and presentation.* - *Competences: Be able to work in individual and team work. Be able to select electrical machines and safety devices for industrial applications.* - *Attitude and Ethics: Professional responsibility and ethics.*
Content	This module includes the following topics: 1 Summary of Power System and Gridlines. 2 Basic Electrical Machines and Applications. 3 Advanced Electrical Machines and Applications. 4 Low Voltage Electrical Instruments. 5 Motor Controlling System. 6 Principles of Electrical Safety and Management.
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 40% 2. Final test = 60%
Media employed	Text books and slides (power points)
Reading list	Main books: Dang Van Thanh (2010). Electrical Engineering, VNUHCM Publishing House, Vietnam. References: • Hambley, Allan R (2008). Electrical Engineering: Principles and Applications. • Hoang Huu Than (1980). Intro to Electrical Engineering, • Rizzoni, Giorgio (2000). Principles and Applications Electrical Engineering.

59. Digital and Analog IC design - PHY10119

Module name:	**Digital and Analog IC design**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10119			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	PhD NGUYEN Chi Nhan			
Lecturers	PhD NGUYEN Chi Nhan			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 10 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (10%) • Homework (20%) • Mid semester exam (20%) • End semester exam (50%)			
Recommended prerequisites	Basic Electronic (PHY10005) Computer Architecture (PHY10103) Embedded Programming Techniques (PHY10101)			
Related Course	None			
Module objectives/intended learning outcomes	This module provides knowledge of logical design, physical design, and chip fabrication process. Applying hardware description language (Verilog HDL) in designing sequential and combinational logic circuits on FPGA. Analog IC design based on CMOS technology. Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to design and program FPGA sequential and combinational logic circuit using IC design tools. Logic gates based on CMOS technology.* - *Skills: Be able to work in problems solving, programming and including skills such as logical thinking.* - *Competences: Ability to apply physics and lectronic engineering knowledge and experience to conceptualize, analyze and design in computer architecture.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Overview of integrated circuit design 2 Hardware description language 3 Tools and software for integrated circuit design 4 Combinational logic circuits design 5 Sequential logic circuits design 6 Analog circuits design
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Mid-term test = 20% 3. Final test = 50% 4. Quizzes = 10%
Media employed	Text books and slides (power points)
Reading list	Main books: Nguyen Chi Nhan. Digital and Analog IC Design course's slide. References: • Nguyen Van Hieu (2015). Electronic Engineering, VNUHCM Publishing House • Tong Van On (2007). Design digital circuit using VHDL & Verilog, Vol 1&2, Labour and Social Publisher Co.Ltd. • Stephen Brown, Zvonko Vranesic (2002). Fundamentals of Digital Logic and Verilog Design, McGram-Hill.

60. Practice in Digital and Analog IC design - PHY10120

Module name:	**Practice in Digital and Analog IC design**
Module level, if applicable	Specialized
Code, if applicable	PHY10120
Subtitle, if applicable	None
Courses, if applicable	None

<table>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PhD NGUYEN Chi Nhan</td></tr>
<tr><td>Lecturers</td><td colspan="4">PhD NGUYEN Chi Nhan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Mandatory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lab: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">1 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">2</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Weekly laboratory (30%)
• End semester exam (70%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Basic Electronic (PHY10005)
Integrated Microelectronic Devices(PHY10105)
Embedded Programming Techniques (PHY10101)
Microcontroller and Applications (PHY10112)</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides practicing knowledge practical knowledge of using Verilog HDL hardware description language, Quartus II software and KIT DE1/DE2 in designing sequential and combinational logic circuits on FPGA.
- Knowledge: Be able to use Verilog HDL, Quartus II software, FPGA to design sequential circuits, combinational circuits, register, ALU (Arithmetic logic unit), ...
- Skills: Be able to work in problems solving, programming, including skills such as logical thinking and communication skills.
- Competences: Ability in teamwork and effective communication.</td></tr>
</table>

	- *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Intro to Quartus software. 2 Design of I/O and LED controller 3 Design of Full Adder, multiplexer, demultiplexer 4 Design of Latch, Flip-flop and Register. 5 Design of Counter and Timer 6 Design of ALU 7 Analysis amplifier circuit
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 30% 2. Final test = 70%
Media employed	Text books and slides (power points)
Reading list	Main books: Nguyen Chi Nhan. Digital and Analog IC Design course's slide. References: • Nguyen Van Hieu (2015). Electronic Engineering, VNUHCM Publishing House • Tong Van On (2007). Design digital circuit using VHDL & Verilog, Vol 1&2, Labour and Social Publisher Co.Ltd. • Stephen Brown, Zvonko Vranesic (2002). Fundamentals of Digital Logic and Verilog Design, McGram-Hill.

61. Industrial Robot - PHY10121

Module name:	**Industrial Robot**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10121			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	M.E. PHAM Xuan Hien			
Lecturers	M.E. PHAM Xuan Hien			
Language	Vietnamese			
Relation to curriculum	Selective			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise, Presentation	Lectures: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 10 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) (5%) ● Classroom Etiqutte (5%) ● Homeworks (10%) ● Class assignments (10%) ● Midterm seminar (15%) ● End semester seminar (55%)			
Recommended prerequisites	Electronic Engineering (PHY10102), Power Electronic (PHY10110), Microcontroller and Application (PHY10112)			
Related Course	None			
Module objectives/intended learning outcomes	The subject provides students with knowledge of control circuits, robot actuators, control methods, control algorithms and skills in designing and programming applications for various types of robots applied in daily life. Students who complete this module could be achieved the following:			

	- *Knowledge:* *Apply fundamental and in-depth knowledge of physics and mathematical formulation for theoretical analysis, modeling and simulation of relevant processes.* *Apply knowledge of one of the following majors: theoretical physics, nuclear physics, applied physics, solid state physics, geophysics, physics and electronic engineering, physics and computer science in order to solve problems in the field of physics and engineering physics.* - *Skills:* *Gain effective career skills for problem solving in physics and engineering physics, including skills such as logical thinking, scientific research, practice, design and conduct experiments* - *Competences:* *Ability to apply physics knowledge and experience to conceptualize, analyze and design new physical situations* *Ability in organization, leadership, planning, teamwork and effective communication in science and social interaction* - *Attitude and Ethics: Understand professional culture, professional ethics, professional responsibility, respect themselves, colleagues, be honest, and community service.*
Content	This module includes the following topics: 1. Intro to Electronics in Robotics 2. Actuators and control methods 3. Force transfer mechanism 4. Application robotics 5. Technologies in robotics 6. Algorithm in programming in robotics.
Study and examination requirements and forms of examination	Assessment method: 1. Quizzes (5%) 2. Assignment (5%) 3. Homework assignment (10%) 4. Class assignments (10%) 5. Midterm test (15%) 6. End test (55%)
Media employed	Text books and slides (power points)
Reading list	Main books: Pham Xuan Hien, *Industrial Robots*, Documents circulated internally, 2009. References: [1] John J. Craig, *Introduction to robotics: mechanics and control*, Pearson Prentice Hall, 2005.

	[2] Nguyen Thien Phuc, *Underwater robot* , Hanoi University of Science and Technology, 2015. [3] Nguyen Thien Phuc, *Robots in the air*, Hanoi University of Science and Technology, 2016.

62. Electronics in Robotic - PHY10122

Module name:	**Electronics in Robotic**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10122			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	M.E. PHAM Xuan Hien			
Lecturers	M.E. PHAM Xuan Hien			
Language	Vietnamese			
Relation to curriculum	Selective			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise, Presentation	Lectures: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 10 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (5%) ● Classroom Etiqutte (5%) ● HomeWorks (10%) ● Class assignments (10%) ● Midterm seminar (15%) ● End semester seminar (55%)			
Recommended prerequisites	Electronic Engineering (PHY10102), Power Electronic (PHY10110), Microcontroller and Application (PHY10112)			
Related Course	None			
Module objectives/intended learning outcomes	The subject provides students with knowledge about robot transmission, control methods, control algorithms and skills in designing and programming applications for industrial robots.			

	Students who complete this module could be achieved the following: *- Knowledge: Apply knowledge of one of the following majors: theoretical physics, nuclear physics, applied physics, solid state physics, geophysics, physics and electronic engineering, physics and computer science in order to solve problems in the field of physics and engineering physics.* *- Skills:* *Gain effective career skills for problem solving in physics and engineering physics, including skills such as logical thinking, scientific research, practice, design and conduct experiments.* *Acquire personal skills such as communication skills, lifelong self-study skills, critical thinking skills, judgment and decision making skills.* *Using specialized English terminology and information technology for scientific research and personal development.* *- Competences: Ability in organization, leadership, planning, teamwork and effective communication in science and social interaction* *- Attitude and Ethics: Understand professional culture, professional ethics, professional responsibility, respect themselves, colleagues, be honest, and community service.*
Content	This module includes the following topics: 1. Intro to Industrial robots 2. Engine and motion system 3. Powertrain system. 4. Set up motion coordinate system 5. Build an algorithm that describes the relationship between the joints of the robot. 6. Experimenting the algorithm on a real model.
Study and examination requirements and forms of examination	Assessment method: 1. Quizzes (5%) 2. Assignment (5%) 3. Homework assignment (10%) 4. Class assignments (10%) 5. Midterm test (15%) 6. End test (55%)
Media employed	Text books and slides (power points)

Reading list	Main books: Pham Xuan Hien, *Industrial Robots*, Documents circulated internally, 2009. References: [1] Le Hoai Quoc, *Introduction to Industrial Robot* , Science and Technology, 2002. [2] Nguyen Thien Phuc, *Industrial Robots*, Science and Technology, 2006. [3] Berthold Klaus Paul Horn, *Robot vision*, MIT Press, 1986.

63. Factory tour and Report - PHY10123

Module name:	**Factory tour and Report**			
Module level, if applicable	Specialization (Physics and Electronic Engineering)			
Code, if applicable	PHY10123			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	8th semester (Bachelor program)			
Person responsible for the module	Assoc. Prof. NGUYEN Van Hieu			
Lecturers and Assistant Lecturers	Assoc. Prof. NGUYEN Van Hieu NGUYEN Hoang Quan, MSc Mr. NGUYEN Hoang Long			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 2 hours x 15 times	120
Total workload	150 hours			
Credit points	2 Credits			
ECTS	1.5 (Lecture) + 2(Practice) = 3.5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Midterm semester exam (30%), • Internship report (Final semester exam) (50%)			
Recommended prerequisites	None			
Related Course	All courses in 6th an 7th semester			
Module objectives/intended learning outcomes	This course consists of 2 parts: - Part of studying at the school: students have access to knowledge about the field of occupational safety and hygiene, the text of the labor law, industrial electrical safety, electric-magnetic field, static electricity on			

	equipment, practice civil electricity and learn about industrial parks and export processing in Vietnam. - Apprenticeship part: Consists of two contents: visiting a factory, factory, production facility, laboratory and internship at an enterprise, production facility, research unit in the field. 1-3 months to approach some technical issues and find out job opportunities after graduation. Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and clearn about occupational safety and hygiene, labor law and the industrial working conditions.* - *Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving with project group, Industrial working issues .* - *Competences: Be able to study other relatied subjects/modules in, 8th semesters and their graduate thesis in bachelor program in Electronic Engineering.* - *Attitute and Ethics: To learn about the history and development of industrial areas; How is about the idea of startup, Study about the Labour Law, Regulation of compapny, be honest, and social activities.*
Contents	This module includes the following topics: 1.Labor and occupational safety: . Safety and labor protection . Industrial electrical safety . Effect of electric field . The influence of the magnetic field. 2. Industrial production: . Industrial parks, export processing zones and high-tech zones in Vietnam . Static electricity due to friction in industrial production lines . Static Elimination Solution . Job application skills 3. Practice civil electricity: .Some civil electrical equipment: Electric drill, cutting machine and electric welding. . Home electrical network design 4. Factor tour (1 day) 5. Internship in industrial company 6. Report

Study and examination requirements and forms of examination	Assessment method: 1. Assignment (Exercise at class, group) = 10% 2. Homework assignment= 10% 3. Midterm test= 30% 4. Final test (Internship report) = 50%
Media employed	Text books and slides (power points)
Reading list	Main book: 1.Nguyen Van Hieu and Nguyen Dac Hien (2011) Industrial Electrial Safety: Factory tour and Report (Vietnamese), VNUHCM Publishing House., Vietnam. **References:** 1. Nguyen Tan Phuoc (2008), Electronic Devices (Vietnamese), Hong Duc Publishing House 2.Website of Vietnam industrial ares http://www.khucongnghiep.com.vn/

64. Smart House - PHY10180

Module name:	**Smart House**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10180			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	8th semester			
Person responsible for the module	PhD NGUYEN Chi Nhan			
Lecturers	PhD NGUYEN Chi Nhan			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 10 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures): Diligence (10%) • Homework (20%) • Mid semester exam (20%) • End semester exam (50%)			
Recommended prerequisites	Basic Electronic (PHY10005) Embedded System Design (PHY10105) Microcontroller and Applications (PHY10112)			
Related Course	None			
Module objectives/intended learning outcomes	This module provides basic concept and requirements of smart home technology, and the application of the Internet of Things (IoT) to building smart home. Students who complete this module could be achieved the following: - *Knowledge: Be able to design communication circuits, control circuits for smart home. Design user*			

	interface on smartphone for monitoring and control smart home via WiFi. - *Skills: Be able to work in problems solving, programming and including skills such as logical thinking.* - *Competences: Ability to apply physics and lectronic engineering knowledge and experience to conceptualize, analyze and design in computer architecture.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Overview of smart home 2 Hardware and software requirements 3 Design and build of the light control system 4 Design and build of the fire alarm system 5 Design and build of the security system 6 Design and build of the devices control system
Study and examination requirements and forms of examination	Assessment method: 1 Homework assignment = 20% 2 Mid-term test= 20% 3 Final test= 50% 4 Quizzes= 10%
Media employed	Text books and slides (power points)
Reading list	Main books: • Nguyen Chi Nhan. Smart House course's slide. References: • Ho Thanh Huy, Nguyen Chi Nhan, Tran Le Thien Thuy (2015). Practices in electronic, Vol 1, VNUHCM Publishing House. • Ngo Dien Tap (2003). AVR microcontroller technology, Sciences and Technies Publishing House

65. PLC Network Programming - PHY10181

Module name:	**PLC Network Programming**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10181			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	8th semester			
Person responsible for the module	M.Sc PHAM Xuan Hien			
Lecturers	M.Sc PHAM Xuan Hien			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise	Lectures: 3 hours x 10 times	30
			Preparation and Follow up 6 hours x 10 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Exercises in class and homework (20%) • Mid semester exam (15%) • End semester exam (55%)			
Recommended prerequisites	Programmable Logic Controller and Production Lines (PHY10116) Electronic Instrumentation and Sensing (PHY10106)			
Related Course	None			
Module objectives/intended learning outcomes	This module provides general knowledge of industrial communication network, information of networking characteristic of PLC Omron kit and programming applications. Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand and apply knowledge of industrial PLC networking and programming application.* - *Skills: Be able self-study, lifelong learning, problems solving.* - *Competences: Be able to work in individual, group work to analyze a PLC procedure and propose improvement.* - *Attitude and Ethics: Professional responsibility.*
Content	This module includes the following topics: 1 Intro to Industrial Communication Network 2 PLC Networking Structure 3 Networking Schematic and Feature of Omron PLC kit 4 Networking Command of Omron PLC kit 5 Programming PLC Network
Study and examination requirements and forms of examination	Assessment method: 1. Assignment (Exercises in class and homework) = 20% 2. Mid term test= 15% 3. Final test= 55%
Media employed	Text books and slides (power points)
Reading list	Main books: Pham Xuan Hien (2009). PLC – Programming PLC controlling network for Omron PLC kit, course's slides and documents. References: • Ngo Ba Hung (2008). Curriculum of Programming communication network, Transportation and Communication Publishing House. • Beck Michael (2005). Ethernet in the first mile: the IEEE 802.3ah EFM standard, McGraw-Hill. • Jim Evans (1996). TCP/IP: running a successful network, Addison-Wesley.

66. Seminar Report - PHY10190

<table>
<tr><td>Module name:</td><td colspan="5">Seminar Report</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="5">PHY10190</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="5">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="5">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="5">8th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="5">PhD NGUYEN Chi Nhan</td></tr>
<tr><td>Lecturers</td><td colspan="5">PhD NGUYEN Chi Nhan</td></tr>
<tr><td>Language</td><td colspan="5">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Mandatory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">10</td><td rowspan="2">Discussion,
Experiment,
Practice,
Report</td><td>Lectures: 10 hours x 18 times</td><td>180</td></tr>
<tr><td>Preparation and Follow up 10 hours x 18 times</td><td>180</td></tr>
<tr><td>Total workload</td><td colspan="5">360 Hours</td></tr>
<tr><td>Credit points</td><td colspan="5">6 Credits</td></tr>
<tr><td>ECTS</td><td colspan="5">12</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">Final seminar report (100%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Average of 7 semesters ≥ 5.0</td></tr>
<tr><td>Related Course</td><td colspan="5">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">Apply knowledge (theory and experiment) and skills in the course to implement projects.
Students who complete this module could be achieved the following:
- Knowledge: Apply fundamental and in-depth knowledge of physics and mathematical formulation for theoretical analysis, modeling and simulation of relevant processes. Apply knowledge of one of the majors to solve problems in the field of physics and engineering physics.
- Skills: Gain effective career skills for problem solving in physics and engineering physics, including skills such</td></tr>
</table>

	as logical thinking, scientific research, practice, design and conduct experiments. Acquire personal skills such as communication skills, lifelong self-study skills, critical thinking skills, judgment and decision making skills. Using specialized English terminology and information technology for scientific research and personal development. - *Competences: Ability to apply physics knowledge and experience to conceptualize, analyze and design new physical situations. Ability to analyze and evaluate experimental results, processes, methods and research results in a specific discipline or interdisciplinary. Ability in organization, leadership, planning, teamwork and effective communication in science and social interaction.* - *Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1 Overview of the project: reason for choose project, objectives of the study, research subjects. 2 Research content of the project: theoretical or experimental research: presenting theoretical foundations, theories, scientific hypotheses and methods, tools, hardware components, ... 3 Results and discussion 4 Conclusions and recommendations
Study and examination requirements and forms of examination	Assessment method: 1. Assignment (Scientific content) = 20% 2. Assignment: Experimental design = 20% 3. Practical skills = 20% 4. Self-written assay: Scientific reports = 20% 5. Project: Attitude at work = 20%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. An Introduction to Physical Science, James T. Shipman, Jerry D. Wilson, Charles A. Higgins, Jr, Omar Torres,14th Edition. 2. Raymond A. Serway, John W. Jewett, Sr (2014). Physics for Scientists and Engineers with Modern Physics. Ninth Edition. BROOK/COLE, USA.

67. Introduction to Material Science - PHY10201

<table>
<tr><td colspan="2">Module name:</td><td colspan="4">Introduction to Material Science</td></tr>
<tr><td colspan="2">Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td colspan="2">Code, if applicable</td><td colspan="4">PHY10201</td></tr>
<tr><td colspan="2">Semester(s) in which the module is taught</td><td colspan="4">VD: 5th Semester</td></tr>
<tr><td colspan="2">Person responsible for the module</td><td colspan="4">Huynh Tran My Hoa</td></tr>
<tr><td colspan="2">Lecturer</td><td colspan="4">Tran Quang Trung, Le Thuy Thanh Giang, La Phan Phuong Ha</td></tr>
<tr><td colspan="2">Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td colspan="2">Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Class Size:</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate
Group Project</td><td rowspan="2"></td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise
Seminar</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td colspan="2">Total Workload</td><td colspan="4">135 Hours</td></tr>
<tr><td colspan="2">Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td colspan="2">ECTS</td><td colspan="4">4.5</td></tr>
<tr><td colspan="2">Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (30%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td colspan="2">Recommended prerequisites</td><td colspan="4">Quantum mechanics (PHY10007); Electrodynamics (PHY10009).</td></tr>
<tr><td colspan="2">Related Course</td><td colspan="4">None</td></tr>
<tr><td colspan="2">Module objectives/intended learning outcomes</td><td colspan="4">This subject provides students with basic knowledge about bulk materials, thin films, nanostructures ... on that basis, students will directly conduct experimental procedures for materials fabrication and analysis in the next modules.
Students who complete this module could be achieved the following
About knowledge
➢ Understand the basic knowledge of materials, especially materials with crystalline structure.
➢ Know the angle measurements used in crystal physics, the symmetry elements of crystals.
➢ Know 32 point groups of crystals.
➢ Understand how to form and define point groups, and crystal systems. - Understand the relationship between crystal structure and symmetry groups.
➢ Understand experimental methods to study crystal structure by X-ray diffraction.</td></tr>
</table>

	➢ *Understand the close relationship between the symmetry, structure of a crystal and its physical properties.* **About skills:** *- Effective thinking skills: self-receiving information from lectures and documents to answer questions and do required exercises.* *- Improve the process of self-study and study documents.* *- Speaking, presentation and discussion skills during the seminar.* *- Use some English terms in the field of crystal physics and start reading English documents* **About competences** ✓ *Effective teamwork and communication in science.* **About attitude and ethics** *- Believe in the scientific meaning as well as the practical value of subject knowledge.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.* *- The spirit of progressive learning.*
Content	This module includes the following topics: 1. Basic concepts of crystals 2. Crystal angle calculation 3. Crystal symmetry 4. Crystallographic symbol 5. Structure of crystals and spatial symmetry groups 6. Study of crystal structure by X-ray diffraction 7. Physical properties of crystals - The relationship between symmetry and crystal structure to its physical properties
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: 1. Vu Thi Phat Minh, ***Crystallography,*** e-book (documents for internal circulation only) References: 1. Trinh Han – Quan Han Khang, ***Crystallography***, University Publishing House, Hanoi, 1997. 2. Vo Trung Chanh, ***Fundetmetal of Crystallography***, VNUHCM Publishing House, Vietnam, 2005. 3. Sanat K. Chatterjee, ***Crystallography and the World of Symmetry***, Published by Springer, 2008.

68. Semiconductor Physics - PHY10202

Module name:		**Semiconductor Physics**			
Module level, if applicable		Specialize			
Code, if applicable		**PHY10202**			
Semester(s) in which the module is taught		VD: 5th Semester			
Person responsible for the module		Nguyen Hoang Hung			
Lecturer		Tran Quang Trung Le Thuy Thanh Giang			
Language		Vietnamese			
Relation to curriculum		Compulsory Course or Elective coures			
Types of teaching and learning	Class Size:	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate Group Project		3	Discussion, Debate, Exercise	Lectures: 3 hours x 15 times	45
				Preparation and Follow up 6 hours x 15 times	90
Total Workload		135 Hours			
Credit points		3 Credits			
ECTS		4.5			
Requirements according to the examination regulations		• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (30%), • Mid semester exam (30%), End semester exam (40%)			
Recommended prerequisites		General Physics 2 (PHY00002); Mathematical methods for Physics (PHY10004)			
Related Course		None			
Module objectives/intended learning outcomes		This course introduces the basic knowledge of semiconductor types and their basic physical properties. This subject is considered as the basis of the following subjects: semiconductor technology, specialized physics practice 1, 2, thin film deposition technology... Students who complete this module could be achieved the following **About knowledge** ➢ *Know the types of semiconductors, the crystal structure of semiconductors* ➢ *Understand the basic physical properties of semiconductors.* ➢ *Know the carrier statistics* ➢ *Understanding carrier transfer phenomena in semiconductors* ➢ *Understanding carrier generation and recombination in semiconductors* ➢ *Know the modern trends in research on semiconductor*			

	materials used in semiconductor devices **About skills:** *- Improve the process of self-study and self-receiving information from lectures and documents to answer questions and do required exercises..* *- Speaking, presentation and discussion skills during the seminar.* *- Using some English terms in the field of semiconductors and start reading English documents* **About competences** ✓ *Effective teamwork and scientific communication* **About attitude and ethics:** *- Belief in the practical value of subject knowledge.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.* *- High spirit of learning.*
Content	This module includes the following topics: 1. Introduction to Semiconductors 2. Energy band structure 3. Statistics of carriers in semiconductors 4. Transport of carriers in semiconductors 5. Generation and recombination of carriers 6. Modern trends in study of semiconductor materials used in semiconductor devices
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: 1 Le Khac Binh, ***Semiconductor***, e-book (documents for internal circulation only) References: 4. A.S. Grove ***Physics and Technology of semiconductor devices,*** Science and technology Publishing House, 1978. 5. Kwok Ng, ***Complete guide to semiconductor devices***, McGraw Hill, 1995. 6. John P McKelvey,***Solid state and semiconductor physics***, Malabar, Florida : Robert E. Krieger, 1984. Software and equipment 1. *Matlab* & *Origin*. 2. *Potentiostat system*

69. Specific Practicals 1 - PHY10203

Module name:	**Specific Practicals 1**				
Module level, if applicable	Specialize				
Code, if applicable	**PHY10203**				
Semester(s) in which the module is taught	VD: 5th Semester				
Person responsible for the module	Pham Hoai Phuong				
Lecturer	Tran Quang Trung Le Thuy Thanh Giang, Tran Quang Nguyen, Lam Minh Long				
Language	Vietnamese				
Relation to curriculum	Compulsory				
Types of teaching and learning	Class Size:	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate Group Project Laboratory session		4	Discussion, Debate, Experiment	Lectures: 4 hours x 15 times	60
				Preparation and Follow up 4 hours x 15 times	60
Total Workload	120 Hours				
Credit points	2 Credits				
ECTS	4				
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures and practices) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)				
Recommended prerequisites	Quantum mechanics (PHY10007); Electrodynamics (PHY10009).				
Related Course	None				
Module objectives/intended learning outcomes	This subject provides students with specialized knowledge about the thin film deposition process from the vapor phase (evaporation method) and liquid phase (spin coating method). Students who complete this module could be achieved the following : **About knowledge** ➢ *Work independently and in groups to collect documents about thin film deposition methods, characterization methods* ➢ *Applying solid-vapor phase transition to deposit thin film materials.* ➢ *Applying liquid-solid phase transition to deposit thin film materials* ➢ *Understand and calculation of absorption coefficient of*				

	materials (metal, semiconductor and dielectric) ➢ *Building experimental skills for students to prepare for the seminar/graduation thesis.* ➢ *Instruct students to follow the principles of safety in the laboratory* **About skills:** *- Effective thinking skills: self-receiving information from references and documents to answer questions and do required experiments.* *- Improve the process of self-study and follow the principles of safety in the laboratory* *- Speaking, presentation and discussion skills during the seminar.* **About competences** ✓ *Effective teamwork and communication in science* ✓ *Ability to analyze and evaluate experimental results* **About attitude and qualities:** *- Believe in the scientific meaning as well as the practical value of experimental subject.* *- Be ethical and honest in studying, practicing and collecting experimental datum* *- Responsibility in group activities.* *- The spirit of progressive learning.*
Content	This module includes the following topics: 1. Introduction to subjects, working environments in the laboratory. The experimental groups 2. Fabrication of metal films by vacuum evaporation method 3. Fabrication of rGO film by spin coating method 4. Fabrication of SnO films by sputtering method 5. Determination of absorbance coefficient of SnO film from UV-vis spectroscopy analysis
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 30% 2. Assignment: Individual activities = 10% 3. Midterm test= 20% 4. Final test= 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: 1. Tran Quang Trung, ***Thin film Technology & Analysis***, e-book (documents for internal circulation only) References: 1. Nguyen Huu Chi***, Vaccum Tecnology & Physics,*** University Publishing House, HCM 2. Nguyen The Binh ***Experimental Spectroscopy***, Education Publishing House, HCM 3. Nguyen Van Thai, ***Material Technology,*** Science & Technology publishing House 4. Smith D, ***Thin film deposition: Princes and practice,*** McGraw Hill, New York, 1995

70. COMPUTER APPLICATIONS - PHY10204

Module name:	**COMPUTER APPLICATIONS**				
Module level, if applicable	Specialize				
Code, if applicable	**PHY10204**				
Semester(s) in which the module is taught	VD: 6th Semester				
Person responsible for the module	Nguyen Hoang Hung				
Lecturer	Tran Quang Trung, Tran Quang Nguyen, Lam Minh Long				
Language	Vietnamese				
Relation to curriculum	Compulsory Course or Elective coures				
Types of teaching and learning	Class Size:	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate Group Project		3	Discussion, Debate, Exercise Seminar	Lectures: 3 hours x 15 times	45
				Preparation and Follow up 4 hours x 15 times	90
Total Workload	135 Hours				
Credit points	3 Credits				
ECTS	5				
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (30%), • Mid semester exam (30%), • End semester exam (40%)				
Recommended prerequisites	Basic Informatics (CSC00003); Basic electronics (PHY10005); Introduction to materials science (PHY10201)				
Related Course	None				
Module objectives/intended learning outcomes	This module provides basic knowledge of structure and operating organization principles of hardware and software of a computer system and how to connect computers with peripheral devices for application in control and automation. Students who complete this module could be achieved the following **About knowledge** ➢ *Work independently and collaboratively in groups to present some given topic in the field of physics* ➢ *Basic description of the structure and hardware and software organization and operation principles of a computer system.* ➢ *Generalization of the DAC system* ➢ *Identify sensor types.* ➢ *Apply the basic knowledge to the technique of connecting computers with peripheral devices* ➢ *Application in measurement, control and automation.*				

	About skills: *- Improve the process of self-receiving information from lectures and documents to answer questions and do required exercises.* *- How to update new knowledge, self-study, self-development and adapt* *- Speaking, presentation and discussion skills during the seminar.* *- PC connection to simple measuring devices to automate data collection* **About Competences** ✓ *Effective teamwork and scientific communication* ✓ *Ability to analyze experimental results.* **About attitude and ethics**: *- Belief in the practical value of subject knowledge.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.* *- The spirit of progressive learning.*
Content	This module includes the following topics: 1. Introduction to computers & peripheral devices 2. Introduction to data acquisition and control system hardware. 3. Basic components of a basic data acquisition and control (DAC) system 4. Digital communication signal 5. Analog communication signal 6. Sensors and signal conditioning 7. Connection of peripherals devices with computer
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: 1 Nguyen Hoang Hung, ***Computer application*** e-book (documents for internal circulation only) References: 1. Robert J. Baron, Computer Architecture, 2. Ngo Dien Tap, ***Computer connection technique***, Science and Technology Publishing House, 2001. 3. Do Thanh Hai, Ngo Thanh Hai, ***Analog Digital Conversion Principle***, Youth Publishing House, 2002. 4. Do Xuan Tien, ***System control programming techniques***, Science and Technology Publishing House, 1999.

71. Optical Properties of Solids - PHY10205

Module name:	**Optical Properties of Solids**				
Module level, if applicable	Specialize				
Code, if applicable	**PHY10205**				
Semester(s) in which the module is taught	6th Semester				
Person responsible for the module	Hoang Thi Thu				
Lecturer	Tran Quang Trung Le Thuy Thanh Giang, La Phan Phuong Ha				
Language	Vietnamese				
Relation to curriculum	Elective coures				
Types of teaching and learning	Class Size:	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate Group Project		3	Discussion, Debate, Exercise Seminar	Lectures: 3 hours x 15 times	45
				Preparation and Follow up 6 hours x 15 times	90
Total Workload	135 Hours				
Credit points	3 Credits				
ECTS	4.5				
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (30%), • Mid semester exam (30%), • End semester exam (40%)				
Recommended prerequisites	Solid State Physics (PHY10010); General Physics 2 (PHY00002); Electrodynamics (PHY10009).				
Related Course	None				
Module objectives/intended learning outcomes	This course provides students with specialized knowledge in the optical properties of semiconductor, metallic and dielectric materials and operation of optical devices. These are the basic knowledge that students can apply to specialized subjects such as semiconductor technology, vacuum technic and thin film deposition... in the next modules Students who complete this module could be achieved the following ***About knowledge:*** ➢ *Understand basic optical properties of semiconductor, metallic and dielectric materials.* ➢ *Understand the energy band structure of materials.* ➢ *Know the luminescence mechanism of materials.* ➢ *Understand Maxwell's equations, electron and hole concentration in equilibrium and non-equilibrium conditions.* ➢ *Understand the operating principle of some photovoltaic devices as well as optical detectors.* **About skills:**				

	- Improve the process of self-study and self-receiving information from lectures and documents to answer questions and do required exercises. *- Speaking, presentation and discussion skills during the seminar.* *- Use some English terms in the field optics and semiconductor and start reading English documents* **About Competences** ✓ *Effective teamwork and communication in science.* **About attitude and ethics:** *- Believe in the scientific meaning as well as the practical value of subject knowledge.* *- High responsibility in the learning process.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.*
Content	This module includes the following topics: 1. Basic concepts of solid materials 2. Energy band structure of solid materials. 3. Luminescence mechanism of materials 4. Maxwell's equations, carriers under equilibrium and non-equilibrium conditions 5. Working principles of photovoltaic devices and optical sensors
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: 1. Phung Ho, ***Electronic Physics,*** Science & Technology publishing House, 2007 References: 7. Lê Khac Binh, Nguyen Nhat Khanh, ***Solid State Physics***, VNUHCM Publishing House, Vietnam 2002. 8. Truong Quang Nghia, **Thernaoluminescence & Applications**, VNUHCM Publishing House, Vietnam, 2007. 9. Jasprit Singh, **semiconductor optoelectronics**, McGraw-Hill, Inc,1995.

72. SEMICONDUCTOR DEVICES - PHY10206

<table>
<tr><td colspan="2">Module name:</td><td colspan="4">SEMICONDUCTOR DEVICES</td></tr>
<tr><td colspan="2">Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td colspan="2">Code, if applicable</td><td colspan="4">PHY10206</td></tr>
<tr><td colspan="2">Semester(s) in which the module is taught</td><td colspan="4">6th Semester</td></tr>
<tr><td colspan="2">Person responsible for the module</td><td colspan="4">Tran Quang Trung</td></tr>
<tr><td colspan="2">Lecturer</td><td colspan="4">Le Thuy Thanh Giang, Tran Quang Nguyen</td></tr>
<tr><td colspan="2">Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td colspan="2">Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Class Size:</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate
Group Project</td><td rowspan="2"></td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise
Seminar</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td colspan="2">Total Workload</td><td colspan="4">135 Hours</td></tr>
<tr><td colspan="2">Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td colspan="2">ECTS</td><td colspan="4">4.5</td></tr>
<tr><td colspan="2">Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (30%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td colspan="2">Recommended prerequisites</td><td colspan="4">Solid State Physics (PHY10010); General Materials 2 (PHY00002); statistical physics (PHY10011); Mathematical methods for physics (PHY10004).</td></tr>
<tr><td colspan="2">Related Course</td><td colspan="4">None</td></tr>
<tr><td colspan="2">Module objectives/intended learning outcomes</td><td colspan="4">The course introduces basic knowledge about the physical nature, carrier statistics, carrier transport processes, working principle... of semiconductor devices and their basic applications.

Students who complete this module could be achieved the following:
About knowledge:
➢ Know the structure of semiconductors, types of semiconductors, properties and basic phenomena occurring inside semiconductors.
➢ Understand the basic physical properties and phenomena of p-n junctions.
➢ Understanding the structure, physical nature, working principle, main parameters and minority carrier concentration distribution of Bipolar Transistor
➢ Understand the structure, physical nature, working principle, main parameters and applications of basic semiconductor</td></tr>
</table>

	devices that are commonly used in practice ➢ *Know the modern trends in the research of new materials used in semiconductor devices.* ➢ *Fabricate a simple semiconductor device such as diodes, bipolar-transistor.* **About skills:** *- Effective thinking skills: self-receiving information from lectures and documents to answer questions and do required exercises. Improve the process of self-study and study documents.* *- Speaking, presentation and discussion skills during the seminar.* *- Use some English terms in the field of semiconductor devices and start reading English documents* **About competences** ✓ *Working in clean-room and Using mask aligner to make devices* ✓ *Effective teamwork and communication in science.* **About attitude and ethics:** *- Belief in the practical value of subject knowledge.* *- High responsibility in the learning process.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.* *- The spirit of progressive learning.*
Content	This module includes the following topics: 1. Semiconductor overview 2. The P-N Junction 3. The Bipolar Transistor 4. The opto-elctronic devices 5. Modern trends in the study of new materials used in semiconductor devices 6. Practice: making simple semiconductor devices
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: • Tran Quang Trung, ***Semiconductor devices***, e-book (documents for internal circulation only) References: • Donald A. Neamen., Semiconductor Physics & Devices, published by IRWIN, USA,1997. • Kwok Ng, ***Complete guide to semiconductor devices***, McGraw Hill, 1995. • M. Balkanski and R. F. Wallis, ***Semicaonductor Physics and Applications***, Oxford University Press, 2000. • Stupelman V. , Filaretov G., ***Semiconductor devices,*** Mir, 1981. Software and equipment • *Matlab* & *Origin*.

	• *Potentiostat system*

73. Crystal Grown Technology - PHY10207

Module name:	**PHY10207 – Crystal Grown Technology**				
Module level, if applicable	Specialize				
Code, if applicable	**PHY10207**				
Semester(s) in which the module is taught	6th Semester				
Person responsible for the module	Tran Quang Trung				
Lecturer	Le Thuy Thanh Giang, La Phan Phuong Ha				
Language	Vietnamese				
Relation to curriculum	Compulsory				
Types of teaching and learning	Class Size:	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate Group Project		3	Discussion, Debate, Exercise Seminar	Lectures: 3 hours x 15 times	45
				Preparation and Follow up 6 hours x 15 times	90
Total Workload	135 Hours				
Credit points	3 Credits				
ECTS	4.5				
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (30%), • Mid semester exam (30%), • End semester exam (40%)				
Recommended prerequisites	Solid State Physics (PHY10010); General Physics 2 (PHY00002); Statistical Physics (PHY10011); Mathematical methods for physics (PHY10004).				
Related Course	None				
Module objectives/intended learning outcomes	This course introduces the basics knowledge of crystal growth such as Crystal surface morphology, Thermodynamic basis of the phase transition during crystal growth… and methods of growing crystals from vapor, solution, molten. Students who complete this module could be achieved the following: **About knowledge:** ➢ *Know the overview of development history. Understand the basic principles of crystal nucleation and growth.* ➢ *Understanding the basic properties of crystal surfaces at equilibrium* ➢ *Understand the basic concepts and main theoretical models of crystal growth.* ➢ *Understand the basic methods of crystal growth from vapor, solution, molten phases, and thin film epitaxy growth* ➢ *Know new crystal growth methods*				

	➢ *Experiments: KDP crystal Growth from solution method.* **About skills:** *- Improve the process of self-study and self-receiving information from lectures and documents to answer questions and do required exercises.* *- Speaking, presentation and discussion skills during the seminar.* *- Use some English terms in the field of crystal growth physics and start reading English documents* **About Competences** ✓ *Effective teamwork and scientific communication* ✓ *Know how to make KDP crystal Growth from solution* **About attitude and ethics:** *- Believe in the scientific meaning as well as the practical value of subject knowledge.* *- Have a sense of responsibility in the learning process.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.*
Content	This module includes the following topics: 1. The basic concepts 2. The physical chemistry basis of crystal growth 3. Crystal Growth in nature 4. Theories of crystal Growth 5. Crystal Growth Technology 6. New trends in crystal Growth Technology 7. Practice: KDP crystal growth
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: 1. Tran Quang Trung, ***Crystal Growth***, e-book (documents for internal circulation only) References: 10. Trinh Han – Quan Hán Khang, ***Crystallography***, University Publishing House, Hanoi, 1997. 11. M. B. Panish H. Temkin, Gas Source Molecular Beam Epitaxy, Springer Series in Materials Science, 1993. 12. Wunderlich Bernhard, ***Macromolecular physics. Volume 2: Crystal nucleation, growth, annealing,*** Academic Press, 1976.

74. Specific Practicals 2 - PHY10207

Module name:	**Specific Practicals 2**
Module level, if applicable	Specialize
Code, if applicable	**PHY10207**
Semester(s) in which the module is taught	7th Semester

<table>
<tr><td colspan="2">Person responsible for the module</td><td colspan="4">Nguyen Hoang Hung</td></tr>
<tr><td colspan="2">Lecturer</td><td colspan="4">Tran Quang Trung
Le Thuy Thanh Giang, Tran Quang Nguyen, Lam Minh Long</td></tr>
<tr><td colspan="2">Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td colspan="2">Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Class Size:</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching, Discussion, Debate
Group Project
Laboratory session</td><td rowspan="2"></td><td rowspan="2">4</td><td rowspan="2">Discussion, Debate, Experiment</td><td>Lectures: 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td colspan="2">Total Workload</td><td colspan="4">120 Hours</td></tr>
<tr><td colspan="2">Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td colspan="2">ECTS</td><td colspan="4">4</td></tr>
<tr><td colspan="2">Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures and practices)
• Homework at class and home (40%),
• Mid semester exam (20%),
End semester exam (40%)</td></tr>
<tr><td colspan="2">Recommended prerequisites</td><td colspan="4">Specific Practice 1 (PHY10203); Solid State Physics (PHY10010); Optical properties of solids (PHY10205); General Materials Science (PHY10201); Crystal growth technique (PHY10207).</td></tr>
<tr><td colspan="2">Related Course</td><td colspan="4">None</td></tr>
<tr><td colspan="2">Module objectives/intended learning outcomes</td><td colspan="4">This subject provides students with specialized knowledge about Uv-Vis, FTIR, Raman spectroscopy. Connect computers to measuring devices to automate data collection. Applications in measurement, control and automation.
Students who complete this module could be achieved the following:
About knowledge:
➢ Working independently and in groups to collect document about film material characterization methods
➢ Understand and analyze UV-Vis, FTIR spectra to collect material information
➢ Connect the computer to the measuring devices to automatically collect data.
➢ Application in measurement, control and automation
➢ Instruct students to follow the principles of safety in the laboratory
About skills:
- Effective thinking skills: self-receiving information from lectures and documents to answer questions and do required experiments.
- Improve the process of self-study and experimental result reports
- Speaking, presentation and discussion skills during the seminar.
About competences:
✓ Building experimental skills for students to prepare for the</td></tr>
</table>

	seminar/graduation thesis ✓ *Effective teamwork and communication in science.* **About attitude and qualities:** *- Belief in the practical value of experimental subject knowledge.* *- Be ethical and honest in studying, measuring and collecting datum.* *- Responsibility in group activities.* *- High spirit of progressive learning.*
Content	This module includes the following topics: 1. Introduction to subjects, working environments in the laboratory. The experimental groups 2. Connection of the computer to the measuring devices 3. Applications in Uv-Vis, FTIR, Raman spectroscopy 4. Applications in measurement, control and automation
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 30% 2. Assignment: Individual activities = 10% 3. Midterm test = 20% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: Specific Practicals 2 – solid state Physics dept VLCR (internal circulation) References: 1. Le Vu Tuan Hung, ***Materials Analysis Technique***, National University Publishing House, Ho Chi Minh City, 2013 2. Bell David A, ***Electronic Instruments and Measurements***, Science and Engineering Publishing House, 1994.

75. THIN FILM & VACUUM TECHNOLOGY - PHY10209

Module name:		**THIN FILM & VACUUM TECHNOLOGY**			
Module level, if applicable		Specialize			
Code, if applicable		**PHY10209**			
Semester(s) in which the module is taught		7th Semester			
Person responsible for the module		Tran Quang Trung			
Lecturer		Tran Quang Nguyen, Le Thuy Thanh Giang, Lam Minh Long			
Language		Vietnamese			
Relation to curriculum		Compulsory			
Types of teaching and learning	Class Size:	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate Group Project Laboratory session		4	Discussion, Debate, Exercise Seminar Experiment	Lectures: 4 hours x 15 times	60
				Preparation and Follow up 8 hours x 15 times	120
Total Workload		180 Hours			
Credit points		4 Credits			
ECTS		7			
Requirements according to the examination regulations		• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures and practices) • Homework at class and home (30%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites		Solid State Physics (PHY10010); General Physics 2 (PHY00002); Statistical Physics (PHY10011); Mathematical methods for Physics(PHY10004).			
Related Course		None			
Module objectives/intended learning outcomes		The course consists of two parts. Part 1 introduces the basic knowledge of high vacuum physics and engineering, the working principle of high vacuum systems and their basic applications. Part 2 introduces the basic knowledge of thin film physics and techniques, the principles of thin film deposition from PVD, CVD and solution methods and their basic applications.. Students who complete this module could be achieved the following : **About knowledge :** ➢ *Know the theoretical basis of thermodynamics of gases. Understand the theory of vacuum and the basic equipments that create a vacuum for a closed volume*			

	➢ *Understand the vacuum system construction and determine the pressure of a closed volume.* ➢ *How to set-up the high vacuum system* ➢ *Understand the principle and method of thin film deposition by PVD technology such as thermal evaporation, electron beam, vacuum arc, magnetron sputtering.* ➢ *Understand the principles and methods of thin film deposition using CVD techniques such as AP-CVD, LP-CVD and PE-CVD* ➢ *Understand non-vacuum thin film deposition methods such as sol-gel, spray pyrolysis, electrolysis* ➢ *Understand the trends of modern deposition technology* **About skills**: *- Effective thinking skills: self-receiving information from lectures and documents to answer questions and do required exercises.* *- Improve the process of self-study and study documents.* *- Speaking, presentation and discussion skills during the seminar.* *- Use some English terms in the field of vacuum physics and thin film technology and start reading English documents* **About competences:** ✓ *Set - up high vacuum system in laboratory* ✓ *Effective teamwork and communication in science.* **About attitude and ethics:** *- Belief in the practical value of subject knowledge.* *- High responsibility in the learning process.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.* *- The spirit of progressive learning.*
Content	This module includes the following topics: 1. Vacuum – Basic Concepts 2. The basic PVD methods 3. The basic CVD methods 4. The basic solution methods 5. The modern Trends in thin film deposition Technology 6. The operation of High vacuum system 7. Fabrication of films by evaporation or sputtering method 8. Fabrication of films by thermo CVD or plasma enhanced CVD method
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: • Tran Quang Trung, ***Thin film & Vaccum Technology***, e-book (documents for internal circulation only) References: • Nguyen Huu Chi***, Vaccum Technology & Physics,*** published by University, 1992.

	• O'Hanlon, ***A User's Guide to Vacuum Technology***, John Wiley & Sons, 1980. • Milton Ohring, ***The Materials Science of Thin Films***, Academic Press, Inc, 1992. • Brian Chapman, ***Glow Discharge Processes – Sputtering and Plasma Etching***, John Wiley & Sons, 1980. • J. M. Lafferty, ***Vacuum Arcs Theory and Application***, John Wiley & Sons, 1980.

76. ANALYSIS METHODS - PHY10210

<table>
<tr><td colspan="2">Module name:</td><td colspan="4">ANALYSIS METHODS</td></tr>
<tr><td colspan="2">Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td colspan="2">Code, if applicable</td><td colspan="4">PHY10210</td></tr>
<tr><td colspan="2">Semester(s) in which the module is taught</td><td colspan="4">7th Semester</td></tr>
<tr><td colspan="2">Person responsible for the module</td><td colspan="4">Tran Quang Trung</td></tr>
<tr><td colspan="2">Lecturer</td><td colspan="4">Le Thuy Thanh Giang, La Phan Phuong Ha, Tran Quang Nguyen</td></tr>
<tr><td colspan="2">Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td colspan="2">Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Class Size:</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching, Discussion, Debate
Group Project
Laboratory session</td><td rowspan="2"></td><td rowspan="2">4</td><td rowspan="2">Discussion, Debate, Exercise
Seminar
Experiment</td><td>Lectures: 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 8 hours x 15 times</td><td>120</td></tr>
<tr><td colspan="2">Total Workload</td><td colspan="4">180 Hours</td></tr>
<tr><td colspan="2">Credit points</td><td colspan="4">4 Credits</td></tr>
<tr><td colspan="2">ECTS</td><td colspan="4">3 (Lecture) + 4 (Practice) = 7</td></tr>
<tr><td colspan="2">Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures and practices)
• Homework at class and home (30%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td colspan="2">Recommended prerequisites</td><td colspan="4">Solid State Physics (PHY10010); General Physics 2 (PHY00002); Statistical Physics (PHY10011); Mathematical methods for Physics(PHY10004).</td></tr>
<tr><td colspan="2">Related Course</td><td colspan="4">None</td></tr>
<tr><td colspan="2">Module objectives/intended learning outcomes</td><td colspan="4">This course introduces basic knowledge about the working principles of the equipments used in the material analysis process such as surface morphology analysis, structural analysis, and micromass analysis. optical measurements and their basic applications
Students who complete this module could be achieved the following:
About knowledge:
➢ Understand morphological characterization methods such as AFM, SEM
➢ Understanding the TEM - analytical microscopy method
➢ Understand the method of analyzing crystal structure and composition of materials by X-ray diffraction
➢ Understanding micromass analysis using the SIMS method
➢ Understanding UV-Vis, FTIR, Ellipsometer optical measurements</td></tr>
</table>

	➢ *Know new analytical trends* **About skills:** *- Improve the process of self-study and self-receiving information from lectures and documents to answer questions and do required exercises.* *- Speaking, presentation and discussion skills during the seminar.* *- Use some English terms in the field of analysis and start reading English documents* **About competences:** ✓ *Know how to analyze a simple TEM, AFM image and XRD pattern* ✓ *Effective teamwork and scientific communication* **About attitude and ethics:** *- Believe in the scientific meaning as well as the practical value of subject knowledge.* *- High spirit of progressive learning.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.* *- Have a sense of responsibility in the learning process.*
Content	This module includes the following topics: 1. Surface morphology analysis – basic concepts 2. TEM - analytical transmission electron microscopy 3. XRD - Structural analysis by X-ray diffraction 4. SIMS – Secondary ion mass spectrometry 5. Optical Analytical Methods 6. New Trends in Analytics method 7. Practice - SEM, TEM image analysis 8. Practice - XRD diffraction pattern analysis 9. Practice - null-ellipsometry analysis
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: • Tran Quang Trung, ***Analysis Methods***, e-book (documents for internal circulation only) References: • Le Cong Duong, ***XRD Technology***, Science & Technology publishing House, 1974. • A. A. Ruxacov (Translaters: Nguyen Xuan Chanh, Nguyen Hoang Nghi, Do Ngoc Uan), ***Metal structure Analysis by XRD, Academic Publishing House,*** Hanoi 1983. • David B. Williams, ***Transmission electron microscopy***, Plenum Press, 1996

77. The Mechanical and Thermal Properties of Solids - PHY10211

<table>
<tr><td>Module name:</td><td colspan="5">The Mechanical and Thermal Properties of Solids</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="5">PHY10211</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="5">VD: 7th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="5">Le Thuy Thanh Giang</td></tr>
<tr><td>Lecturer</td><td colspan="5">Tran Quang Trung, La Phan Phuong Ha</td></tr>
<tr><td>Language</td><td colspan="5">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Elective coures</td></tr>
<tr><td>Types of teaching and learning</td><td>Class Size:</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate
Group Project</td><td rowspan="2"></td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise
Seminar</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total Workload</td><td colspan="5">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="5">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="5">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (30%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">Solid State Physics (PHY10010); General Physics 2 (PHY00002); Statistical Physics (PHY10011); Mathematical methods for Physics(PHY10004).</td></tr>
<tr><td>Related Course</td><td colspan="5">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">This course introduces the fundamentals of mechanical and thermal properties of solids such as defects in solids and some methods of testing for defects in solids, thermal oscillations of solid crystal lattice, heat capacity, heat conduction and thermal expansion.
Students who complete this module could be achieved the following:
About knowledge:
➢ Know the elastic properties of solids such as deformation, elasticity, elastic limit and deformation forms of solids such as tensile force, shear force, torsional strain.
➢ Learn basic defects in solid-body welding technology
➢ Understand methods of testing for defects in solids
➢ Understand the concepts of thermal oscillation of solid lattice such as: dynamics of crystal lattice, concept of phonons, heat capacity of solids, theory of isostatic heat capacity of solids
➢ Understand thermal conduction and thermal expansion of solids.</td></tr>
</table>

	About skills: *- Improve the process of self-study and self-receiving information from lectures and documents to answer questions and do required exercises.* *- Speaking, presentation and discussion skills during the seminar.* *- Use some English terms in the field of solid-state physics and start reading English documents* **About competences** ✓ *Effective teamwork and communication in science.* **About attitude and ethics:** *- Believe in the practical value of subject knowledge.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.* *- The spirit of progressive learning.*
Content	This module includes the following topics: 1. Elastic properties of solids 2. Defects in welds 3. Thermal oscillations of a solid crystal lattice 4. Heat conduction and thermal expansion of solids
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: 1. Le Khac Binh, Nguyen Nhat Khanh, ***solid state physics*** VNUHCM Publishing House, Vietnam, 2002. References: 1 Christman J. Richard, ***Fundamentals solid state physics**,* John Wiley and Sons , 1988. 2 Charles Kittel, ***Introduction to Solid State Physics,*** 8 ED., John Wiley & Sons, Inc, 1996.

78. Ultrasound Technique - PHY10212

<table>
<tr><td>Module name:</td><td colspan="4">Ultrasound Technique</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">General or Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10212</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Pham Hoai Phuong</td></tr>
<tr><td>Lecturer</td><td colspan="4">Tran Quang Trung, Le Thuy Thanh Giang, Tran Quang Nguyen, Lam Minh Long</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Elective coures</td></tr>
<tr><td>Types of teaching and learning</td><td>Class Size:</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td>Workload</td></tr>
<tr><td>Teaching,
Discussion,
Debate
Group Project</td><td></td><td>3</td><td>Discussion,
Debate,
Exercise
Seminar</td><td>Lectures: 3 hours x 15 times — 45
Preparation and Follow up 6 hours x 15 times — 90</td></tr>
<tr><td>Total Workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (30%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">General Materials Science (PHY10201); Solid State physics (PHY10010); Thermomechanical properties of solid (PHY10211), specific practical 1 (PHY10203).</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This subject provides students with specialized knowledge of ultrasonic physics and the mechanism of operation of ultrasonic devices. Application in defect analysis on solid objects .....

Students who complete this module could be achieved the following
About knowledge:
➢ Know the basic knowledge of thermomechanical materials.
➢ Understand piezoelectric properties of materials.
➢ Know the working mechanism of ultrasonic equipment.
➢ How to detect defects in solids by ultrasonic technique
➢ Analysis of defects on solid objects.
About skills:
- Improve the process of self-study, self-receiving information from lectures and documents to answer questions and do required exercises
- Speaking, presentation and discussion skills during the seminar.
- Use some English terms in the field of ultrasonic and non-destruction</td></tr>
</table>

	testing **About competences** ✓ *Effective teamwork and communication in science.* **About attitude and ethics:** *- Believe in the practical value of subject knowledge.* *- High responsibility in the learning process.* *- Be ethical and honest in studying, testing and taking exams.* *- Responsibility in group activities.*
Content	This module includes the following topics: 1. The basics of non-destructive testing 2. Defects in solids. 3. the basic knowledge of thermomechanical and piezoelectric properties of materials 4. Determination of defects in metal by ultrasonic measuring system 5. Analysis of defects in solids
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books, slides (power points), and films
Reading list	Main books: 1 Truong Quang Nghia. Non- destructive testing by ultrasound technology, e-book (documents for internal circulation only) References: 1. Askar Attila*, Lattice dynamical fundations of continuum theories: elasticity, piezoelectricity, viscoelasticity, plasticity,* , World Scientific, 1985 2. W.P.Mason, D.Van Nostrand Co *Physical Acoustic and the Properties of Solids,*., New York, 1958. 3. Sotirios J. Vahaviolos. *Acoustic emission: standards and technology update,* West, 1999 .

79. Nuclear Physics Theory - PHY10301

Module name:	**Nuclear Physics Theory**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10301			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th semester			
Person responsible for the module	Prof. CHAU Van Tao			
Lecturers	Prof. CHAU Van Tao Dr. TRINH Hoa Lang Dr. LE Hoang Chien MSc. NGUYEN Duy Thong MSc. NGUYEN Tri Toan Phuc MSc. CHAU Thanh Tai			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	4	Discussion, Debate, Exercise.	Lectures: 4 hours x 15 times	60
			Preparation and Follow up 8 hours x 15 times	120
Total workload	180 Hours			
Credit points	4 Credits			
ECTS	6			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework (10%) • Final exam (70%)			
Recommended prerequisites	General nuclear physics, Modern physics, Quantum mechanics, Quantum Electrodynamics			
Related Course	Analytical mathematics, Linear algebra			
Module objectives/intended learning outcomes	This module provides knowledge of nuclear structure, strong force, nuclear model, and nuclear reaction. Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand and apply knowledge of nuclear physics in science and life.* - *Skills: Be able to work in individual, group work, self-study, Self-motivation, mathematical skills, communication skills, and problem solving.lifelong self-study skills* - *Competences: Be able to read the international journal involving the nuclear theory and perform a program to calculate the physical quantities of the nuclear models and reactions,information technology for scientific research and personal development.* *-Attitude and Ethics: Professional ethics and professional responsibility*
Content	This module includes the following topics: 1 Introduction about nuclear structure models 2 The liquid drop model 3 Independent particle model 4 Shell model 5 Unified model with collective and single motions 6 Quantum mechanics theory of many-particle system & nuclear structure 7 Classification of nuclear reactions 8 The conservation laws governing nuclear reactions 9 Compound nucleus reactions 10 The optical model 11 Direct reactions 12 Nuclear reactions induced by particle types 13 Nuclear fission and fusion
Study and examination requirements and forms of examination	Assessment method: 1. Quizzes= 10% 2. Assignment: Individual activities at class = 10% 2. Homework assignment = 10% 4. Final test = 70%
Media employed	Textbooks and slides (power points)
Reading list	Main books: 1 Chau Van Tao (2013). Nuclear Physics. VNUHCM Publishing House, Vietnam. 2 References: 3 Ngo Quang Huy (2010). Basic of Nuclear Physics. Science and Technics Publishing House, Vietnam. 4 Dao Tien Khoa (2012). Modern Nuclear Physics. Science and Technics Publishing House, Vietnam. 5 D. Halliday (1971). Introduction Nuclear Physics. Modern ASIA Edition, Japan.

	6 I.K. Yodin (1982). Nuclear Physics. Mir Publishers, Moscow. 7 W.N. Cottingham and D.A. Greenwood (2001). Introduction to atomic and nuclear physics. Second Edition. Cambridge University Press, Cambridge. 8 K.N. Mukhin (1987). Experimental Physics. Mir Publishers, Moscow. 9 H. Ethering (1972). Nuclear Engineering Handbook. McGraw-Hill book Company, New York.

80. Physics of Radioactivity - PHY10302

Module name:	**Physics of Radioactivity**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10302			
Semester(s) in which the module is taught	5th Semester			
Person responsible for the module	Assoc. Prof. TRUONG Thi Hong Loan			
Lecturer	Dr. HOANG Thi Kieu Trang MSc. CHAU Thanh Tai			
Language	Vietnamese			
Relation to curriculum	Compulsory course			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture and seminars	2	Discussion, Debate, Exercises	Lectures: 2(hour) x 15 (meeting)	30
			Preparation and Follow up 4(hour) x 15 self-learning)	60
Total Workload	90 hours			
Credit points	2			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	- General Nuclear Physics, Quantum Mechanics			
Related Course	- Fundamental Practice in Nuclear Physics. - Advanced Practice in Nuclear Physics. - Method of Radiation Detection and Measurement. - Nuclear Safety and Dosimetry.			
Module objectives/intended learning outcomes	This module provides knowledge related to the physics of the basic radioactive decay processes: alpha decay, beta decay, and gamma transition. In which, for each type of decay, state the energy characteristics, the conditions for decay, using quantum mechanics for evaluating the corresponding decay probability. Students who complete this module could be achieved the following: - Knowledge:			

	+ Apply fundamental and in-depth knowledge of physics of radioactive decay and quantum mechanics for calculating decay probability of alpha, beta and gamma transition (2). + Apply knowledge of physics of radioactive decay in order to solve problems in the field of nuclear physics (3). - Skills: logical thinking (1), lifelong self-study skills (2), specialized English for scientific research, and problem solving (3). - Competences: Ability to apply physics knowledge and experience to conceptualize, analyze and design new physical situations (1). - Attitude and ethics: professional ethics, and professional responsibility.
Content	This module includes the following topics: 1. An Introduction to radioactive decay 2. Physics of alpha decay 3. Physics of gamma transition 4. Physics of beta decay
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books, slides (power points).
Reading list	1. W.N. Cottingham, D.A. Greenwood, "An Introduction to Nuclear Physics", second edition, Cambridge University Press, 2004. 2. Robley D. Evans, "The Atomic Nucleus", McGraw-Hill, 1988. 3. Anwar Kamal, "Nuclear Physics", Springer, 2014. 4. Joseph Magill, Jean Galy, "Radioactivity – Radionuclides – Radiation", Springer, 2005. 5. Laraweb - http://www.nucleide.org/Laraweb/ .

81. Method of Radiation Detection and Measurement - PHY10303

Module name:	**Method of Radiation Detection and Measurement**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10303			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th semester			
Person responsible for the module	Dr. VO Hong Hai			
Lecturers	Dr. VO Hong Hai Assoc. Prof. LE Cong Hao			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	General Nuclear physics, General electronic			
Related Course	Radiation safety			
Module objectives/intended learning outcomes	This module provides basic knowledge of Radiation interaction with matter, radiation detector, electronic for detector, coincidence technique, Students who complete this module could be achieved the following: - *Knowledge:*			

	+ Apply basic knowledge of radiation interaction, materials for detector, nuclear electronics to build a nuclear detector. *+Apply fundamental and in-depth knowledge of radiation detectors to measure radiation and determine dose, energy spectra, and radioisotopes.* *+ Apply knowledge of radiation, nuclear electronic to solve problems in nuclear physics.* *- Skills:* *+ Gain effective career skills for design a simple experiment involving radiation detection.* *+Acquire personal skills such as self-learning a programing language, work in individual, group work, self-study and lifelong learning and problem solving.* *+ Using specialized English terminology for nuclear physics scientific research and personal development.* *- Attitude and ethics:* *+ Understand professional culture, professional ethics, professional responsibility, respect themselves, colleagues, and to be honest.*
Content	This module includes the following topics: 1 Introduction of radiation, units, nuclear level diagram. 2 Interaction of radiation in matter. 3 Detectors based on ionization in gases. 4 Detectors based on scintillation. 5 Detectors based on ionization in semiconductor materials. 6 Neutron detectors. 7 Electronics for radiation detectors. 8 Basic coincidence techniques.
Study and examination requirements and forms of examination	Assessment method: 1. Self-written assay= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points), video demo.
Reading list	Main books: 1 Tran Phong Dung, Chau Van Tao, Nguyen Hai Duong (2008) "Methods for ionizing radiation detection", VNUHCM Publishing House, Vietnam. 2 William R. Leo (1994) "Techniques for nuclear and particle physics experiments", Second

	revised edition, Springer Verlag. References: 1. Stefaan Tavernier (2010), “Experimental techniques in Nuclear and particle physics”, Springer. 2. Knoll, Glenn F. (1988) “Radiation Detection and Measurement”, John Wiley & Sons, New York, 1988.

82. Neutron Physics and Nuclear Reactor - PHY10304

<table>
<tr><td>Module name:</td><td colspan="4">Neutron Physics and Nuclear Reactor</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10304</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. HUYNH Truc Phuong</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. HUYNH Truc Phuong
Dr. PHAN Le Hoang Sang</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework at class and home (20%),
● Mid semester exam (30%),
● End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Nuclear Theory, Fundamental Nuclear Physics</td></tr>
<tr><td>Related Course</td><td colspan="4">Radioactivity Physics</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module helps students to have knowledge of basic properties of neutrons, interaction of neutrons with matter, nuclear reactions with neutrons, fission reactions, chain reactions, nuclear energy, diffusion scatter and transport of neutrons in matter.
Students who complete this module could be achieved the following:</td></tr>
</table>

	- *Knowledge: Able to understand the process of neutron interaction with matter in the reactor. Apply the calculations of physical parameters related to the nuclear reactor.* - *Skills: Able to work in individual, group work, self-study, and problem solving.* - *Competences: Able to establish the operating procedure of a basic reactor. .* - *Attitude and Ethic: Honesty, diligence, and responsibility*
Content	This module includes the following topics: 1. Nuclear reactions with neutrons 2. Slowing down neutrons 3. Neutron diffusion theory 4. Chain nuclear reaction 5. Kinetics of nuclear reactors 6. Time dependence of nuclear reactor
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Huynh Truc Phuong (2016). Nuclear Reactor Physics. VNUHCM Publishing House, Vietnam. References: 1. Ngo Quang Huy (2005). Nuclear Reactor Physics. VNUHN Publishing House, Vietnam. 2. John R. Lamarsh (2001). Introduction to Nuclear Reactor Theory. Addison-Wesley Publishing Company, New York, USA.

83. Nuclear Safety and Dosimetry - PHY10305

Module name:	**Nuclear Safety and Dosimetry**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10305/NTE10105			
Subtitle, if applicable	None			
Courses, if applicable	Second semester/ Third year			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	Prof. CHAU Van Tao			
Lecturers	Prof. CHAU Van Tao Dr. HUYNH Nguyen Phong Thu			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	Nuclear physics, Nuclear reactions, Radioactive physics.			
Related Course	Instrument for measuring radiation			
Module objectives/intended learning outcomes	Students who complete this module could be achieved the following outcomes: - Knowledge: + Understanding of nuclear radiation quantities and units, interaction of radiation with matter, effects of radiation on the human species, standards of radiation protection, principles of shielding, methods of doses measurement. + Calculating of radiation effects and computing of exposure and doses.			

	- Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving. - Competences: Be able to design a simple experiment involving estimation of radiation doses. Have the capacity to learn in the next periods.
Content	This module includes the following topics: 1 Basic concepts and units for radiological, nuclear and process safety 2 Interaction of radiation with matter 3 Biological effects of radiation 4 Radiation safety Guides 5 Evaluation for radiation protection 6 Measurements of dosimetry based on ionization 7 Measurements of dosimetry based on luminescence 8 The basic principles of film badge dosimetry 9 Neutron dosimetry
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: • Chau Van Tao (2004). Ionizing radiation safety. VNUHCM Publishing House, Vietnam. • Chau Van Tao (2005). Ionizing radiation dose. VNUHCM Publishing House, Vietnam. References: 1. K. N. Mukhin (1987). Experimental nuclear physics. Mir Publishers, Russia. 2. H. Cember (1996). Introduction to Health Physics Third Edition. McGraw-hill, United Kingdom. 3. W. N. Cottingham, D.A. Greenwood (2001). Introduction to atomic and nuclear physics. Second edition. Cambridge University Press, United Kingdom. 4. G. B. Saha (2003). Physics and Radiobiology of nuclear medicine. Second edition. Springer Publisher.

84. Statistical Analysis for Experimental Data in Nuclear Physics - PHY10306

Module name:	**Statistical Analysis for Experimental Data in Nuclear Physics**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10306			
Semester(s) in which the module is taught	6th Semester			
Person responsible for the module	Assoc. Prof. TRUONG Thi Hong Loan			
Lecturer	Dr. NGUYEN Thi Cam Thu MSc. NGUYEN Duy Thông			
Language	Vietnamese			
Relation to curriculum	Compulsory course			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture and seminars	3	Discussion, Debate, Exercises	Lectures: 3(hour) x 15 (meeting)	45
			Preparation and Follow up 4(hour) x 15 self-learning)	90
Total Workload	135 hours			
Credit points	3			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	- General Nuclear Physics, Probability and Statistics			
Related Course	- Fundamental Practice in Nuclear Physics. - Advanced Practice in Nuclear Physics. - Graduated Thesis.			
Module objectives/intended learning outcomes	The module provides knowledge related to statistical methods to evaluate experimental data, including the concepts of statistical distribution, methods of the mean and standard deviation estimation, testing a statistical hypothesis, statistical design, maximum likelihood method to evaluate the parameters of a problem, method of fitting experimental data, evaluating regression and correlation. - Knowledge: + Apply fundamental and in-depth knowledge of statistical methods in order to to evaluate experimental data (2). - Skills: logical thinking (1), lifelong self-study skills (2).			

	- Competences: Ability to analyze and evaluate experimental results, processes, methods and research results in a specific discipline or interdisciplinary (3). - Attitude and ethics: professional ethics, and professional responsibility.
Content	This module includes the following topics: 1. Uncertainties in Measurements 2. Probability Distribution 3. Error Analysis 4. Estimates of Means and Errors 5. Statistical Hypothesis Test 6. Line Least Squares Fit to a Polynomial 7. Linear Correlation Estimation
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books, slides (power points).
Reading list	1. Byron P. Roe, Probability and Statistics in Experimental Physics, Springer – Verlag, 1992. 2. Canberra Industries, Inc., Genie 2000 version 3.0- Customization Tools Manual, Canberra Industries, Inc., USA, 2004. 3. Knoll G.F., Radiation Detection and Measurement, Third Edition, John Wiley & Sons, Inc., New York, 1999. 4. Robley D. Evans, Ph.D., The Atomic Nucleus, McGraw-Hill, 1988. 5. Philip R. Bevington, D. Keith Robinson, Data reduction and error analysis for the physical sciences, Mc Graww Hill, Inc., New York, 1992. .

85. Informatics Applied in Nuclear Physics - PHY10307

<table>
<tr><td>Module name:</td><td colspan="4">Informatics Applied in Nuclear Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10307</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. VO Hong Hai</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. VO Hong Hai
MSc. CHAU Thanh Tai</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">120 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Fundamental Nuclear Physics, Basic Information technology,</td></tr>
<tr><td>Related Course</td><td colspan="4">Method of Radiation Detection and Measurement</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of
C++ programing, method of Monte-Carlo simulation, a simulation software toolkit, simulate radiation interaction with material, simulate a radiation detector, analysis characteristics of the detector and data analysis.</td></tr>
</table>

	Students who complete this module could be achieved the following: - *Knowledge:* *+Apply basic knowledge of C++ programing language to solving problems in Physics and Monte-Carlo simulation.* *+Apply fundamental and in-depth knowledge of simulation software toolkit to simulate radiation interacts with material, radiation detector. (KNO-2).* *+ Apply knowledge of informatics to solve problems in nuclear physics.* - *Skills:* *+ Gain effective career skills for problem solving in nuclear physics, including skills such as logical thinking, scientific research, practice, design and conduct simulation.* *+Acquire personal skills such as self-learning a programing language, work in individual, group work, self-study and lifelong learning and problem solving.* *+ Using specialized English terminology and information technology for a logical thinking, scientific research and personal development.* - *Competences:* *+ Ability to design a simulation of nuclear detector to study radiation.* *+ Ability in organization, planning, teamwork and effective communication in science and social interaction.* *+ Ability to analyze and evaluate simulation data.* - *Attitude and ethics:* *+ Understand professional culture, professional ethics, professional responsibility, respect themselves, colleagues, and to be honest.*
Content	This module includes the following topics: 1 C++ programing language and Ubuntu OS. 2 Basic Monte-Carlo simulation. 3 Simulation toolkit of Geant4. 4 Build particle Gun, Geometry and Material, PhysicsList and Set cut. 5 Simulate Gas detector for dose 6 Simulate scintillator/semiconductor detector for energy spectrum 7 ROOT data analysis framework.

Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points), video demo.
Reading list	Main books: 1 C++ programing language guide. 2 Monte-Carlo simulation method guide. 3 Geant4 simulation toolkit guide. 4 ROOT data analysis guide. References: 1 http://www.cplusplus.com/ 2 https://geant4.web.cern.ch/ 3 https://root.cern.ch/

86. Fundamental Practice in Nuclear Physics - PHY10308

<table>
<tr><td>Module name:</td><td colspan="5">Fundamental Practice in Nuclear Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="5">PHY10308</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="5">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="5">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="5">3rd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="5">Dr. PHAN Le Hoang Sang</td></tr>
<tr><td>Lecturers</td><td colspan="5">Assoc. Prof. HUYNH Truc Phuong
Assoc. Prof. LE Cong Hao
Dr. LE Hoang Chien
Dr. TRAN Nhan Giang
Dr. PHAN Le Hoang Sang
Dr. NGUYEN Thi Cam Thu
MSc. NGUYEN Duy Thong
MSc. CHAU Thanh Tai
MSc. NGUYEN Tri Toan Phuc
MSc. LE Hoang Minh</td></tr>
<tr><td>Language</td><td colspan="5">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Exercise,
Report.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="5">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="5">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="5">4</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Attendance (10%),
• End semester exam (70%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">None</td></tr>
<tr><td>Related Course</td><td colspan="5">Advanced Practice on Nuclear Physics</td></tr>
</table>

Module objectives/intended learning outcomes	This module provides required knowledge and skills to operate, analyze nuclear measurement system. It helps students to practice some basic experiments to understand and operate some nuclear equipments. Students who complete this module could be achieved the following: - *Knowledge: Apply basic knowledge of natural science and fundamental nuclear radiation measurement by radiation detectors such as Geiger Muller, NaI(Tl), HpGe gamma spectroscopy, alpha spectroscopy, X-ray spectroscopy, neutron activation analysis system and finally learn how to perform data analysis.* - *Skills: Acquire career abd personal skills such as in individual work, group work, lifelong self-study skills, critical thinking in practice, design and conduct fundamental nuclear radiation measurement experiments; using specialized English terminology and information technology to perform experiment data analysis.* - *Competences: Ability in planning, teamwork and effective communication; Ability to to design a simple experiment to measure radiations, analyze data and make report.* - *Attitude and ethics: Understand radiation safety culture, professional ethics and professional responsibility, be honest*
Content	This module includes the following topics: 1 Nuclear electronics 2 Characteristic curve and operating voltage of detector 3 Count rate and errors 4 Statistical distribution of radioactive decay 5 Optimizing measurement time 6 Dead time and efficiency 7 Gamma attenuation through matter 8 Determinating energy of an unknown source and resolution 9 Ionizing radiation safety 1 10 Neutron activation analysis: qualitative measurement 11 X-ray fluoresence analysis: qualititive measurement 12 Alpha Acquisition and Analysis Software in alpha spectroscopy analysis

Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 10% 2. Assignment: Individual report = 20% 3. Final test= 70%
Media employed	Text books and slides (power points)
Reading list	Main books: Department of Nuclear Physics (2013). Fundamental Practice in Nuclear Physics. University of Science, VNU-HCM. References: G.L Knoll (2001). Radiation detection and measurement. Third edition. John Wiley & Sons, Ins.

87. Advanced Practice in Nuclear Physics - PHY10309

<table>
<tr><td>Module name:</td><td colspan="4">Advanced Practice in Nuclear Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10309</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">4th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. PHAN Le Hoang Sang</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. HUYNH Truc Phuong
Assoc. Prof. LE Cong Hao
Dr. LE Hoang Chien
Dr. TRAN Nhan Giang
Dr. PHAN Le Hoang Sang
Dr. NGUYEN Thi Cam Thu
MSc. NGUYEN Duy Thong
MSc. CHAU Thanh Tai
MSc. NGUYEN Tri Toan Phuc
MSc. LE Hoang Minh</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Exercise,
Report.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Attendance (10%),
• End semester exam (70%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
</table>

Module objectives/intended learning outcomes	This module provides required knowledge and skills to operate, analyze nuclear measurement system. It helps students to practice some advanced experiments to understand and operate some nuclear equipments. Students who complete this module could be achieved the following: - *Knowledge: Apply basic knowledge of natural science and advanced nuclear radiation measurement by radiation detectors such as Geiger Muller, NaI(Tl), HpGe gamma spectroscopy, alpha spectroscopy, X-ray spectroscopy, neutron activation analysis system and finally learn how to perform data analysis.* - *Skills: Acquire career abd personal skills such as in individual work, group work, lifelong self-study skills, critical thinking in practice, design and conduct advanced nuclear radiation measurement experiments; using specialized English terminology and information technology to perform experiment data analysis.* - *Competences: Ability in planning, teamwork and effective communication; Ability to to design an advanced experiment to measure radiations, analyze data and make report.* - *Attitude and ethics: Understand radiation safety culture, professional ethics and professional responsibility, be honest*
Content	This module includes the following topics: 1 Neutron activation analysis: quantitative measurement 2 Using Genie-2K in gamma spectroscopy analysis 3 Ionizing radiation safety 2: dose distribution of gamma source 4 Back scattering 5 Neutron dosimeter 6 Liquid level measurement by gamma tranmission method 7 Quantitative analysis by X-ray fluorescent method 8 Determination radioactivity of alpha source by alpha spectroscopy 9 Determination stopping range of alpha particle in air 10 Alpha Acquisition and Analysis Software in alpha spectroscopy analysis Neutron activation analysis: qualitative practice

Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 10% 2. Assignment: Individual report = 20% 3. Final test= 70%
Media employed	Text books and slides (power points)
Reading list	Main books: 1 Department of Nuclear Physics (2013). Advanced Practice in Nuclear Physics. University of Science, VNU-HCM. References: 1 G.L Knoll (2001). Radiation detection and measurement. Third edition. John Wiley & Sons, Ins. 2 G.D. Chase, S. Rituper, J.W. Sulcoski (1964). Experiments in nuclear science. 2^{nd}, Aplha editon. 3 J.L. Ducan (1988). Laboratory investigation in nuclear science. Oak Ridge TN, USA.

88. Nuclear Analytical Methods - PHY10310

Module name:	**Nuclear Analytical Methods**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10310			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Assoc. Prof. HUYNH Truc Phuong			
Lecturers	Assoc. Prof. HUYNH Truc Phuong MSc. NGUYEN Thi Truc Linh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework at class and home (20%), ● Mid semester exam (30%), ● End semester exam (50%)			
Recommended prerequisites	Radiation Measurement and Detection Methods,			
Related Course	Neutron Physics and Reactor			
Module objectives/intended learning outcomes	This module provides students with an understanding of nuclear analysis methods such as X-ray fluorescence analysis (XRF) and neutron activation analysis (NAA). Students who complete this module could be achieved the following: - *Knowledge: Able to understand the interaction of X-rays and of neutrons with matter. Able to apply XRF and NAA analysis methods in sample analysis.*			

	- *Skills: Able to work in individual, group work, self-study, and problem solving.* - *Competences: Able to establish the process of sample analysis by atomic and nuclear method. Able to evaluate the results of analysis of elemental content in samples.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. Fundamentals of XRF analysis 2. XRF analysis methods 3. Matrix effects and correction methods 4. Introduction to neutron activation analysis (NAA) 5. Basic equation in NAA analysis 6. NAA analysis methods 7. Sample preparation 8. Error of measurements
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Huynh Truc Phuong, Tran Phong Dung, Chau Van Tao (2015). Atomic and Nuclear Analysis Methosds. For internal circulation only, University of Science, VNUHCM, Vietnam. References: 1. Raymond A. Serway, John W. Jewett, Sr (2014). Physics for Scientists and Engineers with Modern Physics. Ninth Edition. BROOK/COLE, USA. 2. Alan Giambattista, Betty McCarthy Richardson, Robert C. Richardson (2010). Physics. Second Edition. McGrawHill, USA.

89. Applied Nuclear Physics in Agricultural-Medical-Biology - PHY10311

Module name:	**Applied Nuclear Physics in Agricultural-Medical-Biology**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10311			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Assoc. Prof. LE Cong Hao			
Lecturers	Assoc. Prof. LE Cong Hao			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	30
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	General Nuclear physics, Method of Radiation Detection and Measurement			
Related Course	None			
Module objectives/intended learning outcomes	This module provides basic knowledge of: -Basic concepts of nuclear physics - Radiation interactions with matter - Application in biology, agriculture and medicine - Proton therapy physics Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand radiation interaction with matter and using in agriculture, medicine and biology.* - *Skills: Be able to work in individual, group work, self-study, lifelong learning, problem solving, and English reading skill in nuclear physics.* - *Competences: Be able to apply nuclear physics in Agricultural-Medical-Biology. Have the capacity to learning in the next periods.* - *Attitude and ethics: professional ethics, and professional responsibility*
Content	This module includes the following topics: 1 Radiation interactions with matter. 2 Exposure and absorbed dose. 3 Introduction some applications of radiology in biology and agriculture. 4 Introduction some applications of radiology in medicine
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Textbooks and slides (power points), video demo.
Reading list	Main books: 1. Le Cong Hao, Tran Thien Thanh, Chau Van Tao "Applied Nuclear Physics in Agricultural-Medical-Biology", unpublish. 2. Phan Van Duyet, (1998) "Radiophysiological and physical methods used in agriculture, biology and medicine", Science and Technology Publishing House, Hanoi, Vietnam. References: 3. Tran Phong Dung, Chau Van Tao, Nguyen Hai Duong, Methods of recording ionizing radiation, Publishing House, National University of Ho Chi Minh City. Ho Chi Minh, 2005. 4. F. M. Khan, The physics of the Radiation Therapy, Williams & Wilkins, 1994. 5. Philip M.K. Leung, The Physical Basic of Radiotheraphy, The Ontario Cancer Institute, 1990. 6. Harald Paganetti, Proton therapy physics, CRC Press, 2011

90. Applied Nuclear Physics in Industry - PHY10312

<table>
<tr><td>Module name:</td><td colspan="4">Applied Nuclear Physics in Industry</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10312</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. TRAN Thien Thanh</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. TRAN Thien Thanh
MSc. HUYNH Thanh Nhan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (30%),
• Mid semester exam (20%),
• End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Radiation Measurement and Detection Methods.
Nuclear Safety and Dosimetry
Statistical Analysis for Experimental Data in Nuclear Physics</td></tr>
<tr><td>Related Course</td><td colspan="4">Applied Nuclear Physics in Agricultural-Medical-Biology</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides knowledge of nuclear techniques applying industry. This course presents the principle of transmission gamma method, Compton scattering method, radioactive tracer technique, radiography, and whose applications in industries</td></tr>
</table>

	Students who complete this module could be achieved the following: *- Knowledge: apply knowledge of nuclear physics such as non-destructive testing (NDT), nucleonic control system (NCS), radioactive tracer, and irradiation methods in industrial system.* *- Skills: lifelong self-study skills, specialized English for scientific research, and problem solving.* *- Competences: teamwork, and effective communication in science, analyze and evaluate experimental results.* *- Attitude and ethics: professional ethics, and professional responsibility*
Content	This module includes the following topics: 1 The basis physics of radioactivity 2 Radiation detection 3 Biological effects of radiation and radiological protection 4 Radiography 5 Gamma-ray absorption techniques 6 Radiation scattering techniques 7 Radioactive tracer applications 8 Irradiation
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 15% 2. Assignment: Individual activities = 15% 3. Midterm test= 20% 4. Final test= 50%
Media employed	Textbooks and slides (power points)
Reading list	References: 1 Radioisotope techniques for problem solving in industrial process plants, J.S. Charlton, Leonard Hill, Glasgow and London. 2 Technical data on nucleonic gauges, IAEA-TECDOC-1459, 2005. 3 Radiotracer Applications in Industry — A Guidebook, IAEA-TECDOC 423, 2004

91. Quantum Mechanics in Nuclear Physics - PHY10313

Module name:	**Quantum Mechanics in Nuclear Physics**			
Module level, if applicable	Speciality			
Code, if applicable	PHY10313			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	3nd semester			
Person responsible for the module	Dr. TRINH Hoa Lang			
Lecturers	Dr. TRINH Hoa Lang			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	Calculus 1B, General physic, Quantum Mechanics I			
Related Course	Nuclear physics			
Module objectives/intended learning outcomes	This module provides basic knowledge on the approximations methods of quantum mechanics to solve Schrodinger equation of particle in the complicated potentials. Students who complete this module could be achieved the following: - *Knowledge: Apply mathematical formulation for quantum mechanics in some theoretical nuclear problems.*			

	- Skills: lifelong self-study, and problem solving. *- Competences: apply physics knowledge analyze new physical situations* *- Attitude and ethics: professional ethics, and professional responsibility*
Content	This module includes the following topics: 1 Numerical method of one – dimensional Schrodinger equation. 2 Numerical method of Schrodinger equation for central potentials. 3 Time – independent perturbation theory 4 The Variation principle. 5 Scattering theory. 6 The WKB approxiamtion.
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1 Griffiths - Introduction to Quantum Mechanics (2ed), Pearson Prentice Hall, 2005 References: 2 Paolo Giannozzi, Numerical Methods in Quantum Mechanics, University of Udine 2013

92. Tour for Nuclear Physics - PHY10314

Module name:	**Tour for Nuclear Physics**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10314			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	Assoc. Prof. TRAN Thien Thanh			
Lecturers	Assoc. Prof. TRAn Thien Thanh Dr. PHAN Le Hoang Sang			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Experiment, Discussion, Debate.	4	Discussion, Debate, Report.	Lectures: 4 hours x 15 times	60
			Preparation and follow up 8 hours x 15 times	120
Total workload	180 Hours			
Credit points	2 Credits			
ECTS	4			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Individual report (50%), • End semester exam (50%)			
Recommended prerequisites	Radiation Measurement and Detection Methods, Nuclear Safety and Dosimetry Statistical Analysis for Experimental Data in Nuclear Physics			
Related Course	None			
Module objectives/intended learning outcomes	This module provides students with an understanding of nuclear experiment methods such as radiation measurement, neutron activation analysis and Radiography. Students who complete this module could be achieved the following: - *Knowledge: Apply knowledge of nuclear physics such as interaction of radiation with matter, nuclear*			

	instruments and NAA analysis methods in sample measurement, experimental setup. - *Skills: lifelong self-study, practice and conduct experiments.* - *Competences: teamwork, and effective communication in science, analyze and evaluate experimental results.* - *Attitude and ethics: professional ethics, and professional responsibility.*
Content	This module includes the following topics: 1 Introduction training center of Dalat Nuclear Research Institute 2 Experiment of radiation protection 3 Experimental measurement with dosimeter and personal dosimeter 4 Thickness gauges measurement 5 Experiment of neutron activation analysis methods 6 Radiography
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Individual report = 50% 2. Final test= 50%
Media employed	Textbooks and slides (power points)
Reading list	Main books: 1 Training center, (2015), Twenty-seven experiment of nuclear techniques, Dalat Nuclear Research Institute References: 2 G.L Knoll (2011), Radiation detection and measurement, 4th, John Willey & Sons, Ins. 3 G.D. Chase, S. Rituper, J.W. Sulcoski (1964), Experiments in nuclear science, 2^{nd}, Alpha edition. 4 J. L. Ducan (1988), Laboratory investigation in nuclear science, Oak Rigde TN USA.

93. Accelerator - PHY10315

<table>
<tr><td>Module name:</td><td colspan="4">Accelerator</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Speciality</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10315</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">3nd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. TRINH Hoa Lang</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. TRINH Hoa Lang</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Calculus 1B, General physic</td></tr>
<tr><td>Related Course</td><td colspan="4">Electrodynamics, nuclear physics</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge on particle accelerator for students. The information of this subject is included principles of charged particle accelerator, linear and circular accelerators
Students who complete this module could be achieved the following:
- Knowledge: Apply knowledge of particle accelerator principle in nuclear physics and life.
- Skills: lifelong self-study, and problem solving.</td></tr>
</table>

	- *Competences: apply physics knowledge analyze new physical situations, methods and research results in a specific science and life.* - *Attitude and ethics: professional ethics, and professional responsibility*
Content	This module includes the following topics: 1 Particle Dynamics 2 Electric and Magnetic Forces 3 Electric and Magnetic Field Lenses 4 Calculation of Particle Orbits in Focusing Fields 5 Linear accelerators 6 Circular accelerators
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: Stanley Humphries, Jr, Principles of charged particle accelerator, John Wiley and Sons, 1999. References: • Helmut Wiedemann, Particle Accelerator physics, Springer, 2007. • Martin Reiser, Theory and Design of Charged Particle Beams, Wiley-VCH, 2008 • J.B. ROSENZWEIG, Fundamentals of Beam Physics, Oxford University Press, 2003. • Helmut Liebl, Applied Charged Particle Optics, Springer-Verlag Berlin Heidelberg 2008

94. Particle Physics - PHY10316

Module name:	**Particle Physics**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10316			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	8nd semester			
Person responsible for the module	Prof. CHAU Van Tao			
Lecturers	Dr. Hoang Thi Kieu Trang Dr. LE Hoang Chien			
Language	Vietnamese			
Relation to curriculum	Option			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	Quantum mechanics, relative mechanics			
Related Course	Modern Particle Physics- Mark Thomson			
Module objectives/intended learning outcomes	This module covers the following topics: Conservation principles- Interaction characteristics of leptons, muons, mesons, stranges, etc. Unitary symmetry of the strong interaction-Weak interaction -Quarks and gluons, chromodynamics Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand and apply knowledge of particle physics in science and life.* - *Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving.* - *Competences: Be able to design a simple experiment involving particle physics. Have the capacity to learning in the next periods.*
Content	This module includes the following topics: 1.Conservation principles 2.Interaction characteristics of leptons, muons, mesons, 3.Strange particle 4.Pions 5. Resonance particles 6.Unitary symmetry of the strong interaction 7.Quarks and gluons, chromodynamics
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 20% 3. Midterm test= 30% 4. Final test= 40%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. K.N. Mukhin, Experimental Physics, vol II Mir Publisher, Moscow, 1987 2. I.K. Yodin, Nuclear Physics, Mir Publisher, Moscow, 1982 3. Ronald Gautreau, Modern Physics, Education Publisher, 1998 4. Dao Tien Khoa, Modern Nuclear Physics, Science & Technology Publisher, 2010 5. Jean-Louis Basdevant, James Rich, Fundamentals in Nuclear Physics From nuclear structure to cosmology, Springer Science, 2005 6. Yung–Kuo-Lim, Problems and Solutions of atomic, nuclear and particle physics, World Scientific, 2000 7. A.G Sitenko, Theory of Nuclear Reactions, World Scientific, 1990

95. Nuclear Technique Applied in Environment and Hydrography - PHY10317

Module name:	**Nuclear Technique Applied in Environment and Hydrography**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10317			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Assoc. Prof. LE Cong Hao			
Lecturers	Assoc. Prof. LE Cong Hao Assoc. Prof. TRAN Thien Thanh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	General Nuclear physics, Method of Radiation Detection and Measurement			
Related Course	None			
Module objectives/intended learning outcomes	This module provides basic knowledge of: -Nuclear techniques in the measurement of radioactivity of nuclei in the environment. -Instrumentation and analytical techniques used in isotope geochemistry			

	-Surveying natural radioactive fields emitted from rocks or water to solve geological mapping, finding radioactive ores… -Determination of geological time. Students who complete this module could be achieved the following: *- Knowledge: Be able to understand not only how and why some nuclei decay, but also in understanding the processes that create nuclei and the behavior itself.* *- Skills: Be able to work in individual, group work, self-study, lifelong learning, problem solving, and English reading skill in nuclear physics.* *- Competences: Be able to apply instrumentation and analytical techniques used in isotope geochemistry. Have the capacity to learning in the next periods.* *- Attitude and ethics: professional ethics, and professional responsibility*
Content	This module includes the following topics: 1 Introduction of radiation and natural background radiation. 2 Methods of nuclear analysis in environmental radiation measurement. 3 Gamma measurement method in well geophysical research. 4 Radiometric techniques in geological dating. 5 Radiometric techniques in isotope hydrology.
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Textbooks and slides (power points), video demo.
Reading list	Main books: 1 Le Cong Hao, Tran Thien Thanh, Chau Van Tao “Nuclear Technique Applied in Environment and Geology”, unpublish. 2 Claude J. Alle`gre (2008) “Isotope Geology”, Cambridge University Press References: 1 Pham Duy Hien, Radioactivity in the environment and waste sources, Science and Technology Publishing House, 2014. 2 Dang Duc Nhan, Ngo Quang Huy, Nguyen Hao Quang, Radiometric recording techniques applied in environmental research, Science and Technology Publishing House, 2014. 3 C. Zhang, Fundamentals of environmental

	sampling and analysis, John Wiley & Sons, 2007. 4 M. F. L'Annunziata, 2nd, A Handbook of radioactiovity analysis, Academic Press, New York, USA, 2003. 5 Merril Eisenbud, Thomas Gesell, Environmental radioactivity from natural, industrial and military sources, Academic press, 1997.

96. Nuclear Reactor Technology and Nuclear Power Plant - PHY10318

<table>
<tr><td>Module name:</td><td colspan="4">Nuclear Reactor Technology and Nuclear Power Plant</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10318</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">3rd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. PHAN Le Hoang Sang</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. PHAN Le Hoang Sang</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Optional</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Nuclear Physics Theory, Physics of Radioactivity, Neutron Physics and Nuclear Reactor</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of history and status of nuclear power, generations of nuclear reactor, nuclear reactor design, , components of nuclear power plant, operation principles of nuclear reactor as well as nuclear power plant safety.
Students who complete this module could be achieved the following:</td></tr>
</table>

	- *Knowledge: Apply knowledge of nuclear reactor physics to understand the nuclear reactor design, nuclear power plant structure, principles of nuclear power plant and safety* - *Skills:* + *Acquire career and personal skills such as communication skills, lifelong self-study skills, critical thinking skills in nuclear reactor engineering* + *Using specialized English in the field of nuclear reactor engineering and nuclear power plant* - *Competences: Ability in planning, teamwork and effective communication, analyzing structure of nuclear power plant and its operation, understanding nuclear safety, radiation safety in nuclear power plant* - *Attitude and ethics: Understand professional safety culture, professional ethics and professional responsibility, be honest*
Content	This module includes the following topics: 1 History of nuclear power 2 Nuclear reactor design 3 Structure and components of nuclear power plant 4 Operation principle of nuclear reactors 5 Nuclear power plant safety
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: John R. Lamarsh (2001). Introduction to Nuclear Engineering. Third edition. Prentice Hall, New York. References: • Janet Wood (2007). Nuclear Power. IET power and energy series 52, UK. • Ronald Allen Knief (2008). Nuclear Engineering: Theory and Technology of Commercial Nuclear Power. American Nuclear Society. • Yoshiaki Oka, Katsuo Suzuki (2013). Nuclear Reactor Kinetics and Plant Control. Springer. • DOE Fundamentals Handbook (1993). Nuclear Physics and Reactor Theory. • IAEA Safety Guides. Design of the Reactor Coolant System and Associated Systems in NPP. No. NS-G-1.9. • IAEA Safety Standards (2012). Safety of Nuclear Power Plants: Design Specific Safety Requirements.

97. Medical Imaging and Image Analysis - PHY10319

<table>
<tr><td>Module name:</td><td colspan="4">Medical Imaging and Image Analysis</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialization of Nuclear physics</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10319</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. Hoang Thi Kieu Trang</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. Tran Nhan Giang
Msc. Nguyen Duy Thong
Dr. Van Thi Thu Trang
Dr. Hoang Thi Kieu Trang</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">General Nuclear Physics
Physics of Radioactivity
Method of Radiation Detection and Measurement</td></tr>
<tr><td>Related Course</td><td colspan="4">Informatics Applied in Nuclear Physics
Nuclear Safety and Dosimetry</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of medical imaging systems and fundamental digital image processing methods.</td></tr>
</table>

	Students who complete this module could be achieved the following: - *Knowledge: Be able to apply fundamental and in-depth knowledge of physics, mathematical formulation, and computation in medical image processing. Be able to develop simple image processing codes in python or MATLAB.* - *Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving.* - *Competences: Ability to apply physics knowledge and experience to conceptualize, analyze and design new physical situations* - *Attitude and ethics: professional ethics, and professional resposibility*
Content	This module includes the following topics: 1 Basics of medical image processing 2 Digital imaging systems 3 Image Representation 4 Operations in Intensity Space 5 Filtering and Transformations 6 Image reconstruction
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: • Wolfgang Birkfellner, Applied Medical Image Processing, a basic course, CRC Press. 2014. References: • Rafael C. Gonzalez, Richard E Woods, Digital Image Processing, Pearson Education International, 2011. • David J. Dowsett, Patrick A. Kenny, R.Eugene Joshton, The physics of diagnostic imaging, CRC Press, 2006.

98. General Geology - PHY10401

Module name:	**General Geology**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10401			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th Semester			
Person responsible for the module	MSc TRAN Phu Hung			
Lecturer	MSc TRAN Phu Hung			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Workload				
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Group Project	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total Workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80%. • Homework at class and home = 20%, • Midterm = 30%; • End semester exam = 50%			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	Students who complete this module could be achieved the following - *Knowledge: understanding a basic physical geology; the geological processes and historical geology.* - *Skills: Students are able to classify geological structures.* - *Competences: Students are able to do field surveys; Ability in organization, planning, teamwork* - *Attitude and ethics: professional responsibility, colleagues, be honest, and community service.*			
Content	This module includes the following topics: 1 Historical geology 2 Physical geology (Structure of the Earth; Material of the Earth) 3 Geological processes (Weather hazards; geologic hazards)			

	4 Systematic mineralogy 5 Geotectonics
Study and examination requirements and forms of examination	Assessment method: • Homework Assignment = 30% • Assignment: Score of Teams Project (Group activities) = 20% • Project: Score of Personal Final Project = 50%
Media employed	Textbooks, slides (power points).
Reading list	Main books: 1. Phuoc N.H., Chanh V.T., Hung P.H., Loan V.T.K., Minh N.P. (2006). General Geology. VNUHCM Publishing House, Vietnam References: 1 Dinh P.N., Huoc L.H. (2005) General Geology. University of Education Publishing House, Hanoi, Vietnam. 2 Manh L.V., Bach L.D., Thang T.T. (2005). General Geotectonics. VNUHCM Publishing House, Vietnam.

99. Oceanography - PHY10402

Module name:	**Oceanography**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10402			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th Semester			
Person responsible for the module	Assoc. Prof. LE Quang Toai			
Lecturer	Assoc. Prof. LE Quang Toai, Assoc. Prof. VO Luong Hong Phuoc			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Workload	None			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Group Project	2	Discussion, Exercise	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total Workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework = 30%) • Exercise at class = 20%, • End semester exam = 50%			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	Students who complete this module could be achieved the following - *Knowledge: know the basics of oceanography, understanding how the earth-atmosphere-ocean system functions, physical characteristics of ocean water; Dynamical Oceanography.* - *Skills: using equations to explain some phenomenons relating ocean.* - *Competences: Ability in organization, leadership, planning, teamwork* - *Attitude and ethics: professional responsibility, colleagues, be honest, and community service.*			

Content	1 Introduction, Distribution of sea and land 2 Physical and chemical characteristics of ocean water 3 Distribution of Phosphorous, Nitrogen Silicates and Managanes in seawater 4 Structure of ocean 5 Dynamical Oceanography 6 Pollution of the oceans 7 Optics of the oceans
Study and examination requirements and forms of examination	Assessment method: • Homework assignment = 30% • Assignment: Score of Teams Project (Group activities) = 20% • Project: Score of Personal Final Project = 50%
Media employed	Text books, slides (power points), and GPR machines
Reading list	Main books: 1. Toai L.Q. (2009). General Oceanography. VNUHCM Publishing House, Vietnam. References: 1. Keith Stowe. (2006). Exploring Ocean science, 2ed. John Wiley and sons Ltd. 2. Keith A. Sverdrup, Alison B. Duxbury, Alyn C. Duxbury. (2006). Fundamentals of oceanography. 5ed, McGraw-Hill Higher Education.

100. General Geophysics - PHY10403

Module name:	**General Geophysics**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10403			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th Semester			
Person responsible for the module	Assoc. Prof. NGUYEN Thanh Van			
Lecturer	Assoc. Prof. NGUYEN Thanh Van, MSc. VO Nguyen Nhu Lieu			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Workload	None			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Group Project	2	Discussion, Exercise	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total Workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Exercise at class (30%), • Group activities (20%) • End semester exam (50%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	Students who complete this module could be achieved the following *- Knowledge: Be able to understand the formation and evolution of the earth, having general knowledge about gravity anomalies, geothermal anomalies, seismic waves, geomagnetism, geoelectricity and geodynamics.* *- Skills: Be able to work in individual, group work, self-study* *- Competences: Have the capacity to learning in the next periods.* *- Attitude and ethics: honesty and responsibility*			

Content	1 Gravity and the Earth's shape 2 Seismic waves and the Earth's structure 3 Earth's thermal 4 Geomagnetic 5 Geoelectricity 6 Geodynamics
Study and examination requirements and forms of examination	Assessment method: • Assignment: Exercise at class 30% • Projects: Group activities 20% • Final test: 50%
Media employed	Text books, slides (power points)
Reading list	Main books: 1 Van N.T, Triet L.M, Thanh L.N. (2014). General Geophysics, VNUHCM Publishing House, Vietnam. References: 1. Tien N.D. (2002) General Geophysics. VNU Publishing House, Vietnam. 2. W.M. Telford, L.P. Geldart, R.E. Sherift, D.A. Keys (1990). Applied geophysics. Cambridge Publishing, England.

101. Theory of potential and field - PHY10404

Module name:	**Theory of potential and field**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10404			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6nd semester			
Person responsible for the module	MSc. NGUYEN Ngoc Truong			
Lecturers	MSc. NGUYEN Ngoc Truong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion.	2	Discussion, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	Calculus 1B, Calculus 1B, Mathematical methods for physics			
Related Course	None			
Module objectives/intended learning outcomes	- *Knowledge*: Apply basic math of theory of field. Apply fundamental and in-depth knowledge of mathematical in the analysis of physics fields. Apply knowledge of geophysics to study application of physics fields. - *Skills*: Gain effective skills for problem solving of basic boundary problems. - *Competences:* Ability to apply basic boundary problems and field model for practical application.			

	- *Attitude and ethics*: Be honest
Content	1 **The concept of potentials and types of potential**: Mass potential, Subclass potentials, Magnetic potentials. 2 **Potential and force fields of some simple shaped bodies** : Sphere potential, Logarithm potential, Magnetic potential of sphere. 3 **Newton's potential properties**: Mass potential, Subclass potentials, Gauss's integral. 4 **Green formulas**: Base Green formulas, Green's formula for mass potential and transformation according to Molodenski, Stokes constants. 5 **Boundary problems**: The Dirichlet problem for the sphere, The Dirichlet problem for the infinite plane, The Neyman problems. 6 **Sphere function and properties**: Solving Lengendre's equation in spherical coordinates, Legendre polynomial, Classification of spherical functions.
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Tran Van Nhac, Nguyen Thanh Van, Theory of potential and fields in geophysics, University of Science HCM, 1997. References: 1. Phan Quoc Khanh, Calculus 1, Education, 2008. 2. Phan Quoc Khanh, Calculus 2, Education, 2008. 3. A.X.Kompanheetx, Theoretical physics 1, Basic laws, Nedra Moscow, 1980.

102. Matlab Program for Geophysics - PHY10405

Module name:	**Matlab Program for Geophysics**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10405			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th semester			
Person responsible for the module	MSc. NGUYEN Van Thuan			
Lecturers	MSc. NGUYEN Van Thuan Dr. LE Van Anh Cuong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 4 hours x 15 times	60
			Preparation and Follow up 4 hours x 15 times	60
Total workload	120 Hours			
Credit points	3 Credits			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This module provides basic knowledge of MATLAB programming language (i.e., variables, sub-function, mathematic operators, etc.). Students who complete this module could be achieved the following: *- Knowledge: Be able to understand and apply knowledge of MATLAB programming in science and life.*			

	- Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving. *- Competences: Be able to solve numerical method problems and basic geophysical problems. Have the capacity to learning in the next periods.* *- Attitude and ethics: honesty and responsibility*
Content	This module consists of the following topics: 1 MATLAB introduction 2 Subfunction 3 Operators 4 Graphics and Graphical user interface (GUI) 5 MATLAB applications for numeric problems 6 MATLAB applications for geophysical problems
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Textbooks and slides (power points)
Reading list	Main books: • Trauth MH, Gebbers R, Marwan N, Sillmann E. MATLAB recipes for earth sciences: Springer; 2007. • Dang Van Liet, (2004) Numerical Calculus, VNUHCM Publishing House, Vietnam. References: Margrave GF. Numerical methods of exploration seismology with algorithms in Matlab. CREWES Toolbox Version. 2003;1006.

103. Astronomy - PHY10406

<table>
<tr><td>Module name:</td><td colspan="4">Astronomy</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10406</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PhD NGUYEN Nhat Kim Ngan</td></tr>
<tr><td>Lecturer</td><td colspan="4">PhD NGUYEN Nhat Kim Ngan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Elective</td></tr>
<tr><td>Workload</td><td colspan="4">None</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Group Project</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total Workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80%.
• Homework at class and home (30%),
• End semester exam (70%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of ASTRONOMY
Students who complete this module could be achieved the following:
• Knowledge: understand a basic astronomy, celestial sphere, solar time, motions of sun and planets in solar systems, characteristics of stars, structure of galaxies.
• Skills: astronomy observations
• Competences: Students are able to analysis data, practice observations
• Attitude and ethics: honesty and responsibility</td></tr>
<tr><td>Content</td><td colspan="4">This module includes the following topics:
1 Celestial sphere, axis in astronomy
2 Motion of sun and time
3 Motion of moon
4 Characteristics of stars
5 Introduction of Solar system</td></tr>
</table>

	6 The planet in Solar system 7 The development of stars 8 Galaxies
Study and examination requirements and forms of examination	Assessment method: • Assignment: Individual activities = 30% • Final test= 70%
Media employed	Text books, slides (power points).
Reading list	Main books: 1. Tran Van Nhac, Textbook of Astronomy, University of Science, 2008. 2. Amy, Thomas, Explorations: an introduction to astronomy, 2ed, Boston: McGraw-Hill, 2000. 3. Jeff Hester, 21st century astronomy: stars and galaxies, 2ed, New York: W. W. Norton & Company, 2007. 4. Stuart, An introduction to astronomy: planets, stars, and galaxies, 2ed, New York: John Wiley and Sons, 1967.

104. Atmospheric Physics - PHY10407

Module name:	**Atmospheric Physics**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10407			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th Semester			
Person responsible for the module	Assoc. Prof. LE Quang Toai			
Lecturer	Assoc. Prof. LE Quang Toai; Assoc. Prof. VO Luong Hong Phuoc			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Workload	None			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Group Project	2	Discussion, Exercise	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total Workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Exercise at class (30%), • End semester exam (70%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	Students who complete this module could be achieved the following *- Knowledge: Be able to understand the composition and equation of state of atmosphere, radiation, thermodynamic and air movement.* *- Skills: Be able to work in individual, group work, self-study* *- Competences: Have the capacity to learning in the next periods.* *- Attitude and ethics: honesty and responsibility*			
Content	1 Atmospheric statics 2 Thermodynamic 3 Atmospheric radiation 4 The movement of air			

Study and examination requirements and forms of examination	Assessment method: • Assignment: Exercise at class (30%) • Final test (70%)
Media employed	Textbooks, slides (power points)
Reading list	Main books: 1. Dien N.H. (2002) Physical Meteorology. VNU Publishing House, Vietnam. References: 1. Minh T.C. (2007) General climate and meteorology. VNUHN Publishing House, Vietnam. 2. Minh T.C. (2006), Synoptic scale meteorology. VNU Publishing House, Vietnam.

105. Seismology - PHY10408

<table>
<tr><td>Module name:</td><td colspan="4">Seismology</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10408</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PhD NGUYEN Nhat Kim Ngan</td></tr>
<tr><td>Lecturer</td><td colspan="4">PhD NGUYEN Nhat Kim Ngan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Elective</td></tr>
<tr><td>Workload</td><td colspan="4">None</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Group Project</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total Workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80%.
• Homework at class and home (30%),
• End semester exam (70%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of SEISMOLOGY
Students who complete this module could be achieved the following:
• Knowledge: understand a basic seismology, stress and train tensors, seismic equation, 1D, 2D and 3D plane waves, Snell's law, refraction and reflection parameters, refraction seismology, reflection seismology, surface waves, earthquakes.
• Skills: analysis of data
• Competences: Students are able to survey in fields
• Attitude and ethics: honesty and responsibility</td></tr>
<tr><td>Content</td><td colspan="4">This module includes the following topics:
1 Stress and Train tensors
2 Seismic equation
3 Seimic ray
4 Refraction seismic
5 Refleciton seismic</td></tr>
</table>

	6 Surface waves 7 Earthquakes
Study and examination requirements and forms of examination	Assessment method: • Assignment: Individual activities = 30% • Final test= 70%
Media employed	Text books, slides (power points).
Reading list	Main books: [1] Mai Thanh Tan, Seismic Exploration, Transport Publishing House, 2011. [2] Makin, J., Seismic data processing: theory and practice, Oxford: Blackwell Scientific, 1986. [3] Reynolds, An introduction to applied and environmental geophysics, Wiley - Blackwell, 2011

106. Magnetic method - PHY10409

<table>
<tr><td>Module name:</td><td colspan="4">Magnetic method</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10409</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7nd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">MSc. NGUYEN Ngoc Truong</td></tr>
<tr><td>Lecturers</td><td colspan="4">MSc. NGUYEN Ngoc Truong</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Theory of potential and field, Mathematical methods in physics</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">- Knowledge: Apply fundamental and in-depth knowledge of mathematical in the analysis of magnetic field, Apply knowledge of geophysics to study the magnetic anomaly and it’s application to study the mineral and geological structure.
- Skills: Gain effective skills for applying gravity field transformation methods in analyzing and interpreting magnetic probe data, Using the international literature on new magnetic methods.</td></tr>
</table>

	- *Competences:* Ability to analyze and evaluate the data magnetic anomaly and structure of the Earth. - *Attitude and ethics:* Be honest
Content	1 **Geomagnetic field**: Magnetic coordinate system, Magnetic field of magnetic dipole, Magnetic anomaly 2 **Variations of the geomagnetic field**: Century variation, Magnetic field vibration, Magnetic disturbance, magnetic storm. 3 **Basis of magnetic method**: Magnetism of the material, Magnetic measurement methods. 4 **Magnetic fields of simple geometric objects**: The magnetic potential of magnetizes objects. 5 **Magnetic field transformation methods**: Averaging method, Vertical 2^{nd} derivative, Transferring the field up and down. 6 **Qualitative and quantitative analysis magnetic data**: Fourier transform method.
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Tran Vinh Tuan, Dang Van Liet, Magnetic field and magnetic method, VNUHCM, 2013. References: 1 Reynolds, John M, An introduction to applied and environment geophysics, Wiley-Blackwell, 2011. 2 Milsom John, Field geophysics, John Wiley and Sons, 1996. 3 Tran Van Nhac, Nguyen Thanh Van, Theory of potential and fields in geophysics, University of Science HCM, 1997.

107. Gravity Method - PHY10410

<table>
<tr><td>Module name:</td><td colspan="4">Gravity Method</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10410</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7nd semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. TRAN Van Nhac</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. TRAN Van Nhac
MSc. NGUYEN Ngoc Truong</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Theory of potential and field, Mathematical methods for physics</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">- Knowledge: Apply fundamental and in-depth knowledge of mathematical in the analysis of gravity - gravity potential, Apply knowledge of geophysics to study the gravity anomaly and it’s application to study the deep structure of the Earth and determine the Earth’s shape.
- Skills: Gain effective skills for applying gravity field transformation methods in analyzing and interpreting gravity probe data. Using the international literature on new gravity methods.</td></tr>
</table>

	- *Competences:* Ability to analyze and evaluate the data gravity anomaly and structure of the Earth. - *Attitude and ethics:* Be honest
Content	1 **Theoretical basis of the potential field, the Earth's gravity field**: Gravitational field, Earth's gravity field, Geoid and Ellipsoid, Normal gravity formula. 2 **Gravity anomalies and corrections**: Bouguer correction, Topographic correction, Prei correction. 3 **Studying the deep structure of the Earth using gravity anomalies**: Isostatic models, Isostatic correction. 4 **The shape of the Earth**: The Stokes problem, Stokes series, Stokes formula for geoid height. 5 **Gravity field transformation methods**: Averaging method, Transformation on the basis of solutions to the Dirichlet problem, Normalized gradient method. 6 **Types of measuring machines and methods of measuring**:
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Tran Van Nhac, Gravity field, VNUHCM, 2002. References: 1 Tran Van Nhac, Nguyen Thanh Van, Theory of potential and fields in geophysics, University of Science HCM, 1997. 2 Shimbireiv B.P, Theory of the shape of the earth, Nedra Moscow, 1975. 3 Landau Lifshitz, The classical theory of fields, Nedra Moscow, 1967.

108. Geophysical Field Training - PHY10411

Module name:	**Geophysical Field Training**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10411			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th Semester			
Person responsible for the module	PhD Dang Hoai Trung			
Lecturer	PhD Dang Hoai Trung, MSc. NGUYEN Ngoc Truong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Workload	None			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Discussion,	1	Discussion,	Lectures: 1 hours x 15 times	15
			Preparation and Follow up 2 hours x 15 times	30
Field survey, Group Project	2	Field survey, Reports	Practical: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total Workload	135 Hours			
Credit points	2 Credits			
ECTS	4			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% Personal Assignment (20%), Participation and professionalism during field trip (30%), and Final project reports (50%)			
Recommended prerequisites	Magnetic method, Gravity method, Seismic Prospecting			
Related Course	Geophysical Signal Processing			
Module objectives/intended learning outcomes	This course introduces geophysical field techniques, including gravity, magnetic, seismic and electromagnetic methods. Students who complete this module could be achieved the following *- Knowledge: understanding the main principles some geophysical methods such as seismic, gravity, magnetic and electromagnetic method.* *- Skills: The students be able to to operate proficiently basic geophysical instrumentation; to design and carry out geophysical surveys to meet industry needs in mineral, environmental and engineering exploration; to process and interpret data arising from such surveys.*			

	- Competences: The students shall communicate the results of the surveys through professionally written reports and presentations. *- Attitude and ethics: professional responsibility, colleagues, be honest, and community service.*
Content	This module includes the following topics: 1 Applications, Objectives and Limitations of geophysical methods. 2 Planning and Execution of Investigations. 3 Evaluation and Interpretation of field data. 4 Combination of Results of Geophysical Methods.
Study and examination requirements and forms of examination	Assessment method: 1. Self-written assay: Written lab reports on field testing of instruments = 10% 2. Assignment: Field work design at field sites = 10% 3. Project: Participation and professionalism during field trip = 30% 4. Self-written assay: Final fieldwork reports = 50%
Media employed	Text books, slides (power points).
Reading list	Main books: 1. John M. Reynolds (2011), An Introduction to Applied and Environmental Geophysics. John Wiley & Sons Ltd, England. References: 1 Prem V. Sharma (2012), Environmental and Engineering Geophysics, Cambridge University Press, UK. 2 Nguyen Duc Tien (2002), General geophysics, VNUHCM Publishing House, Vietnam. 3 Van N.T., Giang N.V., Trung D.H., Cuong V.A.L. (2012), Ground Penetrating Radar, VNUHCM Publishing House, Vietnam. 4 Yilmaz O (2001). Seismic Data Analysis: Processing, Inversion, and Interpretation of Seismic Data. Doherty SM, editor. United States of America: Society of Exploration Geophysicists. 5 Dieter Vogelsang (1995). Environmental Geophysics. Springer-Verlag Berlin Heidelberg, Germany. 6 Meju MA (1994). Geophysical data analysis: Understanding inverse problem theory and practice. Society of Exploration Geophysicists.

109. Seismic Prospecting - PHY10412

<table>
<tr><td>Module name:</td><td colspan="4">Seismic Prospecting</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10412</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. LE Van Anh Cuong</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. LE Van Anh Cuong</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">PHY10401, PHY10405</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of fundamental seismic definitions (i.e., sources, receivers, field trip setup, seismic data processing and interpretation).
Students who complete this module could be achieved the following:
- Knowledge: Be able to understand and apply seismic theory in earth science and life.
- Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving.</td></tr>
</table>

	- *Competences: Be able to analysis seismic data for understanding geology structures and other geophysical tasks. Have the capacity to learning in the next periods.* - *Attitude and ethics: honesty and responsibility*
Content	This module consists of the following topics: 1 Seismology introduction 2 Seismic reflection and refraction 3 Seismic waves 4 Reflection seismic data processing 5 Refraction seismic data processing 6 Seismic data interpretation
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Textbooks and slides (power points)
Reading list	Main books: 1. Yilmaz O. Seismic Data Analysis: Processing, Inversion, and Interpretation of Seismic Data. Doherty SM, editor. United States of America: Society of Exploration Geophysicists; 2001. References: 1 Margrave GF. Numerical methods of exploration seismology with algorithms in Matlab. CREWES Toolbox Version. 2003;1006. 2 Dang Van Liet, (2004) Numerical Calculus, VNUHCM Publishing House, Vietnam. 3 Le CVA, Harris BD, Pethick AM. New perspectives on Solid Earth Geology from Seismic Texture to Cooperative Inversion. Scientific Reports. 2019;9(1):14737

110. Geophysics Well Logging - PHY10413

<table>
<tr><td>Module name:</td><td colspan="4">Geophysics Well Logging</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10413</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. NGUYEN Hong Bang</td></tr>
<tr><td>Lecturer</td><td colspan="4">Dr. NGUYEN Hong Bang</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Workload</td><td colspan="4">None</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Group Project</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Exercise</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total Workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80%.
• Homework at class and home = 20%,
• Midterm = 30%;
• End semester exam = 50%</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">General Geophysics</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">Students who complete this module could be achieved the following
- Knowledge: Fundamental basic of geophysics well logging; understand the commonly used logging tools; optimum tools and logging programs;
- Skills: Interpretations of the common log measurements; determining the main lithologies.
- Competences: Have the capacity to learning in the next periods.
- Attitude and ethics: professional responsibility, colleagues, be honest, and community service.</td></tr>
</table>

Content	1 Logging objectives. 2 Challenge of borehole geophysics 3 The commonly used logging tools (Gamma Ray; Resistivity; Density; Acoustic; Neutron; and more) 4 Computerized log evaluation. 5 Recommended logging programs.
Study and examination requirements and forms of examination	Assessment method: • Homework Assignment = 30% • Project: Score of Teams Project (Group activities) = 20% • Final test: Score of Personal Final Project = 50%
Media employed	Textbooks, slides (power points).
Reading list	Main books: 1. Phong N.V., Quy H.V. (2004) Geophysics Well Logging. Transport Publishing House, Hanoi, Vietnam. References: 1. Dominique Shapelier. (1992) Well Logging in hydrogeology, A. A. Balkema, Rotterdam, Brookfield. 2. Prem V. Sharma. (2004) Environmental and Engineering Geophysics, Cambridge University Press.

111. GEOGRAPHIC INFORMATION SYSTEM - PHY10414

<table>
<tr><td>Module name:</td><td colspan="4">GEOGRAPHIC INFORMATION SYSTEM</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10414</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PhD NGUYEN Hong Bang</td></tr>
<tr><td>Lecturer</td><td colspan="4">PhD NGUYEN Hong Bang</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Workload</td><td colspan="4">None</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Group Project</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total Workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80%.
• Homework at class and home (30%),
• End semester exam (70%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge of GIS
Students who complete this module could be achieved the following
• Knowledge: understand a basic Geography, structures of data in Gis, geographic information in Gis, Analysis of information of maps, Applications
• Skills: analysis of data
• Attitude and ethics: honesty and responsibility</td></tr>
<tr><td>Content</td><td colspan="4">This module includes the following topics:
1 Fundamental Geography
2 Structures of data in Gis
3 Characteristics of geographic information in Gis
4 Organization of geographic information in Gis
5 Analysis of information of maps in Gis
6 Applications of Gis</td></tr>
</table>

Study and examination requirements and forms of examination	Assessment method: • Assignment: Individual activities = 30% • Final test = 70%
Media employed	Text books, slides (power points).
Reading list	Main books: [1] Pham Duc Huu, GIS Geographic Information System, Hanoi National University Publishing House, 2002. [2] Nguyen Duc Binh, Mapinfo Professional 7.5 User Manual, Agricultural Publishing House, 2007. [3] Nguyen Thanh Tien, Nguyen Dang Cuong, Application of information technology in forest resource management, Thai Nguyen University of Agriculture and Forestry, 2011. [4] Bao Huy, GIS and Vien Tham in forest resource management and environment, Ho Chi Minh City General Publishing House, 2009. [5] Nguyen Kim Loi, Tran Thong Nhat, Le Canh Dinh, Advanced Geographic Information System, Agricultural Publishing House, Ho Chi Minh City, 2007.

112. Geophysical Signal Processing - PHY10415

Module name:	**Geophysical Signal Processing**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10415			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Dr. LE Van Anh Cuong			
Lecturers	Dr. LE Van Anh Cuong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 4 hours x 15 times	60
Total workload	105 Hours			
Credit points	2 Credits			
ECTS	1.5 (Lecture) + 2 (Practice) = 3.5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This module provides basic knowledge of data transformations (i.e., Fourier Transform, noise filters, etc.) and geophysical inversion theory. Students who complete this module could be achieved the following: - *Knowledge: Be able to understand and apply geophysical signal processing in earth science.* - *Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving.*			

	- *Competences: Be able to apply different geophysical strategies to tackle non-uniqueness of the solution in geophysical inversion problem. Have the capacity to learning in the next periods.* - *Attitude and ethics: honesty and responsibility*
Content	This module consists of the following topics: 1 Introduction 2 Statistics 3 Signal Processing 4 Data transformation 5 Geophysical Inversion 6 Joint Geophysical Inversion
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Textbooks and slides (power points)
Reading list	Main books: 1 Meju MA. Geophysical data analysis: Understanding inverse problem theory and practice: Society of Exploration Geophysicists; 1994. 2 Trauth MH, Gebbers R, Marwan N, Sillmann E. MATLAB recipes for earth sciences: Springer; 2007. References: 1 Yilmaz O. Seismic Data Analysis: Processing, Inversion, and Interpretation of Seismic Data. Doherty SM, editor. United States of America: Society of Exploration Geophysicists; 2001. 2 Dang Van Liet, (2004) Numerical Calculus, VNUHCM Publishing House, Vietnam. 3 Le CVA, Harris BD, Pethick AM. New perspectives on Solid Earth Geology from Seismic Texture to Cooperative Inversion. Scientific Reports. 2019;9(1):14737

113. Electromagnetic Method 1 - PHY10416

Module name:	**Electromagnetic Method 1**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10416			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th Semester			
Person responsible for the module	Assoc. Prof. Dr. NGUYEN Thanh Van			
Lecturer	MSc NGUYEN Van Thuan; Assoc. Prof. Dr. NGUYEN Thanh Van			
Language	Vietnamese			
Relation to curriculum	Elective			
Workload	None			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture and seminars	2	Lecture and discussion	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Group projects	1	Case studies and report writing	Practical: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total Workload	180 Hours			
Credit points	3 Credits			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (according to ITB regulation). • Homework at class and home (20%) • Mid semester exam (30%) • End semester exam (50%)			
Recommended prerequisites	General physics 2 (Electromagnetic - Optics); Electrodynamics.			
Related Course	None			
Module objectives/intended learning outcomes	Students who complete this module could be achieved the following *- Knowledge: Principles of electrical methods; operation of resistivity meters; interpretation of electrical soundings and electrical imaging.* *- Skills: Data acquisition; data processing and interpretation.* *- Competences: Students are able to field survey; have the capacity to learning in the next periods.*			

	- *Attitude and ethics: professional responsibility, colleagues, be honest, and community service.*
Content	1 Principles of electrical methods: relation between resistivity and geological information; principle of vertical electrical sounding and resistivity imaging. 2 Data acquisition: Survey design; field measurements on test site. 3 Data processing and interpretation: principle of equivalence; use of 1D and 2D inversion software for interpretation.
Study and examination requirements and forms of examination	Assessment method: • Assignment: Individual activities = 20% • Midterm test = 30% • Final test = 50%
Media employed	Text books, slides (power points), and ERT meters.
Reading list	Main books: 1. Nguyen Duc Tien (2001). General Geophysics. VNUHCM Publishing House, Vietnam. 2. Nguyen Thanh Van (2000). Electrical Prospecting. VNUHCM Publishing House, Vietnam. References: 1 W.M. Telford, L.P. Geldart, R.E. Sheriff, D.A. Keys. (1990) Applied Geophysics. Cambridge, UK. 2 M.H. Loke (2004). 2-D and 3-D electrical imaging surveys. Geotomo Software, Malaysia.

114. Electromagnetic Method 2 - PHY10417

Module name:	**Electromagnetic Method 2**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10417			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th Semester			
Person responsible for the module	Assoc. Prof. NGUYEN Thanh Van			
Lecturer	Assoc. Prof. NGUYEN Thanh Van			
Language	Vietnamese			
Relation to curriculum	Elective			
Workload	None			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Group Project	2	Discussion, Exercise	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total Workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) Final score is evaluated based on assignment and presence (20%), mid semester exam (30%), and end semester exam (50%)			
Recommended prerequisites	PHY10416			
Related Course	None			
Module objectives/intended learning outcomes	Students who complete this module could be achieved the following *- Knowledge: Be able to understand the propagation and reflection of electromagnetic waves, the advantage and disadvantage of different electromagnetic methods (such as ground penetrating radar, VLF, ...)* *- Skills: Be able to use some GPR equipments to collect, process and interpret data.* *- Competences: Be able to do field survey.* *- Attitude and ethics: honesty and responsibility*			

Content	1 GPR method 2 Transfer field method 3 VLF method 4 Magnetotelluric method 5 Field survey
Study and examination requirements and forms of examination	Assessment method: • Homework assignment (30%) • Project:: Group activities (20%) • Final test (50%)
Media employed	Textbooks, slides (power points)
Reading list	Main books: 1. Van N.T., Giang N.V., Trung D.H., Cuong V.A.L. (2012), Ground Penetrating Radar, NXB ĐHQG TP.HCM. 2. W.M. Telford, L.P. Geldart, R.E. Sheriff, D.A. Keys, (1976), Applied Geophysics, Cambridge Publishing, England. References: 1. Van N.T., Dinh N.K. (2004) Electromagnetic Field, VNUHCM Publishing House, Vietnam. 2. Daniels D.J (1996) Surface Penetrating Radar, Michael Faraday House, UK. 3. Jol H. M, (2009) Ground Penetrating Radar: Theory and Applications, Oxford, UK 4. Sandmeier K.J, REFLEX version 4.2, Copyright 1998.

115. Environmental Geophysics - PHY10418

<table>
<tr><td>Module name:</td><td colspan="4">Environmental Geophysics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10418</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">PhD Dang Hoai Trung</td></tr>
<tr><td>Lecturer</td><td colspan="4">PhD Dang Hoai Trung</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Elective</td></tr>
<tr><td>Workload</td><td colspan="4">None</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Group Project</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Exercise
Field survey</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total Workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">Minimum attendance at lectures is 80%
Homework and Assignment (20%), Teams Project (Midterm) (30%), and End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">General Geophysics</td></tr>
<tr><td>Related Course</td><td colspan="4">Magnetic method, Gravity method, Seismic Prospecting</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course covers the theory of some environmental geophysical methods used in studying environment. This will be followed by field measurements, data processing, data analysis and presentation of the results to the class.
Students who complete this module could be achieved the following
- Knowledge: Ability to understand the main principles of radioactivity; describe how to apply geophysical methods to the investigation of near-surface physico-chemical phenomena which are likely to have (significant) implications for the management of the local environment.
- Skills: The students be able to perform simple geophysical computations. They should know how to do geological interpretations based on geophysical data.</td></tr>
</table>

	- Competences: The students shall have an overview over possibilities and limitations of the geophysical methods used in environmental studies. *- Attitude and ethics: be honest, and community service.*
Content	This module includes the following topics: 1 An introduction to environmental geophysics. 2 Radioactivity 3 Geophysical methods in environmental geophysics 4 Planning a geophysical survey and geophysical survey design.
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books, slides (power points).
Reading list	Main books: 1. John M. Reynolds (2011), An Introduction to Applied and Environmental Geophysics. John Wiley & Sons Ltd, England. References: 1 Prem V. Sharma (2012), Environmental and Engineering Geophysics, Cambridge University Press, UK. 2 Nguyen Duc Tien (2002), General geophysics, VNUHCM Publishing House, Vietnam. 3 Dieter Vogelsang (1995). Environmental Geophysics. Springer-Verlag Berlin Heidelberg, Germany.

116. Electrical Prospecting - PHY10419

Module name:	**Electrical Prospecting**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10419			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th Semester			
Person responsible for the module	MSc NGUYEN Van Thuan			
Lecturer	MSc NGUYEN Van Thuan; Assoc. Prof. Dr. NGUYEN Thanh Van			
Language	Vietnamese			
Relation to curriculum	Elective			
Workload	None			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Lecture and seminars	2	Lecture and discussion	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Group projects	1	Case studies and report writing	Practical: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total Workload	180 Hours			
Credit points	3 Credits			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80%, • Homework at class and home = 20%, • Mid semester exam = 30%, • End semester exam = 50%			
Recommended prerequisites	General physics 2 (Electromagnetic - Optics); Electrodynamics.			
Related Course	None			
Module objectives/intended learning outcomes	Students who complete this module could be achieved the following *- Knowledge: Principles of electrical methods; operation of resistivity meters; interpretation of electrical soundings and electrical imaging.* *- Skills: Data acquisition; data processing and interpretation.*			

	- Competences: Students are able to doing field survey. Ability in organization, leadership, planning, teamwork. Have the capacity to learning in the next periods. *- Attitude and ethics: Understand professional culture, professional ethics, colleagues, be honest, and community service.*
Content	1 Principles of electrical methods: relation between resistivity and geological information; principle of vertical electrical sounding and resistivity imaging. 2 Data acquisition: Survey design; field measurements on test site. 3 Data processing and interpretation: principle of equivalence; use of 1D and 2D inversion software for interpretation.
Study and examination requirements and forms of examination	Assessment method: • Assignment: Individual activities = 20% • Midterm test = 30% • Final test = 50%
Media employed	Text books, slides (power points), and ERT meters.
Reading list	Main books: 1 Tien N.D. (2001) General of Geophysics. VNUHCM Publishing House, Vietnam. 2 Van N.T. Electrical Prospecting. VNUHCM, Vietnam. References: 3 W.M. Telford, L.P. Geldart, R.E. Sheriff, D.A. Keys. (1990) Applied Geophysics. Cambridge, UK. 4 M.H. Loke. (2004) 2-D and 3-D electrical imaging surveys. Geotomo Software, Malaysia.

117. Ground Penetrating Radar method - PHY10420

<table>
<tr><td>Module name:</td><td colspan="5">Ground Penetrating Radar method</td></tr>
<tr><td>Module level, if applicable</td><td colspan="5">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="5">PHY10420</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="5">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="5">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="5">7th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="5">PhD Dang Hoai Trung</td></tr>
<tr><td>Lecturer</td><td colspan="5">PhD Dang Hoai Trung</td></tr>
<tr><td>Language</td><td colspan="5">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="5">Elective</td></tr>
<tr><td>Workload</td><td colspan="5">None</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="3">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Group Project</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Exercise
Field survey</td><td colspan="2">Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td colspan="2">Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total Workload</td><td colspan="5">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="5">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="5">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="5">Minimum attendance at lectures is 80%
Homework and Assignment (20%); Teams Project (Midterm) = 30%; Personal Final Project = 50%</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="5">General physics 2 (Electromagnetic - Optics); Electrodynamics; General Geophysics</td></tr>
<tr><td>Related Course</td><td colspan="5">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="5">Students who complete this module could be achieved the following:
- Knowledge: Ability to describe wave nature of electromagnetic fields; understand the pros and cons of GPR; and explain the operating principle and the applications of GPR.
- Skills: Ability to use some GPR machines, process and interpretate GPR data; and plan a complete survey based on the specific task.
- Competences: Ability to analyze and evaluate GPR field results.
- Attitude and ethics: professional responsibility, colleagues, be honest, and community service.</td></tr>
</table>

Content	1 Electromagnetic principles of Ground Penetrating Radar: GPR basic principles; Wave nature of electromagnetic fields 2 Operating principle of Ground Penetrating Radar: Signal measurement; Survey methodology 3 Ground Penetrating Radar data processing, modelling and analysis: Background and practical principles of GPR data processing; Basic GPR data processing steps; Numerical modelling 4 Field survey: planning; surveying in fields; analysing data and doing report.
Study and examination requirements and forms of examination	Assignment method: Project: Score of Personal Final Project = 50% Project: Score of Teams Project = 30% Homework Assignment = 20 %
Media employed	Text books, slides (power points), and GPR machines
Reading list	Main books: 1. Van N.T., Giang N.V., Trung D.H., Cuong V.A.L. (2012), Ground Penetrating Radar, VNUHCM Publishing House, Vietnam. References: 1. Daniels D.J (1996), Surface Penetrating Radar, Michael Faraday House, UK. 2. Jol H. M (2009), Ground Penetrating Radar: Theory and Applications, Oxford, UK.

118. Quantum Mechanics 2 - PHY10501

<table>
<tr><td>Module name:</td><td colspan="4">Quantum Mechanics 2</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10501</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th Semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. NGUYEN Huu Nha</td></tr>
<tr><td>Lecturer</td><td colspan="4">Dr. NGUYEN Huu Nha</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total Workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment and presence (30%), mid semester exam (30%), and end semester exam (40%))</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Quantum Mechanics I, Functions of Complex Variables, Calculus 2B</td></tr>
<tr><td>Related Course</td><td colspan="4">Theory of Solid State, Statistical Physics</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course covers quantum physics with applications from modern physics. Topics covered in this course include the general formalism of quantum mechanics, mathematical foundations, systems of identical particles, approximation methods such as the perturbation theory, variational method, WKB approximation, scattering theory.

Course Learning Outcomes:
1. Understand the properties of mathematical foundations of quantum mechanics: inner product, bra-ket, Hermit operators, state space, C.S.C.O, tensor product,
2. Understand the general formalism of quantum mechanics: statistical interpretation, evolution operator, Heisenberg formalism,</td></tr>
</table>

	3. Solve the problems involving the identical particles: exchange effect, permutation, statistics for identical particles, second quantization, field operators. 4. Solve the time-independent Schrodinger equation for perturbative cases: perturbation theory, Feynman-Hellmann theorem, fine structure of hydrogen, electron in electric/magnetic fields, 5. Solve the time-independent Schrödinger equation for other approximative cases : variational method, helium, H_2 ion, WKB method, . 6. Understand the scattering theory and solve for some simple potentials: phase shift, Born approximation, • Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below: - Logical thinking, problem solving. - Communication. - Self-study, lifelong self-study. - Using specialized English terminology. - Responsibility, be honest; growth mindset; open-mindedness.
Content	1 Mathematical foundations of Quantum Mechanics 2 General formalism of Quantum Mechanics 3 Systems of identical particles 4 Approximation methods: perturbation theory, variational method, WKB approximation 5 Scattering theory
Study and examination requirements and forms of examination	Assessment method: 1. Paper Assignment 2. Midterm Exam 3. Final Exam FINAL ASSESSMENT • Final test: Score of Final Examination = 40% • Midterm test: Score of midterm examination = 30% • Homework assignment = 30 %
Media employed	Textbooks, slides (power points)
Reading list	Main books: • Griffiths, Introduction to Quantum Mechanics, 3ed, CUP, 2018. References: • Cohen-Tannoudji et al, Quantum Mechanics, vols 1-2, 2nd edition, Wiley, 2019. • Shankar, Principles of Quantum Mechanics, 2nd edition, Plenum, 1994. • Baston Zwiebach, lecture notes. • David Tong, lecture notes.

119. Theory of Solid State - PHY10502

<table>
<tr><td>Module name:</td><td colspan="4">Theory of Solid State</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10502</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Lecturer</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures).
• Score: Homework (30%), Midterm exam (30%), End semester exam (40%).</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Solid State Physics, Quantum Mechanics I & II, Statistical Physics, Electrodynamics, Theoretical Mechanics.</td></tr>
<tr><td>Related Course</td><td colspan="4">Theory of many-particle systems, Semiconductor Optics.</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">The course provides an introduction to the theory of solid state physics. Based on knowledge about solid state phenomena and on theoretical concepts developed in quantum mechanics/statistical physics, the student will be able to explain theoretical models for the properties of solids.

Course Learning Outcomes:
1 Show an understanding of the basic concepts and the theoretical models in solid – state theory.</td></tr>
</table>

	2 Introduce the Hamiltonian (H) of a solid, and apply it (H) to various approximated models: Hartree – Fock approximation (HFA), Jelium model/plasma, electrons in the periodic potential, lattice dynamics, electron – phonon interaction, magnons, light – matter interaction. 3 Derive the H (in the language of creation and annihilation operators) for the approximated models and calculate/explain the ground state energy (in HFA), the dielectric function, and the screened Coulomb potential, the energy band structure, superconductivity, excitons. • Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below: - Logical thinking, Critical thinking and problem solving; scientific research. - Teamwork, Communication. - Self-study, Lifelong self-study. - Using specialized English terminology. - Responsibility, be honest; growth mindset.
Content	This module includes the following topics: 1 The Solid as a Many-Particle Problem 2 Electron gas 3 Electrons in a Periodic Potential 4 Lattice Dynamics: Phonons 5 Electron – Phonon Interaction 6 Spin Waves: Magnons 7 Light – Matter interaction: Excitons
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment (15%) 2. Assignment: Groupwork (15%) 3. Midterm test (30%) 4. Final test (40%)
Media employed	Text books and slides (power points)
Reading list	Main books: 1. N. W. Ashcroft and , N. D. Mermin, *Solid State Phyics*, Brooks Cole, 1976. 2. U. Rössler, *Solid-State Theory: An Introduction*, Spring-Verlag, 2009. 3. H. Haug & S. Koch, Quantum Theory of the Optical and Electronic Properties of Semiconductors, 4th Ed., World Scientific, 2004. References: 1. J. M. Ziman, *Principles of the Theory of Solids*, Cambrige University Press, London, 1972.

120. Groups Theory - PHY10503

<table>
<tr><td>Module name:</td><td colspan="4">Groups Theory</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized Subject</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10503</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Lecturer DANG Ngoc Chau</td></tr>
<tr><td>Lecturers</td><td colspan="4">Lecturer DANG Ngoc Chau</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Elective</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion, Debate, Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework (20%)
● Mid semester exam (30%)
● Final exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Linear Algebra</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">The module provides a detailed knowledge of Linear Lie Groups, Lie Algebras, Representations of Lie Algebras and their applications in Particle Physics.

Students who complete the module could achieve the following:</td></tr>
</table>

	- Knowledge: Understanding Lie Groups, Lie Algebras and their Representations, Irreducible Representations, Tensor Products and Decompositions, SU(2) and Isospin, SU(3) and Quarks, Hadrons and Eightfold Way *- Skills: Self-study, group work.* *- Competences: Have a basic knowledge of symmetries in physics, application of group symmetries to various physical systems from classical to quantum.* *- Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	The module includes the following topics: 1. Basic concepts of Groups Theory 2. Exponential and Logarithm of a matrix 3. Lie Groups and Lie Algebras of Matrices 4. Representations of Lie Algebras 5. SU(2) and Isospin, Baryon numbers and Strangeness 6. Irreducible Reps of SU(2) and Decompositions 7. Fundamental Reps of SU(3) and Quarks 8. Tensor Products and Decompositions of SU(3) 9. Hadrons and Eightfold Way
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 30% 2. Midterm test= 30% 4. Final test = 40%
Media employed	Lecturer's course (PDF file) and slides (power points)
Reading list	Main books: 1. Dang Ngọc Chau, Groups Theory (Lectures Course in Vietnamese), 2018. References: 2. Willard Miller Jr, Symmetry Groups and Their Applications, Academic Press 1st edition 1972. 3. Walter Greiner, Berndt Muller, Quantum Mechanics: Symmetries, Springer 2nd edition, 1994. 4. Howard Georgi, Lie Algebras in Particles Physics, Second Edition, Westview, 1999.

121. Electromagnetic Field Theory - PHY10504

<table>
<tr><td>Module name:</td><td colspan="4">Electromagnetic Field Theory</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10504</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. Vo Quoc Phong</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. Vo Quoc Phong
Dr. Le Duc Ninh
Dr. Truong Ba Ha</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework at class and home (30%),
● Mid semester exam (30%),
● End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Theoretical Mechanics; Electrodynamics</td></tr>
<tr><td>Related Course</td><td colspan="4">Quantum Mechanics 2</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">In this module: Presenting two principles of special relativity in the context of the principle of least action; considering the interaction of charged particles with the electromagnetic field; derivation of maxwell equations and electromagnetic waves.</td></tr>
</table>

	Students who complete this module could be achieved the following: - *Knowledge: Have a complete knowledge of the Maxwell equations and electromagnetic waves; understand and analyze more than the special relativity.* - *Skills: group work, self-study and problem solving.* - *Competences: Have a basic knowledge of electrodynamics; apply and analyze them in the radiation of electromagnetic fields.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. The Principle of Relativity 2. Relativistic Mechanics 3. Charges in Electromagnetic fields 4. The Electromagnetic field Equations 5. Plane Waves
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. L.D Landau, E. M. Lifshitz, The Classical Theory of Fields, Fourth Revised English Edition, Butterworth Heinemann, 1980. References: 2 Jackson, John D., Classical Electrodynamics, 3rd Wiley, 1998. 3 David J. Griffiths, Introduction to Electrodynamics, 3rd Edition, Prentice-Hall, Inc., 1999.

122. Theory of Many-Particle Systems - PHY10505

Module name:	**Theory of Many-Particle Systems**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10505			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th Semester			
Person responsible for the module	Professor NGUYEN Quoc Khanh			
Lecturer	Professor NGUYEN Quoc Khanh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate	3	Discussion, Debate, Exercise	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total Workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% (according to ITB regulation). Final score is evaluated based on assignment and presence (30%), mid semester exam (30%), and end semester exam (40%))			
Recommended prerequisites	Statistical Physics, Electrodynamics, Quantum Mechanics II, Theory of Solid State			
Related Course	Quantum Field Theory			
Module objectives/intended learning outcomes	*This course covers the concepts and physical pictures behind various phenomena that appear in many-body systems. The methods used are second-quantization method and Green's function method. These methods are applied to calculate the energy of many-body systems and the characteristic quantities in dielectric function formalism such as structure factor, excited spectra and dielectric function.* • Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below: - Logical thinking, problem solving. - Communication. - Self-study, lifelong self-study.			

	- Using specialized English terminology. - Responsibility, be honest; growth mindset.
Content	1 Second-quantization method 2 Zero temperature Green's function formalism 3 Hartree-Fock Approximation (Electron gas in uniform positive background) 4 Dielectric function formalism
Study and examination requirements and forms of examination	Assessment method: 1. Paper Assignment 2. Midterm Exam 3. Final Exam FINAL ASSESSMENT • Final test: Score of Final Examination = 40% • Midterm test: Score of midterm examination = 30% • Homework assignment = 30 %
Media employed	Text books, slides (power points)
Reading list	Main books: • Nguyen Quoc Khanh, Theory of many-particle systems (in Vietnamese), VNUHCM Publishing House, 2000. • Fetter & Walecka, Quantum Theory of Many-Particle Systems, Dover, 2003: chapters 1, 3, 4. • Pines D., Elementary excitations in solids, Westview, 1999: chapter 3. References: 1 Mahan G.D, Many Particle Physics, 3ed, Plenum, 2000. 2 Tran Minh Tien, Fundamentals of many-particle physics (in Vietnamese), Natural Science and Technology Publishing House, Vietnam, 2017. 3 Mattuck, A guide to Feynman diagrams in the many-body problems, Dover, 1976.

123. Theory of Gravitational field - PHY10506

Module name:	**Theory of Gravitational field**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10506			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	Dr. Vo Quoc Phong			
Lecturers	Dr. Vo Quoc Phong Dr. Dao Thi Nhung			
Language	Vietnamese			
Relation to curriculum	Elective			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 6 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework at class and home (20%), ● Mid semester exam (30%), ● End semester exam (50%)			
Recommended prerequisites	Calculus 1B, 2B; General physics 1,2,3; Theoretical Mechanics; Electrodynamics			
Related Course	Cosmology, Quantum Field Theory			
Module objectives/intended learning outcomes	In this module: Presentation of the concepts of physics in a curved spacetime, the gravitational equations of Einstein. Applications of this theory in Cosmology (The Cosmic inflation and expansion problem). Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand the gravitational field or the general relativity and explain fundamental problems in cosmology.* - *Skills: group work, self-study, paper reading.* - *Competences: Having a basic knowledge of gravitational fields; applying and evaluating them in the field of gravitational fields or cosmology.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. The basic concepts of spacetime and Curvature 2. The Gravitational field in a curved spacetime 3. The Gravitational field equations 4. Gravitational collapse and the field of gravitating bodies 5. Gravitational energy 6. Cosmology models
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Bernard Schurtz, A First Course in General Relativity, Cambridge University Printing House, Cambridge University Press, New York, USA, 2016. References: 2 Sean M. Carroll, Spacetime and Geometry: An Introduction to General Relativity, Addison Wiley, 2004. 3 L.D Landau, E. M. Lifshitz, The Classical Theory of Fields, Fourth Revised English Edition, Butterworth Heinemann, 1987

124. Quantum Field Theory - PHY10507

Module name:	**Quantum Field Theory**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10507			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	Dr. Phan Hong Khiem			
Lecturers	Dr. Nguyen Chi Linh Dr. Phan Hong Khiem Dr. Le Duc Ninh Dr. Dao Thi Nhung Dr. Vo Quoc Phong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework at class and home (20%), ● Mid semester exam (30%), ● End semester exam (50%)			
Recommended prerequisites	Theoretical Mechanics; Electrodynamics			
Related Course	Quantum Mechanics 1, Quantum Mechanics 2			
Module objectives/intended learning outcomes	This module covers the establishment and quantization of fields; provides a basic understanding of the calculation of quantum interactions. This module provides the Feynman diagram method for interactions in the perturbation theory.			

	Students who complete this module could be achieved the following: - *Knowledge: Understanding and analyzing fields and the quantization process of fields.* - *Skills: group work, self-study, paper reading and problem solving.* - *Competences: Analyzing the methods and applying them in doing research in The Particle Physics.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. Introduction of fields. 2. The Classical field theory: real and complex scalar fields; The Dirac, Vector fields. 3. The quantization of fields. 4. The perturbation theory and its application to the calculation of cross-sections of interactions. 5. The Feynman diagram method.
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Michael M. Peskin and Daniel V. Schroder, An Introduction to Quantum Field Theory, Westview, 2016. References: 2. F. Mandl and G. Shaw, Quantum Filed Theory, Wiley, 1993. 3. Anthony Zee, Quantum field theory in a nutshell, Princeton University Press, 2010.

125. Biophysics - PHY10508

Module name:	**Biophysics**
Module level, if applicable	Specialize
Code, if applicable	PHY10508
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is	6th semester

taught				
Person responsible for the module	Dr. Nguyen Ha Hung Chuong			
Lecturers	Dr. Nguyen Ha Hung Chuong Dr. Ngo Son Tung Dr. Nguyen Thi Anh Thu			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 6 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	Statistical Physics, Electrodynamics, Quantum Mechanics 1			
Related Course	Theory of many-particle systems			
Module objectives/intended learning outcomes	This module will gain basic knowledge about the basic components that make up proteins, interactions in proteins, interactions of proteins with the environment, and structural forms of proteins. Students who complete this module could be achieved the following: - *Knowledge: Having basic knowledge of proteins; understanding and analyzing interactions among them.* - *Skills: group work, self-study, paper reading and problem solving.*			

	- *Competences: Having a basic knowledge of proteins and doing research in Biophysics and simulation of interactions.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. Overview of proteins, Functions of proteins 2. Amino acids: the structure determines the function of proteins, peptide bonds, covalent bonds and quantum mechanics. 3. Van der Waals interactions, Ramachandran diagrams of proteins 4. Water and hydrogen bonds in proteins 5. Hydrophobic effect in protein structure 6. Electrostatic interactions in proteins 7. Secondary structure of proteins
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: **1.** Alexei V. Finkelstein, Oleg Ptitsyn, Protein Physics: a Course of Lectures, Academic Press, 2002. References: **2.** Kim Sneppen, Giovanni Zocchi, Physics in Molecular Biology, Cambridge University Press, 2005. **3.** Tom A. Waigh, Applied Biophysics, John Wiley & Sons, 2007.

126. Computational Methods in Theoretical Physics - PHY10509

<table>
<tr><td>Module name:</td><td colspan="4">Computational Methods in Theoretical Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10509</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Lecturer</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="3">Teaching,
Discussion,
Debate.</td><td rowspan="3">3</td><td rowspan="3">Discussion,
Debate,
Practice,
Exercise.</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Pracitce: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">150 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures).
• Score: Homework (30%), Midterm exam (30%), End semester exam (40%).</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">General Physics, Calculus I & II, Solid State Physics, Quantum Mechanics I & II, Statistical Physics, Electrodynamics, Theoretical Mechanics.</td></tr>
<tr><td>Related Course</td><td colspan="4">Semiconductor Optics, Elementary Particles.</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course provides an introduction to computational methods in solving problems in physics. It introduces numerical methods and their implementation, together with methods of linear algebra. These computational methods are applied to various problems in physics, including the</td></tr>
</table>

	modelling of classical physical systems to quantum systems. Course Learning Outcomes: 1 Identify modern programming methods and describe the extent and limitations of computational methods in physics 2 Recognize and describe the characteristics of various numerical methods. 3 Formulate and computationally solve a selection of problems in classical/quantum physics 4 Learn and use the basics of scientific, numerical simulation and modeling. 5 Interpret and analyze data visually, both during and after computation. • Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below: - Logical thinking, critical thinking and problem solving; scientific research. - Teamwork, communication; planning. - Self-study, lifelong self-study. - Using specialized English terminology. - Responsibility, be honest; growth mindset; open-mindedness.
Content	This module includes the following topics: 1 Apply Maple to solve problems in physics 2 Differentiation and Integration 3 Trial-and-Error Searching 4 Solving Differential Equations 5 Differential Equation Applications 6 Partial Differential Equations (Electrostatics, Heat Flow, Wave/ Strings/ Membranes) 7 Monte Carlo: Randomness,Walks, and Decays 8 Thermodynamic Simulations: Ising Model 9 Molecular Dynamics Simulations
Study and examination requirements and forms of examination	Assessment method: 1 Projects (15%) 2 Assignment: Groupwork (15%) 3 Midterm test (30%) 4 Final test (40%)
Media employed	Text books and slides (power points)
Reading list	Main books: 1 Rubin H. Landau, Manuel Jose Paez, *Computational Problems for Physics - With Guided Solutions Using Python*, CRC Press, 2018. 2 Rubin H. Landau, Manuel J. Páez, Cristian C. Bordeianu,

	Computational Physics, Problem Solving with Computers, John Wiley & Sons, 2007. References: 1 T. Pang, *An Introduction to Computational Physics*, Cambridge University Press, 2006. 2 K. Binder, D. W. Heermann, *Monte Carlo Simulation in Statistical Physics*, Springer, 2002.

127. Semiconductor Optics - PHY10510

<table>
<tr><td>Module name:</td><td colspan="4">Semiconductor Optics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10510</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Lecturer</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Elective</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures).
• Score: Homework (30%), Midterm exam (30%), End semester exam (40%).</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Theory of Solid State, Quantum Mechanics II, Quantum Field Theory, Computational physics.</td></tr>
<tr><td>Related Course</td><td colspan="4">Quantum Optics</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course introduces the basic theory of optical and electronic properties of semiconductors and semiconductor devices. The basic phenomena of optics of semiconductors are discussed in this module.

Course Learning Outcomes:
1 Demonstrate an understanding of basic concepts in semiconductor optics.</td></tr>
</table>

	2 Distinguish linear and nonlinear optical properties of semiconductors. 3 Derive and solve the semiconductor Bloch equations numerically (for different approximations); explain/ predict solutions for different cases. • Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below: - Logical thinking, critical thinking and problem solving; scientific research. - Team collaboration, teamwork, communication. - Self-study, lifelong self-study. - Using specialized English terminology. - Responsibility, be honest; growth mindset.
Content	This module includes the following topics: 1 Basic concepts in Optical Response 2 Mesoscopic Semiconductor Structures 3 Free Carrier Transitions 4 Excitons. Polaritons 5 Semiconductor Bloch Equations 6 Femtosecond Spectroscopy 7 Laser – Semiconductor Laser
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 15% 2. Assignment: Individual activities = 15% 3. Midterm test= 30% 4. Final test= 40%
Media employed	Text books and slides (power points)
Reading list	Main books: • H. Haug & S. Koch, *Quantum Theory of the Optical and Electronic Properties of Semiconductors*, 4th Ed., World Scientific, 2004. • N. Peyghambarian, S. Koch, A. Mysyrowicz, *Introduction to Semiconductor Optics*, Prentice Hall, 1993. References: • C. F. Klingshirn, *Semiconductor Optics*, 3rd Ed., Springer, 2006. • 4. M. Kira, S. Koch, *Semiconductor Quantum Optics*, Cambridge University Press, 2012.

128. PATH INTEGRAL - PHY10511

Module name:	**PATH INTEGRAL**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10511			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Dr. Vo Quoc Phong			
Lecturers	Dr. Vo Quoc Phong Dr. Nguyen Huu Nha Dr. Dao Thi Nhung			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 6 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	Theoretical Mechanics; Quantum Mechanics 1			
Related Course	Quantum Mechanics 2			
Module objectives/intended learning outcomes	This module provides the Feynman view of Quantum Mechanics, the laws of motion in quantum mechanics, Schrodinger equations, perturbation methods and scattering problems from the perspective of path integrals.			

	Students who complete this module could be achieved the following: - *Knowledge: Understanding the methods of path integrals and explaining fundamental problems in Quantum Mechanics.* - *Skills: group work, self-study, paper reading and problem solving.* - *Competences: Having an understanding of the connection problem between Quantum and classical mechanics, and analyzing problems in the field of quantization by the path integral methods.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. The Fundamentals Concepts of Quantum Mechanics 2. The Quantum-mechanics Law of Motion 3. Developing the Concepts with Special Examples 4. Schrodinger Description of Quantum Mechanics 5. Measurements and Operators 6. The Perturbation Method in Quantum Mechanics
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Richard P. Feynman, Albert R. Hibbs, Quantum Mechanics and Path integrals, 1st ED, Dover Publications, 2010. References: 2 R. Shankar, Principles of Quantum Mechanics, 2nd ED, Plenum Press, 1994 3 Zinn Justin, J., Path Integrals in Quantum Mechanics, The Oxford University Press, 2004.

129. Theory of Particle Physics - PHY10512

<table>
<tr><td>Module name:</td><td colspan="4">Theory of Particle Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialize</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10512</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. Phan Hong Khiem</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. Nguyen Chi Linh
Dr. Phan Hong Khiem
Dr. Le Duc Ninh
Dr. Dao Thi Nhung
Dr. Vo Quoc Phong</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework at class and home (20%),
• Mid semester exam (30%),
• End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Quantum Field Theory, Quantum Mechanics 1, Quantum Mechanics 2</td></tr>
<tr><td>Related Course</td><td colspan="4">Path Integral</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module presents the fundamental properties of elementary particles and the three interactions between them (strong, weak, electromagnetic interaction). This module also presents the standard model which unifies three interactions and phenomena in this model.</td></tr>
</table>

	Students who complete this module could be achieved the following: - *Knowledge: Having a complete knowledge of elementary particles and analyzing the electroweak interactions and phenomena of Standard model.* - *Skills: group work, self-study, paper reading and problem solving.* - *Competences: Having methods and techniques in doing research in The Particle Physics.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. Introduction of the module. 2. Mass spectra and properties of elementary particles. 3. Overview of Quantum Chromodynamics (QCD) theory. 4. Standard Model of elementary particles. 5. An overview of the Standard Model phenomenology at the accelerators (LHC, ILC, etc.).
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. F. Halzen and A. D. Martin, Quarks and Leptons: An Introductory Course in Modern Particle Physics, John Wiley & Sons, Hoboken, 1984. References: 2. F. Mandl and G. Shaw, Quantum Filed Theory, Wiley, 1993. 3. Bettini, Introduction to Elementary Particle Physics, Cambridge University Press, 2016 4. Mark Thomson, Modern Particle Physics Cambridge University Press, 2013.

130. Generalized Functions and Green Functions - PHY10513

<table>
<tr><td>Module name:</td><td colspan="4">Generalized Functions and Green Functions</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized Subject</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10513</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7st semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Lecturer DANG Ngoc Chau</td></tr>
<tr><td>Lecturers</td><td colspan="4">Lecturer DANG Ngoc Chau</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">120 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework (20%)
● Mid-semester exam (30%)
● Final exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Calculus 1B, Calculus 2B, Functions of a Complex Variable.</td></tr>
<tr><td>Related Course</td><td colspan="4">Linear Algebra</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">The module provides a detailed knowledge of Distributions (Generalized Functions) in one and multiple dimensions, Generalized Solutions (Green Functions) of ODEs, Laplace equation and Klein-Gordon equation.</td></tr>
</table>

	Students who complete the module could achieve the following: - *Knowledge: Understanding generalized functions, generalized Fourier transform, Green's functions of ODEs, Laplace equation and Klein-Gordon equation.* - *Skills: Self-study, group work.* - *Competences: Having a knowledge of distribution theory to analyzing problems in electromagnetic theory and quantum theory.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	The module includes the following topics: 1. Distributions 2. Generalized derivatives 3. Integral of distributions 4. Green's functions of ODEs 5. Distributions in 3-dimension and 4-spacetime 6. Fourier transforms and generalized Fourier transforms 7. Green's functions for Laplace operator 8. Green's functions for Klein-Gordon operator
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 30% 2. Midterm test = 30% 4. Final test = 40%
Media employed	Lecturer's course (PDF file) and slides (power points)
Reading list	Main books: 1. Dang Ngọc Chau, Generalized Functions and Green's Functions (Lectures Course in Vietnamese), 2018. References: 2. D.H.Griffel, Applied Functional Analysis, Dover Publications, Inc. Mineola, New York, 2002. 3. Ram P. Kanwal, Generalized Functions: Theory and Applications, Springer Science + Business Media New York, 2004.

131. Symmetries in Physics - PHY10514

Module name:	**Symmetries in Physics**
Module level, if applicable	Specialize
Code, if applicable	PHY10514
Subtitle, if applicable	None
Courses, if applicable	None

<table>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. Vo Quoc Phong</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. Vo Quoc Phong
Dr. Nguyen Huu Nha
Mr. Dang Ngoc Chau</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion, Debate, Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework at class and home (20%),
● Mid semester exam (30%),
● End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">General physics 1,2,3; Theoretical Mechanics; Electrodynamics, Quantum Mechanics 1</td></tr>
<tr><td>Related Course</td><td colspan="4">Group theory, Quantum Mechanics 2</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">In this module: Presenting the basic symmetries in Physics; Considering group symmetries and invariances of Lagrange or Hamiltonian; Calculating the symmetries in the classical and quantum mechanics.

Students who complete this module could be achieved the following:
- Knowledge: Be able to understand and analyze symmetries or invariances in Physics.
- Skills: group work, self-study, paper reading and problem solving.</td></tr>
</table>

	- *Competences: Having a basic knowledge of symmetries and applying them in the Quantum field theory and Particles Physics.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1. The power of Symmetries, from and beyond Physics 2. Symmetry and invariance in Physics 3. Symmetry in Classical Physics 4. Symmetry in Quantum Physics
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Amaury Mouchet, Symmetries in Physics- Transformations and invariances, Lectures in Ho Chi Minh city University of Science, December 12th- 20th 2016. References: 2. Howard Georgi, Lie Algebras in Particles Physics, Second Edition, Westview, 1999. 3. Cornwell J. F., Group Theory in physics, Academic Press, London, 2 vols, 1984. 4. Robert T. Sharp, Pavel Winternitz, J. Harnad, C. S. Lam, J. Patera, Symmetry in Physics, Amer Mathematical Society, 2004.

132. Cosmology - PHY10515

Module name:	**Cosmology**			
Module level, if applicable	Specialize			
Code, if applicable	PHY10515			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	Dr. Vo Quoc Phong			
Lecturers	Dr. Vo Quoc Phong Dr. Dao Thi Nhung			
Language	Vietnamese			
Relation to curriculum	Elective			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 6 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (40%)			
Recommended prerequisites	Calculus 1B, 2B; General physics 1,2,3; Theoretical Mechanics; Electrodynamics			
Related Course	Theory of Gravitational field, Quantum Field Theory			
Module objectives/intended learning outcomes	In this module: Presenting the measurement quantities on the large scale of the universe and the standard cosmology model (FLRW model) and simple models; investigating the problem of cosmic expansion and inflation. Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to understand the structure and description of the universe and analyze fundamental problems as inflation and expansion cosmic.* - *Skills: group work, self-study, paper reading and problem solving.* - *Competences: Having a basic knowledge of Modern Cosmology and cosmic models; applying them in the field of gravitational fields or Cosmology.* - *Attitude and Ethic: Honesty, diligence, and responsibility.*
Content	This module includes the following topics: 1 Observational Overview 2 Newtonian Gravity 3 The Geometry of the Universe 4 The basic Cosmology Models 5 The Cosmology Constant 6 The Inflationary and expansionary Universe
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Andrew Liddle, An Introduction to Modern Cosmology, second Ed, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England, 2003 References: 2. Sean M. Carroll, Spacetime and Geometry: An Introduction to General Relativity, Addison Wiley, 2004. 3. L.D Landau, E. M. Lifshitz, The Classical Theory of Fields, Fourth Revised English Edition, Butterworth Heinemann, 1980. 4. Bernard Schurtz, A First Course in General Relativity, Cambridge University Printing House, Cambridge University Press, USA, 2016.

133. Quantum Optics - PHY10516

<table>
<tr><td>Module name:</td><td colspan="4">Quantum Optics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10516</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Lecturer</td><td colspan="4">Dr. VU Quang Tuyen</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Elective</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 3 hours x 10 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures).
• Score: Homework (30%), Midterm exam (30%), End semester exam (40%).</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Theory of Solid State, Quantum Mechanics II, Quantum Field Theory, Computational physics.</td></tr>
<tr><td>Related Course</td><td colspan="4">Semiconductor Optics</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">The course introduces elementary quantum optics and matter-wave interaction theory, help students to understand and describe the world of atoms and photons using quantum mechanics. The module provides basic knowledge and understanding of state-of-the-art experiments in areas such as nonlinear quantum optics, ultracold atoms, quantum information and computation.
Course Learning Outcomes:
1 Describe (in the language quantum mechanics) atomic and photonic systems and their interaction.</td></tr>
</table>

	2 Demonstrate a basic understanding of the implications of superposition, entanglement and non-locality both for the foundation of quantum mechanics as well as for applications in quantum information. 3 Apply quantum mechanics to quantitatively describe the outcome of different state-of-the-art experiments. • Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below: - Logical thinking, critical thinking and problem solving; scientific research. - Teamwork, communication. - Self-study, lifelong self-study. - Using specialized English terminology. - Responsibility, be honest; growth mindset; open-mindedness.
Content	This module includes the following topics: 1 Quantum theory of light 2 Laser 3 Photons 4 Atom–photon interactions 5 Ultracold atoms & ions 6 Quantum information processing
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment= 10% 2. Assignment: Individual activities = 10% 3. Midterm test= 30% 4. Final test= 50%
Media employed	Text books and slides (power points)
Reading list	Main books: • M. Fox, *Quantum Optics: An Introduction*, Oxford University Press, 2006. • P. Meystre and M.Sargent, *Elements of Quantum Optics*, Spinger, 2007. References: • M. Kira, S. Koch, *Semiconductor Quantum Optics*, Cambridge University Press, 2012. • C. Gerry, P. Knight, Introductory Quantum Optics, Cambridge University Press, 2005.

134. Computational Physics - PHY10601

<table>
<tr><td>Module name:</td><td colspan="4">Computational Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10601</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. DANG Van Liet</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. DANG Van Liet</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Practice,
Course projects</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Exercise,
Practice</td><td>Lectures: 2 hours x 8 times
Practice: 3 hours x 10 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 10 hours x 10 times</td><td>100</td></tr>
<tr><td>Total workload</td><td colspan="4">145 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">1.5 (Lecture) + 2 (Practice) = 3.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Assignment (30%),
● Practice (30%),
● Final exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Introduction to Numeral Analysis</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">The objective of the course is to solve physics problems on computers; it combines computer science, physics and applied mathematics to develop scientific solutions of complex problems.</td></tr>
</table>

	Students who complete this module could be achieved the following: *- Knowledge: Apply the basic knowledge of match and understand numerical methods to solve basic physics problems* *- Skills: Using specialized English for reading the theory, able to work and discuss in group.* *- Competences: Programming to solve some physics problems on the computer, analysing and displaying the results* *- Atitutte: Well-behave, honest in proving the results, responsibility*
Content	This module includes the following topics: 1. Introductory concepts 2. Ordinary differential equations 3. Boundary-value problems 4. Hyperbolic Equations- 5. Parabolic Equations 6. Elliptic Equations 7. Eigenvalues and Eigenvectors
Study and examination requirements and forms of examination	Assessment method: 1. Assignment = 30% 2. Project: Practice = 30% 3. Final test = 40%
Media employed	Text books and slides (power points) and Computers
Reading list	Main text books: 1. Dang Van Liet (2006), Computational Physics. VNUHCM Publishing House, Vietnam. References: 2. Tao Pang (2006), An Introduction to Computational Physics, Cambridge University Press. 3. Holly Moore (2015), MATLAB for Engineers, NXB Pearson..

135. Engineering programming in C - PHY10602

Module name:	**Engineering programming in C**
Module level, if applicable	Specialized
Code, if applicable	PHY10602
Subtitle, if applicable	None
Courses, if applicable	None
Semester(s) in which the module is taught	5th semester

<table>
<tr><td>Person responsible for the module</td><td colspan="4">NGUYEN Chi Linh</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. NGUYEN Chi Linh</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese/English</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">5</td><td rowspan="2">Discussion,
Exercise,
Practice,
Mid-projects.</td><td>Lectures: 2 hours x 15 times
Practice: 3 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">150 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3 (Lecture) + 2 (Practice) = 5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Assignment (20%),
● Practice (20%),
● Project (20%)
● Final exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Computational mathematics</td></tr>
<tr><td>Related Course</td><td colspan="4">none</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course focus on describing a certain algorithm by using flow chart; write C/C++ code for a enquired product; build the subroutines/functions for a project so that these are able to be repaired, re-used, and improved.
Students who complete this module could be achieved the following:
- Knowledge: Be able to Use C/C++ language for studying engineering programming problems.
- Skills: Be able to give a speech or defense, to determine the role of and judge of members in group for improving efficient in work.</td></tr>
</table>

	- *Competences: Be able to setup a C program for modeling a given problem.* - *Attitude and Ethics: Be able to become honest in studying and working to produce reliable result.*
Content	This module includes the following topics: 1. Introduction 2. Fundamental types and operators 3. Statements and Flow Control 4. Pointer and Function 5. Data Arrays 6. Chars array: String 7. Struct Data Type 8. File Type 9. Array and Pointer 10. Dynamic memory and linked list
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Practice = 20% 3. Project = 20% 4. Final test= 40%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. D.T.Tran et al. (2014) Introduction to Programming. Science and Technics Publishing House, Vietnam. 2. D.T.Tran et al. (2014) Programming techniques. Science and Technics Publishing House, Vietnam. References: 1. V.A.Pham (2000) C++ and object oriented programming. Scientific and Technical Publishing House, Vietnam. 2. The C/C++ language: Tutorials. published by The C++ resources network

136. Electronic and Digital Circuits - PHY10603

Module name:	**Electronic and Digital Circuits**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10603			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5^{th} semester			
Person responsible for the module	Assoc. Prof. HUYNH Van Tuan			
Lecturers	Assoc. Prof. HUYNH Van Tuan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	5	Discussion, Exercise, Practice, Course projects	Lectures: 3 hours x 15 times Practice: 3 hours x 10 times	75
			Preparation and Follow up 10 hours x 15 times	150
Total workload	225 Hours			
Credit points	4 Credits			
ECTS	6.5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework (20%), • Practice (20%), • Project (20%) • Final exam (40%)			
Recommended prerequisites	Basic electronic			
Related Course	None			
Module objectives/intended learning outcomes	This module introduces the basic concepts of digital electronic circuits, including: binary numbers, truth tables, and logical algebra. Students learn to test, debug, analyze and design digital circuits including: logic			

	gates, three-state logic, flip-flops, registers, counters, encoders and decoders, multiplexers and de-multiplexers, integrated circuits, analog-to-digital converters and digital-to-analog converters. Students who complete this module could be achieved the following: *- Knowledge: Be able to apply knowledge in logic circuit design.* *- Skills: Be able to work in teamwork, self-study and problem solving.* *- Competences: Be able to analyze and design a relatively complete electrical circuit based on digital ICs.* *- Attitude: honest, responsible.*
Contents	This module includes the following topics: 1. Introductory concepts 2. Number systems and codes 3. Logic gates and Boolean algebra 4. Combinational logic circuits 5. Flip-Flops 6. Digital arithmetic: operations and circuits 7. Counters and registers 8. MSI logic circuits 9. Interfacing with the analog world
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Practice = 20% 3. Project = 20% 4. Final test= 40%
Media employed	Text books and slides
Reading list	Main text books: • Huynh Van Tuan (2019), Digital circuits. VNUHCM, Vietnam. References: 1. Vu Duc Tho, Do Xuan Thu (2015), Basic Digital circuits. Education Publishing, Vietnam. 2. Dang Van Chuyet (2017), Digital Electronic Engineering, Education Publishing, Vietnam. 3. Ronald J. Tocci & NealS. Widmer, Digital systems principles and applications (2016), 8th edition, Prentice Hall.

137. Database - PHY10604

<table>
<tr><td>Module name:</td><td colspan="4">Database</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10604</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">MSc. PHAN Nguyet Thuan</td></tr>
<tr><td>Lecturers</td><td colspan="4">MSc. PHAN Nguyet Thuan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Practice,
Course projects</td><td rowspan="2">2</td><td rowspan="2">Discussion, Exercise, Practice, Course projects</td><td>Lectures: 1 hours x 15 times
Practice: 3 hours x 10 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 4 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">105 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">1.5 (Lecture) + 2 (Practice) = 3.5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Homework (10%),
• Practice (30%),
• Final exam (60%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Computational Mathematics</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course provides students with some basic knowledge of relational databases, understanding how to organize data according to the relational data model, relational algebra language, relational operations. . Besides, helping students know how to build, update</td></tr>
</table>

	and query proficiently databases on SQL-Server database management system. In addition, the course also gives students some programming knowledge on T-SQL query language. Students completing this module can achieve the following: *- Knowledge: Be able to apply knowledge in: databases, relational data models, relational algebra language, T-SQL query language, ...* *- Skills: Ability to work individually, in groups, self-study and problem-solving, have the ability to think effectively* *- Competence: students are able to use relational algebra to update and query databases, know how to use T-SQL query language to create, update and query data, can write functions, procedures, using pointers in procedures.* *- Attitude: Be honest and responsibility.*
Content	This module includes the following topics: 1. Database Overview 2. Relational Data Model 3. Relational Algebra 4. SQL Query Language 5. Views and Integrity Constraints 6. Store Procedure 7. Function 8. Cursor
Study and examination requirements and forms of examination	Assessment method: 2. Assignment: Practice = 30% 3. Homework assignment = 10% 4. Final test= 60%
Media employed	Text books and slides (power points)
Reading list	Main text books: • Dong Thi Bich Thuy, Pham Thi Bach Hue, Nguyen Tran Minh Thu (2010), Database Science and Technics Publishing House Vietnam. References: 1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, Fourth Edition, Addison-Wesley, 2004.

138. Microcontrollers - PHY10605

Module name:	**Microcontrollers**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10605			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6^{th} semester			
Person responsible for the module	HO Van Binh			
Lecturers	HO Van Binh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	2	Discussion, Exercise, Practice, Course projects	Lectures: 2 hours x 15 times Practice: 3 hours x 10 times	60
			Preparation and Follow up 4 hours x 15 times	60
Total workload	120 Hours			
Credit points	2 Credits			
ECTS	5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Assignment (5%), • Practice (20%), • Project (35%) • Final exam (40%)			
Recommended prerequisites	Basic Electronics			
Related Course	None			
Module objectives/intended learning outcomes	This course provides systematic analysis, design and synthesis of intelligent processing systems based on working principles of 8, 16, 32bit microprocessors. Methods to organize hardware, build and install software for the problem of designing specialized microprocessor systems for the tasks of receiving, transmitting, processing, and transforming signals (analog and digital) and store them in common memory media. Using ON-CHIP microprocessors for the synthesis problem of functional processing systems is also mentioned. This module will adopt specific exercises, specific exercises to illustrate the theoretical parts mentioned above. Students who complete this module could be achieved the following:			

	- *Knowledge: Be able to apply knowledge in microcontroller system design.* *Skills: Be able to work in individual, group work, self-study and problem solving.* *Competences: Be able to analyze and design a relatively complete project on microcontrollers.*
Content	This module includes the following topics: 1. Microprocessor Architecture 2. Microprocessor 16/32 bit 80X86 3. Programming ASSEMBLY for 16/32 bit INTEL microprocessors 4. Dedicated 16/32 microprocessor design 5. Input - Output Interface 6. Microprocessor interrupt mode 7. Serial communication 8. Analog-to-digital (AD) and digital-to-analog (DA) transform 9. ON-CHIP microprocessor 10. Project
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Practice = 20% 3. Project = 20% 4. Final test= 40%
Media employed	Text books and slides (power points)
Reading list	Main text books: 1. Ngo Dien Tap, Textbook of microprocessors and computer structure, Education Publishing House, 2010. 2. Predko Myke, *Programming and customizing the PIC microcontroller,* McGraw-Hill , 1998. 3. Ho Khanh Lam, Microprocessor technical textbook: volume I; Volume II, Information and Communication Publishing House, 2010 4. Ngo Dien Tap, Programming in Assembly Language, Science and Technology Publishing House, 1998 5. Ytha Yu, Charles Marut, Assembly Language Programming (Assembly) and IBM-PC computers, Education Publishing House, 1996 6. Tong Van On, Hoang Duc Hai, The 8051 family of microcontrollers, Labor-Society, 2001. 7. Kieu Xuan Thuc (Editor), Vu Thi Thu Huong, Vu Trung Kien, Microcontrollers - Structure, Programming and Applications, Education Vietnam, 2009.

139. Electric Circuit Analysis - PHY10606

Module name:	**Electric Circuit Analysis**
Module level, if applicable	Specialized
Code, if applicable	PHY10606
Subtitle, if applicable	None
Courses, if applicable	None

<table>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. DUONG Hoai Nghia</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. DUONG Hoai Nghia</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Lectures combine examples and exercises</td><td>Lectures: 3 hours x 15 times</td><td>45</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">135 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Mid semester exam (50%),
• End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Basic electronic</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides basic knowledge and methods of analysis, calculation, and linear circuits in the process of establishing harmonics and in transients.
Students who complete this module could be achieved the following:
- Knowledge: Be able to understand and apply the circuit analysis techniques and able to analyse the design and build a relatively complete system.
- Skills: Be able to work in individual, self-study, problem solving.
- Competences: Be able to analyse and design a relatively complete electrical circuit based on digital ICs.
-Attitude: truthful, responsibility in the group,</td></tr>
<tr><td>Content</td><td colspan="4">This module includes the following topics:
1 Basic concepts of electrical circuits
2 Linear circuit in harmonic steady mode
3 Transitions in linear circuits</td></tr>
</table>

Study and examination requirements and forms of examination	Assessment method: 1. Midterm test= 50% 2. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main text books: 1. Do Xuan Thu, Electronic Engineering, Education Publishing House, 2000. 2. Nguyen Huu Phuong, Digital Circuit, Transport Publishing House, 2002. 3. R. J. Tocci, Digital systems: Principles and applications, Prentice-Hall international, Inc, 2011. References: 1 Chapman, Stephen J. (2018). Essentials of MATLAB programming (3rd ed.). Boston, MA: Cengage Learning. 2 Charles K. Alexander Matthew N.O. Sadiku (2017). Fundamentals of Electric Circuits (6th ed.). USA: McGraw Hill.

140. Data Structures - PHY10607

Module name:	**Data Structures**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10607			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	MSc. PHAN Nguyet Thuan			
Lecturers	MSc. PHAN Nguyet Thuan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	2	Discussion, Exercise, Practice, Course projects	Lectures: 1 hours x 15 times Practice: 3 hours x 10 times	45
			Preparation and Follow up 4 hours x 15 times	60
Total workload	105 Hours			
Credit points	2 Credits			
ECTS	1.5 (Lecture) + 2 (Practice) = 3.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework (10%), ● Practice (30%), ● Final exam (60%)			
Recommended prerequisites	Computational Mathematics			
Related Course	None			
Module objectives/intended learning outcomes	This course provides students with an overview of data structures and algorithms, sorting algorithms for searching and sorting data on arrays, and how to organize and store linked list, tree and processing algorithms on these data structures.			

	Students completing this module can achieve the following: *- Knowledge: Be able to apply knowledge in data structures* *- Skills: Ability to work individually, in groups, self-study and problem-solving.* *- Competence: Ability to analyze and apply data structures in the development of applications.* *- Attitude: honest, responsible, respect for colleagues.*
Content	This module includes the following topics: 1. Overview of Data Structures and Algorithms 2. Searching Algorithms – Sorting Algorithms 3. Linked List 4. Tree (Binary Search Tree, Balanced BST)
Study and examination requirements and forms of examination	Assessment method: 2. Assignment: Practice = 30% 3. Homework Assignment: = 10% 4. Final test = 60%
Media employed	Text books and slides (power points)
Reading list	Main text books: • Tran Hanh Nhi, Duong Anh Duc (2003), Introduction to data structures and algorithms. VNUHCM Publishing House, Vietnam. References: 1. Pham The Bao (2013), Data structures and algorithms, VNUHCM Publishing House, Vietnam

141. Digital Signal Processing - PHY10608

Module name:	**Digital Signal Processing**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10608			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	HUA Thi Hoang Yen			
Lecturers	HUA Thi Hoang Yen			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	2	Discussion, Exercise, Practice, Course projects	Lectures: 1hours x 15 times Practice: 3 hours x 10 times	45
			Preparation and Follow up 4 hours x 15 times	60
Total workload	105 Hours			
Credit points	2 Credits			
ECTS	1.5 (Lecture) + 2 (Practice) = 3.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Assignment (5%), ● Practice (20%), ● Project (35%) ● Final exam (40%)			
Recommended prerequisites	Computational Mathematics			
Related Course	None			
Module objectives/intended learning outcomes	This module introduces the basic concepts in the field of digital signal processing, including: knowledge of analog signals, digital signals and the relationship between them; how to analyze signals and systems in			

	time domain, frequency domain… The module also presents transform methods for signal processing such as Fourier transform, z transform and design methods for digital filters… From that knowledge, students can apply digital signal processing in many fields such as speech, audio, image processing… Students who complete this module could be achieved the following: *- Knowledge: Be able to apply knowledge in digital signal processing.* *- Skills: Be able to work in individual, group work, self-study and problem solving.* *- Competences: Be able to analyze and design a relatively complete project about digital signal processing.* *- Attitude: Be honest and responsibility.*
Content	This module includes the following topics: 1. Discrete signal and system 2. Discrete time systems 3. Fourier transform 4. Sampling 5. Time domain analysis 6. Frequency domain analysis 7. Z transform 8. Non-recursive filter design 9. Recursive filter design 10. DFT and FFT
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment =5% 2. Assignment: Practice = 20% 3. Project = 35% 4. Final test= 40%
Media employed	Text books and slides (power points)
Reading list	Main text books: 1. Nguyen Huu Phuong (2000), Digital Signal Processing, VNUHCM Publishing House, Vietnam. References: 2. Nguyen Huu Phuong (2015), FIR and IIR filters in signal processing: Theory – Design - Application. VNUHCM Publishing House, Vietnam. 3. Nguyen Huu Phuong (2014), Z transform in digital signal processing, VNUHCM Publishing House, Vietnam.

	4. Sanjit K. Mitra (2001), Digital Signal Processing: A computer-based approach, McGraw-Hill, Boston.

142. Object Oriented Programming - PHY10609

Module name:	**Object Oriented Programming**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10609			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6^{th} semester			
Person responsible for the module	MSc. PHAN Nguyet Thuan			
Lecturers	MSc. PHAN Nguyet Thuan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	3	Discussion, Exercise, Practice, Course projects	Lectures: 2 hours x 15 times Practice: 3 hours x 10 times	60
			Preparation and Follow up 6 hours x 15 times	90
Total workload	150 Hours			
Credit points	3 Credits			
ECTS	3 (Lecture) + 2 (Practice) = 5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework (10%), • Practice (30%), • Final exam (60%)			
Recommended prerequisites	Computational Mathematics, Engineering programming in C			
Related Course	None			
Module objectives/intended learning outcomes	The content includes knowledge of object-oriented programming such as: concepts of object-oriented programming, object-oriented programming language C++. The course provides knowledge of objects and			

	classes, class operators, inheritance, polymorphism and error handling. Students completing this module can achieve the following: - *Knowledge: Ability to understand and apply object-oriented programming knowledge.* - *Skills: Ability to work individually, in groups, self-study and problem-solving.* - *Competence: Ability to analyze and design by using object-oriented programming method; and use C++ to program simple applications.* - *Attitude: honest, responsible.*
Content	This module includes the following topics: 1 Overview of Object Oriented Programming 2 Class and Object 3 Object Initialization and Manipulation 4 Friend function, friend class, class construction principle 5 Inheritance 6 Polymorphic 7 Operator overloading
Study and examination requirements and forms of examination	Assessment method: 1 Assignment: Practice= 30% 2 Homework assignment= 10% 3 Final test= 60%
Media employed	Text books and slides (power points)
Reading list	Main text books: 1. Pham Van AT (2000), C++ and Object Oriented Programming , Science and Technics Publishing House, Vietnam References 2. Robert Lafore, *Object - Oriented Programming in C++ (4th Edition)*

143. Java Programming - PHY10610

<table>
<tr><td>Module name:</td><td colspan="4">Java Programming</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10610</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">MSc. NGUYEN Anh Thu</td></tr>
<tr><td>Lecturers</td><td colspan="4">MSc. NGUYEN Anh Thu</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Practice,
Course projects</td><td rowspan="2">3</td><td rowspan="2">Discussion, Exercise, Practice, Course projects</td><td>Lectures: 2 hours x 15 times
Practice: 3 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">150 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3 (Lecture) + 2 (Practice) = 5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework (20%),
● Practice (30%),
● Final exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Computational Mathematics, Engineering programming in C</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">The content includes knowledge of applying object-oriented programming to organize object classes in application programs and handle exceptions. Provides the knowledge to develop an application in Java</td></tr>
</table>

	language. Students completing this module can achieve the following: - Knowledge: Having basic knowledge of Java programming from which to build real projects such as a mobile application, game or web in Java language. - Skills: Ability to work individually, in groups, self-study and problem-solving. - Attitude: honest, responsible.
Content	This module includes the following topics: 1. Introduction 2. Overview of Object Oriented Programming and environment setup 3. Conditionals, arrays and loop 4. Class, object 5. Abstract class, Interface, inheritance in java 6. String 7. Collection 8. I/O 9. Handle exceptions
Study and examination requirements and forms of examination	Assessment method: 1. Project = 30% 2. Homework assignment = 20% 3. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main text books: 1. Bruce Eckel, President MindView, *Thinking In Java 4th Edition*, Inc. teochew. References 1. Doan Van Ban, *Object Oriented Programming with Java,* Science & Technology Publishing House, 2005.

144. Sensors and measurements - PHY10611

<table>
<tr><td>Module name:</td><td colspan="4">Sensors and measurements</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10611</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. HUYNH Van Tuan</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. HUYNH Van Tuan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">3</td><td rowspan="2">Lectures combine examples and exercises</td><td>Lectures: 3 hours x 10 times
Practice: 3 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 6 hours x 10 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">120 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3 (Lecture) + 2 (Practice) = 5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework (10%),
● Project (20%)
● Practice (30%)
● End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Basic electronic</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides students with basic knowledge about measurement and measuring equipment.
Students who complete this module could be achieved the following:</td></tr>
</table>

	- Knowledge: Knows how to determine measurement error due to measuring equipment. Students know the structure and operation of DC meters and AC (devices for measuring voltage, current, resistance, capacitance, inductance and power): sensors and converters (mechanical quantities, thermal, optical, etc.) to voltage, current, and other quantities. electricity, ...); *- Skills: Be able to work in communication, teamwork, critical thinking and decision making.* *- Competences: Be able to design basic measurement circuits and signal processing circuits.* *- Attitude: honest, responsible, respect for colleagues.*
Content	This module includes the following topics: 1. The concept of measuring equipment 2. Voltmeter and ammeter 3. Measure resistance 4. AC measuring bridge 5. Measure power and energy 6. Measuring sensors and measurements in industry 7. Course projects
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment =10% 2. Assignment: Practice = 30% 3. Project = 20% 4. Final test= 40%
Media employed	Text books and slides (power points)
Reading list	Main text books: 1. Pham Thuong Han, Nguyen Van Hoa, Nguyen Trong Que, Techniques for measuring physical quantities: volume I, Education Publishing House, 2005. 2.Pham Thuong Han, Nguyen Van Hoa, Nguyen Trong Que, Techniques for measuring physical quantities: volume II, Education Publishing House,, 2004. References: • Le Van Doanh, Sensors in measurement and control engineering, Science and Technology Publishing House, 2006.

145. Computer Network - PHY10612

Module name:	**Computer Network**
Module level, if applicable	Specialized
Code, if applicable	PHY10612
Subtitle, if applicable	None
Courses, if applicable	None

Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Master LE Dinh Viet Hai			
Lecturers	Master LE Dinh Viet Hai			
Language	Vietnamese			
Relation to curriculum	Elective			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	4	Lectures combine examples and exercises	Lectures: 3 hours x 10 times Practice: 3 hours x 10 times	60
			Preparation and Follow up 6 hours x 15 times	90
Total workload	150 Hours			
Credit points	3 Credits			
ECTS	3 (Lecture) + 2 (Practice) = 5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Mid semester exam (30%), • Practical (30%) • End semester exam (40%)			
Recommended prerequisites	Mathematical Methods in Physics, Engineering programming in C			
Related Course	None			
Module objectives/intended learning outcomes	This module provides students with knowledge about data transmission on computer networks. Students who complete this module could be achieved the following: *- Knowledge: Application of basic knowledge in the field of computer networks. computing, concepts, communication models, connectivity models, specifications, networking devices, and network operating systems.* *- Skills: Be able to work in individual, group work, self-study and understand specialized English..*			

	- Competences: Be able to analyse and design the architecture of the Internet (TCP/IP) network and the services provided by this network. *- Attitude: faithful, responsible and respect other people*
Content	This module includes the following topics: 1 Development history 2 Basic Concepts 3 Communication model 4 Model of connecting open systems 5 LAN Specifications 6 Network-linked devices 7 TCP/IP protocol 8 Introduction to Windows/Unix Network OS 9 Installation/administration/management system of Windows/Unix/Other 10 Windows/Unix/Other network services
Study and examination requirements and forms of examination	Assessment method: 1. Midterm test = 30% 2. Assignment: Practice (30%) 3. Final test = 40%
Media employed	Text books and slides (power points)
Reading list	Main text books: • Behrouz A. Forouzan, Data communications and neworking, McGraw- Hill, 2001 • James F. Kurose, Keith W. Ross , Computer networking : a top-down approach, Pearson Education, 2007 References: • Tiêu Đông Nhơn, LINUX (LINUX network service),Đại học Quốc gia TP. HCM, 2008.

146. Digital Logic design - PHY10613

<table>
<tr><td>Module name:</td><td colspan="4">Digital Logic design</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10613</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">NGUYEN Chi Linh</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. NGUYEN Chi Linh</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Elective</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">5</td><td rowspan="2">Discussion,
Exercise,
Practice,
Mid-projects
.</td><td>Lectures: 2 hours x 15 times
Practice: 3 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">150 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3 (Lecture) + 2 (Practice) = 5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
• Assignment (20%),
• Practice (20%),
• Project (20%)
• Final exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Basic electronic</td></tr>
<tr><td>Related Course</td><td colspan="4">none</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course focus on designing the certain logic circuits using hardware description language Verilog and implemented on FPGA board.</td></tr>
</table>

	Students who complete this module could be achieved the following: - *Knowledge: Be able to use Verilog language for studying integrated logic circuits.* - *Skills: Be able to use English materials, work in group, discuss for working in project.* - *Competences: Be able to setup a program on FPGA for designing the digital logic.* - *Attitude and Ethics: Be able to become honest in studying and working to produce reliable result.*
Content	This module includes the following topics: 1. Introduction 2. FPGA Overwiev 3. Hardware description language Verilog 4. Switches, Lights, and Multiplexers 5. Numbers and Displays 6. Flip-flops, Registers, and Counters 7. Clocks and Timers 8. Adders, Subtractions, and Multipliers 9. Finite State Machines 10. Register: RAM
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment =20% 2. Assignment: Practice = 20% 3. Project = 20% 4. Final test= 40%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Brown Stephen, Vranesic Zvonko (2003), Fundamentals of digital logic with Verilog design. McGraw-Hill References: 1. Balabanian Norman, Carlson Bradley (2002), Digital logic design principles. John Wiley and Sons. 2. Roth Charles H., John Lizy Kurian (2018), Digital systems design using VHDL. Thomson Learning.

147. Internship - PHY10614

Module name:	**Internship**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10614			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7^{th} semester			
Person responsible for the module	Assoc. Prof. HUYNH Van Tuan, HUA Thi Hoang Yen			
Lecturers	None			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	10	Discussion, Exercise, Practice, Course projects	Preparation and Follow up 2 hours x 60 times	120
Total workload	2 months			
Credit points	2 Credits			
ECTS	4			
Requirements according to the examination regulations	• Practice (25%) • Project (25%) • Seminar (50%)			
Recommended prerequisites	Computational Mathematics, Engineering Programming, Electronic and Digital Circuits, Database, Data Structures, Microcontrollers, Digital Signal Processing			
Related Course	None			
Module objectives/intended learning outcomes	This module provides students the opportunity to improve their acquired knowledge and practical skills to put into practice. Through the internship process, students not only study new knowledge but also can apply it to the actual working environment.			

	From that knowledge, students can improve their awareness, roles and responsibilities towards the field of study, approach and familiarize themselves with jobs in the field they are studying. Students who complete this module could be achieved the following: *- Knowledge: Be able to apply knowledge in actual practice.* *- Skills: Be able to work in individual, group work, self-study and problem solving.* *- Competences: Be able to analyze and design a relatively complete project.* *- Attitude: Be honest and responsibility.*
Content	Students internship based on the assignment of the intern company
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Practice = 25% 2. Project = 25% 3. Final test: Seminar = 50%
Media employed	Text books and slides (power points)
Reading list	None

148. Web Application Development - PHY10615

Module name:	**Web Application Development**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10615			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	PhD NGUYEN Anh Huy			
Lecturers	PhD NGUYEN Anh Huy			
Language	Vietnamese			
Relation to curriculum	Elective			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	3	Discussion, Exercise, Practice, Course projects	Lectures: 2 hours x 15 times Practice: 3 hours x 10 times	60
			Preparation and Follow up 6 hours x 15 times	90
Total workload	150 Hours			
Credit points	3 Credits			
ECTS	3 (Lecture) + 2 (Practice) = 5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework (20%), ● Practice (30%), ● Final exam (50%)			
Recommended prerequisites	Engineering programming in C			
Related Course	Database			
Module objectives/intended learning outcomes	This course will give the students the basic background, terminology and fundamental concepts that they need to understand in order to build web applications. A web developer is familiar with each "layer" of the software technologies involved in a web application, including			

	data modeling and database technologies, the web server environment and middleware components, network protocols, the user interface and basic visual design and user interaction concepts. Students completing this module can achieve the following: - Knowledge: Ability to understand and apply web programming knowledge to web development. - Skills: self-study, presentation, ability to think effectively and problem-solving, using specialized English terminology in study. - Competence: Ability to plan, work individually, in groups. Ability to analyze and design a web application. - Attitude: Be honest and responsible.
Content	This module includes the following topics: 1. Building Web Applications in PHP 2. Introduction to Structured Query Language (SQL) 3. Building Database Applications in PHP 4. JavaScript, jQuery, and JSON
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment = 20% 2. Assignment: Practice = 30% 3. Final test = 50%
Media employed	Text video and slides (power point)
Reading list	Main text books: 1. Semmy Purewal, Learning Web App Development References 1. George Bowlin, Building Progressive Web Apps

149. Programming on Mobile Devices - PHY10616

Module name:	**Programming on Mobile Devices**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10616			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	MSc. NGUYEN Anh Thu			
Lecturers	MSc. NGUYEN Anh Thu			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	3	Discussion, Exercise, Practice, Course projects	Lectures: 2 hours x 15 times Practice: 3 hours x 10 times	60
			Preparation and Follow up 6 hours x 15 times	90
Total workload	150 Hours			
Credit points	3 Credits			
ECTS	3 (Lecture) + 2 (Practice) = 5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework (20%), • Practice (30%), • Final exam (50%)			
Recommended prerequisites	OOP, Engineering programming in Java			
Related Course	None			
Module objectives/intended learning outcomes	Content includes basic knowledge about android studio programming environment using Java programming language, components in android. Students can design layouts and build an android application. The course provides knowledge and understanding of			

	the lifecycle of an Activity, switching screens with intents, building and managing applications using databases, multithreaded programming, some multimedia and animation controls. Students completing this module can achieve the following: - Knowledge: Having basic knowledge to build an android application. - Skills: Ability to work individually, in groups, self-study and problem-solving. - Attitude: honest, responsible.
Content	This module includes the following topics: 1. Overview of Java 2. Introduction and environment setup 3. Activity and the lifecycle of an activity, intent 4. List view 5. Fragment 6. SQLite 7. Content Provider Menu, Action Bar, Toolbar 8. Asynctask – Thread – Handler Service – Broadcast Receiver and Notification
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Practice = 30% 2. Homework assignment = 20% 3. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main text books: 1. Android Programming, *Zigurd Mednieks, Laird Dornin, G. Blake Meike, and Masumi Nakamura, O'Reilly Media, Inc*.

150. Internet of Things Application Development - PHY10680

<table>
<tr><td>Module name:</td><td colspan="4">Internet of Things Application Development</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10680</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">MSc. HUYNH Quoc Viet</td></tr>
<tr><td>Lecturers</td><td colspan="4">MSc. HUYNH Quoc Viet</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Practice,
Course projects</td><td rowspan="2">5</td><td rowspan="2">Discussion,
Exercise,
Practice,
Course,
Project</td><td>Lectures: 2 hours x 15 times
Practice: 3 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>90</td></tr>
<tr><td>Total workload</td><td colspan="4">150 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3 (Lecture) + 2 (Practice) = 5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Assignment (10%),
● Practice (20%),
● Project (30%)
● Final exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Mathematical Methods in Physics, Engineering programming</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This course will illustrate the fundamental concepts of the Internet of Things, as well as the possibilities and problems of setting IoTs to work in real-world scenarios. Moreover, it introduced a unique combination of</td></tr>
</table>

	technologies, including wireless sensor networks, Pervasive (ubiquitous) systems, Ambient Intelligence (AmI), and distributed and contextual systems. The capacity to create simple IoT applications using hardware and software; The capacity to examine and evaluate Internet of Things (IoT) designs, standards, and applications. Students completing this module can achieve the following: - *Understanding: Ability to understand and apply basic of the IoT application* - *Skills: Ability to work individually, in groups, self-study and problem-solving.* - *Competence: Ability to analyze and apply IoT application in the development of system.*
Content	This module includes the following topics: 1 Introduction to Internet of Things 2 CPS Virtual Real-Life System 3 Real-world communication 4 IoTs architecture 5 IoTs Network 6 Smart devices
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Practice = 30% 2. Homework assignment = 10% 3. Final test = 60%
Media employed	Text books and slides (power points)
Reading list	Main text books: • . Le My Ha, Pham Quang Huy, IoT Programming with Arduino, Youth Publishing House, 2017. References: • Pham Huu Khang, Hoang Duc Hai, Phuong Lan, Web programming course using ASP3.0, Labor and Social Publishing House, 2005. • Le Tan Hung, Dinh Thi Phuong Thu, Vu Duc Vuong, Web application programming Internet and wireless network, volume 2, Science and Technology Publishing House, 2006.

151. Advance Logic Design - PHY10681

Module name:	**Advance Logic Design**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10681			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6^{th} semester			
Person responsible for the module	MSc. HUYNH Quoc Viet			
Lecturers	MSc. HUYNH Quoc Viet			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	5	Discussion, Exercise, Practice, Course, Project.	Lectures: 2 hours x 15 times Practice: 3 hours x 10 times	60
			Preparation and Follow up 6 hours x 15 times	90
Total workload	150 Hours			
Credit points	4 Credits			
ECTS	3 (Lecture) + 4 (Practice) = 7			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Assignment (5%), • Practice (20%), • Project (35%) • Final exam (40%)			
Recommended prerequisites	Basic electronic, Engineering programming in C			
Related Course	None			
Module objectives/intended learning outcomes	This module introduces the basic concepts in the field of design and develops embedded systems on the basis of microcontrollers and programmable logic components (FPGA), specifically such as Bus			

	Architecture, Equipment (GPIO, UART, Timer, Counter...), Embedded Memory, Hardware/ Software Integration. Additionally, it helps students approach modern problems while contacting technical realities, thereby helping students grasp the core problems, enhancing their ability to solve technical problems in practice Students who complete this module could be achieved the following: - *Knowledge: Be able to apply knowledge in logical design* - *Skills: Be able to work in individual, group work, self-study, and problem-solving.* - *Competences: Be able to analyze and design a relatively complete project about the logical system.*
Content	This module includes the following topics: 1 Introduction. 2 Embedded system design on FPGA. 3 System design in a programmed microchip.
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment =5% 2. Assignment: Practice = 20% 3. Project = 35% 4. Final test= 40%
Media employed	Text books and slides (power points)
Reading list	Main text books: • Zainalabedin Navabi, Embedded core design with FPGAs, McGraw Hill, 2008 • Jean J.Labrosse, Embedded systems building blocks, 2000, Miller Freeman. References: • http://resource.renesas.com/lib/eng/e_learnig/h8_300henglish. • http://www.altera.com/literature/manual/mnl_avalon_spec.pdf • http://www.altera.com/literature/hb/nios2/n2sw_nii52002.pdf

152. Atomic Spectroscopy - PHY10701

Module name:	**Atomic Spectroscopy**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10701			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th Semester			
Person responsible for the module	Assoc. Prof. Le Vu Tuan Hung			
Lecturer	Assoc. Prof. Le Vu Tuan Hung			
Language	Vietnamese			
Relation to curriculum	Elective course			
Types of teaching and learning	Attendance time (hours per week per semester)	And Forms of active participation	Workload	
Teaching, Discussion, Debate, Group Project Laboratory session…	3	Teaching, Discussion, Debate, Seminar	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total Workload	135 hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% ● Homework at class and home (20%), ● Mid semester exam (30%), ● Final semester exam (50%)			
Recommended prerequisites	General physics 2 (Electro-magnetism – Optics)			
Related Course	None			
Module objectives/intended learning outcomes	The completion of the course allows a student to attain: - *Knowledge: Understand* the theory of atomic spectra, *apply atomic spectra (*Atomic emission and absorption spectroscopy method) *to analyses materials.* - *Skill:* Be able to self-study and solve problem.			

	- *Competence:* Be able to do teamwork, improve presentation. -*Attitude and ethics: develop responsibility and honesty*
Content	The content in this course includes: 1. The theory of atomic spectra: Intensity of absorption and emission atomic, stimulation atomic spectrum. 2. Atomic emission spectra analysis method. 3. Atomic absorption spectra analysis method
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 10% 2. Assignment: Team activities (seminar) = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books, slides (power points), clips
Reading list	Main books: 1. Le Vu Tuan Hung (2002), Atomic spectra and applications, VNUHCM Publishing House, Vietnam. References:

153. Molecule Spectroscopy - PHY10702

Module name:	**Molecule Spectroscopy**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10702			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th Semester			
Person responsible for the module	Assoc. Prof. Le Vu Tuan Hung			
Lecturer	Assoc. Prof. Le Vu Tuan Hung			
Language	Vietnamese			
Relation to curriculum	Elective			
Types of teaching and learning	Attendance time (hours per week per semester)	And Forms of active participation	Workload	
Teaching, Discussion, Debate, Group Project Laboratory session…	3	Teaching, Discussion, Debate, Seminar	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total Workload	135 hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% ● Homework at class and home (20%), ● Mid semester exam (30%), ● Final semester exam (40%)			
Recommended prerequisites	General physics 2 (Electro-magnetism – Optics)			
Related Course	None			
Module objectives/intended learning outcomes	The completion of the course allows a student to attain: - *Knowledge: understand the theory of molecule spectra; apply molecule spectra (* FT-IR and Raman spectroscopy) *to analyses materials.*			

	- *Skill:* self-study, and problem solving. - *Competence:* Be able to do teamwork, improve presentation. - *Attitude and ethics: develop responsibility and honesty*
Content	The content in this course includes: 1. The interaction between light and molecules of materials. 2. Rotational spectrum molecules. 3. Vibrational spectrum molecules. 4. Electronic spectrum molecules. 5. FT-IR spectroscopy. 6. Raman spectroscopy.
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 10% 2. Assignment: Team activities (seminar) = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books, slides (power points), clips
Reading list	Main books: 1. Duong Ai Phuong (2002), molecules spectra and applications, VNUHCM Publishing House, Vietnam. References: 1. F. A. Cotton (1990), Chemical Applications of Group Theory, Wiley, New York. 2. Bernhard Schrader (2002), Infrared and Raman Spectroscopy – Method and application.

154. Photonics and Laser Physics - PHY10703

<table>
<tr><td>Module name:</td><td colspan="4">Photonics and Laser Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialization</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10703</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">5th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr.VO Thi Ngoc Thuy</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr.VO Thi Ngoc Thuy</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 15 times</td><td>30</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>60</td></tr>
<tr><td>Total workload</td><td colspan="4">90 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework at class and home (20%),
● Mid semester exam (30%),
● End semester exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">General physics 2, Solid State Physics, Electrodynamics</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module offers a study of the physical principles of lasers and photonics. It introduces students to concepts and processes such as optical coherence, stimulated emission, laser oscillation, quantum optics, principles of fiber optics, and photonics.

Students who complete this module could be achieved the following:</td></tr>
</table>

	- *Knowledge: Be able to understand concepts, principles of lasers and photonics; And apply knowledge of lasers and photonics to solve problems in the field of physics and engineering physics.* - *Skills: Be able to work in individual, self-study and problem solving.* - *Competences: Be able to do teamwork, improve presentation.* - *Attitude and ethics: develop responsibility and honesty*
Content	This module includes the following topics: 1. Overview of optics, theory of electromagnetic waves and properties of a light wave 2. Optical Coherence and resonators. 3. Gaussian beam optics and Stimulated emission 4. Energy distribution and Laser action 5. The principles of semiconductor lasers and photodiode detectors. 6. Waveguides and optical fibers 7. The light sources (Led) 8. Photovoltaics
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 10% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. S.O. Kasap, "Optoelectronics and Photonics: Principles and Practices", Prentice Hall, Upper Saddle River, NJ 07458, 2001. 2. Richard S. Quimby, "Photonics and Lasers An Introduction", Published by John Wiley & Sons, Inc., Hoboken, New Jersey. Published simultaneously in Canada 2006.

155. Fundamentals of Semiconductor Devices - PHY10704

Module name:	**Fundamentals of Semiconductor Devices**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10704			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th semester			
Person responsible for the module	Assoc. Prof. TRAN Cao Vinh			
Lecturers	Assoc. Prof. TRAN Cao Vinh MSc. PHAM Thanh Tuan Anh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3.5			
Requirements according to the examination regulations	● Mid semester exam (30%) ● End semester exam (70%)			
Recommended prerequisites	Solid State Physics			
Related Course	None			
Module objectives/intended learning outcomes	The module provides students with the background knowledge related to the operating principles of semiconductor devices. After completing this module, students can achieve: *- Knowledge: Understand the formation and transportation of carriers in semiconductor materials; the structure and operation of a p-n junction and a field-effect transistor.* *- Skills: Self-study and solve problems.*			

	- *Competences: Be able to analyse and design new semiconductor materials.* - *Attitude and ethics: develop responsibility and honesty.*
Content	This module includes the following topics: 1. State and Energy of electrons in semiconductors 2. Density of carriers in semiconductors 3. Currents in semiconductors 4. P-N junction 5. Field-effect transistor
Study and examination requirements and forms of examination	Assessment method: 1. Midterm test = 30% 2. Final test = 70%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Betty Lise Anderson, Richard L. Anderson, “Fundamentals of Semiconductor Devices”, McGraw-Hill, 2005. References: 1. Donald A. Neamen, Semiconductor Physics and Devices: Basic principles, McGraw-Hill, 2012

156. Vacuum and Thin Film Physics - PHY10705

Module name:	**Vacuum and Thin Film Physics**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10705			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th semester			
Person responsible for the module	Dr. Le Van Ngoc			
Lecturers	MSc. Nguyen Duy Khanh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework (10%) ● Mid semester exam (30%) ● End semester exam (60%)			
Recommended prerequisites	General physics 1 (Mechanics and Thermodynamic), General physics 2 (Electromagnetism – Optics)			
Related Course	None			
Module objectives/intended learning outcomes	This module provides knowledge about vacuum and thin film physics. Learners' expectations after completing this course are:			

	Knowledge: Understand basic knowledge of vacuum environments based on knowledge of mathematics, chemistry and physics. Apply vacuum technique to fabricate thin films. Skill: Practice and operate the vacuum system Competences: Able to do teamwork Attitude and ethics: Develop responsibility and honesty
Content	This module includes the following topics: 1. fundamental laws of molecular physics 2. vacuum pump 3. vacuum gauge 4. deposition of thin film by PVD method
Study and examination requirements and forms of examination	Assessment method: 1. Midterm test = 30% 2. Final test = 70%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Nguyen Huu Chi. (2008) **Vacuum Physics**. HCMUS Publishing House, Vietnam. References: 1. Donald L. Smith, **Thin - film Deposition**, McGraw – Hill 1995. 2. Milton Ohring, **The Materials Science of Thin Films**, Academic Press 1992. 3. Hans Bach, Dieter Krause, **Thin films on Glass**, Springer 1997.

157. Measurement techniques - PHY10707

Module name:	**Measurement techniques**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10611/ PHY10707			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6^{th} semester			
Person responsible for the module	Assoc. Prof. HUYNH Van Tuan			
Lecturers	Assoc. Prof. HUYNH Van Tuan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Lectures combine examples and exercises	Lectures: 3 hours x 10 times Practice: 3 hours x 10 times	60
			Preparation and Follow up 6 hours x 10 times	60
Total workload	120 Hours			
Credit points	3 Credits			
ECTS	3(Lecture) + 2 (Practice) = 5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework (10%), ● Project (20%) ● Practice (30%) ● End semester exam (40%)			
Recommended prerequisites	Basic electronic			
Related Course	None			
Module objectives/intended learning outcomes	This module provides students with basic knowledge about measurement and measuring equipment. Students who complete this module could be achieved the following:			

	- Knowledge: Knows how to determine measurement error due to measuring equipment. Students know the structure and operation of DC meters and AC (devices for measuring voltage, current, resistance, capacitance, inductance and power): sensors and converters (mechanical quantities, thermal, optical, etc.) to voltage, current, and other quantities. electricity, ...); *- Skills: Be able to work in communication, teamwork, critical thinking and decision making.* *- Competences: Be able to design basic measurement circuits and signal processing circuits.* *- Attitude: responsible, respect for colleagues.*
Content	This module includes the following topics: 1 The concept of measuring equipment 2 Voltmeter and ammeter 3 Measure resistance 4 AC measuring bridge 5 Measure power and energy 6 Measuring sensors and measurements in industry 7 Course projects
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment (10%), 2. Project (20%) 3. Assignment: Practice (30%) 4. Final test (40%)
Media employed	Text books and slides (power points)
Reading list	Main text books: • Pham Thuong Han, Nguyen Van Hoa, Nguyen Trong Que, Techniques for measuring physical quantities: volume I, Education Publishing House, 2005. • Pham Thuong Han, Nguyen Van Hoa, Nguyen Trong Que, Techniques for measuring physical quantities: volume II, Education Publishing House, 2004. References: • Le Van Doanh et al., Sensors in measurement and control engineering, Science and Technology Publishing House, 2006.

158. Digital circuits - PHY10708

Module name:	**Digital circuits**
Module level, if applicable	Specialized
Code, if applicable	PHY10603/ PHY10708
Subtitle, if applicable	None
Courses, if applicable	None

<table>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. HUYNH Van Tuan</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. HUYNH Van Tuan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Practice,
Course projects</td><td rowspan="2">4</td><td rowspan="2">Discussion,
Exercise,
Practice,
Course projects</td><td>Lectures: 2 hours x 15 times
Practice: 3 hours x 10 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 10 hours x 12 times</td><td>120</td></tr>
<tr><td>Total workload</td><td colspan="4">180 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">3 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">3 (Lecture) + 2 (Practice) = 5</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Homework (20%),
● Practice (20%),
● Project (20%)
● Final exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Basic electronic</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module introduces the basic concepts of digital electronic circuits, including: binary numbers, truth tables, and logical algebra. Students learn to test, debug, analyze and design digital circuits including: logic gates, three-state logic, flip-flops, registers, counters.
Students who complete this module could be achieved the following:
- Knowledge: Be able to apply knowledge in logic circuit design.
- Skills: Be able to work in teamwork, self-study and problem solving.</td></tr>
</table>

	- *Competences: Be able to design a relatively complete digital circuit based on digital ICs.* - *Attitude: honest, responsible, respect for colleagues.*
Contents	This module includes the following topics: 1 Introductory concepts 2 Number systems and codes 3 Logic gates and Boolean algebra 4 Combinational logic circuits 5 Flip-Flops 6 Digital arithmetic: operations and circuits 7 Counters and registers
Study and examination requirements and forms of examination	Assessment method: 1. Homework assignment (20%), 2. Project (20%) 3. Assignment: Practice (20%) 4. Final test (40%)
Media employed	Text books and slides
Reading list	Main text books: • Huynh Van Tuan (2019), Digital circuits. VNUHCM, Vietnam. References: • Vu Duc Tho, Do Xuan Thu (2015), Basic Digital circuits. Education Publishing, Vietnam. • Dang Van Chuyet (2017), Digital Electronic Engineering, Education Publishing, Vietnam. • Ronald J. Tocci & NealS. Widmer, Digital systems principles and applications (2016), 8^{th} edition, Prentice Hall.

159. The Thin Film Fabricated Technology - PHY10709

Module name:	**The Thin Film Fabricated Technology**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10709			
Subtitle, if applicable	None			
Courses, if applicable	Applied physics			
Semester(s) in which the module is taught	6^{nd} semester			
Person responsible for the module	Assoc. Prof. VU Thi Hanh Thu			
Lecturers	Assoc. Prof. VU Thi Hanh Thu			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 6 hours x 10 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework (10%) • Mid semester exam (40%) • End semester exam (50%)			
Recommended prerequisites	Vacuum and Thin Film Physics			
Related Course	None			
Module objectives/intended learning outcomes	Students who complete the course will be able to: - *Knowledge:* Apply knowledge of the fundamental theories to comprehend modern nanomaterials and thin film fabrication technologies, and choose the best technique for thin film research and fabrication - *Skill*: lifelong self-study skills, using specialized English terminology for thin film and nanomaterials researches			

	- *Competence*: Ability to analyze experimental data in the thin film and nanomaterials disciplines. - *Attitudes and ethics*: Understand the field of applied physics, professional responsibility, self-esteem, and respect for colleagues
Content	This module includes the following topics: 1. A solution chemical method 2. Chemical vapor deposition 3. Physical vapor deposition
Study and examination requirements and forms of examination	Assessment method: 1. Midterm test = 40% 2. Final test = 60%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Vu Thi Hanh Thu, 2014, Thin film technologies. VNUHCM Publishing House, Vietnam. References: 2. Xu Hou, 2021, Design, Fabrication, Properties and Applications of Smart and Advanced Materials, CRC Press, ISBN 9780367782962 3. Donald L.Smith, 19995, Thin-Film Deposition: Principles and Practice, McGraw-Hill, .

160. Semiconductor Optoelectronic - PHY10710

Module name:	**Semiconductor Optoelectronic**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10710			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6nd semester			
Person responsible for the module	Dr.Phan Thi Kieu Loan			
Lecturers	Dr.Phan Thi Kieu Loan			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework at class and home (30%), ● Mid semester exam (20%), ● End semester exam (50%)			
Recommended prerequisites	Solid State Physics			
Related Course	Experiments for Thin films Fabrication Technology			
Module objectives/intended learning outcomes	This module provides basic knowledge of semiconductor materials and their applications in optoelectronics. Students who complete this module could be achieved the following: - *Knowledge: To understand principles and application of popular optoelectronic devices such as diodes, photodiodes, transistors…*			

	- *Skills: Be able to work in individual, group work, self-study, and problem solving.* - *Competences: Be able to design and perform evaluation of optoelectronic devices. Have the capacity to learn in the next periods.* - *Attitude and ethics: develop responsibility and honesty.*
Content	This module includes the following topics: 1. History of semiconductor and applications 2. Metals, semiconductor and insulators 3. Band structure of semiconductor 4. Defect levels in semiconductor 5. Optical properties of semiconductors 6. Analytical techniques in semiconductor 7. Semiconductor material ZnO, TiO_2, GaAs, Si, Ge, MoS_2 8. Operation and structure of Led, photodiode, transistor
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 30% 2. Midterm test = 20% 3. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Truong Kim Hieu. (2009) Lectures on Semiconductor Optoelectronics 1. University Of Science Publishing House, Vietnam. References: 1. Jasprit Singh – "Semiconductor Optoelectronics",McGRAW-HILL,Inc.1995. 2. J.S.Haris -"Semiconductor Optoelectronics Devices";EE243,(2004)

161. Material Analysis Techniques - PHY10711

Module name:	**Material Analysis Techniques**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10711			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6nd semester			
Person responsible for the module	Dr. NGUYEN Huu Ke			
Lecturers	Dr. NGUYEN Huu Ke			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Seminar	2	Discussion, Debate, Exercise.	Lectures: 1 hours x 15 times, practice: 1 hours x 30 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	2 Credits			
ECTS	3.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework at class and home (20%), ● Seminar (30%), ● End semester exam (50%)			
Recommended prerequisites				
Related Course				
Module objectives/intended learning outcomes	This module provides specialized knowledge about the interaction of electrons, photons with matter, and using signals emitted from samples in analytical methods. Students who complete this module could be achieved the following:			

	- Knowledge: Understand the structure and operating principle of analytical methods; apply each specific method to identify the properties of the sample. *- Skills: Work in individual, group work, self-study, logical thinking, using information technology for scientific research and problem solving.* *- Competences: Be able to identify and analyze properties of the sample; planning, teamwork and effective communication to finish graduation thesis.* *- Attitude and ethics: Professional responsibility, respect for oneself and honesty.*
Content	This module includes the following topics: 1. Introduction and overview of the interaction of photons, electron beams with matter 2. UV-Vis spectroscopy method and how to determine the optical properties of samples 3. PL spectroscopy method and how to determine band gap, impurity level in the sample 4. STM method and quantum arrangement 5. The AFM method and how to determine the surface roughness of the sample 6. SEM method and how to determine sample structure morphology 7. TEM method and determination of the structure and composition of nanoparticles 8. XRD method and how to determine the crystal lattice structure, nanoparticle size 9. XPS method and how to determine the impurity composition and bonding in the film 10. Hall method and how to determine electrical properties of samples
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 10% 2. Assignment: Individual activities = 10% 3. Project: Seminar exam = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Le Vu Tuan Hung (2013) Material Analysis Techniques. VNUHCM Publishing House, Vietnam. References: 1. David Muller, (2008) Scanning Electron Microscopy. 2. Michael Zölffel, (2011) The Clean Microscope 3. Chang Liu, (2005) Scanning Probe Microscopy

	and MEMS.

162. Electronic and Plasma Physics - PHY10712

Module name:	**Electronic and Plasma Physics**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10712			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Prof. Le Van Hieu			
Lecturers	Prof. Le Van Hieu			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate, Group Project Laboratory session…	3	Teaching, Discussion, Debate, Seminar	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	Minimum attendance at lectures is 80% • Homework at class and home (20%), • Mid semester exam (30%), • Final semester exam (50%)			
Recommended prerequisites	Quantum mechanics			
Related Course	None			
Module objectives/intended learning outcomes	The completion of the course allows a student to attain: - *Knowledge: Understand* the theory of electron state in solid and plasma, electron emission mechanism, electromotive and optical characteristics of many charged particles. Apply theory of plasma physics in nano materials, gas discharge light source. - *Skill:* Be able to self-study, and problem solving. - *Competence:* Be able to do teamwork. *Attitude and ethics: develop responsibility and honesty*			

Content	The content in this course includes: 1. Theory of electron state in solid and plasma 2. Electron emission mechanism from metal, semiconductor, dielectric 3. Collison in plasma and application in gas discharge. 4. Mechanism of sputtering magnetron system, vacuum system
Study and examination requirements and forms of examination	Assessment method: 2. Assignment: Team activities (seminar) = 20% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Nguyen Huu Chi, Plasma physics (gas discharge), 1998, VNUHCM Publishing House, Vietnam. 2. Le Van Hieu, Electron physics, 2005, VNUHCM Publishing House, Vietnam. 3. Le Khac Binh, solid state physics, 2003, VNUHCM Publishing House, Vietnam.

163. C++ Programming Language - PHY10713

Module name:	**C++ Programming Language**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10713			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	6th semester			
Person responsible for the module	Dr.VO Thi Ngoc Thuy			
Lecturers	Dr.VO Thi Ngoc Thuy			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	4	Discussion, Debate, Exercise.	Lectures: 4 hours x 15 times	60
			Preparation and Follow up 6 hours x 15 times	60
Total workload	120 Hours			
Credit points	2 Credits			
ECTS	4			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This course introduces students to C++ programming language. Students will be taught the fundamentals of programming, basic principles of programming using C++, algorithmic and procedural problem solving, program design and development, basic data types, control structures, functions, arrays, pointers, and introduction to classes for programmer-defined data types.			

	Students who complete this module could be achieved the following: - *Knowledge: Be able to use data types, control structures, functions, arrays, pointers and object oriented programming in C++ to solve basic problems in the field of physics and engineering physics.* - *Skills: Be able to program logically and fluently problems in the C++ programming language. Be able to work in individual, self-study and problem solving.* - *Competences: Be able to do teamwork and design new models of physical situations.* - *Attitude and ethics: develop responsibility and honesty*
Content	This module includes the following topics: 1. Basic Elements of C++ 2. Input/Output 3. Control Structures I (Selection and Repetition) 4. Function 5. Array 6. Records (Structs) 7. Pointers, Classes, Virtual Functions, and Abstract Classes 8. Inheritance and Composition 9. C++ Standard library
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 10% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Nguyen Tien and Nguyen Van Hoai, C++ textbook-Theory and exercises. Education Publishing House, 1999. 2. Pham Van At, C++ and object-oriented programming, Science and technology, 2000. 3. Beginning Visual C++ 2010- Ivor Horton

164. Experiments for Thin films Fabrication Technology - PHY10714

<table>
<tr><td>Module name:</td><td colspan="4">Experiments for Thin films Fabrication Technology</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialization</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10714</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">6th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">MSc. HOANG Luong Cuong</td></tr>
<tr><td>Lecturers</td><td colspan="4">MSc. HOANG Luong Cuong
Dr. VO Thi Ngoc Thuy
Dr. PHAN Thi Kieu Loan
MSc. DAO Anh Tuan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 30 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>120</td></tr>
<tr><td>Total workload</td><td colspan="4">180 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Homework (15%),
● Class exercises (30%),
● Attend in class (5%)
● Practicing test exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Experiments for Spectroscopy Analysis</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
</table>

Module objectives/intended learning outcomes	Students who complete this module could be achieved the following: - *Knowledge: Apply basic knowledge of applied physics to operate vacuum systems such as: sputtering, evaporating and sol-gel systems.* - *Skills: practice experiments, critical thinking skills* - *Competences: Ability in teamwork and to analyze and evaluate experimental results* - *Attitude and ethics: professional responsibility and honesty*
Content	This module includes the following topics: 1. Film forming by vacuum evaporation method 2. Film making by sputtering 3. Film formation by sol-gel method
Study and examination requirements and forms of examination	Assessment method: ● Homework assignment (10%), ● Assignment: Class exercises (10%), ● Attend in class (10%) ● Project: Practicing test exam (70%)
Media employed	Text books, slides (power points), practice
Reading list	Main books: **1.** GWasa, Kiyotaka, Kitabatake, Makoto, Adachi, Hideak **"**Thin Films Material Technology" 2004 **2.** Krause Dieter , Bach Hans "Thin films on glass"Springer Verlag **,** 1997

165. Nonlinear Optics - PHY10715

Module name:	**Nonlinear Optics**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10715			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Dr. PHAN Trung Vinh			
Lecturers	Dr. PHAN Trung Vinh Dr. NGUYEN Thanh Lam MSc. TON Nu Quynh Trang			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 2 hours x 15 times	30
			Preparation and Follow up 4 hours x 15 times	60
Total workload	90 Hours			
Credit points	2 Credits			
ECTS	3			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	Photonics and laser physics			
Related Course	Experiments for Applications of Laser			
Module objectives/intended learning outcomes	After completing this module, students can achieve: - *Knowledge: understand nonlinear optical effects such as the second harmonic generation, three-wave mixing, self-convergence, Raman coherent scattering, Brillouin scattering, etc. and analyse the interaction between laser and anisotropic crystals.* - *Skills: self-study and problem solving.*			

	- *Competences: Be able to do teamwork, improve presentation.* - *Attitude and ethics: develop responsibility and honesty.*
Content	This module includes the following topics: 1. An introduction to nonlinear optics 2. The basic of nonlinear optics 3. The second harmonic generation 4. Three-wave mixing 5. High-order nonlinear optical effects 6. Raman coherent scattering 7. Mandelstam-Brillouin stimulated scattering
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 10% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Tran Tuan, Le Van Hieu (2004). Nonlinear Optical Effects. VNUHCM Publishing House, Vietnam. References: 2. Tran Tuan (2002). Nonlinear Optics. VNUHCM Publishing House, Vietnam. 3. Ho Quang Quy (2007). Applied nonlinear optics. VNU Hanoi Publishing House, Vietnam.

166. Nano Material and Application - PHY10716

Module name:	**Nano Material and Application**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10716			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	MSc. HOANG Luong Cuong			
Lecturers	MSc. HOANG Luong Cuong			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	2	Discussion, Debate, Exercise.	Lectures: 1 hours x 15 times, practice: 1 hours x 30 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	2 Credits			
ECTS	1.5 (Lecture) + 2 (Practice) = 3.5			
Requirements according to the examination regulations	● Small test (25%), ● Seminar (30%), ● Attend in class (5%) ● Final exam (40%)			
Recommended prerequisites	Material Analysis Techniques			
Related Course	None			

Module objectives/intended learning outcomes	Students who complete this module could be achieved the following: - *Knowledge: Apply basic knowledge about physics and chemistry of nanomaterials, nanoscience and nanotechnology to fabricate nanomaterials.* - *Skills: judgment skills, critical thinking skills.* - *Competences: Ability in organization, teamwork* - *Attitude and ethics: professional responsibility and honesty.*
Content	This module includes the following topics: 1. Some basic concepts of nanomaterials 2. Carbon nanotubes 3. MEMS 4. Quantum dots 5. Nano in solar cell, photocatalyst 6. Nano composite
Study and examination requirements and forms of examination	Assessment method: ● Assignment: Small test (20%), ● Project: Seminar (30%), ● Quizzes (10%) ● Final test (40%)
Media employed	Text books, slides (power points), practice
Reading list	Main books: 1. Tjong Sie Chin, "Carbon nanotube reinforced composites : metal and ceramic matrices", Wiley-VCH Verlag GmbH & Co , 2009. 2. Thomsen C. , Maultzsch J. , Reich S."Carbon nanotubes : basic concepts and physical properties" Wiley-VCH Verlag GmbH & Co , 2004

167. MATLAB - Simulation and Computational Optics and Plasma Physics - PHY10717

<table>
<tr><td>Module name:</td><td colspan="4">MATLAB - Simulation and Computational Optics and Plasma Physics</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialization</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10717</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. LE Vu Tuan Hung</td></tr>
<tr><td>Lecturers</td><td colspan="4">Assoc. Prof. LE Vu Tuan Hung
Dr. PHAN Trung Vinh
MSc. NGUYEN Duy Khanh</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Experiment</td><td rowspan="2">4</td><td rowspan="2">Laboratory session practical, report writing</td><td>Practical: 4.0 (hour) x 15 (meeting)</td><td>60</td></tr>
<tr><td>Preparation and Follow up: 8 (hour) x 15 (self-preparation)</td><td>120</td></tr>
<tr><td>Total workload</td><td colspan="4">180 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Writing code at class and home (60%)
● End semester exam (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">This module provides knowledge in programming using MATLAB software related to optics and plasma physics.</td></tr>
</table>

	- Knowledge: Be able to use the genetics, Monte-Carlo algorithm and simulation techniques for solving problems related to optical properties of multilayer thin films, paraxial optical systems and plasma physics. - Skills: Be able to program logically and fluently optical phenomena and plasma physics in the MATLAB language. Be able to self-study and solve problems. - Competences: Be able to do teamwork and design new models of physics. - Attitude and ethics: develop responsibility and honesty.
Content	This module includes the following topics: 1. MATLAB programming language 2. Genetic algorithms in optical simulation 3. Monte-Carlo algorithms for collision motion models of charge carriers in a gas discharge system 4. Matrix methods in paraxial optics
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Code writing report = 60% 2. Final test = 40%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Huynh Thanh Dat, Le Vu Tuan Hung (2012). Applied Optics. VNUHCM Publishing House, Vietnam. References: 2. Nguyen Huu Chi (1998). Plasma Physics (Ionized Gas). VNUHCM Publishing House, Vietnam. 3. Nguyen Hoai Son et al. (2002). Matlab application in engineering calculations. VNUHCM Publishing House, Vietnam.

168. Experiments for Applications of Thin Film and Nano Material - PHY10718

<table>
<tr><td>Module name:</td><td colspan="4">Experiments for Applications of Thin Film and Nano Material</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialization</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10718</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">MSc. HOANG Luong Cuong</td></tr>
<tr><td>Lecturers</td><td colspan="4">MSc. HOANG Luong Cuong
Dr. NGUYEN Huu Ke
Dr. VO Thi Ngoc Thuy
Dr. PHAN Thi Kieu Loan
MSc. DAO Anh Tuan</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">2</td><td rowspan="2">Discussion,
Debate,
Exercise.</td><td>Lectures: 2 hours x 30 times</td><td>60</td></tr>
<tr><td>Preparation and Follow up 6 hours x 15 times</td><td>120</td></tr>
<tr><td>Total workload</td><td colspan="4">180 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Homework assignment (15%),
● Assignment: Class exercises (30%),
● Quizzes (5%)
● Final test Practicing test exam (50%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">Experiments for Spectroscopy Analysis</td></tr>
<tr><td>Related Course</td><td colspan="4"></td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">Students who complete this module could be achieved the following:
- Knowledge: Apply basic knowledge of physics to analyze and measure the properties of materials such as electrical properties, optical properties, and</td></tr>
</table>

	some applications such as photocatalysis, sensing gas... *- Skills: practice experiments, critical thinking skills* *- Competences: Ability in teamwork and to analyze and evaluate experimental results* *- Attitude and ethics: professional responsibility and honesty*
Content	This module includes the following topics: 1. Investigation of electrical properties of materials by measuring I-V 2. Investigation of optical properties of materials by absorption spectrometry, luminescence spectrometry 3. Application of photocatalyst antibacterial thin film 4. Applications of thin films in gas sensors
Study and examination requirements and forms of examination	Assessment method: ● Homework assignment (10%), ● Class exercises (10%), ● Attend in class (10%) Practicing test exam (70%)
Media employed	Text books, slides (power points), practice
Reading list	Main books: **1.** GWasa, Kiyotaka, Kitabatake, Makoto, Adachi, Hideak **"**Thin Films Material Technology" 2004 **2.** Krause Dieter , Bach Hans "Thin films on glass"Springer Verlag **,** 1997

169. Experiments for Applications of Laser - PHY10719

<table>
<tr><td>Module name:</td><td colspan="4">Experiments for Applications of Laser</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialization</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10719</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">7th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Dr. PHAN Trung Vinh</td></tr>
<tr><td>Lecturers</td><td colspan="4">Dr. PHAN Trung Vinh
Dr. NGUYEN Thanh Lam
MSc. TON Nu Quynh Trang</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Compulsory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Experiment</td><td rowspan="2">4</td><td rowspan="2">Laboratory session practical, report writing</td><td>Practical: 4.0 (hour) x 15 (meeting)</td><td>60</td></tr>
<tr><td>Preparation and Follow up: 8 (hour) x 15 (self-preparation)</td><td>120</td></tr>
<tr><td>Total workload</td><td colspan="4">180 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">2 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">4</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures)
● Writing report at class and home (60%),
● End semester exam (practical) (40%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">Nonlinear Optics</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">After completing this module, students can achieve:
- Knowledge: Be able to understand the procedure for growing nonlinear optical single crystals and their applicability in laser-related optical systems
- Skills: Be able to conduct nonlinear optical experiments such as the second harmonic</td></tr>
</table>

	generation, Z-scan, Raman coherent scattering, etc. Self-study and problem solving. - *Competences: Be able to do teamwork and operate crystal growth and laser-related systems.* - *Attitude and ethics: develop responsibility and honesty.*
Content	This module includes the following topics: 1. Crystal growth methods from an aqueous solution 2. Growing pure and doped KDP single crystals 3. The Sankaranarayanan-Ramasamy technique 4. Lasers for nonlinear optical applications 5. The Second Harmonic Generation (SHG) 6. The Z-Scan 7. The Raman coherent scattering spectroscopy
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Report writing = 60% 2. Final test = 40%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Le Vu Tuan Hung et al. (2014). Specialized Practical Modules for Department of Applied Physics. VNUHCM Publishing House, Vietnam. References: 1. Tran Tuan, Le Van Hieu (2004). Nonlinear Optical Effects. VNUHCM Publishing House, Vietnam. 2. Tran Tuan (2002). Nonlinear Optics. VNUHCM Publishing House, Vietnam. 3. Ho Quang Quy (2007). Applied nonlinear optics. VNU Hanoi Publishing House, Vietnam.

170. Experiments for Spectroscopy Analysis - PHY10720

Module name:	**Experiments for Spectroscopy Analysis**			
Module level, if applicable	Specialization			
Code, if applicable	PHY10720			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	5th semester			
Person responsible for the module	Dr. PHAN Trung Vinh			
Lecturers	Dr. PHAN Trung Vinh MSc. NGUYEN Duy Khanh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Experiment	4	Laboratory session practical, report writing	Practical: 4.0 (hour) x 15 (meeting)	60
			Preparation and Follow up: 8 (hour) x 15 (self-preparation)	120
Total workload	180 Hours			
Credit points	2 Credits			
ECTS	4			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Writing report at class and home (60%), • End semester exam (practical) (40%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	After completing this module, students can achieve: - *Knowledge: Be able to recognize the procedure for measuring each type of spectrum and the information derived from it.* - *Skills: Be able to analyze spectra accurately and write reports with precision and to use Origin Data*			

	Analysis and Graphing software. Self-study and problem solving *- Competences: Be able to do teamwork and operate spectroscopy devices.* *- Attitude and ethics: develop responsibility and honesty.*
Content	This module includes the following topics: 1. Atomic Emission Spectroscopy (AES) 2. Atomic Absorption Spectroscopy (AAS) 3. Molecular Infrared Spectroscopy 4. Molecular Raman Spectroscopy 5. Electron Photoluminescence Spectroscopy 6. Electron Ultraviolet Visible Transmittance Spectroscopy 7. Electron Ultraviolet Visible Absorption Transmittance Spectroscopy
Study and examination requirements and forms of examination	Assessment method: 1. Assignment: Report writing = 60% 2. Final test = 40%
Media employed	Text books and slides (power points)
Reading list	Main books: 1. Le Vu Tuan Hung et al. (2014). Specialized Practical Modules for Department of Applied Physics. VNUHCM Publishing House, Vietnam. References: 1. Nguyen Van Den (2002). Atomic Spectroscopy and applications. VNUHCM Publishing House, Vietnam. 2. Duong Ai Phuong (2002). Molecular Spectroscopy and applications. VNUHCM Publishing House, Vietnam. 3. Huynh Thanh Dat (2002). Raman Spectroscopy. VNUHCM Publishing House, Vietnam.

171. Mathematical Methods in Physics - PHY10980

Module name:	**Mathematical Methods in Physics**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10980			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	8nd semester			
Person responsible for the module	Assoc. Prof. Nguyen Nhat Khanh			
Lecturers	Assoc. Prof. Nguyen Nhat Khanh Dr. Nguyen Huynh Tuan Anh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 3 hours x 15 times	45
			Preparation and Follow up 6 hours x 15 times	90
Total workload	135 Hours			
Credit points	3 Credits			
ECTS	4.5			
Requirements according to the examination regulations	● Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) ● Homework at class and home (20%), ● Mid semester exam (30%), ● End semester exam (50%)			
Recommended prerequisites	Quantum Mechanics 1, Theoretical Mechanics, Statistical Physics, Electrodynamics			
Related Course	Problems Simulation in Physics			
Module objectives/intended learning outcomes	This course provides an introduction to methods in solving partial differential equations in physics. These methods are applied to various problems in physics, including the modelling of classical physical systems to quantum systems. Course Learning Outcomes:			

	1. Identify methods of solving partial differential equations
	2. Recognize and describe the characteristics of various methods.
	3. Formulate analyze and computationally solve a selection of problems in classical/quantum physics
	• Skills/Competences/Attributes: Students will have opportunities to develop the skill(s)/competence(s)/ attribute(s) specified below:
	  • Logical thinking, critical thinking and problem solving; scientific research.
	  • Self-study, lifelong self-study.
	  • Responsibility, be honest; growth mindset.

Content	This module includes the following topics: 1. Partial differential equations and boundary value problems 2. Method of Separation of Variables 3. Canonical Transformations 4. Laplace Transformations 5. Some Applications of Laplace Transformations
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 10% 2. Assignment: Individual activities = 10% 3. Midterm test = 30% 4. Final test = 50%
Media employed	Text books
Reading list	Main books: 1. La Thị Cang, Mathematical methods - part 1 (in Vietnamese), VNUHCM Publishing House, Vietnam, 2014 2. Murray R. Spiegel, *Theory and Problems of Laplace Transforms*, McGraw – Hill Book Company, 1065 3. Kusse B.R., Westwig E.A., Mathematical Physics - Applied Mathematics for Scientists and Engineers, 2ed, Wiley-VCH, 2006. 4. Boas, Mathematical Methods in the Physical Sciences, 3ed, Wiley, 2005: chapters 7, 9, 13. References: 5. Arfken, Mathematical methods for physicists _ a comprehensive guide, 7ed, Elsevier, 2012. 6. Riley, Essential Mathematical Methods for the Physical Sciences, CUP, 2011 7. Chow, Mathematical methods for physicists, CUP, 2000

172. Problems Simulation in Physics - PHY10981

Module name:	**Problems Simulation in Physics**			
Module level, if applicable	General			
Code, if applicable	PHY10981			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	7th semester			
Person responsible for the module	Dr. NGUYEN Huynh Tuan Anh			
Lecturers	Dr. NGUYEN Huynh Tuan Anh			
Language	Vietnamese			
Relation to curriculum	Compulsory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Debate.	3	Discussion, Debate, Exercise.	Lectures: 4 hours x 15 times	60
			Preparation and Follow up 6 hours x 15 times	90
Total workload	150Hours			
Credit points	3 Credits			
	3 (Lecture) + 2 (Practice) = 5			
Requirements according to the examination regulations	• Minimum attendance at lectures is 80% (Absences must not exceed 3 times for the entire duration of the lectures) • Homework at class and home (20%), • Mid semester exam (30%), • End semester exam (50%)			
Recommended prerequisites	Calculus 1B, General physics 1			
Related Course	Computational Mathematics			
Module objectives/intended learning outcomes	This module provides basic knowledge of simulation and thereby an understanding of the laws and phenomena of physics problem. Students who complete this module could be achieved the following: *- Knowledge: Be able to understand and apply knowledge of simulation in science and life.*			

	- *Skills: Be able to work in individual, group work, self-study, lifelong learning, and problem solving.* - *Competences: Be able to design a independent program simulation. Have the capacity to learning in the next periods.*
Content	This module includes the following topics: 1. Introduction 2. Matrices 3. Interpolation and Approximation 4. Ordinary diferential equations 5. Finite diference method 6. Seminar: Using Matlab GUI program to simulation a physics problem.
Study and examination requirements and forms of examination	Assessment method: 1. Paper assignment = 10% 2. Assignment: Individual activities = 20% 3. Midterm test = 30% 4. Final test = 40%
Media employed	Text books and slides (power points)
Reading list	References: 1. Dang Van Liet, Computational Physics, Vietnam National University, HCMC (2006). 2. J. M. Mathews, *Numerical method for Mathematics*, Science and Engineering, Prentice-Hall International Inc (1992) 3.D. Redfern, C. Campbell, *The MATLAB 5 Handbook*, Springer (1997) 4.A. Knight, Basics of MATLAB and Beyond, CRC Press LLC, 2000 5.R. E. White, Computational Mathematics Models Methods and Analysis with MATLAB, CRC Press, 2003 6.B. D. Hahn, D. T. Valentine, Essential MATLAB for Engineers and Scientists, Elsevier Ltd, Third edition 2007

173. Seminar Report - PHY10991

<table>
<tr><td>Module name:</td><td colspan="4">Seminar Report</td></tr>
<tr><td>Module level, if applicable</td><td colspan="4">Specialized</td></tr>
<tr><td>Code, if applicable</td><td colspan="4">PHY10991</td></tr>
<tr><td>Subtitle, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Courses, if applicable</td><td colspan="4">None</td></tr>
<tr><td>Semester(s) in which the module is taught</td><td colspan="4">8th semester</td></tr>
<tr><td>Person responsible for the module</td><td colspan="4">Assoc. Prof. HUYNH Van Tuan</td></tr>
<tr><td>Lecturers</td><td colspan="4">None</td></tr>
<tr><td>Language</td><td colspan="4">Vietnamese</td></tr>
<tr><td>Relation to curriculum</td><td colspan="4">Mandatory</td></tr>
<tr><td>Types of teaching and learning</td><td>Attendance time (hours per week per semester)</td><td>Forms of active participation</td><td colspan="2">Workload</td></tr>
<tr><td rowspan="2">Teaching,
Discussion,
Debate.</td><td rowspan="2">10</td><td rowspan="2">Discussion,
Experiment,
Practice,
Report</td><td>Lectures: 10 hours x 12 times</td><td>120</td></tr>
<tr><td>Preparation and Follow up 10 hours x 12 times</td><td>120</td></tr>
<tr><td>Total workload</td><td colspan="4">240 Hours</td></tr>
<tr><td>Credit points</td><td colspan="4">4 Credits</td></tr>
<tr><td>ECTS</td><td colspan="4">8</td></tr>
<tr><td>Requirements according to the examination regulations</td><td colspan="4">Presentation and essay (100%)</td></tr>
<tr><td>Recommended prerequisites</td><td colspan="4">None</td></tr>
<tr><td>Related Course</td><td colspan="4">None</td></tr>
<tr><td>Module objectives/intended learning outcomes</td><td colspan="4">Apply knowledge (theory and experiment) and skills in the course to implement projects.
Students who complete this module could be achieved the following:
- Knowledge: Apply fundamental and in-depth knowledge of physics and mathematical formulation for theoretical analysis, modeling and simulation of relevant processes. Apply knowledge of one of the majors to solve problems in the field of physics and engineering physics.
- Skills: Gain effective career skills for problem solving in physics and engineering physics, including skills such as logical thinking, scientific research, practice, design</td></tr>
</table>

	and conduct experiments. Acquire personal skills such as communication skills, lifelong self-study skills, critical thinking skills, judgment and decision making skills. Using specialized English terminology and information technology for scientific research and personal development. *- Competences: Ability to apply physics knowledge and experience to conceptualize, analyze and design new physical situations. Ability to analyze and evaluate experimental results, processes, methods and research results in a specific discipline or interdisciplinary. Ability in organization, leadership, planning, teamwork and effective communication in science and social interaction.* *- Attitude and Ethics: Diligence, professional responsibility and be honest.*
Content	This module includes the following topics: 1. Overview of the project: reason for choose project, objectives of the study, research subjects. 2. Research content of the project: theoretical or experimental research: presenting theoretical foundations, theories, scientific hypotheses and methods, tools, hardware components, ... 3. Results and discussion 4. Conclusions and recommendations
Study and examination requirements and forms of examination	Assessment method: 1. Project: Scientific content = 20% 2. Assignment: Experimental design = 20% 3. Project: Practical skills = 20% 4. Self-written assay: Scientific reports = 20% 5. Assignment: Attitude at work = 20%
Media employed	Text books and slides (power points)
Reading list	Main books: 3. An Introduction to Physical Science, James T. Shipman, Jerry D. Wilson, Charles A. Higgins, Jr, Omar Torres,14th Edition. 4. Raymond A. Serway, John W. Jewett, Sr (2014). Physics for Scientists and Engineers with Modern Physics. Ninth Edition. BROOK/COLE, USA.

175. Graduation Thesis - PHY10995

Module name:	**Graduation Thesis**			
Module level, if applicable	Specialized			
Code, if applicable	PHY10995			
Subtitle, if applicable	None			
Courses, if applicable	None			
Semester(s) in which the module is taught	8th semester			
Person responsible for the module	Assoc. Prof. HUYNH Van Tuan			
Lecturers	None			
Language	Vietnamese			
Relation to curriculum	Mandatory			
Types of teaching and learning	Attendance time (hours per week per semester)	Forms of active participation	Workload	
Teaching, Discussion, Practice, Course projects	20	Discussion, Practice, Research Course projects	Preparation and Follow up 10 hours x 60 times	600
Total workload	600 Hours			
Credit points	10 Credits			
ECTS	20			
Requirements according to the examination regulations	Presentation and essay (100%)			
Recommended prerequisites	None			
Related Course	None			
Module objectives/intended learning outcomes	This module provides students the opportunity to improve their acquired knowledge and practical skills to analyze and solve a problem specific in the field of study/specialization. The graduation dissertation is an applied research, demonstrating the student's ability to apply theory into practice. From that dissertation, students can improve their awareness, roles and responsibilities towards the field of study. Students who complete this module could be achieved the following: *- Knowledge: Be able to apply knowledge in actual practice.* *- Skills: Be able to work in individual, group work, self-study and problem solving.*			

	- Competences: Be able to analyze and design a relatively complete project. *- Attitude: Be honest and responsibility.*
Content	Students do research based on the project - Choose a topic - Built the project and research plan - Outline assessment by instructor - Do research
Study and examination requirements and forms of examination	Assessment method: Self-written assay: Presentation and essay (100%)
Media employed	Text books and slides (power points)
Reading list	None