VIETNAM NATIONAL UNIVERSITY – HO CHI MINH CITY
INTERNATIONAL UNIVERSITY
DEPARTMENT OF PHYSICS
Space Engineering Program

PROGRAM SPECIFICATION

PROGRAM LEVEL

BACHELOR OF ENGINEERING IN SPACE ENGINEERING

HCMC, 2024

PREFACE

In 2016, the International University officially opened the undergraduate Space Engineering program in the Department of Physics according to decision No. 261/QĐ-ĐHQG dated April 14^{th}, 2016, of the Chancellor of Viet Nam National University -Ho Chi Minh City (VNU-HCM). The program of Space Engineering is designed for a Bachelor of Engineering in the application of satellite technology, including signal processing and analysis, remote sensing technology, and satellite navigation. The program curriculum provides students the following modules: (1) Mathematics, (2) Physics, (3) Sciences for space engineers, (4) Development of technical solutions, such as signals and information systems, image processing, geographic information system (GIS), and satellite communication systems, (5) Programming for mobile devices using global positioning systems (GPS), (6) Big data analytics for satellite technology and business, and (7) Experiment in eight laboratories with 15 credits, focusing on analyzing and interpreting satellite signals.

Annually the program curriculum has been revised since 2019. The revisions were based on the feedback of stakeholders, approved by Committee of the Department of Physics and Science and Education Committee of the International University, and issued by Rector of the university, as follows:

Semester 1, 2019-2020:

- Change the subject structure of “Geographical Information System and Spatial Analytics” from 3 credits of theory to 2 credits of theory and 1 credit of laboratory.
- Discuss an update of the subject content of “Optics and Photonics”.

Semester 1, 2020-2021:

- Combine the subject of Geolocation apps development for iOS” (3 credits of theory) and the subject of “Geolocation apps development for iOS laboratory” (1 credit of laboratory) into the subject of “Geolocation apps development for iOS” (3 credits of theory and 1 credit of laboratory).
- Discuss an update of the subject content of “Big data analytics for remote sensing”.

Semester 1, 2021-2022

- Change the subject “Navigation System” from elective to compulsory.
- Change the subject of “Emerging Engineering Technologies” from a compulsory course to an elective course.

Semester 1, 2023-2024

- Remove the following 3 subjects from the curriculum:
    - Introduction to Computer for Engineers
    - Optics and Photonics
    - Engineering Ethics and Professional Skills
- Add the following 3 compulsory courses to the curriculum:

    - Discrete Mathematics
    - Principles of Database Management
    - General Law
- Add the following 5 elective courses to the curriculum:
    - Data Structures and Algorithms
    - Analytics for Observational Data
    - Data Mining
    - Business Analytics with Big Data
    - Business Analytics with Big Data Laboratory

Semester 1, 2024-2025

- Rename the following courses:
    - "Mathematics for Engineers" to "Fundamental Mathematics for Engineers"
    - "Big Data Analytics for Remote Sensing" to "Remote Sensing utilizing Big Data Analytics"
    - "Big Data Analytics for Remote Sensing Laboratory" to "Remote Sensing utilizing Big Data Analytics Laboratory"
- Change the number of credits of the following courses:
    - Earth Observation and the Environment from 3 credits to 2 credits.
    - iOS Programming Fundamentals from 4 credits (3 credits of theory and 1 credit of laboratory) to 3 credits (2 credits of theory and 1 credit of laboratory).
    - Geolocation App Development for iOS from 4 credits (3 credits of theory and 1 credit of laboratory) to 3 credits (2 credits of theory and 1 credit of laboratory).
    - Introduction to Space Communications from 3 credits to 2 credits.
    - Big Data Analytics for Remote Sensing from 3 credits to 4 credits.
    - Internship from 3 credits to 4 credits.

In conclusion, the Program Specification in 2024 is in accordance with all the revisions in 2019, 2020, 2021, 2023, and 2024 as summarized above.

CONTENTS

A. PROGRAM SPECIFICATION

1. INTRODUCTION

1.1 Vision - Mission - Objectives

The goals of the Space Engineering (SE) program are aligned with the vision, mission, and philosophy of education of International University (IU) and the national strategy for developing space science and technology.

- ✓ Bachelor of Engineering in Space Engineering program provides graduates with good political ethics and moral attitudes, professional knowledge and skills, research skills, and creative thinking.
- ✓ The graduates have abilities to flexibly apply knowledge and skills to solve various problems in space engineering and related fields.
- ✓ The graduates have abilities to study at a higher education level in space science, satellite communication, remote sensing, and global navigation satellite systems (GNSS) applications.

1.2 Program language

The language used in all the courses is English, except for 4 political courses delivered by VNU-HCM.

1.3 Qualification

The Space Engineering program requires students to spend four and half years of study at IU and it offers students a degree awarded by IU-VNU once completing the program.

Degree title: Bachelor of Engineering in Space Engineering

2. THE PROGRAM OBJECTIVE

The program's goals (POs) are centered on developing graduates who can serve as dependable professionals, leaders, and agents of social change and who have the necessary capacity to be sensitive and flexible to issues they face. Graduates of the program will possess the following knowledge, abilities, and competencies:

PO1. Broad fundamental knowledge of Mathematics, Physics, and Informatics to meet the requirements of the Space Engineering field and pursuit higher education levels.

PO2. Strong professional knowledge and skills in space science, satellite communication, digital image processing, remote sensing, GNSS, and geolocation-based services to develop applications in space engineering and related fields.

PO3. Solid skills in research, communication, and teamwork suitable for interdisciplinary contexts and multicultural environments.

PO4. Good understanding of socioeconomics and politics to effectively contribute to the sustainable development of society and community.

3. PROGRAM LEARNING OUTCOMES

3.1 Intended learning outcomes (ILOs)

The Intended Learning Outcomes (ILOs) of the SE program has continuously been developed, aiming at enhancing student achievement. The ILO development is a part of curriculum design and complies with the standard procedure. The ILOs applied since the 2019 cohort are presented in Table 1.1.

Table 1.1 The ILOs grouped by knowledge, skills, and attitudes

Knowledge, skills, and attitudes	Intended learning outcomes
Generic knowledge	ILO1 - Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.
Specific knowledge	ILO2 - Apply knowledge of physics and space science for solving problems in satellite technology applications. ILO3 - Apply knowledge and skills of digital signal processing for analyzing satellite communication signals. ILO4 - Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
Specific skills	ILO5 - Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
General skills	ILO6 - Communicate effectively in career. ILO7 - Work effectively in a team in space engineering and interdisciplinary areas.
Attitudes	ILO8 - Show an understanding of the role and responsibility of an engineer in society. ILO9 - Show abilities of further self-learning and lifelong learning. ILO10 - Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society.

3.2 Short report on the results of stakeholders' survey on ILOs of the program before designing/modification

In 2019, ILOs were assessed to ensure that they are in line with the objectives and the competence profile. The ten ILOs of the SE program, as presented in Table 1.1, are condensed from 91 expected learning outcomes designed upon the 2016 CDIO standards. The department's academic staff, senior students, and stakeholders participated in developing intended learning outcomes. The result of the feedback survey analysis shows that about 100% of stakeholders agreed with the ILOs, as shown in Table 1.2

Table 1.2 Agreements of the suggested ILOs from the stakeholders

Participants	Intended Learning Outcomes									
	ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8	ILO9	ILO10
Stakeholders	11	11	11	11	11	11	11	10	11	11
Senior students	12	12	12	12	12	12	12	12	12	12
Lecturers	7	7	7	7	7	7	7	7	7	7
Total of agreements	30	30	30	30	30	30	30	29	30	30
Percentage	100 %	100 %	100 %	100 %	100 %	100 %	100 %	97 %	100 %	100%

4. JOB OPPORTUNITIES

Bachelor's Program in Space Engineering provides graduates with good political ethics and moral attitudes, professional knowledge and skills, research skills, and creative thinking. The graduates have abilities to flexibly apply knowledge and skills to solve various problems in space engineering and related fields. The graduates can:

- Work in software, logistics, and telecommunication companies exploiting big data analysis, remote sensing, GNSS, and geolocation-based services.
- Work in worldwide organizations of applying satellite data in urban planning, management of the environment, natural resources, forest, land, and territory.
- Study at a higher education level and work in worldwide institutes or universities in space science, satellite communication, remote sensing, and GNSS applications.

5. PROGRAM OFFERING

5.1 Name of qualification

Bachelor of Engineering in Space Engineering

5.2 Title conferred (full, abbreviated; in original language):

Bachelor of Engineering in Space Engineering; BE. in SE; Kỹ sư Kỹ thuật Không gian

5.3 Major: Space Engineering

5.4 Institution awarding the qualification:

International University, Vietnam National University, Ho Chi Minh City

5.5 Faculty/Department offering the Degree Program:

Department of Physics

5.6 Language of instruction: English

5.7 Admission criteria of the program

Since the academic year (AY) 2017-2018, the admission of a candidate to IU is based on his/her performance obtained from either one of the following 6 schemes:

Table 1.3 The schemes for the admission to the IU, VNU-HCM

Scheme	Name and rule	Quota in 2024
S-1	National High School Graduation Exam: based on the total score of three subjects that students have registered for their expected programs.	50% - 70%
S-2	Enrollment without entrance exam: the best students based on the regulation from MOET on selection and registration, or the best students at the high schools designated by VNU-HCM.	1%
S-3	Priority for direct admission of excellent and talented candidates from High schools according to the regulations of VNU-HCM in 2024	1%
S-4	Admission priority of VNU-HCM: excellent students from high schools designated by VNU-HCM, based on the average score of three subjects during the 10th, 11th, and 12th grades.	5% - 15%
S-5	Results from the Scholastic Aptitude Exam held by VNU-HCM or VNU.	10% - 45%
S-6	Admission for candidates with International Baccalaureate: based on GPAs of three years and certificates such as Scholastic Assessment Test (SAT), American College Testing (ACT), International Baccalaureate (IB), Cambridge International Examinations A-Level (A-Level), Australian Tertiary Admission Rank (ATAR), etc.	5% - 10%
S-7	Academic Records of high schools (applied for twinning programs): based on the average score of three subjects during the 10th, 11th and 12th grades.	15%

For the 5th scheme, during AYs 2017-2018 to 2019-2020, the IU admission is also based on candidates' performance obtained from the results of the Scholastic Aptitude Exam held by the IU. After that, it was replaced by the Scholastic Aptitude Exam held by the VNU-HCM

The selection from either scheme is made by taking the candidates with the highest scores down until the corresponding quota is filled. The quota for each scheme varies each year depending on the recruitment strategy of IU. Information about student intake policy is updated and published every year in the IU admission brochure and the IU website.

Admission procedure

For national students

After receiving the official admission announcement from the institution in order to become students of IU, the applicants must have to follow the enrollment steps as below:

- Submit the required documents as in the enrollment guideline (online or offline)
- Submit the tuition fee and other fees (the tuition fee just only can be refunded in special case(es) such as enrollment for military training or sickness)
- Register for the English Entrance Placement Test
- Register for Physical training.

For international students

Similar to national students, after submitting a full application package, including proofs of a high school diploma, official transcript and/or international certificates, the international students must attend an interview session with the Admission Committee to officially become IU students.

Admission scholarship

In addition to the admission criteria, IU also has its own scholarship eligibility criteria for the students who get high scores in the national high school Graduation Examination and students who learn the graduate programs each year. This policy is one of the factors that attract excellent and highly qualified students to the programs at IU.

6. TEACHING AND LEARNING APPROACH

Our teaching methods reflect the IU's philosophy of education and help students effectively achieve the SE program's learning outcomes. The teaching methods consist of lectures, experiments, assignments, and projects. The learning model used is the student-centered learning (SCL), such as cooperative learning (CPL), problem-based learning (PBL), project-based learning (PAL), and skill-based learning (SBL). The CPL model directs students to use knowledge and understanding to solve authentic problems. The PBL model is a learning strategy that focuses on problem solving. Before students learn knowledge, they are given a problem. To be able to solve problems, students are required to learn new knowledge. The PBL is a good method for encouraging critical thinking and cooperative learning, as well as improving problem solving skills by solving real world problems. The PAL model is a teaching approach that involves students' interests and motivations, links theoretical concepts learned in the classroom and their applications are explored during activities outside the classroom and provide more opportunities for direct interaction between students. The PAL has the potential to deepen student understanding and enhance interaction between students in completing authentic problem-based assignments that occur in everyday life. The SBL model uses a laboratory where independence, thinking skills, collaboration and active learning are developed at the same time as knowledge is obtained. The learning media used consists of projectors, computers/laptops, and whiteboards, as well as tools/equipment in laboratories for practices.

Table 1.4: The SCL learning model applied in the SE program

Learning model	Examples of the application
CPL	General Physics (Mechanics, Thermodynamics, Magnetic Electricity, Quantum), Calculus, Probability and Statistics, Differential Equation, Computer, Programming for Engineers, and others
PBL	General Physics Laboratory, Programming for Engineers Laboratory, Digital Signal Processing Laboratory, Digital Image Processing, Big Data for Remote Sensing, and others
PAL	Space Environment, iOS programming, Satellite Technology, Navigation System, Remote Sensing, thesis and others
SBL	General Physics, Signals and Systems, Digital Signal Processing, Antenna and Microwave Engineering, Satellite Signal, and Image Processing

At the beginning of a new semester, lecturers upload course materials, such as course information, lectures, assignments, references, etc., to the IU Blackboard server (Blackboard System: https://blackboard.hcmiu.edu.vn/). Accordingly, students can have an overview of the course to achieve CLOs during their studies effectively. The university also offers facilities to study, such as high-speed student Wi-Fi, textbooks, journals, proceedings, etc. Lecturers can apply the learning instruments and methods according to their courses. At the end of the semester, lecturers receive feedback on their teaching instruments and methods from students through the QATO's online survey system. Subsequently, they consider choosing suitable teaching instruments and methods next time.

The IU has usually organized various training sessions on teaching methods and pedagogy for lecturers since 2016. Experts from domestic and international academic institutes are invited to conduct these sessions. Furthermore, the lecturers have more opportunities to participate in such training sessions organized by VNU-HCM. Moreover, they can join seminars on sharing experiments in teaching methods and course learning outcome assessments organized by members of VNU-HCM. Through these sessions or seminars, the lecturers' knowledge and skills of pedagogy are improved. Then they can apply teaching instruments and methods suitable for the subjects they teach.

7. STUDENT ASSESSMENT

To achieve the intended competence, every ILO is assessed through different courses and methods. Internal assessment is conducted by the schools via evaluation of the students' performance at courses supporting to achieve the student outcomes. The criteria for assessing students' performance are clearly stated in the assessment plans of each course syllabus. Based on the IU's Academic Regulation Under Credit System. The assessment of CLOs consists of elements with the 100-point grading scale.

- The component proportion of the total score of a subject is given as follows:
  - ✓ In-class assessment: attendance, active participation, quiz, homework, and assignment: 20-40% (offline instruction) or 30-60% (online).
  - ✓ Midterm exam: 20-40% (offline instruction) or 20-40% (online).
  - ✓ Final exam or essay: 30-50% (offline instruction) or 20-40% (online).
  - ✓ For practical subjects, the regulations are as follows:
  - ✓ Practical exercises: 70-80%.
  - ✓ Final exam: 20-30%.
  - ✓ Except for the internship, project, and thesis courses, for example, the total score (TS) of the course can be determined using the following formula:

$$TS = 30\%\ I + 30\%\ M + 40\%\ F$$

Wherein:

- I: in-class activities consist of participation (P) (such as attendance and discussion) and assignments/homework (A). They are planned on the course's syllabus to provide students with experience in mastering hard and soft skills. Therefore, the in-class score can be determined as 30% I = 10% P + 20% A.
- M: the midterm exam is sub-summative.
- F: the final exam is summative.

Accordingly, a student passes a subject when he/she gets the subject's total score of at least 50 marks and inversely he/she fails. Through these measures, only students who achieved the ILOs will graduate, and those who fail will have to retake courses to gain more knowledge and skills till they meet the expected learning outcome for the graduation. To record each student's performance, there are three different scores available on the IU's Education server: the Edusoft Web, used to evaluate the student's performance namely the course score, semester Grade Point Average (GPA) and cumulative GPA.

To guarantee the students understand about ILOs of degree programs and courses, a module document will be given by the respective lecturer at the beginning of the course meeting as a contract. The description of learning goals for a course has been written in the module document. The learning outcomes are put into practice within the individual courses of the program. The learning outcomes for individual courses are defined in the student handbook and used as help to describe knowledge, skills and attitudes acquired in the courses. The description of learning outcomes of the courses has been written by lecturers of respective courses.

8. PROGRAM STRUCTURE

8.1 Summary of the number of credits by knowledge blocks.

The curriculum can be classified into four blocks of knowledge: general courses (G), core courses (C), major courses (M), and internship, project, and thesis courses (P). Each course provides learning outcomes that contribute to ILOs at specified levels as follows:

- General courses provide basic knowledge of natural science, social science, and humanities. Natural science courses, including mathematics, physics, and informatics, are distributed in the first two years. Social science courses, including political theory, physical education, and military training, spread over four years.
- Core courses provide essential knowledge and skills of space science and technology. These courses spread from the 1st semester to the 5th semester and consist of three groups: Earth observation from space, satellite communication technology, and fundamentals of satellite technology applications.
- Major courses provide specific knowledge and skills for developing satellite technology applications. These courses are mainly distributed in the 6th semester and are elective courses in the 7th semester.
- Internship, project, and thesis courses provide working skills and attitudes, such as teamwork, communication, and lifelong learning, essential for space engineering and related areas. These courses help students apply knowledge to practice. For the internship in the summer after the 6th semester, students have six weeks to study and work with a supervisor at worldwide research institutes or industrial companies. For the research project in the 7th semester, students can participate in a research project under a supervisor. In the final semester, each student individually conducts a thesis whose topic can be proposed by the student or supervisor.

Table 1.5: The knowledge blocks of the SE program

Knowledge Block	Number of Credits	ECTS	Percentage
General courses (G)	62	98.1	41%
Core courses (C)	35	55.93	23%
Major courses (M)	37	60.83	24%
Internship, project, thesis (P)	18	29.46	12%
Total	152	244.32	100%

8.2 Comparison with other programs

❖ Comparison with Space Engineering program of York University (Canada)

According to the QS World University Rankings 2015–2016, York University's Space Engineering program is ranked 441-450. To perform system design, fabrication, and integration of satellite communication systems, remote sensing technology, and scientific payloads, as well as design and management of complex hardware and data systems, the program is based on a framework of applied mathematics, physics, astronomy, and computer science.

	MANDATORY & SPECIALIZED SUBJECTS		EVALUATION		
No.	**International University (IU-VNU)**	**York University (Canada)**	**Equivalent**	**Partially Equivalent**	**N/A or Not Equivalent**
1	Calculus 1	Applied Calculus I	x		
2	General Physics 1	Engineering Mechanics Dynamics Introduction to Continuum Mechanics	x		
3	General Physics 1 Laboratory				x
4	Introduction to Space Engineering				x
5	Calculus 2	Applied Calculus II Applied Multivariate	x		

		and Vector Calculus			
6	General Physics 2	Electricity and Magnetism	x		
7	General Physics 2 Laboratory				x
8	Critical Thinking				x
9	Earth observation and the environment	The Earth Environment	x		
10	General Physics 3	Electricity, Magnetism and Optics for Engineers	x		
11	General Physics 3 Laboratory				x
12	General Laws	Renaissance Engineer 1: Ethics, Communication and Problem Solving		x	
13	Introduction to Relativity and Modern Physics				x
14	Differential equations	Differential Equations for Scientists and Engineers	x		
15	Probability and statistics for engineers	Introduction to Probability and Statistics	x		
16	Programming for engineers				x
17	Programming for engineers Laboratory				x
18	Fundamental Mathematics for Engineers				x
19	Discrete Mathematics				x

20	Space Environment	Physics of the Space Environment	x		
21	Introduction to Signals and Systems	Introduction to Control Systems		x	
22	Signals and Systems Laboratory				x
23	Introduction to Space Communications				x
24	Satellite Technology	Geophysics and Space Science		x	
25	Digital Signal Processing				x
26	Digital Signal Processing Laboratory				x
27	Principles of Database Management				x
28	iOS programming fundamentals				x
29	Navigation Systems	Global Positioning Systems	x		
30	Geolocation App Development for iOS				x
31	Introduction to Digital Image Processing				x
32	Digital Image Processing Laboratory				x
33	Satellite Signal and Image Processing Laboratory	Payload Design Space Mission Design Finite Element Methods in Engineering Design		x	
34	Antenna and Microwave Engineering				x

35	Antenna and Microwave Engineering Laboratory				x
36	Digital Image Processing				x
37	Remote Sensing	Remote Sensing of the Earth's Surface	x		
38	Remote Sensing Utilizing Big Data Analytics				x
39	Remote Sensing Utilizing Big Data Analytics Laboratory				x
40	Project Management	Engineering Projects: Management, Economics & Safety		x	
41	Research Project	Engineering Project	x		
42	Fundamental of Surveying				x
43	Geographic Information Systems (GIS) and Spatial Analysis	Global Geophysics and Geodesy		x	
44	Radio Astrophysics	Radio Science and Techniques for Space Exploration		x	
45	Advanced Remote Sensing	Remote Sensing of the Atmosphere		x	
46	Emerging Engineering Technologies				x
47	Data Structures and Algorithms				x
48	Analytics for Observational Data				x

49	Data mining				x
50	Business analytics with Big data				x
51	Business analytics with Big data Laboratory				x

Equivalent percentage: 39.2%

❖ Comparison with Geoinformatics program of National University of Science and Technology (Pakistan)

The BE Programmed in Geoinformatics has been tailored to be in consonance with the guidelines given by PEC mandatory policy of 65% engineering subjects and 35% non-engineering subjects.

	MANDATORY & SPECIALIZED SUBJECTS		**EVALUATION**		
No.	**International University (IU-VNU)**	**National University of Science and Technology (Pakistan)**	**Equivalent**	**Partially Equivalent**	**N/A or Not Equivalent**
1	Calculus 1	Calculus & Analytical Geometry		x	
2	General Physics 1				x
3	General Physics 1 Laboratory				x
4	Introduction to Space Engineering				x
5	Calculus 2	Calculus & Analytical Geometry		x	
6	General Physics 2				x
7	General Physics 2 Laboratory				x
8	Critical Thinking	Communication Skills		x	

9	Earth observation and the environment	Geography Geosciences		x	
10	General Physics 3				x
11	General Physics 3 Laboratory				x
12	General Laws	Professional Ethics Occupational Health and Safety		x	
13	Introduction to Relativity and Modern Physics				x
14	Differential equations	Differential Equations	x		
15	Probability and statistics for engineers	BS CS Probability & Statistics	x		
16	Programming for engineers	Fundamentals of Programming	x		
17	Programming for engineers Laboratory	Fundamentals of Programming	x		
18	Fundamental Mathematics for Engineers	Linear Algebra		x	
19	Discrete Mathematics				x
20	Space Environment				x
21	Introduction to Signals and Systems				x
22	Signals and Systems Laboratory				x
23	Introduction to Space Communications				x

24	Satellite Technology				x
25	Digital Signal Processing				x
26	Digital Signal Processing Laboratory				x
27	Principles of Database Management	Database Management Systems	x		
28	iOS programming fundamentals	Object Oriented Programming (OOP)		x	
29	Navigation Systems	GPS Surveying	x		
30	Geolocation App Development for iOS	Object Oriented Programming (OOP)		x	
31	Introduction to Digital Image Processing	Digital Mapping & Image Processing		x	
32	Digital Image Processing Laboratory	Digital Mapping & Image Processing		x	
33	Satellite Signal and Image Processing Laboratory				x
34	Antenna and Microwave Engineering				x
35	Antenna and Microwave Engineering Laboratory				x
36	Digital Image Processing	Digital Mapping & Image Processing		x	
37	Remote Sensing	Introduction to Remote Sensing	x		

38	Remote Sensing Utilizing Big Data Analytics	Data Structures and Algorithms Machine Learning	x		
39	Remote Sensing Utilizing Big Data Analytics Laboratory	Data Structures and Algorithms Machine Learning	x		
40	Project Management	Geospatial Project Management		x	
41	Research Project	Final Year Design Project-I Final Year Design Project-II		x	
42	Fundamental of Surveying	Surveying-I	x		
43	Geographic Information Systems (GIS) and Spatial Analysis	Introduction to GIS Spatial Data Analysis Web GIS Cartography and Map Production GIS Applications Spatial Databases GIS Programming	x		
44	Radio Astrophysics				x
45	Advanced Remote Sensing				x
46	Emerging Engineering Technologies				x
47	Data Structures and Algorithms	Database Management Systems		x	

Equivalent percentage: 41.2%

❖ Comparison with Geoinformatics program of University of Technology (Malaysia)

According to the QS World University Rankings 2014–2015, University of Technology (Malaysia)'s Geoinformatics program is ranked 294-303. The program is focused on the improvements in sensor technology, especially in the spatial, spectral, and radiometric resolution. These improvements have enabled the scientific community to operationalize the methodology as well as broadening applications of remote sensing data to support sustainable natural resource and environmental managements.

	MANDATORY & SPECIALIZED SUBJECTS		**EVALUATION**		
No.	**International University (IU-VNU)**	**University of Technology (Malaysia)**	**Equivalent**	**Partially Equivalent**	**N/A or Not Equivalent**
1	Calculus 1	Mathematics for Surveyors I	x		
2	General Physics 1	Physics Theory for Surveyors		x	
3	General Physics 1 Laboratory				x
4	Introduction to Space Engineering				x
5	Calculus 2	Mathematic for Surveyors II - Advance Calculus	x		
6	General Physics 2	Applied Physics for Surveyors		x	
7	General Physics 2 Laboratory				x
8	Critical Thinking	Science and Technology Thinking		x	
9	Earth observation and the environment				x
10	General Physics 3				x
11	General Physics 3 Laboratory				x
12	General Laws	Professional Communication Skills		x	

13	Introduction to Relativity and Modern Physics				x
14	Differential equations				x
15	Probability and statistics for engineers	Statistic for Surveyors	x		
16	Programming for engineers	Computer Programming	x		
17	Programming for engineers Laboratory				x
18	Fundamental Mathematics for Engineers				x
19	Discrete Mathematics	Mathematic for Surveyors III -Survey Computation		x	
20	Space Environment	Geodesy I Geodesy II		x	
21	Introduction to Signals and Systems				x
22	Signals and Systems Laboratory				x
23	Introduction to Space Communications				x
24	Satellite Technology				x
25	Digital Signal Processing	Photogrammetry I Photogrammetry II		x	
26	Digital Signal Processing				x

	Laboratory				
27	Principles of Database Management				x
28	iOS programming fundamentals				x
29	Navigation Systems	Satellite Positioning I Satellite Positioning II	x		
30	Geolocation App Development for iOS				x
31	Introduction to Digital Image Processing				x
32	Digital Image Processing Laboratory				x
33	Satellite Signal and Image Processing Laboratory				x
34	Antenna and Microwave Engineering				x
35	Antenna and Microwave Engineering Laboratory				x
36	Digital Image Processing				x
37	Remote Sensing	Remote Sensing	x		
38	Remote Sensing Utilizing Big Data Analytics				x
39	Remote Sensing				x

	Utilizing Big Data Analytics Laboratory				
40	Project Management	Project Management for Surveyors	x		
41	Research Project	Undergraduate Project II	x		
42	Fundamental of Surveying	Fundamental of Survey & Mapping	x		
43	Geographic Information Systems (GIS) and Spatial Analysis	Geographical Information System Geospatial Data Analysis	x		
44	Radio Astrophysics	Field Astronomy		x	
45	Advanced Remote Sensing	Marine Geodesy		x	
46	Emerging Engineering Technologies	Science and Technology Thinking Engineering Surveying Technology		x	
47	Data Structures and Algorithms				x

Equivalent percentage: 29.4%

- Comparison with Space Science and Satellite Technology program of University of Science and Technology of Hanoi (USTH).

The curriculum of the Space Science and Satellite Technology program at USTH follows the Bologna process for Diploma, which is widely applied in more than 45 European countries. The curriculum spans three academic years, which equates to 180 European credits (ECTS). The first two semesters, which include the natural sciences (mathematics, physics, chemistry, and biology), informatics, and English courses, make up the foundation year. Students will get scientific/technological competences and knowledge spanning different areas, approaches, and tools starting in the second year. After then, Earth Observation & Modeling, Astrophysics, and Satellite Technologies make up the important topics coming under the banner of Space science/technology and its applications. The fundamental concepts of space science and technology are covered in the courses.

	MANDATORY & SPECIALIZED SUBJECTS		EVALUATION		
No.	**International University (IU-VNU)**	**University of Science and Technology of Hanoi (USTH)**	**Equivalent**	**Partially Equivalent**	**N/A or Not Equivalent**
1	Calculus 1	Math reasoning & Calculus	x		
2	General Physics 1	Classical Mechanics I Thermodynamics I Classical Mechanics II Thermodynamics II Fluid Mechanics	x		
3	General Physics 1 Laboratory				x
4	Introduction to Space Engineering				x
5	Calculus 2	Analysis & integration + differential equations (ODE) Linear and bilinear algebra	x		
6	General Physics 2	Electricity and Electromagnetism Electromagnetism II	x		
7	General Physics 2 Laboratory				x
8	Critical Thinking				x
9	Earth observation and the environment	Introduction to Earth system Climate Modelling		x	
10	General Physics 3	Atomic & Molecular Orbitals		x	

11	General Physics 3 Laboratory				x
12	General Laws				x
13	Introduction to Relativity and Modern Physics	Introduction to Relativity	x		
14	Differential equations	Analysis & integration + differential equations (ODE)	x		
15	Probability and statistics for engineers	Probabilities and Statistics	x		
16	Programming for engineers	Basic Programming Algorithms and Data Structure	x		
17	Programming for engineers Laboratory				x
18	Fundamental Mathematics for Engineers				x
19	Discrete Mathematics				x
20	Space Environment	Solar system and celestial mechanics		x	
21	Introduction to Signals and Systems				x
22	Signals and Systems Laboratory				x
23	Introduction to Space Communications	Communication, Antenna and Microwaves		x	
24	Satellite	Space System	x		

	Technology	Design I (satellite) Space System Design II (satellite)			
25	Digital Signal Processing				x
26	Digital Signal Processing Laboratory				x
27	Principles of Database Management				x
28	iOS programming fundamentals				x
29	Navigation Systems				x
30	Geolocation App Development for iOS				x
31	Introduction to Digital Image Processing				x
32	Digital Image Processing Laboratory				x
33	Satellite Signal and Image Processing Laboratory	Signal and Image processing in space applications Data acquisition & Satellite sensors	x		
34	Antenna and Microwave Engineering	Communication, Antenna and Microwaves	x		
35	Antenna and Microwave Engineering Laboratory				x
36	Digital Image				x

	Processing				
37	Remote Sensing	Fundamental of Remote sensing	x		
38	Remote Sensing Utilizing Big Data Analytics	Data analysis and visualization		x	
39	Remote Sensing Utilizing Big Data Analytics Laboratory				x
40	Project Management	Basic Principles of Project management	x		
41	Research Project	Group Project	x		
42	Fundamental of Surveying				x
43	Geographic Information Systems (GIS) and Spatial Analysis	Introduction to Geographic Information System	x		
44	Radio Astrophysics	Modern Astrophysics	x		
45	Advanced Remote Sensing	Radar remote sensing of Earth's surface Monitoring natural disasters by using satellite data	x		
46	Emerging Engineering Technologies				x
47	Data Structures and Algorithms	Data analysis and visualization		x	

Equivalent percentage: 38.9%

9. CURRICULUM

9.1 Level AE

LEVEL AE (TOEFL iBT ≥ 61 or IELTS ≥ 5.5)							
No	Course ID	Course name	Credit				ECTS
			Theory	Practice	Project	Total	
Semester 1			**14**	**2**	**0**	**16**	**25.63**
1	MA001IU	Calculus 1	4	0		4	6.18
2	PH019IU	General Physics 1	4	0		4	6.18
3	PH020IU	General Physics 1 Laboratory	0	2		2	4
4	PH018IU	Introduction to Space Engineering	2	0		2	3.09
5	EN007IU	Writing AE1	2	0		2	3.09
6	EN008IU	Listening AE1	2	0		2	3.09
7	PT001IU	Physical training 1	0	0		0	0
Semester 2			**16**	**1**	**0**	**17**	**26.73**
8	MA003IU	Calculus 2	4	0		4	6.18
9	PH021IU	General Physics 2	3	0		3	4.64
10	PH022IU	General Physics 2 Laboratory	0	1		1	2
11	PH061IU	Earth observation and the environment	2	0		2	3.09
12	EN011IU	Writing AE 2	2	0		2	3.09
13	EN012IU	Speaking AE2	2	0		2	3.09
14	PE015IU	Marxist-Leninist philosophy	3	0		3	4.64
15	PT002IU	Physical training 2	0	0		0	0
Summer semester (Year 1)							
Semester 3			**15**	**2**	**0**	**17**	**27.19**
16	PH023IU	General Physics 3	2	0		2	3.09

17	PH024IU	General Physics 3 Laboratory	0	1		1	2
18	PH037IU	Space Environment	3	0		3	4.64
19	PH026IU	Differential equations	2	0		2	3.09
20	PH030IU	Probability and statistics for engineers	3	0		3	4.64
21	EE057IU	Programming for engineers	3	0		3	4.64
22	EE058IU	Programming for engineers Laboratory	0	1		1	2
23	PE016IU	Marxist - Leninist Political Economy	2	0		2	3.09
Semester 4			**15**	**1**	**0**	**16**	**25.19**
24	PH068IU	Fundamental Mathematics for engineers	4	0		4	6.18
25	IT153IU	Discrete Mathematics	3	0		3	4.64
26	PH029IU	Introduction to Relativity and Modern Physics	3	0		3	4.64
27	PH032IU	Introduction to Signals and Systems	3	0		3	4.64
28	PH033IU	Signals and Systems Laboratory	0	1		1	2
29	PE017IU	Scientific socialism	2	0		2	3.09
Summer semester (Year 2)							
30	MP001IU	Military training	0	0		0	0
Semester 5			**15**	**3**	**0**	**18**	**29.19**
31	PH063IU	Introduction to Space Communications	2	0		2	3.09
32	PH040IU	Satellite Technology	3	0		3	4.64
33	EE092IU	Digital Signal Processing	3	0		3	4.64
34	EE093IU	Digital Signal Processing Laboratory	0	1		1	2

35	IT079IU	Principles of Database Management	3	1		4	6.64
36	PH062IU	iOS programming fundamentals	2	1		3	5.09
37	PE018IU	History of Vietnamese Communist Party	2	0		2	3.09
Semester 6			**11**	**5**	**0**	**16**	**27.01**
38	PH047IU	Navigation Systems	3	0		3	4.64
39	PH065IU	Geolocation App Development for iOS	2	1		3	5.09
40	PH038IU	Introduction to Digital Image Processing	2	0		2	3.09
41	PH039IU	Digital Image Processing Laboratory	0	1		1	2
42	PH043IU	Satellite Signal and Image Processing Laboratory	1	2		3	5.55
43	EE105IU	Antenna and Microwave Engineering	3	0		3	4.64
44	EE124IU	Antenna and Microwave Engineering Laboratory	0	1		1	2
Summer semester (Year 3)							
Semester 7			**16**	**1**	**0**	**17**	**26.74**
45	PH041IU	Digital Image Processing	3	0		3	4.64
46	PH036IU	Remote Sensing	3	0		3	4.64
47	PH069IU	Remote sensing utilizing Big Data Analytics	4	0		4	6.18
48	PH070IU	Remote sensing utilizing Big Data Analytics Laboratory	0	1		1	2
49	PH056IU	Project Management	3	0		3	4.64
50	PE008IU	Critical thinking	3	0		3	4.64
Semester 8			**10**	**2**	**4**	**16**	**26**

51	PH042IU	Research Project	0	0	4	4	6.55
Electives (choose 12 credits in 10 courses below)			10	2		12	19.45
52	PH045IU	Fundamental of Surveying	2	1		3	5.09
53	PH046IU	Geographic Information Systems (GIS) and Spatial Analysis	2	1		3	5.09
54	PH048IU	Radio Astrophysics	3	0		3	4.64
55	PH049IU	Advanced Remote Sensing	3	0		3	4.64
56	EE133IU	Emerging Engineering Technologies	3	0		3	4.64
57	IT013IU	Data Structures and Algorithms	3	1		4	6.64
58	IT142IU	Analytics for Observational Data	3	1		4	6.64
59	IT160IU	Data mining	3	1		4	6.64
60	PH058IU	Business analytics with Big data	3	0		3	4.64
61	PH059IU	Business analytics with Big data Laboratory	0	1		1	2
Summer semester (Year 4)			**0**	**0**	**4**	**4**	**6.55**
62	PH064IU	Internship	0	0	4	4	6.55
Semester 9			**5**	**0**	**10**	**15**	**24.09**
63	PE021IU	General Laws	3	0		3	4.64
64	PE019IU	Ho Chi Minh's Thought	2	0		2	3.09
65	PH050IU	Thesis	0	0	10	10	16.36
Total			**117**	**17**	**18**	**152**	**244.32**

9.2 Level IE2

LEVEL IE2 (46≤ TOEFL iBT ≤ 60 or IELTS = 5.0)							
No	**Course ID**	**Course**	**Credit**				**ECTS**
			Theory	**Practice**	**Project**	**Total**	
Semester 1			**17**	**0**	**0**	**17**	**6.18**
1	ENTP02IU	IE2	13	0		13	0
2	MA001IU	Calculus 1	4	0		4	6.18
3	PT001IU	Physical training 1	0	0		0	0
Semester 2			**16**	**2**	**0**	**18**	**28.72**
4	PH019IU	General Physics 1	4	0		4	6.18
5	PH020IU	General Physics 1 Laboratory	0	2		2	4
6	PH018IU	Introduction to Space Engineering	2	0		2	3.09
7	EN007IU	Writing AE1	2	0		2	3.09
8	EN008IU	Listening AE1	2	0		2	3.09
9	MA003IU	Calculus 2	4	0		4	6.18
10	PH061IU	Earth observation and the environment	2	0		2	3.09
11	PT002IU	Physical training 2	0	0		0	0
Summer semester (Year 1)			**8**	**1**	**0**	**9**	**14.37**
12	PE015IU	Marxist-Leninist philosophy	3	0		3	4.64
13	PE016IU	Marxist - Leninist Political Economy	2	0		2	3.09
14	PH021IU	General Physics 2	3	0		3	4.64
15	PH022IU	General Physics 2 Laboratory	0	1		1	2
Semester 3			**15**	**2**	**0**	**17**	**27.19**
16	PH023IU	General Physics 3	2	0		2	3.09

17	PH024IU	General Physics 3 Laboratory	0	1		1	2
18	EN011IU	Writing AE 2	2	0		2	3.09
19	EN012IU	Speaking AE2	2	0		2	3.09
20	PH037IU	Space Environment	3	0		3	4.64
21	PH030IU	Probability and statistics for engineers	3	0		3	4.64
22	EE057IU	Programming for engineers	3	0		3	4.64
23	EE058IU	Programming for engineers Laboratory	0	1		1	2
Semester 4			**17**	**1**	**0**	**18**	**28.28**
24	PH069IU	Fundamental Mathematics for engineers	4	0		4	6.18
25	IT153IU	Discrete Mathematics	3	0		3	4.64
26	PH029IU	Introduction to Relativity and Modern Physics	3	0		3	4.64
27	PH032IU	Introduction to Signals and Systems	3	0		3	4.64
28	PH033IU	Signals and Systems Laboratory	0	1		1	2
29	PH026IU	Differential equations	2	0		2	3.09
30	PE017IU	Scientific socialism	2	0		2	3.09
Summer semester (Year 2)							
31	MP001IU	Military training	0	0		0	0
Semester 5			**15**	**3**	**0**	**18**	**29.19**
32	PH063IU	Introduction to Space Communications	2	0		2	3.09
33	PH040IU	Satellite Technology	3	0		3	4.64
34	EE092IU	Digital Signal Processing	3	0		3	4.64
35	EE093IU	Digital Signal Processing Laboratory	0	1		1	2

36	IT079IU	Principles of Database Management	3	1		4	6.64
37	PH062IU	iOS programming fundamentals	2	1		3	5.09
38	PE018IU	History of Vietnamese Communist Party	2	0		2	3.09
Semester 6			**11**	**5**	**0**	**16**	**27.01**
39	PH047IU	Navigation Systems	3	0		3	4.64
40	PH065IU	Geolocation App Development for iOS	2	1		3	5.09
41	PH038IU	Introduction to Digital Image Processing	2	0		2	3.09
42	PH039IU	Digital Image Processing Laboratory	0	1		1	2
43	PH043IU	Satellite Signal and Image Processing Laboratory	1	2		3	5.55
44	EE105IU	Antenna and Microwave Engineering	3	0		3	4.64
45	EE124IU	Antenna and Microwave Engineering Laboratory	0	1		1	2
Summer semester (Year 3)							
Semester 7			**16**	**1**	**0**	**17**	**26.74**
46	PH041IU	Digital Image Processing	3	0		3	4.64
47	PH036IU	Remote Sensing	3	0		3	4.64
48	PH070IU	Remote sensing utilizing Big Data Analytics	4	0		4	6.18
49	PH071IU	Remote sensing utilizing Big Data Analytics Laboratory	0	1		1	2
50	PH056IU	Project Management	3	0		3	4.64
51	PE008IU	Critical thinking	3	0		3	4.64
Semester 8			**10**	**2**	**4**	**16**	**26**

52	PH042IU	Research Project	0	0	4	4	6.55
Electives (choose 12 credits in 10 courses below)			10	2		12	19.45
53	PH045IU	Fundamental of Surveying	2	1		3	5.09
54	PH046IU	Geographic Information Systems (GIS) and Spatial Analysis	2	1		3	5.09
55	PH048IU	Radio Astrophysics	3	0		3	4.64
56	PH049IU	Advanced Remote Sensing	3	0		3	4.64
57	EE133IU	Emerging Engineering Technologies	3	0		3	4.64
58	IT013IU	Data Structures and Algorithms	3	1		4	6.64
59	IT142IU	Analytics for Observational Data	3	1		4	6.64
60	IT160IU	Data mining	3	1		4	6.64
61	PH068IU	Business analytics with Big data	3	0		3	4.64
62	PH059IU	Business analytics with Big data Laboratory	0	1		1	2
Summer semester (Year 4)			**0**	**0**	**4**	**4**	**6.55**
63	PH064IU	Internship	0	0	4	4	6.55
Semester 9			**5**	**0**	**10**	**15**	**24.09**
64	PE021IU	General Laws	3	0		3	4.64
65	PE019IU	Ho Chi Minh's Thought	2	0		2	3.09
66	PH050IU	Thesis	0	0	10	10	16.36
Total			**130**	**17**	**18**	**165**	**244.32**

9.3 Level IE1

LEVEL IE1 (35≤ TOEFL iBT ≤ 45 or IELTS = 4.5)								
No	Course ID	Course	Credit				ECTS
			Theory	Practice	Project	Total	
Semester 1			**30**	**0**	**0**	**30**	**0**
1	ENTP01IU	IE1	17	0		17	0
2	ENTP02IU	IE2	13	0		13	0
Semester 2			**16**	**2**	**0**	**18**	**28.72**
3	MA001IU	Calculus 1	4	0		4	6.18
4	PH019IU	General Physics 1	4	0		4	6.18
5	PH020IU	General Physics 1 Laboratory	0	2		2	4
6	PH018IU	Introduction to Space Engineering	2	0		2	3.09
7	EN007IU	Writing AE1	2	0		2	3.09
8	EN008IU	Listening AE1	2	0		2	3.09
9	PH061IU	Earth observation and the environment	2	0		2	3.09
10	PT001IU	Physical training 1	0	0		0	0
Summer semester (Year 1)			**9**	**0**	**0**	**9**	**13.91**
11	PE015IU	Marxist-Leninist philosophy	3	0		3	4.64
12	PE016IU	Marxist - Leninist Political Economy	2	0		2	3.09
13	MA003IU	Calculus 2	4	0		4	6.18
Semester 3			**15**	**2**	**0**	**17**	**27.19**
14	PH021IU	General Physics 2	3	0		3	4.64

15	PH022IU	General Physics 2 Laboratory	0	1		1	2
16	EN011IU	Writing AE 2	2	0		2	3.09
17	EN012IU	Speaking AE2	2	0		2	3.09
18	PH026IU	Differential equations	2	0		2	3.09
19	PH030IU	Probability and statistics for engineers	3	0		3	4.64
20	EE057IU	Programming for engineers	3	0		3	4.64
21	EE058IU	Programming for engineers Laboratory	0	1		1	2
22	PT002IU	Physical training 2	0	0		0	0
Semester 4			**15**	**2**	**0**	**17**	**27.19**
23	PH069IU	Fundamental Mathematics for engineers	4	0		4	6.18
25	PH023IU	General Physics 3	2	0		2	3.09
26	PH024IU	General Physics 3 Laboratory	0	1		1	2
27	IT153IU	Discrete Mathematics	3	0		3	4.64
28	PH037IU	Space Environment	3	0		3	4.64
29	PH032IU	Introduction to Signals and Systems	3	0		3	4.64
30	PH033IU	Signals and Systems Laboratory	0	1		1	2
Summer semester (Year 2)							
30	MP001IU	Military training	0	0		0	0
Semester 5			**16**	**3**	**0**	**19**	**30.74**
31	PH063IU	Introduction to Space Communications	2	0		2	3.09

32	PH029IU	Introduction to Relativity and Modern Physics	3	0		3	4.64
33	PH040IU	Satellite Technology	3	0		3	4.64
34	EE092IU	Digital Signal Processing	3	0		3	4.64
35	EE093IU	Digital Signal Processing Laboratory	0	1		1	2
36	IT079IU	Principles of Database Management	3	1		4	6.64
37	PH062IU	iOS programming fundamentals	2	1		3	5.09
Semester 6			**11**	**5**	**0**	**16**	**27.01**
38	PH047IU	Navigation Systems	3	0		3	4.64
39	PH065IU	Geolocation App Development for iOS	2	1		3	5.09
40	PH038IU	Introduction to Digital Image Processing	2	0		2	3.09
41	PH039IU	Digital Image Processing Laboratory	0	1		1	2
42	PH043IU	Satellite Signal and Image Processing Laboratory	1	2		3	5.55
43	EE105IU	Antenna and Microwave Engineering	3	0		3	4.64
44	EE124IU	Antenna and Microwave Engineering Laboratory	0	1		1	2
Summer semester (Year 3)							
Semester 7			**18**	**1**	**0**	**19**	**29.83**
45	PH041IU	Digital Image Processing	3	0		3	4.64
46	PH036IU	Remote Sensing	3	0		3	4.64
47	PH070IU	Remote sensing utilizing Big Data Analytics	4	0		4	6.18

48	PH071IU	Remote sensing utilizing Big Data Analytics Laboratory	0	1		1	2
49	PE017IU	Scientific socialism	2	0		2	3.09
50	PH056IU	Project Management	3	0		3	4.64
51	PE008IU	Critical thinking	3	0		3	4.64
Semester 8			**12**	**2**	**4**	**18**	**29.09**
52	PH042IU	Research Project	0	0	4	4	6.55
53	PE018IU	History of Vietnamese Communist Party	2	0	0	2	3.09
Electives (choose 12 credits in 10 courses below)			10	2		12	19.45
54	PH045IU	Fundamental of Surveying	2	1		3	5.09
55	PH046IU	Geographic Information Systems (GIS) and Spatial Analysis	2	1		3	5.09
56	PH048IU	Radio Astrophysics	3	0		3	4.64
57	PH049IU	Advanced Remote Sensing	3	0		3	4.64
58	EE133IU	Emerging Engineering Technologies	3	0		3	4.64
59	IT013IU	Data Structures and Algorithms	3	1		4	6.64
60	IT142IU	Analytics for Observational Data	3	1		4	6.64
61	IT160IU	Data mining	3	1		4	6.64
62	PH068IU	Business analytics with Big data	3	0		3	4.64
63	PH059IU	Business analytics with Big data Laboratory	0	1		1	2
Summer semester (Year 4)			**0**	**0**	**4**	**4**	**6.55**
64	PH064IU	Internship	0	0	4	4	6.55

Semester 9			**5**	**0**	**10**	**15**	**24.09**
65	PE021IU	General Laws	3	0		3	4.64
66	PE019IU	Ho Chi Minh's Thought	2	0		2	3.09
67	PH050IU	Thesis	0	0	10	10	16.36
Total			**147**	**17**	**18**	**182**	**244.32**

9.4 Level IE0

LEVEL IE0 (TOEFL iBT ≤ 31 or IELTS ≤ 4.0)							
No	**Course ID**	**Course**	**Credit**				**ECTS**
			Theory	**Practice**	**Project**	**Total**	
Semester 1			**34**	**0**	**0**	**34**	**0**
1	ENTP00IU	IE0	17	0		17	0
2	ENTP01IU	IE1	17	0		17	0
Semester 2			**13**	**0**	**0**	**13**	**0**
3	ENTP02IU	IE2	13	0		13	0
4	PT001IU	Physical training 1	0	0		0	0
Summer semester (Year 1)			**5**	**0**	**0**	**5**	**7.73**
5	PE015IU	Marxist-Leninist philosophy	3	0		3	4.64
6	PE016IU	Marxist - Leninist Political Economy	2	0		2	3.09
Semester 3			**14**	**2**	**0**	**16**	**25.63**
7	MA001IU	Calculus 1	4	0		4	6.18
8	PH019IU	General Physics 1	4	0		4	6.18
9	PH020IU	General Physics 1 Laboratory	0	2		2	4

10	PH018IU	Introduction to Space Engineering	2	0		2	3.09
11	EN007IU	Writing AE1	2	0		2	3.09
12	EN008IU	Listening AE1	2	0		2	3.09
Semester 4			**13**	**1**	**0**	**14**	**22.09**
13	MA003IU	Calculus 2	4	0		4	6.18
14	PH021IU	General Physics 2	3	0		3	4.64
15	PH022IU	General Physics 2 Laboratory	0	1		1	2
16	PH061IU	Earth observation and the environment	2	0		2	3.09
17	EN011IU	Writing AE 2	2	0		2	3.09
18	EN012IU	Speaking AE2	2	0		2	3.09
19	PT002IU	Physical training 2	0	0		0	0
Summer semester (Year 2)							
20	MP001IU	Military training	0	0		0	0
Semester 5			**13**	**2**	**0**	**15**	**24.1**
21	PH023IU	General Physics 3	2	0		2	3.09
22	PH024IU	General Physics 3 Laboratory	0	1		1	2
23	PH037IU	Space Environment	3	0		3	4.64
24	PH026IU	Differential equations	2	0		2	3.09
25	PH030IU	Probability and statistics for engineers	3	0		3	4.64
26	EE057IU	Programming for engineers	3	0		3	4.64
27	EE058IU	Programming for engineers Laboratory	0	1		1	2
Semester 6			**15**	**1**	**0**	**16**	**25.19**

28	PH069IU	Fundamental Mathematics for engineers	4	0		4	6.18
29	IT153IU	Discrete Mathematics	3	0		3	4.64
30	PH029IU	Introduction to Relativity and Modern Physics	3	0		3	4.64
31	PH032IU	Introduction to Signals and Systems	3	0		3	4.64
32	PH033IU	Signals and Systems Laboratory	0	1		1	2
33	PE017IU	Scientific socialism	2	0		2	3.09
Summer semester (Year 3)							
Semester 7			**15**	**3**	**0**	**18**	**29.19**
34	PH063IU	Introduction to Space Communications	2	0		2	3.09
35	PH040IU	Satellite Technology	3	0		3	4.64
36	EE092IU	Digital Signal Processing	3	0		3	4.64
37	EE093IU	Digital Signal Processing Laboratory	0	1		1	2
38	IT079IU	Principles of Database Management	3	1		4	6.64
39	PH062IU	iOS programming fundamentals	2	1		3	5.09
40	PE018IU	History of Vietnamese Communist Party	2	0		2	3.09
Semester 8			**11**	**5**	**0**	**16**	**27.01**
41	PH047IU	Navigation Systems	3	0		3	4.64
42	PH065IU	Geolocation App Development for iOS	2	1		3	5.09
43	PH038IU	Introduction to Digital Image Processing	2	0		2	3.09

44	PH039IU	Digital Image Processing Laboratory	0	1		1	2
45	PH043IU	Satellite Signal and Image Processing Laboratory	1	2		3	5.55
46	EE105IU	Antenna and Microwave Engineering	3	0		3	4.64
47	EE124IU	Antenna and Microwave Engineering Laboratory	0	1		1	2
Summer semester (Year 4)							
Semester 9			**16**	**1**	**0**	**17**	**26.74**
48	PH041IU	Digital Image Processing	3	0		3	4.64
49	PH036IU	Remote Sensing	3	0		3	4.64
50	PH070IU	Remote sensing utilizing Big Data Analytics	4	0		4	6.18
51	PH071IU	Remote sensing utilizing Big Data Analytics Laboratory	0	1		1	2
52	PH056IU	Project Management	3	0		3	4.64
53	PE008IU	Critical thinking	3	0		3	4.64
Semester 10			**10**	**2**	**4**	**16**	**26**
54	PH042IU	Research Project	0	0	4	4	6.55
Electives (choose 12 credits in 10 courses below)			10	2		12	19.45
55	PH045IU	Fundamental of Surveying	2	1		3	5.09
56	PH046IU	Geographic Information Systems (GIS) and Spatial Analysis	2	1		3	5.09
57	PH048IU	Radio Astrophysics	3	0		3	4.64
58	PH049IU	Advanced Remote Sensing	3	0		3	4.64
59	EE133IU	Emerging Engineering Technologies	3	0		3	4.64

60	IT013IU	Data Structures and Algorithms	3	1		4	6.64
61	IT142IU	Analytics for Observational Data	3	1		4	6.64
62	IT160IU	Data mining	3	1		4	6.64
63	PH068IU	Business analytics with Big data	3	0		3	4.64
64	PH059IU	Business analytics with Big data Laboratory	0	1		1	2
Summer semester (Year 5)			**0**	**0**	**4**	**4**	**6.55**
65	PH064IU	Internship	0	0	4	4	6.55
Semester 11			**5**	**0**	**10**	**15**	**24.09**
66	PE021IU	General Laws	3	0		3	4.64
67	PE019IU	Ho Chi Minh's Thought	2	0		2	3.09
68	PH050IU	Thesis	0	0	10	10	16.36
Total			**164**	**17**	**18**	**199**	**244.32**

10. RELATION OF PROGRAM ILOS AND COURSES

10.1 Matrix course versus learning outcomes

No	Course ID	Course name	Credits	ECTS	Intended Learning Outcomes									
					General Knowledge	Specific Knowledge			Specific Skills	General Skills		Attitudes		
					ILO1	ILO2	ILO3	ILO4	ILO5	ILO6	ILO7	ILO8	ILO9	ILO10
Semester 1														
1	MA001IU	Calculus 1	4	6.18	L									
2	PH019IU	General Physics 1	4	6.18	L									
3	PH020IU	General Physics 1 Laboratory	2	4					L					
4	PH018IU	Introduction to Space Engineering	2	3.09		L					L		L	
5	EN007IU	Writing AE1	2	3.09							L			
6	EN008IU	Listening AE1	2	3.09							L			
7	PT001IU	Physical training 1	0	0										
Semester 2														
8	MA003IU	Calculus 2	4	6.18	M									

9	PH021IU	General Physics 2	3	4.64	L									
10	PH022IU	General Physics 2 Laboratory	1	2					L					
11	PE015IU	Marxist-Leninist philosophy	3	4.64								L		
12	PH061IU	Earth observation and the environment	2	3.09		L			L					L
13	EN011IU	Writing AE2	2	3.09							M			
14	EN012IU	Speaking AE2	2	3.09							M			
15	PT002IU	Physical training 2	0	0										
Summer Semester (Year 1)														
Semester 3														
16	PH023IU	General Physics 3	2	3.09	L									
17	PH024IU	General Physics 3 Laboratory	1	2					L					
18	PH037IU	Space Environment	3	4.64		M			L					L
19	PH026IU	Differential equations	2	3.09	L									
20	PH030IU	Probability and statistics for engineers	3	4.64	M									

21	EE057IU	Programming for engineers	3	4.64	L									
22	EE058IU	Programming for engineers Laboratory	1	2					L					
23	PE016IU	Political economics of Marxism and Leninism	2	3.09						L		L		
Semester 4														
24	PH069IU	Fundamental Mathematics for Engineers	4	6.18	M									
25	IT153IU	Discrete Mathematics	3	4.64	M									
26	PH029IU	Introduction to Relativity and Modern Physics	3	4.64		M					L		L	
27	PH032IU	Introduction to Signals and Systems	3	4.64			L							
28	PH033IU	Signals and Systems Laboratory	1	2					L					
29	PE017IU	Scientific socialism	2	3.09						L		M		
Summer Semester (Year 2)														
30	MP001IU	Military Training	0	0										

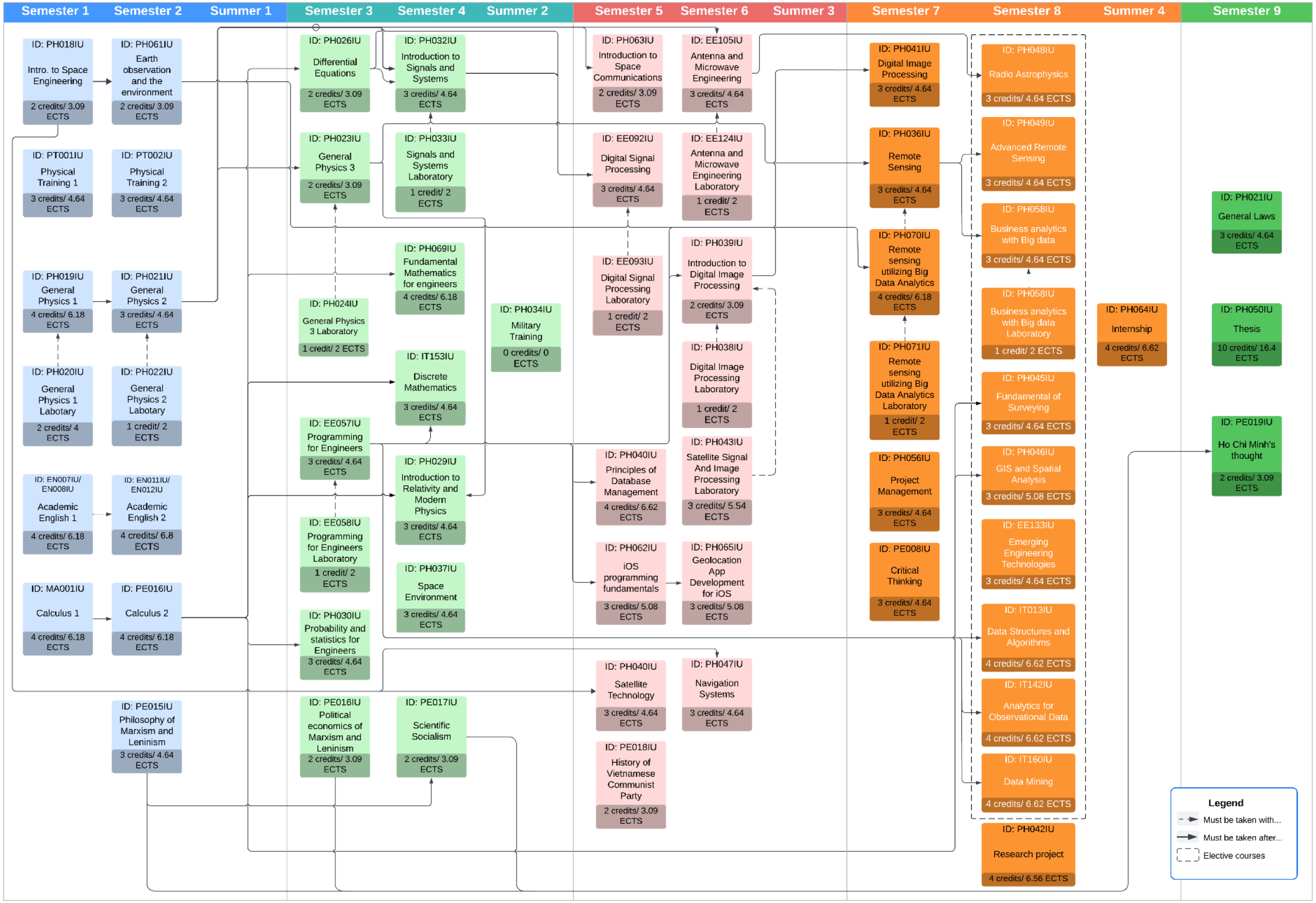
Semester 5														
31	PH063IU	Introduction to Space Communications	2	3.09	M		M				M	M		
32	PH040IU	Satellite Technology	3	4.64			M			L				L
33	EE092IU	Digital Signal Processing	3	4.64			M							
34	EE093IU	Digital Signal Processing Laboratory	1	2					M					
35	IT079IU	Principles of Database Management	4	6.64				M						
36	PH062IU	iOS programming fundamentals	3	5.09	M			M	M			L		
37	PE018IU	History of Vietnamese Communist Party	2	3.09								M		
Semester 6														
38	PH047IU	Navigation Systems	3	4.64				M	M					M
39	PH065IU	Geolocation App Development for iOS	3	5.09				H	H	M	M			
40	PH038IU	Introduction to Digital Image Processing	2	3.09				M	M			M		

41	PH039IU	Digital Image Processing Laboratory	1	2				M	M			M		
42	PH043IU	Satellite Signal and Image Processing Laboratory	3	5.55			H		H	M				M
43	EE105IU	Antenna and Microwave Engineering	3	4.64			M							
44	EE124IU	Antenna and Microwave Engineering Laboratory	1	2					M					
Summer Semester (Year 3)														
Semester 7														
45	PH041IU	Digital Image Processing	3	4.64				H	H				M	
46	PH036IU	Remote Sensing	3	4.64	M			H	H					M
47	PH070IU	Remote Sensing Utilizing Big Data Analytics	4	6.18				H	H				M	
48	PH071IU	Remote Sensing Utilizing Big Data Analytics Laboratory	1	2.0				H	H				M	

49	PH056IU	Project Management	3	4.64						M		M		
50	PE008IU	Critical thinking	3	4.64					L			L		
Semester 8														
51	PH042IU	Research Project	4	6.55					H	M	H	M	M	M
Electives (choose 12 credits in 10 courses below)														
52	PH045IU	Fundamental of Surveying	3	5.09				M	M					M
53	PH046IU	Geographic Information Systems (GIS) and Spatial Analysis	3	5.09				H	H			M	M	
54	PH048IU	Radio Astrophysics	3	4.64		M			M				M	
55	PH049IU	Advanced Remote Sensing	3	4.64				H	H					M
56	EE133IU	Emerging Engineering Technologies	3	4.64		M								M
57	IT013IU	Data Structures and Algorithms	3	1				M						
58	IT142IU	Analytics for Observational Data	3	1				M						

59	IT160IU	Data mining	3	1				M						
60	PH068IU	Business analytics with Big data	3	0				H	H				M	
61	PH059IU	Business analytics with Big data Laboratory	0	1				H	H				M	
Summer Semester (Year 4)														
62	PH064IU	Internship	4	6.55					H	M	M	M	M	M
Semester 9														
63	PE021IU	General Laws	3	4.64								M		
64	PE019IU	Ho Chi Minh's Thought	2	3.09								M		
65	PH050IU	Thesis	10	16.36					H		H	M	M	M

11. CURRICULUM MAPPING



12. ACADEMIC REGULATION

CHAPTER I GENERAL PROVISIONS

Article 1: Scope of regulations and subjects of application

1. This Decision provides a set of regulations for organizing and managing undergraduate education at International University, including curriculum and study period; organizing and planning teaching activities; assessing outcome standards and accrediting; other regulations for undergraduate students.
2. These regulations apply to organizations and individuals involved in undergraduate education at IU. Joint programs whose accreditations are provided by partnering universities may follow these regulations or partnering universities' own regulations provided that the partnering universities' regulations are compatible with IU's regulations.
    1. List of all abbreviations:

IU	International University
VNU-HCM	Vietnam National University – Ho Chi Minh City
TS	Teaching staff
AA	Academic advisor
CI	Curriculum
OS	Outcome standard
SAM	Semester average mark
AAM	Accumulated average mark
ME	Military Education
PE	Physical Education
Cr.	Credit
Int.	Graduation internship
Thesis	Graduation thesis

Article 2: Curriculum and study period

1. Credits are used for calculating the academic load of the students. A credit shall be equivalent to 15 theory periods; 30 - 45 periods of practice, experiment or discussion; 45 - 90 hours of internship; 45 - 60 hours of thesis, coursework or graduation thesis ('thesis'). For theory courses or practical courses, students shall spend at least 30 hours for self- preparation. The study period shall last 50 minutes.
2. A "course" means a nearly complete amount of knowledge which students can accumulate during the study process. Most courses can carry 2 to 4 credits, course content is provided completely and evenly during a semester. Knowledge in each

course shall correspond to a level according to the course design and shall be structured as a part of a subject or a collection of subjects. Each course shall be designated with a particular code as regulated by the university. Courses are divided into compulsory and elective courses:

a) A compulsory course contains the primary knowledge of a curriculum which all students must acquire.

b) An elective course contains the necessary knowledge that students are allowed to select for themselves under the guidance of their respective universities in order to diversify the specialties or select freely to accumulate sufficient courses as required.

3. A “specialty” is the body of knowledge or professional skills of a scientific domain or a vocation. A specialty may consist of one or many subspecialties. Each specialty shall be designated with a particular code in the MOET’s level-four classification of education at undergraduate level.

4. A curriculum shall specify the aim(s) of education; knowledge and skill standards; the scope and structure of the educational content; methods and forms of training; forms of evaluation for each course, credit, specialty and level of education:

   a) A curriculum shall be developed according to the credit system and structured from individual courses; a curriculum shall cover all compulsory courses and meet the current curriculum standards as prescribed by the MOET. In cases of multidisciplinary and disciplinary – sub disciplinary education, the curriculum shall specify the general and specific workload for each discipline/subdiscipline.

   b) The aim(s) of education shall be specific, compatible with the values and vision of IU, consistent with the aim of education as prescribed by the MOET.

5. Outcome standards (OS) are requirements for students after completing the curriculum, pertaining to both competences and virtues. These standards consist of minimum requirements for knowledge, skills, autonomy and other responsibilities that students shall meet when graduate. OS shall meet the following criteria:

   a) Be specific and realistic, clearly exemplify the learners’ learning outcomes in terms of general knowledge, core knowledge at their level of education, and other requirements for their specialties and disciplines.

   b) Clearly evaluate and differentiate different levels of thinking; execute and improve the curriculum as well as teaching methods; assess and evaluate academic performance and award degrees to learners.

   c) Be consistent with the aims of the program; clearly demonstrate contributions and at the same time meet the representative requirements of contemporary recruiters and other related parties.

d) Be able to specify the level of education and meet the outcome standards for knowledge, autonomy, responsibilities, and competences, as prescribed by the Vietnamese qualification framework for the respective level of education.

e) Ensure continuity with the admission requirements for higher level(s) of education (if applicable); at the same time create interconnectivity with same-level curricula, especially with curricula in the same area of specialty or expertise.

f) Be clearly and concretely present in the outcome standards for each credit and course in the curriculum; and at the same time be executed systematically through the connection between academic credits and courses.

g) Be feasible and suitable for the academic workload in order for most learners who have met the admission requirements to complete the curriculum in the standard time.

h) Meet the qualifications prescribed in VNU-HCM's requirements for competences and virtues.

6. The curriculum's content and outcome standards shall be applied uniformly to different forms and methods of teaching as well as types of learners. For learners that have completed a different academic level or specialty, the actual academic workload is calculated on the basis of the respective accreditation(s) or converted the accumulated credits and excluded credits for the previous program(s).

7. The content of the curriculum shall be publicized for learners before admission and the start of the course; modifications made to the curriculum shall be applied according to current regulations as well as approved and announced to learners before the enrollment course in order not to cause adverse effects to students.

8. The curriculum shall provide a standard academic plan for the enrollment course in order to orient students. The time of education for formal undergraduate education shall conform to the regulations prescribed in the MOET's structural framework of the national education system and at the same time ensure that most students will be able to complete the curriculum.

9. For programs offering bachelor's degrees, each curriculum can carry from 120 to 130 credits, which are designed for the standard study duration of 4 years. For programs offering engineering degrees, each curriculum can carry from 150 to 160 credits, which are designed for the standard study duration of 4 to 5 years.

10. The maximum time for students to complete their curriculum is one and a half hours of the standard study duration for that enrollment course. Under certain circumstances, the rector may permit to prolong the time of education to up to 2 times the standard study duration for that enrollment course. For students that have already completed a university degree and have had the study duration deducted accordingly, the maximum time to complete the curriculum shall be discerned on the basis of the

deducted workload.

Article 3: Method of training organization

1. IU agrees to conduct its training under the credit system, which shall be applied to all programs and forms of training.
2. Education applying academic credit system is a method of training organization which divides the knowledge into different courses, allowing students to accumulate credits from each course and complete their training program according to their personal plan and IU's teaching plan;
3. Students who fail to complete a compulsory course shall have to take that course again or substitute it with an equivalent course in the training program, or take a replacement course if that course is no longer offered;
4. Students who fail to complete an elective course shall take that course again or choose another elective course as prescribed in the training program.

Article 4: Forms of education

1. IU offers formal university training for undergraduate courses for which the university or its accredited partner provides certifications;
2. All teaching activities are conducted on IU campuses. Field trips, practical activities, practical experience activities and online teaching activities may be conducted outside of the university campuses;
3. The time to conduct teaching activities is from 6 a.m. to 8 p.m. every day of the week (excluding Sunday). The time to conduct other specific activities in the curriculum shall be decided on a case-by-case basis by the Rector.

CHAPTER II FORMULATE AND EXECUTE TEACHING PLANS

Article 5: Teaching and learning plans

1. Teaching and learning plans shall elaborate the curriculum of that year or semester, concurrent with training activities at IU.
2. The plan for the academic year shall specify the different milestones for all training activities in that academic year. The plan shall be publicized to all concerned parties before the start of the academic year. Each academic year has two main semesters (the first and second semester), each semester has at least 15 study weeks. Aside from the two semesters, IU also offers a summer semester (the third semester), which lasts for at least 7 weeks.
3. The plan for the semester consists of a plan to open courses, form of teaching and learning (in-person, online, or hybrid), academic calendar, exam schedule for all modules in the respective courses of that semester, training plan. The plan for that

semester shall be formulated and announced 2 weeks before course registration, complete with all necessary information so that students may formulate their own academic plan.

4. The agenda specifies the time, location, teaching and learning activities for each class in that course and training program. The agenda for each module is divided evenly in the weeks of that semester.

Article 6: Organization of course registration

1. Before the start of each semester, the Office of Undergraduate Academic Affairs (OUAA), departments/schools and supervisors are responsible for notifying and instructing students to register for courses on the school's registration software.
2. Students shall sign up for courses that they intend to take that semester, including new courses, unfinished courses (in order to take them again) and completed courses (in order to improve their grades, if they so desire) based on the list of all courses offered in that semester and the prerequisites for respective courses.
3. The course registration process abides by the following regulations:
   a) Before a semester, the OUAA formulates the plan for that semester, timetable, course registration plan and announces the information to schools/department in order for them to publicize the information to their respective students;
   b) Schools/Departments shall publicize the following information to their students: (a) a list of all courses offered that semester; (b) TS for that semester and prerequisites for respective courses and (c) deadline for course registration;
   c) Academic advisors are responsible for: (a) giving students advice on how to form their own academic schedules; (b) organizing the registration so that students may sign up for all necessary courses within the prescribed time period; (c) on the basis of the curriculum and each student's academic performance, giving students advice on choosing the appropriate number of credits and courses for that semester; (d) checking and vetting the registration of students. Academic advisors shall meet with students at least once per semester;
   d) Students register for courses within the prescribed time period;
   e) For each student, the amount of workload in any given semester is no less than two- thirds (2/3) of the standard workload for a semester but also no more than three-halves (3/2) of the standard workload;
   f) First year students ('freshmen') do not need to register for courses. The OUAA will automatically sign them up for courses based on the university's standard curriculum for students. Students in previous academic years will

be given priority in course registration;

g) Students do not need to register for courses during the summer semester.

4. Adding, dropping, and modifying courses:

a) Registered courses may be cancelled before or one week after the start of a semester when they do not meet the criteria for starting a course. Cancelled courses will not appear on the agenda or incur tuition fees;

b) Students may modify their course registration during the first week of a main semester (first or second semester). They may not modify their course registration for the summer semester;

c) Students may be permitted to add, drop, or modify courses after the first week of a main semester on the basis of the requested time for modification. Their tuition may also be recalculated on the same basis.

5. The registration results are stored on IU's academic affairs management software.

Article 7: Organizing teaching and learning activities

1. Principles for organizing teaching and learning activities:

a) Promoting the professional competences and liability of every lecturer while adhering to current regulations for working regimes for lecturers;

b) Promoting an active role while upholding each student's responsibilities, facilitating and encouraging students to actively study; upholding academic rigor, increasing the teaching quality and effectiveness;

c) Having an inspection regime, internal surveillance and a quality improvement regime based on the collection of learners' feedback.

2. Online teaching and learning:

a) IU shall organize online classes when the university has met all current regulations for applying technology in managing and organizing training through the Internet; have solutions to ensure the quality of these online classes and the ability to demonstrate that the quality of online classes is not lower than that of in-person classes;

b) The number of credits from online courses shall not exceed 30% of the total credits of the curriculum. In case of natural disasters, pandemics or *force majeure* circumstances, online classes will be organized in accordance with the current regulations prescribed by the MOET and VNU-HCM.

3. Responsibilities in organizing teaching and learning activities:

a) Schools/Departments are responsible for assigning lecturers to courses: lecturers are liable for teaching theories, giving students instructions on how to do experiments, internships, projects, theses and other learning activities;

ensuring their own professional competences and liabilities, in concurrence with current IU regulations on working regime for lecturers;

b) The Office of Quality Assurance and Testing (OQAT) is responsible for collecting the feedback of students on quality assurance measures and learning efficiency; reporting the results to the unit(s) responsible for the courses and the schools/departments responsible for the lecturer assignment; reporting to the Board of Rectors after the semester ends. The results of the feedback survey shall be publicized on the official website;

c) Lecturers assigned to teach or instruct students have to ensure the academic workload and teaching quality conform to IU regulations on teaching activities;

d) Upon enrolling in a course; participating in an experiment; practicing; undertaking an internship, a project, a thesis or any other learning activities, students shall be liable for completing all assigned tasks and meeting the minimum required study time; students shall also adhere to all rules and regulations of the university, as well as the professional requirements of their lecturers. Students participating in an experiment; practicing; undertaking an internship, a project, a thesis or any other learning activities reserve the rights to be instructed and to practice, to be informed publicly of all regulations and evaluation methods, and to complain about the evaluated results and other matters arising during the study duration.

Article 8: Tuition fees

1. Students shall fulfill their financial responsibilities when registering for courses in any given semester, as prescribed by IU regulations.
2. The tuition fee for each module shall be calculated based on the number of credits that module carries. The tuition fee of each credit in any given module shall be decided by the Rector. The tuition rates for special modules shall be calculated separately.
3. Tuition payment:

a) Students shall pay for tuition fees on time, for all courses that have been registered and/or have official timetables. Students can check for tuition fees on the EdusoftWeb software and pay for tuition fees accordingly, before the deadline prescribed by the Office of Finance and Planning (OFP). Fees that have not been paid will be debited;

b) For main semesters, students shall have to pay for tuition fees before mid-semester (specifically announced every semester). Students who fail to pay the tuition before the deadline will not be allowed to take examinations or register for courses in the upcoming semester;

c) In case a student fails to pay for tuition fees before the deadline due to unforeseen difficulties, he or she shall make a petition to prolong the tuition deadline and submit it to the OFP. In the petition, s/he has to specify the reasons in order to be permitted to take examinations, register for courses and gets their own agenda for next semester.

4. Students who fail to pay for tuition fees without a legitimate reason will be considered for academic sanction according to the regulations on student affairs and other IU regulations.

CHAPTER III ACADEMIC EVALUATION AND CERTIFYING

Article 9: Evaluation and calculation of academic modules

1. The official scale of assessment is a 100-point scale, rounded to the nearest unit. The other scales of assessment are used for referential purposes only. The conversion to other scales of assessment have to be conducted from the official 100-point scale.
2. For any academic module, students are evaluated through at least two component scores. Modules that carry fewer than one credit only have one component point. Component scores are calculated on the 100-point scale. Forms, methods of evaluation and weightage of component scores are regulated in the detailed syllabus which has been approved for that module. The weightage for each component score included in the final result shall be calculated as follows:

   - Score given for practice exercises, homework and essays: 20-40%;
   - Score given for midterm examinations: 20-40%;
   - Score given for final examinations: 30-50%.

   For practical modules, the weightage for each component score shall be calculated as follows:

   - Score given for practice exercises throughout the semester: 70-80%;
   - Score given for final examinations: 20-30%.

   For online courses, the weightage shall be calculated as follows:

   - Score given for practice exercises, homework and essays: 30-60%;
   - Score given for midterm examinations: 20-40%;
   - Score given for final examinations: 20-40%.

   The total percentage of all component scores is 100%.

3. The form of online evaluation shall be employed in an honest, fair and impartial manner, similarly to in-person evaluation. Online evaluation shall not contribute to more than 50% of that module’s score. Online thesis/essay evaluation may account for a higher weightage if these additional conditions are fulfilled:

a) The evaluation has to be conducted by an evaluation panel consisting of at least 3 members;

b) The form of online defense and evaluation has to be approved by the members of the panel and the learners;

c) The proceedings of the defense session shall be recorded on video and audio, and archived.

d) In case of natural disasters, pandemics or *force majeure* circumstances, the form of online evaluation shall be considered for a higher weightage by the Rector.

4. The evaluation of a module has to be conducted in accordance with the approved detailed syllabus. A module may consist of multiple examinations but there shall only be one midterm examination and one final examination. During the summer semester, the university is responsible for organizing the final examination. TS members are responsible for organizing the midterm examination. Modules that replace the midterm and final examinations with other forms of evaluation that are not in the detailed syllabus have to be recommended by the department/school and approved by the Board of Rectors within 02 weeks (or 01 week for the summer semester) after the start of the module.

5. The content of the midterm and final examinations has to be suitable with the approved content of the module:

   a) For modules that are taught to one class, the content of the examination is developed by the lecturer;

   b) For modules that are taught to multiple classes by multiple lecturers, the OUAA (for general modules) or Departments/schools (for modules that are managed by Departments/schools) shall be responsible for the development of the exam content: one or multiple lecturers who teach the modules are responsible for the developing the content of the examination or compiling the exam papers that the lecturers have composed into one test;

   c) Exam papers approved by the Department/school shall be presented in IU style. The approver and exam maker shall be responsible for the professionalism and security of the exam paper;

   d) If multiple classes study the same module, the final examination shall take place at the same time by using only one test paper;

   e) The exam lasts between 45 and 120 minutes;

   f) In some cases, (disasters, pandemics) the final examination shall be organized according to the regulations approved by the Board of Rectors.

6. Final examinations in the form of oral exams may be moderated by one or many lecturers. The oral exam score is announced publicly after each exam session. In case

the lecturers are unable to agree on the score, the lecturers shall present the scores to the Head of the school/department for decision.

7. For projects and theses, the evaluation shall be conducted by a panel approved by the Rector. The minimum number of members in a panel is 3. The Rector will regulate the addition of bonus points for journal articles related to the research topic, based on the recommendations made by the school/department and the Office of Research and Development. Modules concerning graduation internship, internship, excursion outside of IU campuses as well as practical and other specialized modules shall be evaluated according to the plan of the respective school or department, which shall be clearly specified in the module's syllabus.
8. The Rector shall make regulations pertaining to the preservation of answer sheets, the grading process and archive of answer sheets after grading.
9. Exam prohibition, absence, delay and late arrival:
    a) For theoretical modules, students who are absent for more than 20% of the course duration will be prohibited from taking the final exam and receive a zero (0) for that course. For practical modules, students who are absent (with or without reason) for more than 20% of the practice sessions (defined as seminars, experiments, homework) and 50% of the quizzes shall receive a zero for both the practical and theoretical parts; the list of students prohibited from taking the final examination shall be compiled by the lecturer and announced publicly at lab rooms and the office of the Department/school right after the module ends;
    b) Students who are absent from lab sessions, practice sessions, in-class quizzes, non- centralized tests shall submit a petition clearly specifying the justifications for such absence to the lecturer. The deadline for submission is one day after the date of absence (excluding Sundays and holidays). If the justifications are accepted the student will be arranged for a makeup test by the lecturer. If the justifications are not accepted or the students fail to present the justifications for their absence, they will receive 0s for the absent sessions;
    c) Students who are absent from the centralized final exam shall submit a petition specifying the justifications for such absence to their respective Department/school within 05 days from the date of examination (excluding Sundays and holidays). If the justifications are not accepted or the students fail to present the justifications for their absence, they will receive 0 for that exam session. Only after the School/department has approved the petition and the OUAA has issued an approval, the absence will be accepted as legitimate and, in the score sheet, the score will be marked as 'incomplete';
    d) Students who arrive any later than 15 minutes after the start of the exam will not be allowed to enter the test room and considered "absent" for that exam session.

10. The score of an academic component is calculated by multiplying the component scores with their respective weightages and rounding the result to the nearest unit. The performance will be ranked by using the following systems:

a) The classification of pass marks, which is used for modules whose scores are included in the GPA:

Rank	100-point scale	Letter grade	4-point scale
Excellent	90 to 100	A+	4,0
Very good	80 to near 90	A	3,5
Good	70 to near 80	B+	3,0
Rather good	60 to near 70	B	2,5
Fair	50 to near 60	C	2,0

b) The non-classified pass system, which is used for modules that only require a pass and are not counted towards the GPA (P-scale);

c) The classification of non-pass marks:

Rank	100-point scale	Letter grade	4-point scale
Weak	40 to near 50	D+	1,5
Poor	30 to near 40	D	1,0
	Under 30	F	0,0

d) Special cases where special letters are used for classification and not counted towards the GPA:

I: Incomplete with permission to be absent from the test/exam; X: Incomplete due to insufficient data;

WH: exempted modules and credits; PC: prohibited from taking the exam.

11. Conditions and procedures to request an "I" mark

a) Students have to fulfill all of the following conditions to qualify for an "I" mark:

- Attended the course, completed all exams and quizzes during the course and activities related to the module such as experiments, practice sessions, homework etc.

- Paid for the module's tuition fee;

- Have not got an "I" for the course they want to apply for (students may only receive one "I" for every module);

- The course is one that organizes exam sessions. Practical courses, experiment-oriented courses, PE courses, internship, in-class quizzes, graduation thesis, graduation internship are therefore not eligible;

- Absent due to *force majeure* reasons, such as funeral, hospitalization, etc.;

- The student is currently not under exam prohibition or barred from taking the exam due to late arrival. Students who are under academic admonition, suspension, disciplined for violations as regulated in this decision, or currently pausing their study are also disqualified.

b) Procedures to request an "I" mark:

- In case a student requests an "I" mark before the exam day: the student submits a petition with valid justifications and proof to the lecturer. Based on the opinion of the lecturer and the approval of the Department/school, the OUAA will consider approving the student's request for an "I" mark;

- In case where the university dispatches a student for competition, work-related trips or student exchange: the student submits a petition with the dispatch decision of the Board of Rectors or the admission letter of the partnering university to the OUAA;

- In case of emergency (funeral, hospitalization): the student or his/her relative submits a petition to the OUAA with the justifications and proof (in case of hospitalization, it shall be the hospital admission record, medicine prescriptions, health booklet, social security paper etc.); in case of a close relative's (grandparents, parents, siblings) funeral, students shall submit a copy of the death certificate within 05 days from the date of absence. Based on the opinion of the lecturer and the approval of the school/department, the OUAA will consider approving the student's request;

- In case of natural disasters and pandemics, the deadline for proof submission may be extended by up to 30 days;

- Other special circumstances: students shall submit the petition to their respective school/department. The school/department shall make a letter of suggestion for the Board of Rectors to approve. The letter of suggestion shall then be sent back to the OUAA for update.

c) Procedures to cancel an "I" mark:

- Students who are approved for an "I" mark do need to enroll in the course for which they receive an "I." Instead, they shall submit a petition to re-take the examination within 01 week after the exam date is announced. If students do not re-take the exam to cancel the "I" mark one year after the date of approval, the "I" mark will be automatically converted into a zero (0). In case where the school/department does not open the course, the deadline to cancel the "I" mark may be extended at the behest of the school/department. In case where students decide to enroll in the course for which they receive an "I," the "I" will be automatically converted into a 0.

12. Students are exempted from taking a module if the module is equivalent to one of the modules they have completed and successfully accumulated during the study process:

   a) The percentage of exempted modules does not exceed 50% of all modules;

   b) Students eligible for module exemption include: (1) students who have successfully completed equivalent/commutative modules during their learning period at IU (automatically exempted based on IU category of equivalent/commutative modules);

      (2) students who have received a certificate and/or completed all political/ME modules;

      (3) students who have completed modules at other universities which IU considers to be equivalent upon comparing the curricula of the two universities (in order to qualify as equivalent, a module needs to have the same or longer study duration as its counterpart at IU and the content of the module needs to be at least 70% similar to the content of its IU counterpart);

   c) Students who want to be considered for module exemption shall submit a petition and supply all necessary proof. The OUAA shall decide whether some courses are equivalent or commutative based on the list of equivalent or commutative courses, which is presented by the School/Department and approved by the Board of Rectors;

   d) When a module has been considered to be equivalent and the request for exemption is approved, the OUAA will use the letters "WH" to differentiate the exempted module from the other accumulative modules. If students aspire to receive a higher score, they will have to enroll in that module again;

   e) The scores of equivalent modules at IU will not be counted towards that semester's GPA but will be included in the accumulated GPA. In case the students transfer from other universities to IU, the scores of equivalent modules will be reserved and not included in either the semester's GPA or the accumulated GPA;

   f) The scores of equivalent modules will not be used for scholarship consideration;

   g) Credits from equivalent modules will not be counted towards that semester's accumulated credits but included in the number of accumulated credits at that time;

   h) For students switching majors or programs, the score sheet will display the scores of all academic modules starting from freshman year (including those that are not from the students' current majors). However, the accumulated GPA will be calculated based on the modules of the students' current majors while the other modules are excluded;

13. Re-taking courses, taking courses and tests to improve scores.

    a) Students who fail to complete a module shall re-take that module as prescribed in Article 3 of this Decision; the score of the latest attempt shall be the official score for that module; the scores of all attempts shall be archived in full in the students' respective databases;

    b) Students who pass a module may re-take that module to improve their scores, according to the university's current regulations. The highest score shall be the official score for that module; the scores of all attempts shall be archived in full in the students' respective databases.

14. Announcing the module evaluation results:

    a) Within 02 weeks from the test date (for mid-term and final exams), lecturers shall announce the scores on the university's academic affairs software according to current regulations and submit 02 official score sheets (with the signatures of the lecturers and the School/Department): a copy is saved at the Department/school and the other is saved at the OUAA. For subjects that do not have an exam date, the deadline for score sheet submission is the end of the last exam week for that semester;

    b) If there are any errors in the original score sheet, the lecturers shall send in a score modification sheet (with the signatures of the lecturers and the School/Department) to the OUAA, then print and re-submit a new score sheet by following the same procedures within 02 months from the end of the semester;

    c) Schools/Departments shall announce the module evaluation results every semester. The OUAA is liable for announcing the module evaluation results for general modules.

15. Re-marking:

    a) For in-class quizzes and mid-term exams, students shall contact the lecturer if they have any concerns about the scores. The deadline to make a re-marking request is 01 week from the announcement of the results. If there are any changes in the results, the lecturer will announce the new results to the students and send the new scores to the OUAA in the appropriate form;

    b) For final exams, students reserve the right to make a re-marking request. The re- marking request for final exams shall be sent to the OUAA or responsible Schools/Departments within 02 weeks from the date of result announcement. Past this deadline, students reserve no rights to petition for a re-marking request. The re- marking results will be announced publicly within 01 week from the request deadline.

16. Re-taking courses to improve scores:

a) If students wish to improve their scores for successfully completed courses, they will need to enroll in that course again and pay for the tuition fees according to current regulations;

b) Based on the current teaching situation, IU shall specify which courses are not eligible for re-taking (if applicable);

c) The scores of re-taken courses are not considered for scholarship consideration but they are included in that semester's GPA and the accumulated GPA.

Article 10: Evaluation of academic performance by semester and academic year

1. The academic performance of students is evaluated every semester and every academic year based on the results of all curricular modules they have accumulated. The evaluation is based on the following criteria:

    a) The number of credits that a student fails to accumulate in a semester or academic year, or the number of credits in arrears from the beginning of the enrollment course;

    b) The number of credits that a student has accumulated from the beginning of the enrollment course (accumulated credits), including exempted and commutative credits;

    c) The average score of all modules in a semester (semester's GPA), in an academic year (yearly GPA) or from the beginning of the enrollment course (accumulated GPA), calculated based on the official score of that module and its weightage (the number of credits that module carries).

2. The semester's GPA and the accumulated GPA is calculated as follows:

$$A=\frac{\sum_{i=1}^{N} a_i n_i}{\sum_{i=1}^{N} n_i}$$

In which:

A is the semester's GPA or the accumulated GPA

n_i is the number of credits of i^{th} module

a_i is the number of credits of i^{th} module N is the total number of credits

a) The scores from intensive English, Physical Education and Military education courses are not included in the semester's, yearly or accumulated GPA. The scores of reserved and exempted modules are not included in the semester's GPA and accumulated GPA;

b) The semester's GPA is used for scholarship and commendation consideration but also serves as a basis for allowing a student to study beyond their level and embark on a multi-disciplinary and multi-university track. The GPA is calculated by averaging the scores of first-attempt modules in the corresponding semester. The accumulated GPA is used for classifying academic performance, issuing academic disciplinary measures and classifying academic degrees;

c) The addition of bonus points for prize-winning scientific projects to the semester's and accumulated GPA shall be decided by the Rector and publicized to all students.

3. Letter grades that are not included in clause 10, article 9 will not be included in the semester's, yearly or accumulated GPA. Modules that are outside of the curriculum will not be included in the academic assessment.

4. The students' academic performance (semester's, yearly or accumulated GPA) is classified as follows:

Rank	100-point scale	Letter grade	4-point scale
Excellent	90 to 100	A+	4,0
Very good	80 to near 90	A	3,5
Good	70 to near 80	B+	3,0
Rather good	60 to near 70	B	2,5
Fair	50 to near 60	C	2,0
Weak	40 to near 50	D+	1,5
Poor	30 to near 40	D	1,0
	Under 30	F	0,0

5. Students' yearly academic performance is classified based on the number of credits they have accumulated from the beginning of the enrollment course (hereby referred to as N) and the average number of credits for a standard academic year (hereby referred to as M). The details are as follows:

d) For first-year students: $N<M$;

e) For second-year students: $M \leq N < 2M$;

f) For third-year students: $2M \leq N < 3M$;

g) For fourth-year students: $3M \leq N < 4M$;

h) For fifth-year students: $4M \leq N < 5M$.

6. During the study duration, students may request a transcript of their academic

performance. In order to receive a transcript, students will need to fill out a form and pay for the required fees. The transcript will be available after 05 working days at the latest. The transcript contains the information for all academic modules.

Article 11: Issuing disciplinary measures based on academic credits

1. At the end of each semester, students may receive academic warnings for the following violations:
   a) The number of unsuccessfully completed credits exceeds 50% of that semester's total number of registered credits, or the number of arrears credits from the beginning of the course exceeds 24;
   b) The GPA of that student is below 35 (out of 100) or the GPA of two consecutive semesters is below 40 (out of 100);
   c) Students fail to pay for the tuition, the health insurance cost and other fees as required by the university.
2. Students will be dismissed from the university in these circumstances:
   d) The student has received academic warnings more than twice;
   e) The study duration exceeds the maximum study duration as regulated in clause 10, Article 2 of this Decision;
   f) The student has paused their study for 02 consecutive main semesters or for longer than permitted;
   g) The student has dropped out of university for more than 01 semester or has not done the procedures to enroll in an academic module;
   h) The student has violated academic affairs, disciplinary, and other IU regulations to the point of dismissal;
   i) Other special circumstances which shall be decided by the Rector.
3. Students who have received more than 02 academic warnings may be temporarily re-accepted if the following criteria are satisfied:
   j) The student has been evaluated and accepted by his/her Department or school;
   k) The student has completed all procedures at his/her Department or school in a timely manner and signed up for a salvaging semester;
   l) Other special circumstances shall be taken into consideration by the Rector at the behest of the OUAA. After the student has been temporarily re-accepted, he or she may be officially re-accepted if he or she does not commit any violations in the following semester.
4. Academic advisors are responsible for tracking the progress of students and reporting to their school/department to issue academic warnings by semester. This is done in

order for low-performing students to correct and adjust their academic schedules so that they may be able to graduate within the prescribed timeframe.

5. Every year, the university will issue academic disciplinary measures in two batches: after the first semester and after the summer semester. Academic performance during the summer semester will be considered an extension of the second semester's performance and calculated jointly. The OUAA will process the statistics and compile a list of students considered for disciplinary measure. The final verdict shall be issued by an Academic affairs council, which is comprised of representatives from all schools/departments. The verdict shall then be announced to the students and their respective schools/departments as well as sent to their permanent residencies.
6. In case the student is expelled from the university, his/her accumulated academic results will be reserved for 3 years from the date of the decision for expulsion.
7. The calculation, evaluation and classification of training points will be conducted in accordance with the framework for evaluating students' training points.

Article 12: Outcome standards and recognition for fulfilling the foreign language outcome

1. Students will have to satisfy the input conditions for English fluency in order to start studying specialized modules; students who are accepted into IU will have to take an English placement test under the formats of IELTS or TOEFL iBT, after which they will be classified into English classes that correspond to their English fluency; alternatively, students may submit their valid international certificates in lieu of taking the English placement test; the input conditions for English fluency, the conversion between different scales and the list of accepted certificates shall be decided by the Rector.
2. The English fluency outcome in order to be considered for graduation shall be modified by the Rector at the suggestion of the Science and Education panel but the outcome shall not be lower than that of VNU-HCM or the MOET.
3. In order to be recognized for fulfilling the foreign language outcome, students shall submit their international English certificates according to the regulations. The OUAA will present to the Rector the Decision on recognizing the fulfillment of the foreign language outcome several times a year, which is valid throughout the study period.

Article 13: Graduation internship and graduation thesis

1. In order to register for a graduation internship module, students have to satisfy all prerequisites such as previous courses and the number of accumulated credits. The prerequisites may vary between schools/departments due to the characteristics of each school/department. Students may only do a graduation internship if their names appear on the approved list of all students who will do a graduation internship that semester. The prerequisites for the graduation internship module shall be publicly announced on the school/department's website.

2. In order to do a graduation thesis, students have to satisfy all prerequisites for doing the graduation thesis, which varies between schools/departments; accumulate at least 90% of all credits in their respective curriculum; receive a recognition for fulfilling the foreign language outcome; appear on the approved list of all students who will do a graduation thesis that semester.
3. The Rector shall decide: the prerequisites for doing a graduation thesis; form and duration of the thesis; requirements for thesis advisors; the establishment of a thesis evaluation panel and the form of evaluation; the maximum number of students an advisor can take on at the same time.

Article 14: Recognition of academic results and credit transfer

1. The academic results that a student has accumulated from another training level, in another specialty, during another program or at another university shall be considered for recognition and credit transfer.
2. The Rector shall establish a professional council at the suggestion of a school/department in order to consider the academic results for recognition and credit transfer. The consideration shall be done on the basis of comparing the outcome standards, academic workloads, methods of evaluation and quality assurance measures. There are several levels of recognition:
    a) Recognition and transfer of individual academic modules;
    b) Recognition and transfer of individual groups of modules;
    c) Recognition and transfer of the entire training program.
3. In order to be considered for credit transfer, academic modules from a previous training program shall fulfill the following criteria:
    d) The module is from a current formal undergraduate program and the outcome result of the module is classified as "Pass" according to Article 9 of this Decision;
    e) The module has similar content to the module in comparison and the number of credits it carries has to be equal to or greater than the number of credits the module in comparison carries.
4. Modules that are not considered for credit transfer: graduation internship, graduation thesis and other modules that do not meet the requirements of clause 3 in this Article.
5. The university shall be liable for certifying the academic results of students when they complete their study process.

Article 15: Recognition of graduation and granting graduation degrees

1. Students are considered and recognized for graduation once they have fulfilled the following conditions:

a) Accumulated sufficient modules and credits; completed all compulsory modules as required by the curriculum; met the outcome standard of the curriculum;

b) The accumulated GPA is classified as "Average" or above;

c) Met the foreign language outcome; completed the ME and PE modules, as well as other compulsory modules according to the regulations of VNU-HCM and IU (including political courses and citizens' activities sessions);

d) At the time of consideration, students are not being examined for penal liability or under academic suspension;

e) Students have fulfilled all responsibilities and obligations according to current IU regulations.

2. Students who have fulfilled all of the aforementioned conditions will be recognized for graduation and issued graduation degrees or temporary graduation certificates within 03 months from the date of condition fulfillment.

3. Graduation classification is determined based on the final accumulated GPA as decreed in clause 4 Article 10 of this Decision. The classification of students who have "very good" or "excellent" GPA shall be reduced by one rank if they belong to one of the following cases:

   a) The weightage of re-taken modules (due to unsuccessful completion, not including modules that are re-taken to improve grades) exceeds 5% of all required credits for that exam

   b) The students have received disciplinary measures above warning.

4. Students who have exhausted the maximum study duration but have not fulfilled the graduation conditions due to uncompleted ME/PE modules or failure to meet the foreign language outcome may fulfill the unmet criteria and request for graduation consideration within 03 years from dropping out.

5. Students who fail to graduate will be granted certificates for modules accumulated during their study duration.

6. The procedures for considering and recognizing graduation are as follows:

   a) Every year, IU establishes a council for graduation consideration in 02 batches: May and September. Based on the criteria for graduation, the council will make a list of all students who have fulfilled the conditions for graduation and request approval from the Rector;

   b) During the processing time, qualified students may be issued a temporary certificate. This certificate is valid from the date of issuance to the date of the issuance of the official degree and does not replace the degree.

7. Academic results of students who fail to graduate will be reserved and recognized

according to MOET's and VNU-HCM's regulations.

CHAPTER IV OTHER REGULATIONS FOR STUDENTS

Article 16: Hiatus and suspension

1. Students may take a hiatus and have their academic results reserved if they belong to one of the following cases:
    a) Inducted into the armed forces;
    b) Inducted by a competent agency to represent the nation in an international competition or other contests;
    c) Sickness, pregnancy or long-term rehabilitation after an accident with the recognition of competent medical establishments as decreed by the Ministry of Health;
    d) Other personal reasons, on the condition that the student has studied at least one semester on campus and is not being considered for disciplinary measures or academic suspension. The Rector will consider and approve these reasons on a case-by-case basis.
2. Academic pauses taken for personal reasons as specified at point d clause 01 of this Article will be included in the total study time as decreed in clause 10 Article 02 of this Decision.
3. Students who want to drop out due to personal reasons, except for being considered for disciplinary measures or academic suspension, will have to partake in the admission process like any other candidates should they wish to return to IU. Other special cases shall be considered and decided by the Rector.
4. Students may only take a hiatus with the permission of the Rector. The hiatus shall not span 02 consecutive main semesters and the total amount of time reserved for academic pauses shall be equivalent to 04 main semesters for 4- to 6-year programs.
5. Students who return from a hiatus shall have to complete the required admission procedures on a timely manner. The deadline is 04 weeks before the start of a semester.
6. Students who take a hiatus for military duty shall submit the discharge decision/confirmation of duty accomplishment.
7. In order to perform the procedures for taking a hiatus, dropping out, getting readmitted, reserving and having academic results certified, students shall fill out a form provided by the OUAA and submit the form back to the OUAA. The requests will be processed for no longer than 07 days from the date of request reception.

Article 17: Switching majors, changing universities, changing campuses, changing forms of learning

1. Students may change programs or switch majors if they fulfill the following

conditions:

a) The student is not in the first or final academic year, not being considered for academic suspension and still has enough study time as decreed in clause 10 Article 2 of this Decision;

b) The student has met the admission requirements of the program and the major in the same enrollment course;

c) The receiving major or program fulfills all conditions for quality assurance and has not surpassed its training capacity according to current MOET's regulations;

d) The student has received permission from the head of that major, program and the Rector.

2. Students who are in joint programs with foreign universities and wish to switch to another joint program in the same major will need to fulfill the following conditions:

a) The student is not in the first or final academic year, not being considered for academic suspension and still has enough study time as decreed in clause 10 Article 2 of this Decision;

b) The student is currently not in an intensive English class to meet the foreign language requirements;

c) The program has not surpassed its training capacity;

d) The student has met the admission requirements of the program and the major in the same enrollment course;

e) The student has received permission from the head of that major, program and the Rector.

3. Procedures to switch majors: students will submit the form for major change consideration between the fifth and eighth week in a main semester and between the first and second week in a summer semester. The form will be processed for no longer than 15 days from the date of reception.

4. The maximum study duration for students who switch majors or programs is the maximum study duration decreed in clause 10 Article 2 of this Decision.

5. Students may change universities if they fulfill the following conditions:

a) The student is not in the first or final academic year, not being considered for academic suspension and still has enough study time as decreed in clause 10 Article 2 of this Decision;

b) The student has met the admission requirements of the program and the major in the same enrollment course at the new university;

c) The receiving university fulfills all conditions for quality assurance and has not surpassed its training capacity according to current MOET's regulations;

d) The student has received permission from the Rector of the receiving university and the Rector of IU.

6. Procedures to change universities:

   a) The student who wishes to change university shall fill out a form for university transfer and submit the form with necessary proof. The form shall then be sent to the Rector of the receiving university for approval and additional conditions (if applicable);

   b) If the receiving university accepts the request, the student will send the form with his/her academic profile to the receiving university. The Rector of IU shall issue a decision on accepting the university transfer, supply the academic transcript and verify the academic profile of the student at the request of the receiving university;

   c) The Rector of the receiving university shall issue a decision on accepting the student and begin recognizing the accumulated academic modules at the recommendation of the department/school-in-charge;

   d) The deadline for these procedures is 15 days from the reception of the request.

Article 18: Student exchange and cooperation in training

1. "Student exchange program" is the reception of students from a partnering university or the dispatch of IU students to a partnering university for a short period of time, with the aim of short-term training (with or without credit) and socializing within a framework designed by IU and its partnering universities.

2. The procedures for participating in a student exchange program and other related regulations are conducted according to IU regulations for managing and organizing student exchange programs.

3. In training cooperation between IU and a partnering university, the two rectors may agree on certifying each other's credits and using a shared evaluation method. In that case, the number of credits a student may accumulate at a partnering university shall not exceed 25% of the workload in the curriculum.

4. Audit students: students who wish to supplement their knowledge in one or several subjects and satisfy all academic, personal requirements may be considered to become audit students:

   a) Audit students shall have to pay 100% of the tuition fee for each enrolled module;

   b) Audit students will be provided with a certificate of completion and have their results recognized if they strictly follow all regulations on training and academic affairs and meet the requirements of the lecturer throughout the course;

c) Audit students may not do projects, graduation thesis or be considered for a degree. Audit students who are foreigners will not be supported for passport application.

Article 19: Studying two curricula at the same time

1. For education applying academic credit system, students may register for courses from another major or program when facility conditions permit, but they may only enjoy the official benefits and be considered for graduation in the second program once they have successfully enrolled in the second program, as regulated in clause 2 of this Article.
2. Students may enroll in the second program as soon as they are in second year of the first program. At the time of enrollment, students shall satisfy the following conditions:
    a) Possess suitable academic aptitude and entry score, which shall be defined as satisfying one of the following two conditions:

    - The accumulated GPA is classified as "good" or above and meets the quality assurance threshold of the second program for that enrollment year; or

    - The accumulated GPA is classified as "fair" or above and meets the admission requirements of the second program for that enrollment year;

    b) The specialty of the second program shall differ from the specialty of the first program;

    c) There are no differences in the form and level of training between the two programs.
3. During the study duration, if the accumulated GPA of the first program falls below "fair" or becomes subject to academic warning, the student shall suspend the second program in the following semester; the student will also be eliminated from the list of enrolled students in the second program.
4. The maximum study duration for students enrolling in two programs is also the maximum study duration for the first program, as decreed in clause 10 Article 2 of this Decision. The results of equivalent or commutative programs in the first program will be recognized for the second program.
5. Students may only be considered for graduation in the second program if they have met the requirements for graduation in the first program and enrolled in the second program for at least 02 years from the date of consideration.

Article 20: Handling students' violations

1. Students who cheat during quizzes, exams and academic evaluations will be subject to disciplinary measures for every affected module, according to the current regulation on High school graduation exam promulgated by MOET, except for cases regulated in clause 2 of this Article.
2. Students who take exams for other students or ask other people to take exams on their behalf will be academically suspended for 01 year for the first violation and dismissed from the university for the second violation.
3. Students who use forged profiles, documents and certificates to meet the admission or graduation requirements will be dismissed from the university; any issued degrees will be recalled and nullified.

CHAPTER V ORGANIZING THE IMPLEMENTATION OF THIS DECISION

Article 21: Formulating and implementing training regulations

1. The OUAA has the responsibility to advise the Board of Rectors on formulating, updating, issuing and organizing the implementation of training regulations at the suggestions of the council of science and training and on the basis of internal regulations.
2. IU schools and departments will publicize and instruct their students in the matters of regulations and provisions on students' rights and obligations from the beginning of the enrollment course.
3. The OQAT is liable for monitoring the teaching quality, collecting feedback from students, advising the Board of Rectors on maintaining the teaching quality.
4. The Office of Inspection and Legal affairs is liable for supervising and conducting internal inspections on the implementation of this Decision as well as other training-related matters;
5. In case of necessity, the Rector may make amendments or supplementations to this Decision in accordance with the actual situation.

Article 22: Reporting, archiving, and publicizing information

1. Before the 31st day of December every year, the OUAA reports to the MOET and VNU-HCM the following statistics: newly admitted students, graduated students, suspended students, in-training students, students expected to graduate next year, graduated students that have found a job within 12 months from the date of graduation; as well as classify the statistics by enrollment demographics, majors, enrollment courses and forms of training.
2. Documents pertaining to the training process shall be archived and preserved in a secure manner by the OUAA, according to the MOET's regulations:
   a) Admission decisions, original score sheets, recognition of graduation

decisions, the original version of booklets used for degree issuance shall be preserved permanently;

b) Other documents pertaining to the admission and training process shall be preserved throughout the training process;

c) The disposal of documents pertaining to the admission and training process whose archival time has expired shall be conducted in accordance with current MOET's regulations.

3. IU shall publicize the following information on its website at the latest 45 days before organizing the admission procedures:

   d) Regulations on academic affairs and other related regulations on managing the training process;

   e) Decisions on opening new departments and decisions on organizing the training process in accordance with current regulations;

   f) Quality assurance conditions according to current MOET's regulations;

   g) Proof that the training programs attain the quality promulgated by current MOET's regulations;

   h) Admission notification according to current regulations on admission./.

B. COURSE SPECIFICATION

COURSE SYLLABUS

MARXIST-LENINIST PHILOSOPHY

Course Code : **PE015IU**

Course title	MARXIST-LENINIST PHILOSOPHY *(Triết học Mac-Lenin)*
Module designation	The course equips students with basic knowledge of Marxist-Leninist philosophy.
Semester(s) in which the module is taught	Summer Semester (1st year)
Person responsible for the module	Lecturers at School of Political and Administration Sciences, VNU-HCM
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, group discussion, presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	None
Module objectives	- The course equips students with the basic contents of the worldview and the Marxist-Leninist philosophical methodology. - Help students to apply knowledge about worldview, Marxist-Leninist philosophical methodology creatively in cognitive and practical activities, in order to solve problems of social life of country and time.
Tentative learning outcomes	I. Knowledge 1. Philosophy and its role in social life 1.1. Conceptualize philosophy and some basic concepts 1.2. Recognize the opposition between materialism and idealism in solving the fundamental problem of philosophy 1.3. Understanding dialectical materialism - the highest developed form of it

	1.4. Understand the birth, objects, functions and roles of Marxist-Leninist philosophy 2. Dialectical materialism 2.1. Understanding matter from the point of view of dialectical materialism 2.2. Understanding consciousness from the point of view of dialectical materialism 2.3. Resolving the relationship between matter and consciousness from the point of view of dialectical materialism 2.4. Understand dialectics and materialistic dialectics 2.5. Understand the two basic principles of materialist dialectic and derive the methodological significance of each 2.6. Understand the pairs of basic categories of the material dialectic and derive the methodological meaning of each pair of categories 2.7. Understand the fundamental rules of the materialist dialectic and derive the methodological meaning of each one 2.8. Understand practice, perception, the role of practice in perception and truth 3. Historical materialism 3.1. Understand the role of production and its methods in the existence and development of society 3.2. Understand the dialectical relationship between forces of production and relations of production 3.3. Understand the dialectical relationship between infrastructure and market economy; the natural development of socio-economic forms 3.4. Understand class, class struggle; ethnicity and the relationship among class, nation and humanity 3.5. Understanding the state and social networks 3.6. Understand the dialectical relationship between social existence and social consciousness 3.7. Understand the nature of human being; the phenomenon of alienation and liberation of man from the relationship between the individual and society, and from the role of the masses.
	II. Skills Demonstrate the ability to generalize, think, debate, critique, and groupwork 1. Have the skill of generalizing to pick out keywords for each content and think systematically 2. Have skills in presenting, explaining, criticizing, debating and eloquent about theories being studied and researched based on practice 3. Have skills in social communication, cooperation and teamwork, sharing knowledge and experience, ability to run a group III. Attitudes Express consciousness and awareness during and after learning

<table>
<tr><td></td><td>1. Have a sense of responsibility to protect the science, revolution and humanity of Marxism-Leninism
2. Have a sense of personal responsibility towards the community
3. Have awareness of the need for lifelong learning and research and applying practically.</td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: period (1 period = 50 minutes)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table><tr><td>Topic</td><td>Weight</td><td>Level</td></tr><tr><td>Introduction</td><td>1</td><td>I, T</td></tr><tr><td>Philosophy and its role in social life</td><td>15</td><td>T, U</td></tr><tr><td>Dialectical materialism</td><td>15</td><td>T, U</td></tr><tr><td>Historical materialism</td><td>14</td><td>T, U</td></tr></table></td></tr>
<tr><td>Examination forms</td><td>Class discussion; Group presentations and reports; Mid-term exam: essay (opened-book); Final exam: essay (closed-book)</td></tr>
<tr><td>Study and examination regulations</td><td>1. Regulations for group presentations
- Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam.
- Week 4 (4th session) begin to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents.
- Submission form: submit files and minutes of group work via email to the lecturer
2. Regulations on time, attendance and discipline in the course: attend class on time and at least 80% of the sessions (only to be absent for a maximum of 20%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have all test scores, lively discussions, constructive and serious statements in class.</td></tr>
<tr><td>Materials</td><td>1. Ministry of Education and Training (2019), Giáo trình Triết học Mác - Lênin, National Political Publishing House, Hanoi.
2. Ministry of Education and Training (2012), Giáo trình Những Nguyên lý cơ bản của chủ nghĩa Mác - Lênin, National Political Publishing House, Hanoi.
3. Governing Body (2008), Giáo trình Triết học Mác-Lênin, National Political Publishing House, Hanoi.</td></tr>
</table>

MARXIST - LENINIST POLITICAL ECONOMY

Course Code: **PE016IU**

Course title	MARXIST-LENINIST POLITICAL ECONOMY *(Kinh tế chính trị Mac-Lenin)*
Module designation	*The program consists of 6 chapters, in which Chapter 1 discusses the Objects, research methods and functions of Marxist-Leninist political economy; the remain chapters present the core content of Marxist-Leninist Political Economy according to the module's objectives. Specifically, the content includes commodities, markets and the role of stakeholders; producing surplus value; competition and monopoly; socialist-oriented market economy and economic interest relations in Vietnam; and industrialization, modernization, and international economic integration in Vietnam.*
Semester(s) in which the module is taught	Summer Semester (1st year)
Lecturer	Lecturers at School of Political and Administration Sciences, VNU-HCM
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, group discussion, presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (lecture, exercise): 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Marxist-Leninist philosophy (PE015IU)
Module objectives	Firstly, to equip students with fundamental knowledge of Marxist-Leninist political economy in the context of economic development of the country and the world today; to ensure the basic, systematic, scientific, and up-to-date knowledge associated with practice, creativity, skills, thinking, and traits of students, as well as to enhance the interdisciplinary and non-overlapping interoperability, also reduce the amount of academic or outdated material for college and university non-theoretical students.

	Secondly, on that basis, to form the mindset, skills of analysis, evaluation, and identification of 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. Thirdly, to contribute to building the stance and ideology of Marxism-Leninism towards students.
Tentative learning outcomes	I. Knowledge *1. Objects, research methods and functions of Marxist-Leninist political economy* 1.1. Understanding the formation and development of Marxist-Leninist political economy 1.2. Identify the research object of Marxist-Leninist political economy 1.3. Understand the research method of Marxist-Leninist political economy 1.4. Understand the functions of Marxist-Leninist political economy course *2. Commodities, markets, and the role of stakeholders* 2.1. Understand the definition and the conditions for the production of goods 2.2. Understanding the commodity, its two attributes, and the relationship between them 2.3. Understand the relationship between the duality of commodity-producing labor and the two attributes of commodities 2.4. Understand the quality and quantity of the good's value and the affecting factors 2.5. Understand the origin, nature and function of money 2.6. Understanding the market, the role of the market, the market mechanism and the market economy 2.7. Understand some key patterns of the market economy 2.8. Understand the role of stakeholders *3. Surplus value in a market economy* 3.1. Understand the concept, the general formula and contradiction of capital 3.2. Understand what the commodity labor is and why need to study it 3.3. Understand what surplus value is 3.4. Understanding the nature of capital accumulation 3.5. Understand the concepts: production cost, profit, profit margin, average profit, commercial profit, factors affecting profit rate 3.6. Understand what income is 3.7. Understanding capitalist rents, their types and land prices *4. Competition and monopoly in the market economy* 4.1. Understand the relationship between competition and monopoly in a market economy 4.2. Understand the causes of monopoly formation in the market economy 4.3. Understanding the basic economic features of monopoly in capitalism from Lenin's viewpoint 4.4. Understand the causes of formation and development of state monopoly capitalism

	4.5. Understand the nature and the main manifestations of state monopoly in capitalism 4.6. Understand the historical role of capitalism *5. Socialist-oriented market economy and economic interest relations in Vietnam* 5.1. Understand the concept of a socialist-oriented market economy in Vietnam 5.2. Understand the objective necessity of developing a socialist-oriented market economy in Vietnam 5.3. Understanding the characteristics of the socialist-oriented market economy in Vietnam 5.4. Understand what the socialist-oriented market economy institution is and the need to improve it 5.5. Grasp the basic contents of improving the socialist-oriented market economy institution in Vietnam 5.6. Understand the concept and the relationship of economic benefits 5.7. Understand the role of the state in ensuring the harmonization of relations of interest *6. Vietnam's industrialization, modernization and international economic integration* 6.1. Understand what the industrial revolution is and be able to generalize the historical revolutions 6.2. Understand the role of the industrial revolution for development 6.3. Understand the concept and typical models of industrialization in the world 6.4. Understand the objective necessity of industrialization and modernization in Vietnam 6.5. Understand the contents of industrialization and modernization in Vietnam 6.6. Understand industrialization and modernization in Vietnam in the context of the 4.0 industrial revolution. 6.7. Understand the concept and the reason why international economic integration an objective necessity 6.8. Understand the contents and positive and negative impacts of international economic integration 6.9. Grasp the direction of improving the efficiency of international economic integration in Vietnam's development II. Skills *Demonstrate the ability to generalize, think, debate, critique, and groupwork* 1. Have the skill of generalizing to pick out keywords for each content and think systematically 2. Have skills in presenting, explaining, criticizing, debating and eloquent about theories being studied and researched based on practice 3. Have skills in social communication, cooperation and teamwork, sharing knowledge and experience, ability to run a group

<table>
<tr><td></td><td>III. Attitudes
Express consciousness and awareness during and after learning
1. Have a sense of responsibility to protect the science, revolution and humanity of Marxism-Leninism
2. Have a sense of personal responsibility towards the community
3. Have awareness of the need for lifelong learning and research and applying practically.</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: period (1 period = 50 minutes)
Teaching levels: I (introduce); T (teach); U (utilize)
<table>
<tr><th>Topic</th><th>Weight</th><th>Level</th></tr>
<tr><td>Introduction</td><td>1</td><td>I</td></tr>
<tr><td>Objects, research methods and functions of Marxist-Leninist political economy</td><td>2</td><td>I, T</td></tr>
<tr><td>Commodities, markets, and the role of stakeholders</td><td>6</td><td>T</td></tr>
<tr><td>Surplus value in a market economy</td><td>6</td><td>T, U</td></tr>
<tr><td>Socialist-oriented market economy and economic interest relations in Vietnam</td><td>5</td><td>T, U</td></tr>
<tr><td>Vietnam's industrialization, modernization, and international economic integration</td><td>5</td><td>T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Class discussion; Group presentations and reports; Mid-term exam: essay (opened-book); Final exam: essay (closed-book)</td></tr>
<tr><td>Study and examination regulations</td><td>1. Regulations for group presentations
- Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam.
- Week 4 (4th session) begin to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents.
- Submission form: submit files and minutes of group work via email to the lecturer
2. Regulations on time, attendance, and discipline in the course: attend class on time and at least 80% of the sessions (only to be absent for a maximum of 20%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have all test scores, lively discussions, constructive and serious statements in class.</td></tr>
</table>

Materials	1. Mandatory document: Marxist-Leninist political economy textbook for non-specialized undergraduates. 2. Referential materials: a) Robert, J.R. & Robert, F. H. (2003), *History of economic theory and method (in Vietnamese)*, Statistical Publishing House. b) Politic Economy Institute, Ho Chi Minh National Academy of Politics (2018), *Giáo trình Kinh tế chính trị Mác - Lê nin*, Political Theory House. c) K. Marx and F.Engels, Full Volume (vol. 20, 23, 25), National Political Publishing House, 1994. d) V.I. Lenin, Full Volume, Progress Press, Moscow, 1976. e) Davig Begg, Stanley Fisher, Rudiger Dornbusch, *Kinh tế học*, Hanoi Education Publishing House, 1992. f) Communist Party of Vietnam (2016), Document of the 12th National People's Congress, National Political Publishing House, Hanoi. g) Communist Party of Vietnam (2016), Report summarizing some theoretical and practical problems through thirty years of renovation (1986 - 2016), National Political Publishing House, Hanoi. h) Communist Party of Vietnam (2017), Resolution No. 11-NQ/TW dated June 3, 2017 on: "Improving the socialist-oriented market economy institution" i) Directive No. 16/CT-TTg (2017) "on strengthening access to the 4.0 industrial revolution". j) Jeremy Rifkin (2014), *The third industrial revolution (in Vietnamese)*, Labor and Social Publisher Co. Ltd. k) Manfred B. Steger (2011), *Globalization - A Very Short Introduction*, Knowledge Publishing House. l) Klaus Schwab (2015), *The fourth industrial revolution*, National Political Publishing House, 2018.

SCIENTIFIC SOCIALISM

Course Code: **PE017IU**

Course title	SCIENTIFIC SOCIALISM *(Chủ nghĩa Xã hội Khoa học)*
Module designation	The course equips students with basic knowledge of scientific socialism.
Semester(s) in which the module is taught	Semester 1 (2nd year)
Person responsible for the module	Lecturers at School of Political and Administration Sciences, VNU-HCM
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, group discussion, presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (lecture, exercise): 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Marxist-Leninist political economy (PE016IU), Marxist-Leninist philosophy (PE015IU)
Module objectives	- The subject equips students with the basic contents of scientific socialism (one of the three constituent parts of Marxism-Leninism). - Help students to apply knowledge about scientific socialism creatively in cognitive and practical activities, in order to solve problems of social life of country and time.
Tentative learning outcomes	I. Knowledge *1. Introduction to Scientific Socialism* 1.1. Generalize the birth of Scientific Socialism, the historical background and the role of Karl Marx and Friedrich Engels 1.2. Recognize the basic development stages of Scientific Socialism shown in the works

	1.3. Understand the object, method and significance of the study of Scientific Socialism *2. The historical mission of the working class* 2.1. Understand the concept of the working class and its characteristics 2.2. Understand the content and characteristics of the historical mission of the working class 2.3. Explain the conditions that determine the historical mission of the working class 2.4. Analyze the similarities and differences of the working class and the implementation of the mission of them in the world today 2.5. Understand the basic characteristics of the Vietnamese working class and the content of the historical mission of them today 2.6. Present the direction and some key solutions to build the working class in Vietnam today *3. Socialism and the transition to socialism* 3.1. Understanding Socialism is the first stage of the socialist-economic form of communism 3.2. Describe the basic features of socialism 3.3. Explain the objective necessity of the transition to socialism and the basic features of it 3.4. Understand the characteristics of the transition period and socialism in Vietnam, present the directions to build socialism in Vietnam today *4. Democracy and the socialist state* 4.1. Explain the concept of democracy and the birth and development of democracy in the history of human society 4.2. Understand the birth process and nature of socialist democracy 4.3. Understand the birth, nature and function of the socialist state as well as the relationship between democracy and the state 4.4. Understand the birth, development and nature of socialist democracy in Vietnam 4.5. Present the basic characteristics and solutions to build a legal socialist state in Vietnam today *5. Social structure - classes and alliances of classes and classes in the transition to socialism* 5.1. Present the concept of social structure - generalization and the change of class social structure during the transition to socialism 5.2. Explain the inevitability of class alliances during the transition to socialism 5.3. Understand the social-class structure in Vietnam during the transitional period and present basic solutions to build and develop class alliances and social classes in Vietnam *6. Ethnic and religious issues in the transition to socialism* 6.1. Understand the basic concepts and characteristics of the nation and the Marxist-Leninist point of view on the national issue

	6.2. Present the basic characteristics of the nation in Vietnam and the viewpoints on ethnic policies of the Party and State of Vietnam. 6.3. Understanding the nature, origin, features of religion and basic principles of solving religious problems in the transition to socialism 6.4. Explain the characteristics of religion in Vietnam and the policies of the Party and State of Vietnam towards religious beliefs today 6.5. Understand the characteristics of ethnic and religious relations in Vietnam and present basic orientations to solve the relationship between ethnicity and religion in Vietnam today *7. Family problems in the transition to socialism* 7.1. Outline the position, function and role of the family in society 7.2. Identify the bases for building a family during the transition to socialism 7.3. Explain the change of the Vietnamese family and present the basic directions for building and developing the Vietnamese family during the transition to socialism II. Skills *Demonstrate the ability to generalize, think, debate, critique, and groupwork* 1. Have the skill of generalizing to pick out keywords for each content and think systematically 2. Have skills in presenting, explaining, criticizing, debating and eloquent about theories being studied and researched based on practice 3. Have skills in social communication, cooperation and teamwork, sharing knowledge and experience, ability to run a group III. Attitudes *Express consciousness and awareness during and after learning* 1. Have a sense of responsibility to protect the scientific and revolutionary nature of Marxist-Leninist theories on socialism and the transition to socialism in Vietnam 2. Have a sense of personal responsibility towards the community 3. Have awareness of the need for lifelong learning and research and applying practically
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: period (1 period = 50 minutes) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Introduction	1	I, T
Introduction to Scientific Socialism	4	I, T

<table>
<tr><td></td><td>
<table>
<tr><td>The historical mission of the working class</td><td>4</td><td>T</td></tr>
<tr><td>Socialism and the transition to socialism</td><td>4</td><td>I, T</td></tr>
<tr><td>Democracy and the socialist state</td><td>4</td><td>T, U</td></tr>
<tr><td>Social structure - classes and alliances of classes and classes in the transition to socialism</td><td>4</td><td>I, T</td></tr>
<tr><td>Ethnic and religious issues in the transition to socialism</td><td>4</td><td>T, U</td></tr>
<tr><td>Family problems in the transition to socialism</td><td>5</td><td>T, U</td></tr>
</table>
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<tr><td>Examination forms</td><td>Class discussion; Group presentations and reports; Practices; Mid-term exam; Final exam</td></tr>
<tr><td>Study and examination regulations</td><td>1. Regulations for group presentations
- Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam.
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- Submission form: submit files and minutes of group work via email to the lecturer
2. Regulations on time, attendance, and discipline in the course: attend class on time and at least 80% of the sessions (only to be absent for a maximum of 20%). An exam ban is applied to those who miss more than the regulated number of sessions. Students must have all test scores, lively discussions, constructive and serious statements in class.</td></tr>
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3. Governing Body. (2008). Giáo trình Chủ nghĩa xã hội khoa học, National Political Publishing House, Hanoi.</td></tr>
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HISTORY OF VIETNAMESE COMMUNIST PARTY

Course Code: **PE018IU**

Course title	HISTORY OF VIETNAMESE COMMUNIST PARTY (*Lịch sử Đảng Cộng sản Việt Nam*)
Module designation	The course equips students with basic knowledge about the History of the Communist Party of Vietnam
Semester(s) in which the module is taught	Semester 1 (3rd year)
Person responsible for the module	Lecturers at School of Political and Administration Sciences, VNU-HCM
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, group discussion, presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (lecture, exercise): 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Marxist-Leninist political economy (PE016IU), Marxist-Leninist philosophy (PE015IU), Scientific socialism (PE017IU)
Module objectives	1. Knowledge: 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 struggle for power (1930-1945), the two resistance wars against French and US colonialism (1945-1975), and national construction and defense during the period of the country's transition to socialism and carrying out the renovation work (1975-2018). 2. Ideology: Through historical events and experiences to build a sense of respect for objective truths, raise pride and confidence in the Party's leadership. 3. Skills: Equip with scientific thinking methods on history, skills in choosing research materials and studying subjects; and the ability to

	apply historical awareness to practical work and critical thinking toward false claims about the history of the Party.
Tentative learning outcomes	I. Knowledge 1. Objects, functions, tasks, contents and methods of research and study History of the Communist Party of Vietnam Understand the objects, purposes of study and research and some basic requirements on learning and research methods 2. The Communist Party of Vietnam was born and led the struggle for power (1930-1945) 2.1. Understanding the historical context that influenced the birth of the Communist Party of Vietnam 2.2. Understand the process of preparing the conditions for the establishment of the Party of Nguyen Ai Quoc 2.3. Understand the contents of the Party's founding conference and the Party's first political platform 2.4. Understand the historical significance of the establishment of the Communist Party of Vietnam 2.5. Understanding the revolutionary movements of 1930-1935 and the policies of restoring the movement in 1932-1935 2.6. Understanding the democracy movement in 1936-1939 2.7. Understanding the national liberation movement in 1939-1945 2.8. Understanding the nature, meaning and experience of the August Revolution in 1945 3. The Party led two resistance wars, completed the national liberation and reunification (1945-1975) 3.1. Understand the policy of building and defending the revolutionary government in 1945-1946 3.2. Understand the line of national resistance against the French colonialists and the process of organizing its implementation from 1946 to1950 3.3. Understand the policy of promoting the resistance against the French colonialists and the implementation process from 1946 to 1950 3.4. Understand the historical significance and experience of the Party in leading the resistance war against French colonialism and US intervention 3.5. Understanding the Party's process of leading the two regions' revolutions in the 1954-1965 period 3.6. Mastering the Party's revolutionary leadership in the 1965-1975 period 3.7. Understand the meaning and experience of the Party's leadership in the resistance war against the US in 1954-1975
	4. The Party led the country in the transition to socialism and carried out the Doi moi (1975-2018)

	4.1. Understand the policy of building socialism and defending the Fatherland 1975-1981 4.2. Understanding the contents of the 5th National Congress of the Party and the breakthroughs to continue economic renovation 1982-1986 4.3. Understanding the Party's point of view of comprehensive renovation, bringing the country out of the 1986-1996 socio-economic crisis 4.4. Understand the achievements and experiences of the innovation process 4.5. Understand the great victories of the Vietnamese revolution under the leadership of the Party 4.6. Understanding the great lessons of the Party's leadership from 1930 to 2018 II. Skills Demonstrate the ability to generalize, think, debate, critique, and groupwork 1. Exercise independent thinking capacity in researching the Party's revolutionary lines, strategies and tactics 2. Have critical thinking, analytical, synthesis and evaluation skills related to the subject; and from there, apply the learned knowledge to actively and actively perceive political, economic, cultural and social issues according to the guidelines, policies and laws of the Party and State. 3. Have writing skills, individual working skills, teamwork skills, and presenting research results III. Attitudes Express consciousness and awareness during and after learning 1. Believe in the Party's leadership for the Vietnamese revolution 2. Determine to strive for the implementation of the Party's revolutionary line 3. Have a serious attitude in learning, scientific research, awareness of life and society, self-training to become a person of solid political quality, bravery, ethics, and good level of expertise; form affection and belief in the revolutionary path that our nation has chosen
Content	The description of the contents should clearly indicate the weighting of the content and the level. Weight: period (1 period = 50 minutes) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Introduction	1	I, T

	Objects, functions, tasks, contents and methods of research and study History of the Communist Party of Vietnam	4	I, T
	The Communist Party of Vietnam was born and led the struggle for power (1930-1945)	5	T
	The Party led two resistance wars, completed the national liberation and reunification (1945-1975)	5	I, T
	The Party led the country in the transition to socialism and carried out the Doi moi (1975-2018)	5	T, U
Examination forms	Class discussion; Group presentations and reports; Mid-term exam; Final exam		
Study and examination regulations	1. Regulations for group presentations - Forming a group: 5 students/group. The deadline for group topic registration on the forum is session 2 or directly submit it to the lecturer at the exam. - Week 4 (4th session) begin to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents. - Submission form: submit files and minutes of group work via email to the lecturer 2. Regulations on time, attendance and discipline in the course: attend class on time and at least 80% of the sessions (only to be absent for a maximum of 20%). Exam ban is applied to those who miss more than the regulated number of sessions. Students must have all test scores, lively discussions, constructive and serious statements in class.		
Materials	1. Ministry of Education and Training. (2019). Chương trình môn học Lịch sử Đảng Cộng sản Việt Nam. 2. Governing Body directed the compilation of national textbooks of Marxist-Leninist sciences, Ho Chi Minh's Thoughts. (2018). Giáo trình Lịch sử Đảng Cộng sản Việt Nam (revised and supplemented edition). National Political Publishing House, Hanoi.		

HO CHI MINH'S THOUGHTS

Course Code: **PE019IU**

Course title	HO CHI MINH'S THOUGHTS *(Tư tưởng Hồ Chí Minh)*
Module designation	*The course equips students with basic knowledge about subjects, research methods and meaning of Ho Chi Minh's ideologies; origin of Ho Chi Minh's ideologies; national independence and socialism; Communist Party of Viet Nam and the Vietnamese State; great national unity and international solidarity; culture, morality and human.*
Semester(s) in which the module is taught	Semester 1 (3rd year)
Person responsible for the module	Lecturers at School of Political and Administration Sciences, VNU-HCM
Language	Vietnamese
Relation to curriculum	Compulsory
Teaching methods	Lecture, group discussion, presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (lecture, exercise): 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Marxist-Leninist political economy (PE016IU), Marxist-Leninist philosophy (PE015IU), Scientific socialism (PE017IU)
Module objectives	Knowledge: Equip students with basic knowledge about the concept, origin, process of formation and development of Ho Chi Minh's thoughts; the basic contents of Ho Chi Minh's thoughts; the application of the Communist Party of Vietnam in the national-democratic and socialist revolution in the current national renewal process. Skills: Form the skills of independent thinking, analyzing, evaluating and applying Ho Chi Minh's thought creatively to solve problems in life, study and work.

	Attitudes: Help students improve their political bravery, patriotism, loyalty to the goals and ideals of national independence associated with socialism; aware of the role and value of Ho Chi Minh's thoughts for the Vietnamese Party and nation; aware their responsibility in studying and training to contribute to the construction and defense of the Fatherland.
Tentative learning outcomes	I. Knowledge *1. Concept, subject, research methodology and meaning of Ho Chi Minh ideology module* 1.1. Understand the concept of Ho Chi Minh's thoughts 1.2. Understand the research object 1.3. Grasp some basic requirements on learning and research methods of Ho Chi Minh's ideology 1.4. Understand the meaning of learning ideological course *2. The foundation, formation and development of Ho Chi Minh ideology* 2.1. Understand the practical basis, theoretical premise and subjective factors forming Ho Chi Minh's thoughts 2.2. Understand the process of formation and development of Ho Chi Minh's thoughts 2.3. Grasp the value of Ho Chi Minh's thoughts for the Vietnamese revolution and the progressive development of mankind *3. Ho Chi Minh ideology on national independence and socialism* 3.1. Aware of the scientific, revolutionary and creative nature of Ho Chi Minh's thoughts on national independence and liberation revolution 3.2. Grasp Ho Chi Minh's view on the necessity of socialism, building socialism and the transition period to socialism in Vietnam 3.3. Understand Ho Chi Minh's view on the relationship between national independence and socialism 3.4. Apply Ho Chi Minh's thoughts on national independence associated with socialism in the current revolution
	4. Ho Chi Minh ideology on the Communist Party of Vietnam of the people, by the people and for the people 4.1. Understand the basic contents of Ho Chi Minh's thoughts on the Communist Party of Vietnam 4.2. Understand the basic contents of Ho Chi Minh's thoughts on the state of the people, by the people, for the people 4.3. Apply Ho Chi Minh's thoughts to the construction of the Party and the State *5. Ho Chi Minh ideology on national great unity and international solidarity* 5.1. Understand the basic views of Ho Chi Minh's thoughts on great national unity 5.2. Understand the basic views of Ho Chi Minh's thoughts on international solidarity 5.3. Apply Ho Chi Minh's thoughts on great national unity and international solidarity in the current period

<table>
<tr><td></td><td>6. Ho Chi Minh ideology on culture, morality and human
6.1. Grasp basic knowledge of Ho Chi Minh's thoughts on culture
6.2. Grasp basic knowledge of Ho Chi Minh's thoughts on new morality (revolutionary morality)
6.3. Grasp the basic knowledge of Ho Chi Minh's thoughts on culture
6.4. Apply Ho Chi Minh's thoughts on culture, morality and people in building the current Vietnamese culture, morality and human
II. Skills
Demonstrate the ability to generalize, think, debate, critique, and groupwork
1. Have skills in thinking, analyzing and evaluating Ho Chi Minh's thoughts.
2. Have skills in presenting, explaining, criticizing, debating and eloquent about theoretical knowledge being studied and researched based on practice.
3. Have skills in creatively applying Ho Chi Minh's thoughts to solving practical problems in life, study and work.
III. Attitudes
1. Recognize the role and value of Ho Chi Minh's thoughts for the Party and nation of Vietnam
2. Have political bravery, patriotism, loyalty to the goals and ideals of national independence associated with socialism
3. Recognize responsibility in studying, researching and applying knowledge in life to contribute to national construction and defense</td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: period (1 period = 50 minutes)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
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<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction</td><td>1</td><td>I, T</td></tr>
<tr><td>Concept, subject, research methodology and meaning of Ho Chi Minh ideology module</td><td>2</td><td>T</td></tr>
<tr><td>The foundation, formation and development of Ho Chi Minh ideology</td><td>3</td><td>T</td></tr>
<tr><td>Ho Chi Minh ideology on national independence and socialism</td><td>3</td><td>T, U</td></tr>
<tr><td>Ho Chi Minh ideology on the Communist Party of Vietnam of the people, by the people and for the people</td><td>3</td><td>T, U</td></tr>
<tr><td>Ho Chi Minh ideology on national great unity and international solidarity</td><td>3</td><td>T, U</td></tr>
</table></td></tr>
</table>

	Ho Chi Minh ideology on culture, morality and human | 3 | I, T
Examination forms	Class discussion; Group presentations and reports; Mid-term exam: Multiple choice (closed-book) or essay (opened-book); Final exam: Essay (opened-book)
Study and examination regulations	- Regulations on assessment: according to the Regulations on the teaching and learning of Political Theory subjects of the School of Political and Administration Sciences. - Regulations on group presentation: Forming a group: 5 students/group. + The deadline for group topic registration on the forum is session 2. + Week 4 (4th session) begin to present in order. Note that the presenting groups need to fully show up and bring along all relevant documents. + Submission form: submit files and minutes of group work via email to the lecturer.
Materials	1. Ministry of Education and Training (2019). *Giảo trình Tư tưởng Hồ Chí Minh,* National Political Publishing House, Hanoi. 2. School of Political and Administration Sciences VNU-HCM. *Tài liệu hướng dẫn học tập Tư tưởng Hồ Chí Minh.* 3. *Ho Chi Minh* (2011). Full volume, National Political Publishing House, Hanoi. 4. *Biography of Ho Chi Minh* (2016). National Political Publishing House, Hanoi.

WRITING AE1 (ACADEMIC WRITING)

Course Code: **EN007IU**

1. General information

Course title	WRITING AE1 *(Tiếng Anh chuyên ngành 1: Kỹ năng Viết)*
Course designation	*This course provides students with comprehensive instructions and practice in essay writing, including transforming ideas into different functions of writing such as process, cause-effect, comparison-contrast, and argumentative essays.*
Semester(s) in which the course is taught	1, 2, 3
Person responsible for the course	Lecturers of School of Languages
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (lecture, exercise): 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Students must fulfill ONE of the following requirements to attend this course: ● Hold TOEFL iBT certificate with score ≥ 61 ● Hold IELTS certificate with score ≥ 5.5 ● Have complete IE2 course
Course objectives	Throughout the whole course, students are required to read university-level texts to develop the ability to read critically and to respond accurately, coherently and academically in writing. Through providing them with crucial writing skills such as brainstorming, paraphrasing, idea developing, revising, and editing, this course prepares the students for research paper writing in the next level of AE2 writing.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course, students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Understand and follow different steps in the writing process to produce a complete essay
CLO2. Employ different methods to improve their writing such as peer feedback and teacher comments</td></tr>
<tr><td>Skill</td><td>CLO3. Read critically, analyze and annotate an academic text
CLO4. Use different functions of writing to successfully communicate their purposes to the audience (describe a process, discuss the causes and effects, compare and contrast, make arguments, paraphrase and summarize)</td></tr>
<tr><td>Attitude</td><td>CLO5. Reason around ethical issues in writing academic essays and avoid committing plagiarism</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (2 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>The process of Academic Writing</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Using Outside Sources</td><td>3</td><td>T, U</td></tr>
<tr><td>From Paragraph to Essay</td><td>4</td><td>T, U</td></tr>
<tr><td>Process Essays</td><td>4</td><td>T, U</td></tr>
<tr><td>Cause/Effect Essays</td><td>4</td><td>T, U</td></tr>
<tr><td>Comparison/ Contrast Essays</td><td>4</td><td>T, U</td></tr>
<tr><td>Argumentative Essays</td><td>6</td><td>T, U</td></tr>
<tr><td>Summarizing</td><td>2</td><td>U</td></tr>
<tr><td>Review & Correction</td><td>2</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Essay writing</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance
Regular on-time attendance in this course is expected. A student will be allowed no more than three absences. It is compulsory that the students attend at least 80% of the course to be eligible for the final examination.
Missed Tests
Students are not allowed to miss any of the tests (both Mid-term and Final). There are very few exceptions. Only with extremely reasonable excuses (eg. certified paper from doctors), students may re-take the examination.
Class Behaviors
Students are required to treat their studying in college as a full-time job and spend an adequate amount of time for this Writing AE1 course with approximately 8-10 hours per week (both in class and self-study). Accordingly, students are supposed to follow the obligations below:</td></tr>
</table>

	● Prepare thoroughly for each class in accordance with the course syllabus and complete home assignments as the instructor's request. ● Participate fully and constructively in all course activities and discussions (if any). ● Display appropriate courtesy to all involved in the class. ● Provide constructive feedback to faculty members regarding their performance. *Plagiarism* Students are warned not to copy from other books or from their peers for all assessment tasks. Committing plagiarism will result in 0 point for the task. Students who plagiarize twice will be prohibited from sitting the final examination. *Writing Center (Room 509)* Students are encouraged to visit the Writing Center to schedule an appointment for additional help with essay writing.
Reading list	[1] Oshima, A., & Hogue, A. (2017). *Longman Academic Writing Series, Level 4: Essays* (5th ed.). New Jersey, NJ: Pearson Longman. [2] Oshima, A., & Hogue, A. (2006). *Longman Academic Writing Series, Level 4: Essays* (4th ed.). New Jersey, NJ: Pearson Longman.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										
2										
3							x			
4							x			
5										

ILO7. Communicate effectively in career.

3. Planned learning activities and teaching methods

Note:

As: Assignment; Mid: Midterm exam; Fin: Final exam

Week	Topic	CLO	Assessment	Learning Activities	Resources
1	The process of Academic Writing	1-5	As Mid	Lecture Discussion	[2] pp. 265-279 [1] pp. 58-65

2	*Using Outside Sources (Cont'd)* Strategies for writing a successful summary	1-5	As Mid	Lecture Discussion	[1] pp. 58 - 72
3 & 4	The introductory paragraph: ● General statements & Introductory techniques ● Thesis statements & Logical division of ideas Body paragraphs: ● Topic sentences The concluding paragraph: ● Restatement ● Final thoughts Outlines of essays	1-5	As Mid	Lecture Discussion	[1] pp. 74 ○ – 100
5	Process Essays Introduction Analyzing the models Thesis statements for process essays Transitional signals Write together: Writing from a diagram (p.115)	1-5		Lecture Discussion	[1] pp. 101
6	<u>*In-class Assignment:*</u> Write a process essay about one of these topics or a topic of the lecturer's choice: ● How to cook a favorite food ● How to do a favorite hobby ● How to succeed in your major area or professional field ● How to accomplish an	1-5	As Mid	Lecture Discussion	[1] pp. 101

	academic task (register for classes, apply for a scholarship, pass an exam, etc.)				
7	Cause/ Effect Essays Introduction Analyzing the models Organization Signal words and phrases Write together: Write the introduction, ONE body paragraph and the conclusion on one of the topics below or a topic of the lecturer's choice: ● The cause of obesity ● The effects of involvement in ● sports on young children ● The causes of stress in college students ● The effects of regular reading ● on students' lives	1-5	As Mid	Lecture Discussion	[1] pp. 116 - 132
8	*In-class Writing:* Write the introduction, ONE body paragraph and the conclusion on one of the two topics left (except for the ones that has been worked on in class and assigned as homework) or a topic of the lecturer's choice: ● The cause of obesity ● The effects of involvement in sports on young	1-5			

	children • The causes of stress in college students The effects of regular reading on students' lives				
MID-TERM					
9	Comparison/ Contrast Essays Introduction Analyzing the models Organization: • Points of comparison • Point-by-point organization • Block organization Comparison and Contrast signal words Write together: Write the introduction, ONE body paragraph and the conclusion on one of the topics below or a topic of the lecturer's choice: • Compare and contrast the relationship between parents and children in two different cultures. • Compare and contrast the university culture in two different countries. • Compare and contrast the culture of a small town and a big city.	1-5	As Fin	Lecture Discussion	[1] pp. 133
10	Comparison/ Contrast Essays (Cont'd) Review/ Correction: Lecturer gives feedback to one or two students' writings in class.	1-5	As Fin	Lecture Discussion	[1] pp. 133-151

	In-class Assignment: Write a compare and contrast essay on the topic left or a topic of the lecturer's choice: ● Compare and contrast the relationship between parents and children in two different cultures. ● Compare and contrast the university cultures in two different countries. ● Compare and contrast the cultures of a small town and a big city				
11 & 12	Argumentative Essays Introduction Analyzing the model	1-5	As Fin	Lecture Discussion	[1] pp. 152-168
	Organization: Block vs. Point-by- point pattern The elements of an argumentative essay: ● An explanation of the issue ● A clear thesis statement. ● A summary of the opposing arguments ● Rebuttals to the opposing arguments ● Your own arguments The introductory paragraph: Thesis Statement Statistics as support Write together: Write the introduction, ONE body paragraph and the conclusion on one of	1-5	As Fin	Lecture Discussion	

	the topics below or a topic of the lecturer's choice: ● Can same-sex parenting negatively influence a child's mentality? ● Do famous artists have an innate talent, or do they put in great effort to improve their skills? ● Is homework helpful?				
13	Argumentative Essays (Cont'd) Review/ Correction: Lecturer gives feedback to one or two students' writings in class. In-class Writing: Write an argumentative essay on the topic left or a topic of the lecturer's choice: ● Can same-sex parenting ● negatively influences a child's mentality. ● Do famous artists have an innate talent, or do they put in great effort to improve their skills? ● Is homework helpful?	1-5	As Fin	Lecture Discussion	
14	Review & Practice: Summarizing	1-5	As Fin	Lecture Discussion	Sample final test
15	Review/Correction: Lecturer gives feedback to one or two students' argumentative essays + sample final test in class. Lecturer has students check their own assignment scores.	1-5	As Fin	Lecture Discussion	
	FINAL EXAMINATION				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5
Homework completion (10%)	80% Pass	80% Pass	80% Pass		
Week 6: In-class writing assignment: Process essay (10%)				80% Pass	
Week 10: In-class writing assignment: Compare & Contrast essay (10%)				80% Pass	
Midterm exam (30%)	80% Pass			80% Pass	80% Pass
Final exam (40%)				80% Pass	80% Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: 15 August, 2022

LISTENING AE1 (LISTENING & NOTE-TAKING)

Course Code: **EN008IU**

1. General information

Course title	LISTENING AE1 *(Tiếng Anh chuyên ngành 1: Kỹ năng Nghe)*
Course designation	*The course is designed to prepare students for effective listening and note-taking skills, so that they can pursue the courses in their majors without considerable difficulty. The course is therefore lecture-based in that the teaching and learning procedure is built up on lectures on a variety of topics such as business, science, and humanities.*
Semester(s) in which the course is taught	1, 2, 3
Person responsible for the course	Lecturers of School of Languages
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (lecture, exercise): 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Students must fulfill ONE of the following requirements to attend this course: ● Hold TOEFL iBT certificate with score ≥ 61 ● Hold IELTS certificate with score ≥ 5.5 ● Have complete IE2 course
Course objectives	There are a number of objectives embedded in various teaching activities in Listening AE1 course: Pre-listening activities: aim to activate students' current knowledge of the topic, and to provide them with lecture language and effective strategies in listening and note-taking to prepare themselves for the coming lecture. These activities include reading (this can be done before class meetings), discussing and reviewing what they have learned from the reading.

	While-listening and post-listening activities: aim to enable students to put their newly activated knowledge and acquired strategies into work by taking notes on the lecture, using the outline given by the teacher or prepared by themselves. They are later on asked to assess their understanding based on their notes and discuss them with their classmates. Finally, as an optional activity, depending on time and students' needs, students are asked to summarize the lecture. Follow-up activities: students are required to discuss the lecture topic and to prepare arguments for or against the topic in the debate. The purpose is to enhance students' comprehension of the lecture, and to allow them to put their acquired academic language into practice, and to experience the atmosphere of a university lecture class.
Course learning outcomes	Upon the successful completion of this course, students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Remember different strategies and techniques in listening to academic lectures and taking notes. CLO2. Improve their specialized knowledge of academic lectures
Skill	CLO3. Respond to academic lectures with appropriate strategies CLO4. Communicate effectively with their classmates and professors.
Attitude	CLO5. Respond to academic lectures with confidence

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (2 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Orientation & Introduction of strategies and techniques in note-taking	2	I, T, U
Chapter 1: New Trends in Marketing Research	3	T, U
Chapter 2: Business Ethics	3	T, U
Chapter 3: Trends in Children's Media Use	2	T, U
Chapter 4: The Changing Music Industry	2	T, U
Chapter 5: The Placebo Effect	2	T, U
Midterm Sample Test & Review	2	T, U
Chapter 6: Intelligent Machines	3	T, U
Chapter 7: Sibling Relationships	3	T, U
Chapter 8: Multiple Intelligences	3	T, U
Chapter 9: The Art of Graffiti	3	T, U
Final Sample Test & Review	2	T, U

Examination forms	Paper and pen tests: Correct the mistakes, Fill in the blanks, Write short answers, Write a summary paragraph.

Study and examination requirements	*Attendance* Regular on-time attendance in this course is expected. It is compulsory that students attend at least 80% of the course to be eligible for the final examination. *Missed tests* Students are not allowed to miss any of the tests (both on-going assessment and final test). There are very few exceptions. (Only with extremely reasonable excuses, e.g. certified paper from doctors, may students re-take the tests.) *Class behavior* Students are supposed to: ● prepare thoroughly for each class in accordance with the syllabus and complete all assignments upon the instructor's request ● participate fully and constructively in all class activities (and discussions if any) ● display appropriate courtesy to all involved in the class ● provide constructive feedback to faculty members regarding their performance
Reading list	[1] Frazie, L., & Leeming, S. (2013). *Lecture ready 3.* Oxford: Oxford University Press. References: [2] Frazie, L., & Leeming, S. (2013). *Lecture ready 1, 2.* Oxford: Oxford University Press.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (SLO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										
2										
3							x			
4							x			
5										

ILO7. Communicate effectively in career.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	ORIENTATION	1-5			

2	Recognizing topic introducing and lecture plan presenting expressions Organizing ideas by outlining	1-5	As Mid	Lecture discussion & inclass-tasks	Chapter 1 New Trends in Marketing Research
3	Recognizing transition expressions Using symbols and abbreviations	1-5	As Mid	Lecture discussion & inclass-tasks	Chapter 2 Business Ethics
4	REVIEW	1-5	As Mid	Lecture discussion & inclass-tasks	REVIEW
5	Recognizing generalization and support expressions	1-5	As Mid	Lecture discussion & inclass-tasks	Chapter 3 Trends in Children's Media Use
6	Recognizing expressions for clarification or emphasis Organizing notes by using a split-page format	1-5	As Mid	Lecture discussion & inclass-tasks	Chapter 4 The Changing Music Industry
7	Recognizing cause and effect expressions Noting causes and effects	1-5	As Mid	Lecture discussion & inclass-tasks	Chapter 5 The Placebo Effect
8	Sample test correction WRAP-UP AND REVIEW	1-5	As Mid	Lecture discussion & inclass-tasks	
MID-TERM EXAMINATION					
9	Recognizing expressions used to predict causes and effects Using arrows to show the relationship between causes and effects	1-5	As Fin	Lecture discussion & inclass-tasks	Chapter 6 Intelligent Machines
10	REVIEW	1-5	As Fin	Lecture discussion	

				& inclass-tasks	
11	Recognizing expressions of comparison and contrast Noting comparison and contrast	1-5	As Fin	Lecture discussion & inclass-tasks	Chapter 7 Sibling Relationships
12	Recognizing non-verbal signals indicating important information Representing information in list form	1-5	As Fin	Lecture discussion & inclass-tasks	Chapter 8 Multiple Intelligences
13	REVIEW	1-5	As Fin	Lecture discussion & inclass-tasks	
14	Recognizing expressions of definition Reviewing and practicing all note taking strategies	1-5	As Fin	Lecture discussion & inclass-tasks	Chapter 9 The Art of Graffiti
15	WRAP-UP AND REVIEW	1-5	As Fin	Lecture discussion & inclass-tasks	
FINAL EXAMINATION					

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5
On-going assessment (30%) (participation, individual work, group work, assignments, etc.)	80% Pass	80% Pass	80% Pass	80% Pass	80% Pass
Midterm exam (30%)	80% Pass		80% Pass		
Final exam (40%)	80% Pass		80% Pass		

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics (optional)

6. Date revised: 15 August, 2022

WRITING AE2 (RESEARCH PAPER WRITING)

Course Code: **EN011IU**

1. General information

Course title	WRITING AE2 (*Research Paper Writing*)
Course designation	*This course introduces basic concepts in research paper writing, especially the role of generalizations, definitions, classifications, and the structure of a research paper to students who attend English- medium college or university. It also provides them with methods of developing and presenting an argument, a comparison or a contrast.*
Semester(s) in which the course is taught	1, 2, 3
Person responsible for the course	Lecturers of School of Languages
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (lecture, exercise): 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Writing AE1 (EN007IU)
Course objectives	Students are required to work on the tasks selected to maximize their exposure to written communication and are expected to become competent writers in the particular genre: the research paper. As writing is part of an integrated skill of reading and writing where reading serves as input to trigger writing, this course is designed to familiarize non-native students with academic literature in their major study by having them read and critically respond to texts of a variety of topics ranging from natural sciences such as biology to social sciences and humanities like education, linguistics and psychology.
Course learning outcomes	Upon the successful completion of this course, students will be able to: Competency level | Course learning outcome (CLO)

	Knowledge: CLO1. Understand the structure of a research paper and emILOy appropriate academic language in writing a research paper Skill: CLO2. Read critically, analyze, and annotate academic articles and journals. CLO3. EmILOy the research writing skills obtained to work on their own paper in their major study. Attitude: CLO4. Reason around ethical issues in writing research paper and avoid committing plagiarism
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (2 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)
Examination forms	Essay writing
Study and examination requirements	*Attendance* Regular on-time attendance in this course is expected. A student will be allowed no more than three absences. It is compulsory that the students attend at least 80% of the course to be eligible for the final examination. *Assignment (Literature review)* Purpose: Students will use the knowledge of paraphrasing, summarising, developing arguments, and APA styles to write a 1,000-word literature review on a research scope of their choice. Task: ● Follow guidelines on how to write a literature review. ● Use relevant academic writing skills such as paraphrasing, summarising, developing arguments, and APA 7th Style Guidelines – see https:/www.apastyle.org/ ● Develop arguments in relation to the research scope and identify the research gap

Knowledge	CLO1. Understand the structure of a research paper and emILOy appropriate academic language in writing a research paper
Skill	CLO2. Read critically, analyze, and annotate academic articles and journals. CLO3. EmILOy the research writing skills obtained to work on their own paper in their major study.
Attitude	CLO4. Reason around ethical issues in writing research paper and avoid committing plagiarism

Topic	Weight	Level
Unit 1: The Academic Writing Process Introduction	4	I, T, U
Unit 2: Researching and Writing	2	T, U
Unit 3: Fundamentals & Feedback	2	T, U
Unit 4: Definitions, Vocabulary & Clarity	2	T, U
Unit 5: Generalizations, Facts and Honesty	4	T, U
Unit 6: Seeing Ideas and Sharing Texts	2	T, U
Unit 7: Description, Methods & Reality	2	T, U
Unit 8: Results, Discussion & Relevance	2	T, U
Unit 9: The Whole Academic Text	2	T, U
Unit 10: Creating the Whole Text	4	T, U
Course Review	2	U

Notes: All papers should be typed, double-spaced, in 13-pt font, and with 1-inch margins. All papers must be original for this class. Criterion-referenced grading is used in this course.

Missed Tests

Students are not allowed to miss any of the tests (both Mid-term and Final). There are very few exceptions. Only with extremely reasonable excuses (eg. certified paper from doctors), students may re- take the examination.

Class Behaviors

Students are required to treat their studying in college as a full-time job and spend an adequate amount of time for this Writing AE2 course with approximately 8-10 hours per week (both in class and self- study). Accordingly, students are supposed to follow the obligations below:

- Prepare thoroughly for each class in accordance with the course syllabus and complete home assignments as the instructor’s request.
- Participate fully and constructively in all course activities and discussions (if any).
- Display appropriate courtesy to all involved in the class.
- Provide constructive feedback to faculty members regarding their performance.

Plagiarism

All forms of plagiarism and unauthorised collusion are seriously regarded and could result in penalties.

Plagiarism occurs when students copy or reproduce people’s words or ideas and then present them as students’ own work without proper acknowledgement, including when students copy the work of their fellow students.

Plagiarism in student submissions can be detected by:

- some web-based programs such as SafeAssign or Turnitin, or
- examiner's judgments with evidence of originals

The rater will review the paper to check if citations or references are provided properly. Penalties due to improper citations or references include:

Degree of magnitude	Description
Below 15%	Marked as it is.
15% - 25%	The score is deducted by 25%.
25% - 40%	The score is deducted by 50%
Over 40%	The score is 0.

Notes: Part of the test is marked as it is if no plagiarism is detected. Students who plagiarize over 40% twice will be prohibited from sitting the final examination.

Writing Center (Room 509)

	Students are encouraged to visit the Writing Center or to schedule an appointment for additional help.
Reading list	[1] Hamp-Lyons, L., & Heasley, B. (2006). *Study Writing.* Cambridge, UK: Cambridge University Press [2] Articles and Essays taken from *The Allyn and Bacon Guide to Writing* by Ramage et al (2009), Pearson Longman. [3] Cormack, J. & Slaught, J. (2009). *English for academic study: Extended writing and research skills*. Cambridge: Cambridge University Press. Garnet Education [4] Folse, K. S. & Pugh, T. (2010). *Great writing 5: Greater essays*. Boston: Heinle, Cengage Learning. [5] Keezer, S. (Ed.) (2003). *Write your research report: A real-time guide*. New Jersey: Pearson Learning Group. [6] Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners*. Sage Publications

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										
2										
3							x			
4										

ILO7. Communicate effectively in career.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities
1	Orientation of the Course <u>Unit 1:</u> The Academic Writing Process Introduction	1-4		Lecture discussion and writing practice
2	<u>Unit 1:</u> The Academic Writing Process (Cont.) Thinking about writing processes Distinguishing between academic and personal styles of writing Grammar of academic discourse	1-4	HW: Task 10	Lecture discussion and writing practice
3	<u>Unit 2:</u> Researching and Writing Recognizing categories and classification The language of classification The structure of a research paper	1-4	HW: Task 17	Lecture discussion and writing practice

4	Unit 3: Fundamentals & Feedback Exploring comparison and contrast structures The language of comparison and contrast Using comparisons and contrasts to evaluate and recommend	1-4	HW: Task 12	Lecture discussion and writing practice
5	Unit 3: Fundamentals & Feedback (Cont.) The research paper Identifying a research gap The writing process	1-4	Assignment 1: Task 20	Lecture discussion and writing practice
6	Unit 4: Definitions, Vocabulary & Clarity The clarity principle The language of definition The place of definition The writing process	1-4	HW: Task 15	Lecture discussion and writing practice
7	Unit 5: Generalizations, Facts and Honesty Honesty principle The language of generalization	1-4	HW: Task 13	Lecture discussion and writing practice
8	Unit 5: Generalizations, Facts and Honesty (Cont.) Writing a literature review The writing process Brainstorming and clustering APA 7th Style Guidelines – see https:/www.apastyle.org/	1-4	Assignment 2: Writing Literature review	Lecture discussio n and writing practice
MID-TERM				
9	Unit 6: Seeing Ideas and Sharing Texts Writing about events in time Connecting events Learning about peer reviews	1-4	HW: Tasks 12 & 13	Lecture discussion and writing practice
10	Unit 7: Description, Methods & Reality Describing processes and products The language for writing about processes Writing the Methods section Giving and getting formal peer feedback	1-4	HW: Tasks 9 & 11	Lecture discussion and writing practice
11	Unit 8: Results, Discussion & Relevance What is an argument? The language of argument The Results and Discussion sections Finding an academic voice	1-4	HW: Task 9	Lecture discussion and writing practice
12	Unit 9: The Whole Academic Text S-P-S-E: Focus on structure S-P-S-E in the introduction The language of coherence and connection	1-4	HW: Task 9	Lecture discussion and writing practice

	Teacher evaluation			
13	Unit 10: Creating the Whole Text Structure of the research paper Creating your own research	1-4		Lecture discussion and writing practice
14	Unit 10: Creating the Whole Text Plagiarism Creating citations Paraphrase and summary Authorial identity	1-4		Lecture discussion and writing practice
15	Course Review	1-4	Submitting Literature review	Lecture discussion and writing practice
FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Class participation and Assignments (30%)	80% Pass	80% Pass	80% Pass	
Midterm exam (30%)	80% Pass		80% Pass	80% Pass
Final exam (40%)	80% Pass		80% Pass	80% Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics

5.1. Midterm exam sample rubrics (100 points)

TASK 1: 30 points

CATEGORIES	CRITERIA	POINTS	CLO
Category	Farm animals seem to have more complex cognitive and social skills	7.5	CLO 1,2
Sub-category 1	1. Sheep experience stress a. increase stress (when isolated from the flock) b. reduce stress (when seeing familiar sheep faces)	7.5	
Sub-category 2	2. Cows' co-operative partnerships & physiological response on learning something new a. Those learning tasks experience an increase in heart rate (when facing same situation). b. Those not learning tasks do not experience a heart rate increase.	7.5	CLO 1,2
Sub-category 3	3. Pigs' different reactions react differently based on past experience	7.5	CLO 1,2

	a. avoid the place where they have been shut for long b. go for the place where they were released from quickly.		
	Total	30	

TASK 2: 70 points

CATEGORIES	CRITERIA	POINTS	CLO
Content	All main points relevant to topic Essay question fully answers	20	CLO 1,3,4
Organization	Topic and purpose of the essay discussed in the introduction Each main point discussed in a paragraph All main points summarized and rephrased in the conclusion	20	CLO 1,3,4
Coherence	Paragraphs ordered in a systematic manner based on, for example, importance, priority, etc. Comparison/contrast transitions are properly used.	15	CLO 1,3,4
Style and Tone	Formal writing with full forms Polite writing Academic vocabulary	15	CLO 1,3,4
	Total	70	

5.2. Final exam rubrics: 100 points

CATEGORIES	CRITERIA	POINTS	CLO
Content	• Presenting his/her view on the question clearly and persuasively	20	CLO 1,3,4
Structure of ideas	• Introduction with thesis statement, and conclusion with summary and comment • Topic sentences well supported with explanations, examples, etc.	40	CLO 1,3,4
Convincing argumentative techniques, e.g., counterargument		20	CLO 1,3,4
Language use: *use vocabulary and grammatical structures*		20	CLO 1,3,4
	Total	100	

6. Date revised: 15 August, 2022

SPEAKING AE2 (EFFECTIVE PRESENTATIONS)

Course Code: **EN012IU**

1. General information

<table>
<tr><td>Course title</td><td>SPEAKING AE2 (Effective Presentations)</td></tr>
<tr><td>Course designation</td><td>Giving presentations today becomes a vital skill for students to succeed not only in university but also at work in the future. Speaking AE2, therefore, provides students with the knowledge and skills needed to deliver effective presentations (informative and persuasive presentations).</td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1, 2, 3</td></tr>
<tr><td>Person responsible for the course</td><td>Lecturers of School of Languages</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory</td></tr>
<tr><td>Teaching methods</td><td>Lecture, lesson, mini presentations</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td>(Estimated) Total workload: 85
Contact hours (lecture, exercise): 25
Private study including examination preparation, specified in hours: 60</td></tr>
<tr><td>Credit points/ECTS</td><td>2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)</td></tr>
<tr><td>Required and recommended prerequisites</td><td>Previous course: Writing AE1 (EN007IU), Listening (EN008IU)</td></tr>
<tr><td>Course objectives</td><td>Speaking AE2 aims at introducing and training students many aspects of giving a presentation: building up confidence, preparing and planning, using the appropriate language, applying effective visual aids, applying delivery techniques, dealing with questions and responding, performing body language, and so on.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course, students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Understand many aspects of giving a presentation: building up confidence, preparing and planning, using the appropriate language, applying effective visual aids, applying delivery techniques, dealing with questions and responding, performing body language</td></tr>
</table></td></tr>
</table>

	Skill	CLO2. Prepare and deliver effective, formal, structured presentations that are appropriate to the specific environment and audience.
	Attitude	CLO3. Deliver both informative and persuasive speech with confidence
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (2 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)	

Topic	Weight	Level
Orientation & Introduction Needs analysis	2	I, T, U
Building up confidence	2	T, U
The first few minutes	2	T, U
Organizing what you want to say	2	T, U
Summarizing and concluding	2	T, U
Using equipment	2	T, U
Delivery techniques: Putting it all together	2	T, U
Group presentations for the instructor's evaluation and advice	2	U
Introduction to persuasive speeches	2	T, U
Methods of persuasion	2	T, U
Maintaining interest	2	T, U
Dealing with problems and questions	2	T, U
Body language	2	T, U
Individual presentations for the instructor's evaluation and advice	4	U

Examination forms	Oral Presentations
Study and examination requirements	*Attendance* Regular on-time attendance in this course is expected. A student will be allowed no more than three absences. It is compulsory that the students attend at least 80% of the course to be eligible for the final examination. *Missed Tests* Students are not allowed to miss any of the tests (both Mid-term and Final). There are very few exceptions. Only with extremely reasonable excuses (e.g. certified paper from doctors), students may re-take the examination. *Class Behaviors* Students are required to treat their studying in college as a full-time job and spend an adequate amount of time for this Speaking AE2 course with approximately 8-10 hours per week (both in class and self-study). Accordingly, students are supposed to follow the obligations below: • Prepare thoroughly for each class in accordance with the course

	syllabus and complete home assignments as the instructor's request. • Participate fully and constructively in all course activities and discussions (if any). • Display appropriate courtesy to all involved in the class. • Provide constructive feedback to faculty members regarding their performance. *Plagiarism* Students are warned not to copy from other books or from their peers for all assessment tasks. Committing plagiarism will result in 0 point for the task. Students who plagiarize twice will be prohibited from sitting the final examination.
Reading list	[1] Lowe, S, & Pile, L. (2010). *Presenting.* Singapore*:* Cengage Learning [2] Comfort, J. (1997). *Effective presentations*. Oxford: Oxford University Press [3] Lucas, S. (2014). *The art of public speaking* (12th edition). New York: McGraw-Hill Education. [4] Harrington, D., & Lebeau, C. (2009). *Speaking of speech*. Macmillan

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										
2							x			
3										

ILO7. Communicate effectively in career.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Orientation & Introduction Needs analysis	1-3	Group work	Lecture, Discussion, Presentation practice	[1] *Presenting*, p. 5
2	Building up confidence	1-3	Group work	Lecture, Discussion, Presentation practice	
3	Unit 1: The first few minutes	1-3	Group work	Lecture, Discussion,	• *Presenting*, pp. 8-13

				Presentation practice	*Effective Presentations*: p.7 + video clip; p.13+ video clip
4	Unit 3: Organizing what you want to say	1-3	Group work	Lecture, Discussion, Presentation practice	• *Presenting*, pp. 22-27) *Effective Presentations*: p.19 + video clip
5	Unit 6: Summarizing and concluding	1-3	Group work	Lecture, Discussion, Presentation practice	• *Presenting*, pp. 40- 45 *Effective Presentations*: p.41 + video clip
6	Unit 2: Using equipment	1-3	Group work	Lecture, Discussion, Presentation practice	• *Presenting*, pp. 14- 21) *Effective Presentations*: p.31 + video clip
7	Delivery techniques: Putting it all together	1-3	Group work	Lecture, Discussion, Presentation practice	[2] *Effective Presentations*: p.50 + video clip Assignment: Topic(s) for group presentation)
8	Group presentations for the instructor's evaluation and advice	1-3	Group work	Lecture, Discussion, Presentation practice	
	MIDTERM EXAM				
9	Introduction to persuasive speeches	1-3	Group work	Lecture, Discussion, Presentation practice	[3] *The art of public speaking*, Chapter 15 (Handout

					given by the instructor)
10	Methods of persuasion	1-3	Group work	Lecture, Discussion, Presentation practice	[3] *The art of public speaking*, Chapter 16 (Handout given by the instructor)
11	Unit 4: Maintaining interest	1-3	Group work	Lecture, Discussion, Presentation practice	• *Presenting*: pp. 28- 33) *Effective Presentations*: p.25 + video clip)
12	Unit 5: Dealing with problems and questions	1-3	Group work	Lecture, Discussion, Presentation practice	○ *Presenting*: pp. 34- 39) *Effective Presentations*: p.44 (Question time)
13	Unit 6: Body language	1-3	Group work	Lecture, Discussion, Presentation practice	[2] *Effective Presentations:* pp.36-39
14	Practice	1-3	Group work	Presentation, Discussion	(to be determined by the instructor)
15	Wrap-up and advice	1-3	Group work	Discussion	(to be determined by the instructor)
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
On-going Assessment (30%) (discussion, group presentation, individual presentation, and so on) *(It is requested that lecturers collect students' scripts or any type of evidence of their participation for possible fact check).*	80% Pass	80% Pass	80% Pass

Midterm exam (30%) (Students will give a five-to-six-minute informative presentation on a topic to be determined)	80% Pass	80% Pass	80% Pass
Final exam (40%) (Students will deliver a seven-to-eight-minute persuasive presentation on a topic to be determined.)	80% Pass	80% Pass	80% Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. **Rubrics & Mark sheets**
6. **Date revised: 15 August, 2022**

CALCULUS 1

Course Code: **MA001IU**

1. General information

Course title	CALCULUS 1 *(Giải tích 1)*
Course designation	*This course equips students with basic concepts of calculus: limits, continuity, differentiation, and integration. Applications of these concepts are extensively discussed.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Lecturers of Department of Mathematics
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lectures, assignments
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 170 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 50 Private study including examination preparation, specified in hours: 120
Credit points/ECTS	4 credits/ 6.16 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	None
Course objectives	• To provide students with the main ideas and techniques of calculus. These include limits, continuity, differentiation, and integration. • To introduce practical applications of these ideas and techniques, through practical examples taken from many areas of engineering, business, and life sciences. • To develop skills in mathematical modeling and problem solving, ability to think logically, and adapt these skills creatively to new situations
Course learning outcomes	Upon the successful completion of this course students will be able to: <table><tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr></table>

	Knowledge	CLO1. Have basic knowledge of limits and derivatives (Program outcomes: a) CLO2. Have basic knowledge of definite/indefinite integrals (Program outcomes: a)
	Skill	CLO3. Can compute often used limits, can define and compute derivatives (Program outcomes: a, j) CLO4. Can compute standard types of integrals. Use integrals in practical situations (Program outcomes: a, j)
	Attitude	CLO5. Confident when dealing with derivatives and integrals. Comfortable with using derivatives and integrals in practical situations. (Program outcome: j, k)
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (4 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)	

Topic	Weight	Level
Functions and Graphs, Inverse Functions, Exponential and Logarithmic Functions	1	I, T
Parametric Curves, Limit. One-sided Limits, Laws of Limits.	1	I, T
Evaluating Limits. The Squeeze Theorem. Continuity. The Intermediate Value Theorem	1	T, U
Tangent Lines and Velocity Problems. Rates of Change, Derivative.	1	T, U
Higher-Order Derivatives, Rules of Differentiation. Rates of Change in the Natural and Social Sciences	1	T, U
Implicit Differentiation, Differentiation of Inverse Functions,	1	T, U
Logarithmic Differentiation, Linear Approximations. Differentials.	1	T, U
Related Rates, Maxima and Minima. Critical Point, The Mean Value Theorem.	1	T, U
The First and Second Derivative Test, Concavity. Shapes of Curves, Curve Sketching	1	T, U
Indeterminate Forms and l'Hôpital's Rules, Maxima and Minima Problems, Newton's Method	1	T, U
Anti-derivatives and Indefinite Integrals, The Definite Integral	1	I, T
Properties of the Definite Integral. The Fundamental Theorem of Calculus, Integration by Substitution	1	I, T, U
Integration by Parts, Partial Fractions, Numerical Integration,	1	T, U
Improper Integrals, Areas between Curves Areas Enclosed by Parametric Curves	1	T, U

	Volumes, Arc Length, Applications to Engineering, Economics and Science	1	T, U	
Examination forms	Written examination			
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.			
Reading list	J. Stewart, *Calculus*, Cengage Learning, 7th edition, 2010.			

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2	x									
3										
4										
5										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topics	CLO	Assessment	Teaching and Learning activities
1	Functions and Graphs, Inverse Functions, Exponential and Logarithmic Functions	1,3		Lecture
2	Parametric Curves, Limit. One-sided Limits, Laws of Limits.	1,3	Quiz	Lectures and Quiz
3	Evaluating Limits. The Squeeze Theorem. Continuity. The Intermediate Value Theorem	3, 5	Quiz	Lectures and Quiz
4	The Tangent and Velocity Problems. Rates of Change, The Derivative.	3, 5	HW1	Lectures and HW
5	Higher-Order Derivatives, Rules of Differentiation. Rates of Change in the Natural and Social Sciences	3, 5	Quiz	Lectures and Quiz

6	Implicit Differentiation, Differentiation of Inverse Functions,	3, 5	HW2	Lectures and HW
7	Logarithmic Differentiation, Linear Approximations. Differentials.	3, 5	Quiz	Lectures and Quiz
8	Related Rates, Maxima and Minima. Critical Point, The Mean Value Theorem.	3, 5	HW3	Lectures and HW
	MIDTERM EXAM	1, 2, 3, 4, 5		
9	The First and Second Derivative Test, Concavity. Shapes of Curves, Curve Sketching	2, 4	Quiz	Lectures and Quiz
10	Indeterminate Forms and l'Hôpital's Rules, Maxima and Minima Problems, Newton's Method	2, 4	Quiz	Lectures and Quiz
11	Anti-derivatives and Indefinite Integrals, The Definite Integral	4, 5	HW4	Lectures and HW
12	Properties of the Definite Integral. The Fundamental Theorem of Calculus, Integration by Substitution	2, 4	Quiz	Lectures and Quiz
13	Integration by Parts, Partial Fractions, Numerical Integration,	4, 5	Quiz	Lectures and Quiz
14	Improper Integrals, Areas between Curves Areas Enclosed by Parametric Curves	2, 4, 5	HW5	Lectures and HW
15	Volumes, Arc Length, Applications to Engineering, Economics and Science	1, 2, 3, 4, 5	Exercises	
	FINAL EXAM	1, 2, 3, 4, 5		

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5
In-class exercises/ quizzes (10%)	Qz1->Qz4 80% Pass	Qz5->Qz8 80%Pass	Qz1->Qz4 80% Pass	Qz5->Qz8 80% Pass	Qz2, 4, 6, 8 70% Pass
Homework exercises (10%)	HW1->H3 70% Pass	HW4, HW5 70%	HW1->HW3 70% Pass	HW4, HW5 70%	HW1->HW5 60% Pass

Midterm exam (30%)	Q1, Q2 80% Pass		Q3, Q4 70% Pass		Q5 50%
Final exam (50%)		Q1, Q2 80%Pass		Q3, Q4 70%Pass	Q5 50%

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

CALCULUS 2

Course Code: **MA003IU**

1. General information

Course title	CALCULUS 2 *(Giải tích 2)*
Course designation	*This course is a continuation of Calculus 1. Its aim to equip student with basic concepts of sequence, series, vector functions, functions of several variables, multiple integrals and their applications*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Lecturers of Department of Mathematics
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lectures, assignments
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 170 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 50 Private study including examination preparation, specified in hours: 120
Credit points/ECTS	4 credits/ 6.18 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Calculus 1 (MA001IU)
Course objectives	• To provide students with the main ideas and techniques of calculus. These include sequences, series, functions of several variables, optimal problems, multiple integrals, vector calculus. • To introduce practical applications of these ideas and techniques, through practical examples taken from many areas of engineering, business, and life sciences. • To develop skills in mathematical modeling and problem solving, ability to think logically, and adapt these skills creatively to new situations
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

	Knowledge	CLO1. Have basic knowledge of series, functions of several variables, multiple integrals (Program outcomes: a) CLO2. Have basic knowledge of vector calculus (Program outcomes: a)
	Skill	CLO3. Can compute partial derivatives, multiple integral (Program outcomes: a, j) CLO4. Can show the convergence of a sequence and a series and u, se power series to simplify computation. Can show the optimal problem using partial derivatives, can find the volume of an object in higher dimension by using the multiple integrals (Program outcomes: i, h)
	Attitude	CLO5. Confident when dealing with partial derivatives, multiple integrals. Comfortable with using partial derivatives and multiple integrals in practical situations. (Program outcome: j, k)

Content

The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (4 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Sequences and Convergence	1	I, T
Series	1	I, T
Tests for Convergence	1	T, U
Power series	1	T, U
Representations of Functions as Power series	1	T, U
Taylor and Maclaurin series	1	T, U
Vector Functions and Space Curves, Limit and continuity of vector functions	1	I, T
Derivatives and Integrals of vector functions, Length of space curves	1	T, U
Functions of Several Variables, Limits and Continuity	1	I, T
Partial Derivatives, Tangent Plane and Linear Approximations	1	T, U
Chain Rules, Directional Derivatives and Gradient	1	T, U
Maximum and Minimum Values of Functions of two variables	1	T, U
Lagrange Multipliers and Applications	1	T, U
Double Integrals in Rectangles, Iterated Integrals	1	I, T
Double, Triple Integrals in General regions and Applications	2	T, U

Examination forms	Written examination

Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	J. Stewart, *Calculus*, Thomson Learning, 7th edition, 2012.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2	x									
3										
4										
5										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topics	CLO	Assessment	Teaching and Learning activities
1	Sequences, Series, The Integral Test and Estimates Sums, The comparison Tests	2, 4	HW	Lectures and Quiz
2	Alternating Series, Absolute Convergence and the Ratio and Roots Tests, Strategy for Testing Series	2, 4	HW	Lectures and Quiz
3	Power Series, Representations of Functions as Power Series, Taylor & Maclaurin Series, Applications of Taylor Polynomials	4, 5	Quiz	Lectures and Quiz
4	3D Coordinate Systems, Vectors, The Dot Product, The Cross Product, Equations of Lines and Planes, Functions of Surface.	2, 4	HW	Lectures and Quiz
5	Vector Functions and Space Curves, Derivatives and Integrals of Vector Functions, Arc Length, Parametric Surfaces	4, 5	HW	Lectures and Quiz
6	Functions of Several Variables, Limit and Continuity,	2, 4, 5	Quiz	Lectures and Quiz

7	Partial Derivatives, Tangent Planes and Linear Approximations,	3, 5	HW	Lectures and Quiz
8	Chain Rule, Directional Derivatives and Gradient Vectors,	3, 5	HW	Lectures and Quiz
MIDTERM EXAM				
9	Maximum and Minimum Values, Lagrange Multiplier	2, 4	HW	Lectures and Quiz
10	Double Integrals over Rectangles, Iterated Integrals, Double Integrals over General Regions	2, 4	HW	Lectures and Quiz
11	Double Integrals in Polar Coordinates, Application of Double Integrals.	4, 5	HW	Lectures and Quiz
12	Triple Integrals, Triple Integrals in Cylindrical and Spherical Coordinates. Change of Variables in Multiple Integrals	2, 4	Quiz	Lectures and Quiz
13	Vector Fields, Line Integrals, the Fundamental Theorem for Line Integrals	4, 5	HW	Lectures and Quiz
14	Green's Theorem, Curl and Divergence, Surface Integrals	2, 4, 5	HW	Lectures and Quiz
15	Stokes' Theorem, Divergence Theorem.	1, 2, 3, 4, 5	Exercises	
FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5
In-class exercises/ quizzes (10%)	Qz1->Qz4 80% Pass	Qz5->Qz8 80%Pass	Qz1->Qz4 80% Pass	Qz5->Qz8 80% Pass	Qz2, 4, 6, 8 70% Pass
Homework exercises (10%)	HW1->H3 70% Pass	HW4, HW5 70%	HW1->HW3 70% Pass	HW4, HW5 70%	HW1->HW5 60% Pass
Midterm exam (30%)	Q1, Q2 80% Pass		Q3, Q4 70% Pass		Q5 50%
Final exam (50%)		Q1, Q2 80%Pass		Q3, Q4 70%Pass	Q5 50%

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

PROGRAMMING FOR ENGINEERS

Course Code: **EE057IU**

1. General information

Course title	PROGRAMMING FOR ENGINEERS *(Lập trình cho kỹ sư)*
Course designation	*This course is aimed at students with no or little programming experience. Generally, it endeavors to provide students with an understanding about the role of programming that can play in solving problems. The course content thus equips the basic terminologies of principles of programming and data structures via C programming language.* *The fundamentals include the history of programming, stepwise refinement and flow-charting, introduction to algorithm analysis; basic data types, type conversion, making decision and looping, branching, I/O operations; functions, recursion; arrays and multiple-subscripted arrays, searching and sorting algorithms; pointers/function pointers; characters and strings; structures, unions, enumerates, operations on bits; introduction to abstract data types; dynamic memory allocation, file processing.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Ngọc Trường Minh
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Programming for Engineers Laboratory (EE058IU)
Course objectives	The course is designed to provide students with complete knowledge of C language. Students will be able to develop logic which will help them to create programs, applications in C. Also, by learning the basic programming constructs they can easily switch over to any other language in future.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
CLO1: Implement C instructions, data types and programming techniques to solve simple problems
CLO2: Use novel computing technology and translate hypothesis as well as solutions into computer programs
CLO3: Explain the impact of electrical engineering solutions in a global, economic, environmental and social context
CLO4: Use collaboration skill with teammates
CLO5: Implement C into systems
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1, CLO2, CLO3, CLO4, CLO5</td></tr>
<tr><td>Skill</td><td>CLO1, CLO2, CLO3, CLO4, CLO5</td></tr>
<tr><td>Attitude</td><td></td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduction); T (Teaching); U (Utilization)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Programming Fundamentals & Introduction to Computers and C Programming</td><td>1</td><td>I</td></tr>
<tr><td>Algorithm and Flow-Chart</td><td>1</td><td>I</td></tr>
<tr><td>Variables, Data Types and Arithmetic Expressions</td><td>1</td><td>I</td></tr>
<tr><td>Making Decisions, Branching and Looping</td><td>1</td><td>U</td></tr>
<tr><td>I/O Operations in C</td><td>1</td><td>U</td></tr>
<tr><td>Working with C Functions/Recursion</td><td>1</td><td>U</td></tr>
<tr><td>Working with C Pointers/Pointers to Functions</td><td>2</td><td>U</td></tr>
<tr><td>Working with Structures/Unions</td><td>2</td><td>U</td></tr>
<tr><td>Working with C Characters</td><td>1</td><td>U</td></tr>
<tr><td>Operations on Bits</td><td>1</td><td>T</td></tr>
<tr><td>File Processing and Dynamic Memory Allocation</td><td>1</td><td>T</td></tr>
<tr><td>Project</td><td>2</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Multiple-choice questions, practical programming exercises</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>[1] Paul Deitel and Harvey Deitel, “C How to Program,” 8th edition, Pearson, 2016
[2] Brian Kernighan and Dennis Ritchie, “The C Programming Language,” 2nd edition, Prentice Hall, 1988
[3] Stephen G. Kochan, “Programming in C,” 4th edition, Sams Pub., 2014</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2	x									
3	x									
4	x									
5	x									

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Programming Fundamentals & Introduction to Computers and C Programming	1	Homework	Lecture Class discussion	[1], [2], [3]
2	Algorithm and Flow-Chart	1	Homework	Lecture Class discussion	[1], [2], [3]
3	Variables, Data Types and Arithmetic Expressions	1	Homework	Lecture Class discussion	[1], [2], [3]
4	Making Decisions, Branching and Looping	2	Homework Quiz	Lecture Class discussion	[1], [2], [3]
5	I/O Operations in C	2	Homework	Lecture Class discussion	[1], [2], [3]
6	Working with C Functions/Recursion	2	Homework	Lecture Class discussion	[1], [2], [3]
7	Working with C Arrays	2	Homework	Lecture Class discussion	[1], [2], [3]
8	Working with C Arrays	2	Homework Quiz	Lecture Class discussion	[1], [2], [3]
	MIDTERM EXAM	**1, 2**			
9	Working with C Pointers/Pointers to Functions	4 5	Homework	Lecture Class discussion	[1], [2], [3]
10	Working with C Pointers/Pointers to Functions	4 5	Homework Quiz	Lecture Class discussion	[1], [2], [3]
11	Working with Structures/Unions	4 5	Homework	Lecture Class discussion	[1], [2], [3]

12	Working with Structures/Unions	4 5	Homework Project	Lecture Class discussion	[1], [2], [3]
13	Working with C Characters	1	Homework	Lecture Class discussion	[1], [2], [3]
14	Operations on Bits	1	Homework	Lecture Class discussion	[1], [2], [3]
15	File Processing and Dynamic Memory Allocation	5	Homework	Lecture Class discussion	[1], [2], [3]
	FINAL EXAM	1, 2			

4. Assessment plan

Assessment Type	Percentage
HW & Quiz & Attendance	20%
Project	10%
Midterm exam	30%
Final exam	40%

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: September 15, 2022

PROGRAMMING FOR ENGINEERS LABORATORY

Course Code: **EE058IU**

1. General information

Course title	PROGRAMMING FOR ENGINEERS LABORATORY *(Thực hành lập trình cho kỹ sư)*
Course designation	*This laboratory is associated with the Programming for Engineers course. It covers everything that students will need to understand the basic concepts covered in the theory course, as well as the implementation of simple-to-complex C programs especially in the field of engineering. Topics include data types, control structures, functions, arrays, files, and the mechanics of running, testing, and debugging.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	M.Eng Trang Kiến
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credits/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Programming for Engineers (EE057IU)
Course objectives	This course conducts sequence of laboratory experiments to present and illustrate implement and debug programs using the C techniques which can investigate some case studies in order to comprehend professional and ethical responsibilities
Course learning outcomes	Upon the successful completion of this course students will be able to: CLO1: Able to design problem solutions, implement and debug programs using the C techniques. CLO2: Able to examine some case studies to understand professional and ethical responsibility.

	CLO3: Understand the impact of electrical engineering solutions in a global, economic, environmental and social context. Competency level — Course learning outcome (CLO) Knowledge — CLO1, CLO2, CLO3 Skill — CLO1, CLO2, CLO3 Attitude — CLO2, CLO3
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: laboratory session (4 periods) Teaching levels: I (Introduction); T (Teaching); U (Utilization)
Examination forms	short-answer questions
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	[1] Laboratory Manual supplied by the instructor

Competency level	Course learning outcome (CLO)
Knowledge	CLO1, CLO2, CLO3
Skill	CLO1, CLO2, CLO3
Attitude	CLO2, CLO3

Topic	Weight	Level
Variables, Data Types, Making Decisions, Branching and Looping	1	I, T, U
I/O operations	1	I, T, U
Functions/Recursion	1	I, T, U
Arrays	1	I, T, U
Pointers/Function Pointers	1	I, T, U
Structures/Unions/Enumerates	1	I, T, U
Characters and Strings, Operations on Bits	1	I, T, U

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1					x					
2					x					
3										

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Variables, Data Types, Making Decisions, Branching and Looping	1, 2, 3	Report	Lecture Class discussion	[1]
2	I/O operations	1, 2, 3	Report	Lecture Class discussion	[1]
3	Functions/Recursion	1, 2	Report	Lecture Class discussion	[1]
4	Arrays	1, 2	Report	Lecture Class discussion	[1]
5	Pointers/Function Pointers	1, 2	Report	Lecture Class discussion	[1]
6	Structures/Unions/Enumerates	1, 2	Report	Lecture Class discussion	[1]
7	Characters and Strings, Operations on Bits	1, 2	Report	Lecture Class discussion	[1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	Percentage
LAB Report	70%
Final exam	30%

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

GENERAL PHYSICS 1

Course Code: **PH019IU**

1. General information

Course title	GENERAL PHYSICS 1 *(Vật lý đại cương 1)*
Course designation	*This subject will provide an introduction to mechanics including concepts and principles of kinetics, dynamics, energetics of motion of a particle and a rigid body and provide a basic knowledge of fluid mechanics; macroscopic description of gases; heat and the first law of thermodynamics; heat engines and the second law of thermodynamics; microscopic description of gases and the kinetic theory of gases.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Assos. Prof. Phan Bảo Ngọc; Dr. Đỗ Xuân Hội; Dr. Phan Hiền Vũ; Dr. Nguyễn Quang
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 170 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 50 Private study including examination preparation, specified in hours: 120
Credit points/ECTS	4 credits/ 6.18 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	None
Course objectives	This course will provide students with: • The basic knowledge of general Mechanics Physics, Fluid Mechanics and Thermal Physics • Skills to solve problems in engineering environment by applying both theoretical and experimental techniques • Understanding and skills needed to use physical laws governing real process and to solve them in the engineering environment • Confidence and fluency in discussing physics in English.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Understand basic knowledge of kinematics, dynamics, and laws of conservation of a mechanical system.
CLO2. Understand basic knowledge of fluid mechanics, laws of thermodynamics, and the kinetic theory of an ideal gas.
CLO3. Apply knowledge of physics to solving problems in science and engineering</td></tr>
<tr><td>Skill</td><td>CLO4. Apply skills to analyzing and solving problems in science and engineering</td></tr>
<tr><td>Attitude</td><td>CLO5. Communicate effectively in writing manner</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (2 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Bases of Kinematics</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Chapter 2: The Law of Motion</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 3: Work and Mechanical Energy</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Chapter 4: Linear Momentum and Collisions</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 5: Rotation of a Rigid Object About a Fixed Axis</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Chapter 6: Equilibrium and Elasticity</td><td>1</td><td>I</td></tr>
<tr><td>Chapter 7: Universal Gravitation</td><td>1</td><td>I</td></tr>
<tr><td>Chapter 1: Fluid Mechanics</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 2: Temperature, Heat, and the First Law of Thermodynamics</td><td>4</td><td>I, T, U</td></tr>
<tr><td>Chapter 3: The Kinetic Theory of Gases</td><td>5</td><td>I, T, U</td></tr>
<tr><td>Chapter 4: Entropy and the Second Law of Thermodynamics</td><td>4</td><td>I, T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written Examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>[1] Lecture Notes
[2] Halliday D., Resnick R. and Walker, J. (2011) Principles of Physics, 9th edition, John Willey and Sons, Inc.
[3] Alonso M. and Finn E.J. (1992) Physics, Addison-Wesley Publishing Company.</td></tr>
</table>

	[4] Faughn/Serway (2006) *Serway's College Physics*, Thomson Brooks/Cole.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2	x									
3										
4										
5										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Mechanics:

Week	**Topic**	**CLO**	**Assessments**	**Learning activities**	**Resources**
1-3	Chapter 1: Basis of Kinematics Motion in One Dimension: - Position, Velocity, and Acceleration - One-Dimensional Motion with Constant Acceleration - Freely Falling Objects Motion in Two Dimensions: - Position, Velocity, and Acceleration Vectors - Two-Dimensional Motion with Constant Acceleration. Projectile Motion - Circular Motion. Tangential and Radial Acceleration - Relative Velocity and Relative Acceleration	1,3-5	Assignment/ Quiz, Midterm	Lecture, Discussion, In class-Quiz	[1] 1 [2] 1, 2, 3, 4
4-5	Chapter 2: Laws of Motion - Newton's First Law and Inertial Frames - Newton's Second Law - Newton's Third Law	1,3-5	Assignment/ Quiz Midterm	Lecture, Discussion, In class-Quiz	[1] 2 [2] 5, 6

	Some Applications of Newton's Laws: - Gravitational Force and Weight - Forces of Friction - Uniform Circular Motion and Non-uniform Circular Motion - Motion in the Presence of Resistive Forces - Motion in Accelerated Frames				
6-8	Chapter 3: Work and Mechanical Energy - Work Done by Force. Power - Kinetic Energy and Work. Kinetic Energy Theorem - Potential Energy of a System - Conservation of Mechanical Energy - Conservative and Non-conservative Forces - Changes in Mechanical Energy for Non-conservative Forces - Relationship Between Conservative Forces and Potential Energy	1,3-5	Assignment/ Quiz Final	Lecture, Discussion, In class- Quiz	[1] 3 [2] 7, 8
	MIDTERM EXAM				
9-10	Chapter 4: Linear Momentum and Collisions - Linear Momentum and Its Conservation - Impulse and Momentum - Collisions in One Dimension and Two Dimensions	1,3-5	Assignment/ Quiz Final	Lecture, Discussion, In class- Quiz	[1] 4 [2] 9
11-13	Chapter 5: Rotation of a Rigid Object About a Fixed Axis - Rotational Kinematics. Rotational Motion with Constant Angular Acceleration - Torque and Angular Acceleration - Moments of Inertia - Rotational Kinetic Energy - Rolling Motion of a Rigid	1,3-5	Assignment/ Quiz Final	Lecture, Discussion, In class- Quiz	[1] 5 [2] 10, 11

	Object - Angular Momentum of a Rotating Rigid Object - Conservation of Angular Momentum				
14	Chapter 6: Equilibrium and Elasticity The Conditions for Equilibrium The Center of Gravity	1,3-5	Assignment/ Quiz	Lecture, Discussion, In class-Quiz	[1] 6 [2] 12
15	Chapter 7: Universal Gravitation Newton's Law of Gravitation Kepler's Laws and the Motion of Planets The Gravitational Field and Gravitational and Potential Energy	1,3-5	Assignment/ Quiz	Lecture, Discussion, In class-Quiz	[1] 7 [2] 13
	FINAL EXAM				

Fluid Mechanics and Thermal Physics:

Week	Topic	CLO	Assessments	Learning activities	Resources
1-2	Chapter 1: Fluid Mechanics - Fluids at Rest - Ideal Fluids in Motion - Bernoulli's Equation	2-5	Assignment/ Quiz Midterm	Lecture, Discussion, In class-Quiz	[1] 1 [2] 14
3-6	Chapter 2: Temperature, Heat, and First Law of Thermodynamics - Temperature and Zeroth Law of Thermodynamics - Thermal Expansion - Heat and Absorption of Heat by Solids and Liquids - Work and Heat in Thermodynamic Processes - First Law of Thermodynamics and Its Some Special Cases - Heat Transfer Mechanisms	2-5	Assignment/ Quiz Midterm	Lecture, Discussion, In class-Quiz	[1] 2 [2] 18
7-8	Chapter 3: Kinetic Theory of Gases - Ideal Gases: Experimental Laws, Equation of State - Molecular Model of an Ideal Gas. Mean Free Path	2-5	Assignment/ Quiz Midterm	Lecture, Discussion, In class-Quiz	[1] 2 [2] 19
	MIDTERM EXAM				

9-11	Chapter 3: Kinetic Theory of Gases - Boltzmann Distribution Law and Distribution of Molecular Speeds - Molar Specific Heats of an Ideal Gas - Equipartition of Energy Theorem - Adiabatic Expansion of an Ideal Gas	2-5	Assignment/ Quiz Final	Lecture, Discussion, In class-Quiz	[1] 2 [2] 19
12-15	Chapter 4: Entropy and Second Law of Thermodynamics - Reversible, Irreversible Processes and Entropy - Second Law of Thermodynamics - Entropy in Real World: Engines - A Statistical View of Entropy	2-5	Assignment/Quiz Final	Lecture, Discussion, In class-Quiz	[1] 4 [2] 20
	FINAL EXAM				

4. **Assessment plan**

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5
In-class exercises/quizzes (10%)	70% Pass	70% Pass	70% Pass	70% Pass	70% Pass
Homework exercises (20%)	70% Pass	70% Pass	70% Pass	70% Pass	70% Pass
Midterm exam (30%)	70% Pass	70% Pass	70% Pass	70% Pass	70% Pass
Final exam (40%)	70% Pass	70% Pass	70% Pass	70% Pass	70% Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. **Rubrics (optional)**
6. **Date revised: January 12, 2022**

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

GENERAL PHYSICS 1 LABORATORY

Course Code: **PH020IU**

1. General information

Course title	GENERAL PHYSICS 1 LABORATORY (*Thực hành Vật Lý đại cương 1*)
Course designation	*This subject is an experimental course that provides students necessary skills to do experiment of mechanics, thermodynamics and fluid mechanics.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	MEng. Trịnh Thanh Thủy; MSc. Lê Thị Quế
Language	English
Relation to curriculum	Compulsory
Teaching methods	Experiment, writing report
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 110 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 50 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 4 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: General Physics 1 (PH019IU)
Course objectives	This course will provide students with: • Knowledge of mechanics, thermodynamics and fluid • Skills to do experiments related to the knowledge • Laboratory experiences (using devices, computer software, ...) • Confidence and fluency in discussing physics in English.
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Understand basic knowledge of law of conservations and dynamics of rigid body and of the kinetic energy of ideal gas and the second law of thermodynamics.

<table>
<tr><td></td><td><table>
<tr><td>Skill</td><td>CLO2. Approach and solve problems in Mechanic and Thermodynamics experiments
CLO3. Write scientific report, have understanding the relations between theory and experiment</td></tr>
<tr><td>Attitude</td><td>CLO4. Communicate effectively in writing manner</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: laboratory session (4 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Projectile motion</td><td>1</td><td>T, U</td></tr>
<tr><td>Newton’s law of motion</td><td>1</td><td>T, U</td></tr>
<tr><td>Conservation of momentum</td><td>1</td><td>T, U</td></tr>
<tr><td>Conservation of angular momentum</td><td>1</td><td>T, U</td></tr>
<tr><td>Rotational inertia</td><td>1</td><td>T, U</td></tr>
<tr><td>Sliding friction</td><td>1</td><td>T, U</td></tr>
<tr><td>Pendulum</td><td>1</td><td>T, U</td></tr>
<tr><td>Vibrating Strings</td><td>1</td><td>T, U</td></tr>
<tr><td>Gyroscope</td><td>1</td><td>T, U</td></tr>
<tr><td>Bernoulli’s principle</td><td>1</td><td>T, U</td></tr>
<tr><td>Ideal gas law</td><td>1</td><td>T, U</td></tr>
<tr><td>Boyle’s law and Gay-Lussac’s law</td><td>1</td><td>T, U</td></tr>
<tr><td>Heat engine cycles</td><td>1</td><td>T, U</td></tr>
<tr><td>Blackbody radiation</td><td>1</td><td>T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Experiment, write report</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>[1] Lab manual, PASCO Scientific
[2] Halliday D., Resnick R. and Walker, J. (2011) Principles of Physics, 9th edition, John Willey and Sons, Inc.
[3] Alonso M. and Finn E.J. (1992) Physics, Addison-Wesley Publishing Company.
[4] Faughn/Serway (2006) Serway’s College Physics, Thomson Brooks/Cole.</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										

2					x					
3										
4										

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding technical problems in satellite technology applications.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Projectile motion	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
2	Newton's law of motion	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
3	Conservation of momentum	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
4	Conservation of angular momentum	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
5	Rotational inertia	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
6	Sliding friction	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
7	Pendulum	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
8	Vibrating Strings	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
9	Gyroscope	1-4	Prelab Quiz Lab report	Lecture Discussion Experiment	[1]

			Final exam	Presentation	
10	Bernoulli's principle	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
11	Ideal gas law	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
12	Gay-Lussac's law	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
13	Heat engine cycles	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
14	Blackbody radiation	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (20%)				
Prelab (20%)	x	x	x	x
Report (30%)	x	x	x	x
Final exam (30%)	x	x	x	x

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics (optional)

6. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022

CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

GENERAL PHYSICS 2

Course Code: **PH021IU**

1. General information

<table>
<tr><td>Course title</td><td>General Physics 2 (Electricity and Magnetism) (Vật lý đại cương 2)</td></tr>
<tr><td>Course designation</td><td>This subject will provide a basic knowledge of electricity and magnetism.</td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1, 2</td></tr>
<tr><td>Person responsible for the course</td><td>Assos. Prof. Phan Bảo Ngọc; Dr. Phan Hiền Vũ; Dr. Nguyễn Quang</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory</td></tr>
<tr><td>Teaching methods</td><td>Lecture, lesson, assignment.</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td>(Estimated) Total workload: 127.5
Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5
Private study including examination preparation, specified in hours: 90</td></tr>
<tr><td>Credit points/ECTS</td><td>3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)</td></tr>
<tr><td>Required and recommended prerequisites</td><td>Previous course: General Physics 1 (PH019IU)</td></tr>
<tr><td>Course objectives</td><td>This course will provide students with:
The basic knowledge of electricity and magnetism such as electric charge, electric potential, magnetic fields, electromagnetic waves, etc.
Skills to solve problems in engineering environment by applying both theoretical and experimental techniques.
Understanding and skills needed to use physical laws governing real processes and to solve them in the engineering environment.
Confidence and fluency in discussing physics in English.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:<table><tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr><tr><td>Knowledge</td><td>CLO1. Understand basic knowledge of electricity and magnetism.</td></tr></table></td></tr>
</table>

		CLO2. Apply knowledge of physics to solving problems in science and engineering.
	Skill	CLO3. Apply skills to analyzing and solving problems in science and engineering.
	Attitude	CLO4. Communicate effectively in writing manner.
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (3 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)	
Examination forms	Exam	
Study and examination requirements	*Attendance:* A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. *Assignments/Examination:* Students must have more than 50/100 points overall to pass this course.	
Reading list	[1] Halliday D., Resnick R. and Walker, J. (2011) *Fundamentals of Physics*, 9th edition, John Willey and Sons, Inc. [2] Alonso M. and Finn E.J. (1992) *Physics,* Addison-Wesley Publishing Company. [3] Hecht, E. (2000) *Physics: Calculus,* 2nd edition, Brooks/Cole. [4] Faughn/Serway (2006) *Serway's College Physics*, Thomson Brooks/Cole.	

Content topics:

Topic	Weight	Level
Chapter 1: Electric Fields	3	I, T, U
Chapter 2: Electric Potential and Capacitance	2	I, T, U
Chapter 3: Current and Resistance. Direct Current Circuits	3	I, T, U
Chapter 4: Magnetism	2	I, T, U
Chapter 5: Electromagnetic Induction	2	I, T, U
Chapter 6: Electromagnetic Oscillations and Alternating Current	2	I, T, U
Chapter 7: Maxwell's Equation and Electromagnetic Waves	1	I, T, U

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10

1	x									
2	x									
3										
4										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1-3	Chapter 1: Electric Fields	1-4	Quiz 1/ Assignment Midterm exam	Lecture, Discussion	[1].0. [2].1.
4-5	Chapter 2: Electric Potential and Capacitance	1-4	Quiz 2/ Assignment Midterm exam	Lecture, Discussion	[1].9.
6-8	Chapter 3: Current and Resistance. Direct Current Circuits	1-4	Assignment Midterm exam	Lecture, Discussion	[2].2.
	MIDTERM EXAM				
9-10	Chapter 4: Magnetism	1-4	Quiz 3/ Assignment Final exam	Lecture, Discussion	[2]. 4. [1]. 18.
11-12	Chapter 5: Electromagnetic Induction	1-4	Quiz 4/ Assignment Final exam	Lecture, Discussion	[3]. 10
13-14	Chapter 6: Electromagnetic Oscillations and Alternating Current	1-4	Assignment Final exam	Lecture, Discussion	[2]. 4. [1]. 18.
15	Chapter 7: Maxwell's Equation and Electromagnetic Waves	1-4	Final exam	Lecture	[3]. 10
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance + Homework + in-class discussion (15%)				
Quizzes (Qz) / assignment (As) (15%)	Qz1, Qz3/ As.P1 50%Pass	Qz2, Qz4/ As.P2 50%Pass	Qz1, Qz2, Qz3, Qz4 / As.P3 50%Pass	Qz1, Qz2, Qz3, Qz4 / As.P4 50%Pass

Midterm exam (30%)	Q1, Q2, Q3 50%Pass	Q4, Q5 50%Pass	Q3, Q5 50%Pass	Q3, Q5 50%Pass
Final exam (40%)	Q1, Q2, Q3 50%Pass	Q4, Q5 50%Pass	Q3, Q5 50%Pass	Q3, Q5 50%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. **Rubrics (optional)**
6. **Date revised: January 12, 2022**

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

GENERAL PHYSICS 2 LABORATORY

Course Code: **PH022IU**

1. General information

Course title	GENERAL PHYSICS 2 LABORATORY (*Thực hành Vật Lý đại cương 2*)
Course designation	*This course provides students with basic knowledge of electricity and magnetism in laboratory, consists of: Ohm's law, LRC circuit, RC circuit, LR circuit, magnetic fields of coils….*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	MEng. Trịnh Thanh Thủy; MSc. Lê Thị Quế
Language	English
Relation to curriculum	Compulsory
Teaching methods	Experiment, writing report
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credits/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: General Physics 2 (PH021IU)
Course objectives	This course will provide students with: • The basic knowledge of electricity and magnetism such as electric charge, electric potential, magnetic fields, electromagnetic waves, etc. • Skills to do experiments related to the knowledge • Laboratory experiences (using devices, digital multi-meter, computer software, ...) • Confidence and fluency in discussing physics in English.
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level: Course learning outcome (CLO) Knowledge: CLO1. Understand basic knowledge of electricity and magnetism.

	Skill	CLO2. Approach and solve problems in electricity and magnetism experiments CLO3. Write scientific report, have understanding the relations between theory and experiment
	Attitude	CLO4. Communicate effectively in writing manner.
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: laboratory session (4 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)	
Examination forms	Experiment, write report	
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.	
Reading list	[1] Lab manual, PASCO Scientific [2] Halliday D., Resnick R. and Walker, J. (2011) Principles of Physics, 9th edition, John Willey and Sons, Inc. [3] Alonso M. and Finn E.J. (1992) Physics, Addison-Wesley Publishing Company. [4] Faughn/Serway (2006) Serway's College Physics, Thomson Brooks/Cole.	

Content topics:

Topic	Weight	Level
Ohm's law	1	T, U
Resistances in Circuits	1	T, U
LRC Circuits	1	T, U
Kirchhoff's laws	1	T, U
RC circuit	1	T, U
LR circuit	1	T, U
Magnetic fields of coils	1	T, U
The e/m experiment	1	T, U

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1					x					
2					x					
3										
4										

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Ohm's law	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
2	Resistances in Circuits	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
3	LRC Circuits	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
4	Kirchhoff's laws	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
5	RC circuit	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
6	LR circuit	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
7	Magnetic fields of coils	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
8	The e/m experiment	1-4	Prelab Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (20%)				
Prelab (20%)	x	x	x	x
Report (30%)	x	x	x	x
Final exam (30%)	x	x	x	x

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics (optional)

6. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

GENERAL PHYSICS 3

Course Code: **PH023IU**

1. General information

Course title	GENERAL PHYSICS 3 *(Vật lý đại cương 3)*
Course designation	*This subject will provide a basic knowledge of Wave and Modern Physics*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Đỗ Xuân Hội
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: General Physics 2 (PH021IU)
Course objectives	This course will provide students with: ● The basic knowledge of Wave and Modern Physics ● Skills to solve problems in engineering environment by applying both theoretical and experimental techniques ● Understanding and skills needed to use physical laws governing real process and to solve them in the engineering environment ● Confidence and fluency in discussing physics in English.
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Understand basic knowledge of waves, quantum physics, special relativity, and nuclear physics CLO2. Apply knowledge of physics to solving problems in science and engineering

	Skill	CLO3. Apply skills to analyzing and solving problems in science and engineering
	Attitude	CLO4. Communicate effectively in writing manner

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (2 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Chapter 1: Vibration and Mechanical Wave	3	I, T, U
Chapter 2: Properties of Light	2	I, T, U
Chapter 3: Introduction to Quantum Physics	3	I, T, U
Chapter 4: Atomic Physics	4	I, T, U
Chapter 5: Relativity and Nuclear Physics	3	I, T, U

Examination forms	Written Examination
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	[1] Lecture Notes [2] Halliday D., Resnick R. and Walker, J. (2011) *Principles of Physics*, 9th edition, John Willey and Sons, Inc. [3] Alonso M. and Finn E.J. (1992) *Physics,* Addison-Wesley Publishing Company. [4] Faughn/Serway (2006) *Serway's College Physics*, Thomson Brooks/Cole.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2	x									
3										
4										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1-3	Chapter 1: Vibration and Mechanical Wave - Simple Harmonic Motion. Energy	1-4	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz	[1] 1 [2] 15, 16

	of the Simple Harmonic Oscillator. The Pendulum - Damped Oscillations and Forced Oscillations - Wave Equation - Superposition and Interference - Standing waves - Energy Transfer by Waves - Sound Waves. The Doppler Effect				
4-5	Chapter 2: Properties of Light - Interference of Light Waves - Diffraction Patterns and Polarization - Reflection and Refraction. Mirrors and Thin Lenses	1-4	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz	[1] 1 [2] 34, 35. 36
6-8	Chapter 3: Introduction to Quantum Physics - The Wave-Particle Duality of Light - De Broglie's Theory - Matter Wave - The Schrödinger's Equation. - The Heisenberg's uncertainty principle - Potential Well Tunneling Phenomena	1-4	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz	[1] 3
	MIDTERM EXAM				
9-12	Chapter 4: Atomic Physics - Atomic spectra - The Bohr Theory of the Hydrogen Atom - The Quantum Mechanical Picture of the Hydrogen Atom. - Spin Magnetic Quantum Number - Quantum computing: An introduction - The Pauli Exclusion Principle and The Periodic Table of the Elements - X-Rays - The Laser - Band Theory of Solids and Semi-conductivity	1-4	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz	[1] 4
13-15	Chapter 5: Relativity and Nuclear Physics - Special Theory of Relativity:	1-4	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz	[1] 5 [2] 37

	Einstein's Postulates - Relativity of Time Intervals and of Length - Relativistic Dynamics - The General Theory of Relativity - Properties of Nuclei - Nuclear Binding and Nuclear Structure - Nuclear Reactions - Radioactivity - Fundamental Particles - Quarks				
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance + Homework + in-class discussion (15%)				
Quizzes (Qz) / assignment (As) (15%)	Qz1, Qz3/ As.P1 50%Pass	Qz2, Qz4/ As.P2 50%Pass	Qz1, Qz2, Qz3, Qz4 / As.P3 50%Pass	Qz1, Qz2, Qz3, Qz4 / As.P4 50%Pass
Midterm exam (30%)	Q1, Q2, Q3 50%Pass	Q4, Q5 50%Pass	Q3, Q5 50%Pass	Q3, Q5 50%Pass
Final exam (40%)	Q1, Q2, Q3 50%Pass	Q4, Q5 50%Pass	Q3, Q5 50%Pass	Q3, Q5 50%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics (optional)

6. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS
(**Signed**)

Phan Bảo Ngọc

GENERAL PHYSICS 3 LABORATORY

Course Code: **PH024IU**

1. General information

Course title	GENERAL PHYSICS 3 LABORATORY *(Thực hành Vật lý đại cương 3)*
Course designation	*This course provides students with basic knowledge of optics in laboratory, consists of diffraction, interferences, telescope, Brewster's law, photoelectric effect….*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	MEng. Trịnh Thanh Thủy; MSc. Lê Thị Quế
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credits/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: General Physics 3 (PH023IU)
Course objectives	This course will provide students with: • Knowledge of optics • Skills to do experiments related to the knowledge • Laboratory experiences (using devices, computer software, ...) • Confidence and fluency in discussing physics in English.
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Understand basic concepts in Optics and Atomic Physics.
Skill	CLO2. Approach and solve problems in Optics and Atomic Physics experiments

		CLO3. Write scientific report, have understanding the relations between theory and experiment
	Attitude	CLO4. Communicate effectively in writing manner

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: laboratory session (4 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Intensity versus Distance	1	T, U
Diffraction and Interference of light	1	T, U
Polarization of light	1	T, U
Telescope	1	T, U
Brewster's Angle	1	T, U
Photoelectric effect 1	1	T, U
Photoelectric effect 2	1	T, U
Atomic Spectra	1	T, U

Examination forms	Experiment, write report
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	[1] Lab manual, PASCO Scientific [2] Halliday D., Resnick R. and Walker, J. (2011) Principles of Physics, 9th edition, John Willey and Sons, Inc. [3] Alonso M. and Finn E.J. (1992) Physics, Addison-Wesley Publishing Company. [4] Faughn/Serway (2006) Serway's College Physics, Thomson Brooks/Cole.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1					x					
2					x					
3										
4										

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Intensity versus Distance	1-4	Prelab, Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
2	Diffraction and Interference of light	1-4	Prelab, Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
3	Polarization of light	1-4	Prelab, Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
4	Telescope	1-4	Prelab, Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
5	Brewster's Angle	1-4	Prelab, Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
6	Photoelectric effect 1	1-4	Prelab, Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
7	Photoelectric effect 2	1-4	Prelab, Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]
8	Atomic Spectra	1-4	Prelab, Quiz Lab report Final exam	Lecture Discussion Experiment Presentation	[1]

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (20%)				
Prelab (20%)	x	x	x	x
Report (30%)	x	x	x	x
Final exam (30%)	x	x	x	x

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. **Rubrics (optional)**
6. **Date revised: January 12, 2022**

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

FUNDAMENTAL MATHEMATICS FOR ENGINEERS

Course Code: **PH069IU**

1. General information

Course title	FUNDAMENTAL MATHEMATICS FOR ENGINEERS *(Cơ bản Toán cho kỹ sư)*
Course designation	*This course provides essential knowledge in mathematics for solving engineering problems, including complex analysis, determinant, and matrix.*
Semester(s) in which the course is taught	1,2, summer semester
Person responsible for the course	Dr. Nguyễn Quang
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 170 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 50 Private study including examination preparation, specified in hours: 120
Credit points/ECTS	4 credits/ 6.18 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Calculus 2 (MA003IU)
Course objectives	This course will provide students with: • The synthetic view of mathematical knowledge • Skills in analyzing and modeling Signals and Systems • Understanding and skills needed to use the mathematical tools of complex analysis, especially the Cauchy formula • Confidence and fluency in discussing mathematics in English.
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Show the understanding of complex analysis, determinants, and matrices.
Skill	CLO2. Apply skills to solve problems in science and engineering.

	Attitude: CLO3. Recognize the need for further self-learning in mathematics.
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (4 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Part I Complex analysis Functions of a complex variable: limits and continuity	2	I, T, U
Singular points, Poles. Laurent series. Line integrals. Cauchy's integral theorem.	2	I, T, U
Residues. Residue theorem. Evaluation of definite integrals	1	I, T, U
Application of the residue theorem to compute the Fourier and Laplace transform	2	I, T, U
Part II Determinants and matrices Introduction to determinants	1	I, T, U
Matrices: definition; special type of matrices; addition, multiplication; transposition, inversion	2	I, T, U
Systems of linear equations; existence of solution; unicity condition; Gauss-Jordan elimination; homogeneous linear systems	2	I, T, U
Eigenvalues and eigenvectors of a matrix	2	I, T, U
Applications of Eigen technique to solve linear problems.	1	I, T, U

Examination forms	Written examination
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	[1] Lecture Notes [2] K.T. Tang, Mathematical Methods for Engineers and Scientists 1", Springer Verlag, 2007.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-2) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2										

3										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities
1-2	Part I Complex analysis Functions of a complex variable: limits and continuity; Derivatives, Analyticity; Cauchy-Riemann condition.	1-3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
3-4	Singular points, Poles. Laurent series. Line integrals. Cauchy's integral theorem.	1-3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
5	Residues. Residue theorem. Evaluation of definite integrals	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
6-7	Application of the residue theorem to compute the Fourier and Laplace transform	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
	MIDTERM EXAM			
8	Part II Determinants and matrices Introduction to determinants: definition; computation techniques; geometrical interpretation	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
9-10	Matrices: definition; special type of matrices; addition, multiplication; transposition, inversion	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
11-12	Systems of linear equations; existence of solution; unicity condition; Gauss-Jordan elimination; homogeneous linear systems.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
13-14	Eigenvalues and eigenvectors of a matrix: definition, characteristic polynomial; similarity transformation; diagonalization.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
15	Applications of Eigen technique to solve linear problems.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
	FINAL EXAM			

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance + Homework + in-class discussion (30%)	HW1, HW2 70%Pass	HW3, HW4 70%Pass	HW5 70%Pass

Midterm exam or Course Project (30%)	Q1, Q2 70%Pass	Q3, Q4 70%Pass	Q5 70%Pass
Final exam (40%)	Q1, Q2 70%Pass	Q3, Q4 70%Pass	Q5 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics (optional)

6. Date revised: December 10, 2023

Ho Chi Minh City, 15/12/2023
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

DIFFERENTIAL EQUATIONS

Course Code: **PH026IU**

1. General information

<table>
<tr><td>Course title</td><td>DIFFERENTIAL EQUATIONS (Phương trình vi phân)</td></tr>
<tr><td>Course designation</td><td>This course provides an introduction to ordinary differential equations. Topic includes first order, second order, numerical methods, series solutions, Laplace transforms and Fourier series.</td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1, 2, summer semester</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Nguyễn Quang</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory</td></tr>
<tr><td>Teaching methods</td><td>Lecture, lesson, assignment.</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td>(Estimated) Total workload: 85
Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25
Private study including examination preparation, specified in hours: 60</td></tr>
<tr><td>Credit points/ECTS</td><td>2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)</td></tr>
<tr><td>Required and recommended prerequisites</td><td>Previous course: Calculus 2 (MA003IU)</td></tr>
<tr><td>Course objectives</td><td>This course will provide students with:
The ordinary differential equations. Topics discussed include first-order differential equations, existence and uniqueness theorems, second-order linear equations, higher-order linear equations, systems of equations, non-linear equations.
Applications of differential equations in physics, engineering, biology, and economics are presented.
Confidence and fluency in discussing mathematics in English.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:<table><tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr></table></td></tr>
</table>

	Knowledge	CLO1. Solve mathematical problems by using first order, second order, numerical methods, series solutions, Laplace transforms and Fourier series.
	Skill	CLO2. Apply the techniques, skills, and modern engineering tools to engineering practice
	Attitude	CLO3. Confidence when applying differential equations to practical situations.

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (2 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Chapter 1: Introduction	1	I, T, U
Chapter 2: First Order Differential Equations	2	I, T, U
Chapter 3: Second Order Linear Equations	4	I, T, U
Chapter 4: The Laplace Transform	3	I, T, U
Chapter 5: Numerical Methods	3	I, T, U
Chapter 6: Partial Differential Equations and Fourier Series	2	I, T, U

Examination forms	Written Examination
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	[1] Lecture Notes [2] W.E. Boyce, R.C. DiPrima, *Elementary Differential Equations and Boundary Value Problems*, 8th ed., John Wiley & Sons, 2004

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-2) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2										
3										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities
1	Chapter 1: Introduction Some Basic Mathematical Models; Direction Fields Solutions of Differential Equations Classification of Differential Equations	1, 2, 3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
2-3	Chapter 2: First-order differential equations Linear Equations Method of Integrating Factors Separable Equations Modeling with First Order Equations Differences	1, 2, 3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
4-7	Chapter 3: Linear second-order differential equations Fundamental solution set of homogeneous equations Linear independence and Wronskian Homogeneous linear second-order differential equations with constant coefficients	1, 2, 3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
	MIDTERM EXAM			
8-10	Chapter 4: The Laplace Transform - Application to non-homogenous forced oscillation RLC circuit	1, 2, 3		
11-13	Chapter 5: Numerical Methods - Application: Solving Electrical Network Problems	1, 2, 3	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
14-15	Chapter 6: Partial Differential Equations and Fourier Series - Application: Heat conduction in a bar Wave equation, Laplace equation	1, 2, 3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
	FINAL EXAM			

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
In-class exercises/ quizzes (10%)	Qz1->Qz4 80% Pass	Qz5->Qz8 80%Pass	Qz1->Qz4 80% Pass
Homework exercises (10%)	HW1->H3 70% Pass	HW4, HW5 70%	HW1->HW3 70% Pass
Midterm exam (30%)	Q1, Q2 80% Pass		Q3, Q4 70% Pass

Final exam (50%)	Q3, Q4 70%Pass	Q1, Q2 80%Pass	

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics (optional)

6. Date revised: December 10, 2023

Ho Chi Minh City, 15/12/2023
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

PROBABILITY AND STATISTICS FOR ENGINEERS

Course Code: **PH030IU**

1. General information

Course Title	PROBABILITY AND STATISTICS FOR ENGINEERS *(Xác suất và thống kê cho kỹ sư)*
Course designation	*This course develops an engineer's view of probability, starting from the notion of chance, relative frequencies and then probability. It covers all fundamental concepts in probability, random variables and statistics that will serve everyday an engineer working in practical fields such as quality control, signal processing, biomedical engineering, automatic control, communications etc…*
Semester(s) in which the course is taught	1, 2, summer semester
Person responsible for the course	Dr. Nguyễn Quang
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project, seminar.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Calculus 2 (MA003IU)
Course objectives	This course will provide students with: • Using data from a variety of sources such as quality control, signal processing, biomedical engineering, automatic control, communications etc • Contemporary computing and database environments, such as R/Python, and being exposed to case studies from outside the classroom. • Skill of formulating a practical problem related to probability and statistics in an analytical form in order to solve it.
Course learning outcomes	Upon the successful completion of this course students will be able to:

<table>
<tr><td></td><td>
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Compute probability of simple and complicated events with probability rules; Evaluate probability, mean and variance of random variables and function of random variables
CLO2. Apply the concept of hypothesis testing to statistical problems</td></tr>
<tr><td>Skill</td><td>CLO3. Construct a practical problem related to probability and statistics in an analytical form in order to solve it</td></tr>
<tr><td>Attitude</td><td></td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>
The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction to Probability</td><td>1</td><td>I, T</td></tr>
<tr><td>Axiomatic definition</td><td>2</td><td>T, U</td></tr>
<tr><td>Introduction to random variables (RV)</td><td>3</td><td>T, U</td></tr>
<tr><td>Mean, Variance and Higher Moments of a RV</td><td>2</td><td>T, U</td></tr>
<tr><td>Random vectors</td><td>2</td><td>I, T</td></tr>
<tr><td>Introduction to Computer Simulation of Random Variables</td><td>2</td><td>T, U</td></tr>
<tr><td>Fundamental sampling distributions and data descriptions</td><td>2</td><td>T, U</td></tr>
<tr><td>Estimation Problems</td><td>1</td><td>T, U</td></tr>
</table>
</td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbook:
[1] Lecture notes
References:
[2] Robert V. Hogg, Elliot A. Tanis and Dale L. Zimmerman, "Probability and Statistical Inference", Pearson, 9th Edition, 2015
[3] M. Spiegel et al., "Theory and problems of probability and Statistics", Schaum's ouline series, McGraw-Hill Book Company, 3rd Edition, 2009.
[4] S. Kay, "Intuitive Probability and Random Processes Using MATLAB", Springer, 2006
[5] S. Ross, "Introduction to Probability models", Academic Press, 10th Edition, 2010</td></tr>
</table>

	[6] F.M. Dekking C. Kraaikamp, H.P. Lopuhaa and L.E. Meester "*A Modern Introduction to Probability and Statistics*", Springer, 2005

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2	x									
3										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Introduction to Probability: intuitive explanation; chance, relative frequencies, Number of Favorable Cases Over. The Total Number of Cases. Combinatoric analysis and applications to probability.	1	Quiz1	Lecture, HW	[1].1 [2].2 [3].3
2-3	Axiomatic definition: random experiments; event; algebra of events; probability axioms; conditional probability; independent events	2		Lecture, HW	[1].2
4-6	Introduction to random variables (RV): Cumulative Distribution Function; Probability Density Function. Continuous RV, examples; discrete RV, examples	2	Quiz2	Lecture HW	[1].2 [2].1 [3].3
7-8	Mean, Variance and Higher Moments of a RV. Examples; Characteristic Function of a Random variable.	2	Quiz3	Lecture, HW	[1].3, [2].2, 3 [3].4
	MIDTERM EXAM				
9-10	Random vectors: Cumulative Distribution Function of a Random Vector; Probability Density Function of a Random Vector; Marginal Distribution of a Random Vector; Conditional Distribution of a Random Vector; Mean, Variance and Higher Moments of a Random Vector;	3	HW2	Lecture, Discussion, HW	[2].4

	Chebychev theorem; Characteristic Function of a Random Vector				
11-12	Introduction to Computer Simulation of Random Variables: Uniform Random Variable Generator; Generating Discrete Random Variables; Finite Discrete Random Variables; Infinite Discrete Random Variables: Poisson Distribution; Simulation of Continuous Random Variables; Cauchy Distribution; Exponential Law; Rayleigh Random Variable; Gaussian Distribution	1		Lecture, Discussion, HW	[1]. 1. [3].2
13-14	Fundamental sampling distributions and data descriptions; Random sampling; Some important statistics; Data displays and graphical methods; Sampling distributions; Sampling distribution of means; Sampling distribution of t-Distribution, F-Distribution	3	Quiz4	Lecture, Discussion, HW	[1]. 9 [3].7
15	Estimation Problems: Statistical inference; Classical methods of estimation; Single sample: Estimating the mean; Standard error of a point estimate; Prediction interval; Two samples: Estimating the difference between two Means; Paired observations; Single sample: Estimating a proportion. Two samples: Estimating the difference between two proportions; Single sample: Estimating the variance; Two samples: Estimating the ratio of two variances	3	Quiz5	Lecture, Discussion, HW	[1]. 10 [3]. 8
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
In-class exercises/quizzes (20%)	Qz1 70%Pass	Qz2, Qz3 70%Pass	Qz3, Qz4 70% Pass
Homework exercises (10%)	HW1 70%Pass	HW2 70%Pass	

Midterm exam (30%)	Part I 70%Pass	Part II 70%Pass	
Final exam (40%)		Part II 70%Pass	Part I 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

CRITICAL THINKING

Course Code: **PE008IU**

1. General information

Course title	CRITICAL THINKING *(Tư duy phân tích)*
Course designation	*This course provides the nature and techniques of thought as a basis for our claims, beliefs, and attitudes about the world. The course also explores the process in which people develop their claims and support their beliefs. Specifically, the course includes the theory and practice of presenting arguments in oral and written forms, making deductive and inductive arguments, evaluating the validity or strength of arguments, detecting fallacies in arguments, and refuting fallacious arguments. Resources for the reasoning process include hypothetical and real-life situations in various fields of natural sciences, social sciences, and humanities.*
Semester(s) in which the course is taught	1, 2, 3
Person responsible for the course	Dr. Trần Thanh Tú; Dr. Nguyễn Thị Thủy; Dr. Phạm Ngọc; Dr. Nguyễn Văn Tiếp; MA. Vũ Tiến Thịnh; MA. Đỗ Thị Diệu Ngọc.
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lectures, discussions, homework assignments, students' presentations
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	None
Course objectives	This course will enable students to ● develop the habits of assessing and defending the reasonableness of their beliefs and values as well as those of others ● appreciate the importance of looking at an issue from a variety of perspectives ● apply critical thinking skills in both public and personal settings

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course, students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Know the general concepts and standards of critical thinking; and comprehend the disadvantages of barriers to critical thinking in various contexts
CLO2. Know the elements of an argument and two patterns of reasoning
CLO3 Know the fallacies of relevance and insufficient evidence in arguments</td></tr>
<tr><td>Skill</td><td>CLO4. Construct and evaluate deductive and inductive arguments in spoken and written forms
CLO5. Test the validity of deductive arguments using Venn diagram and truth tables
CLO6. Analyze and standardize arguments
CLO7. Evaluate truth claims and refute arguments
CLO8. Analyze weaknesses in inductive arguments to strengthen them</td></tr>
<tr><td>Attitude</td><td>CLO9. Defend personal/group beliefs with good arguments and in appropriate manners (project presentations)</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (2 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction to Critical thinking</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Recognizing arguments</td><td>3</td><td>T, U</td></tr>
<tr><td>Basic logical concepts</td><td>3</td><td>T, U</td></tr>
<tr><td>A little categorical logic</td><td>3</td><td>T, U</td></tr>
<tr><td>A little propositional logic</td><td>3</td><td>T, U</td></tr>
<tr><td>Logical fallacies I</td><td>3</td><td>T, U</td></tr>
<tr><td>Logical fallacies II</td><td>3</td><td>T, U</td></tr>
<tr><td>Review for Midterm test</td><td>3</td><td>U</td></tr>
<tr><td>Analyzing arguments</td><td>3</td><td>T, U</td></tr>
<tr><td>Evaluating arguments and truth claims</td><td>3</td><td>T, U</td></tr>
<tr><td>Inductive reasoning</td><td>3</td><td>T, U</td></tr>
<tr><td>Project: Group presentation</td><td>9</td><td>U</td></tr>
<tr><td>Review for Final Exam</td><td>3</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>40 multiple-choice questions for the midterm and final exams and group presentations for the final project</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Overall passing score: 50/100</td></tr>
</table>

Reading list	Textbooks: [1] Bassham, Irwin, Nardone, and Wallace, *Critical Thinking: A Student's Introduction*, 6th edition, McGraw-Hill Education, 2019. [2] Moore, B.N. et al. (2009). *Critical Thinking*, 9th ed. McGraw-Hill References: [3] Patrick J. Hurley (2012). *A Concise Introduction to Logic* (11^{th} ed.), Wadsworth, Cengage Learning + Relevant web resources

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-9) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										
2										
3										
4					x					
5					x					
6					x					
7					x					
8					x					
9								x		

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications

ILO8. Show an understanding of the role and responsibility of an engineer in society.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Introduction to Critical thinking	1	HW 1/Quiz 1	Lecture, Discussion, Homework, Quiz	[1] Chapter 1
2	Recognizing arguments	2	HW 2/Quiz 2	Lecture, Discussion, Homework, Quiz	[1] Chapter 2
3	Basic logical concepts	2	HW 3/Quiz 3	Lecture, Discussion, Homework, Quiz	[1] Chapter 3

4	A little categorical logic	3	HW 4/Quiz 4	Lecture, Discussion, Homework, Quiz	[1] Chapter 9
5	A little propositional logic	3	HW 5/Quiz 5	Lecture, Discussion, Homework, Quiz	[1] Chapter 10
6	Logical fallacies I	4	HW 6/Quiz 6	Lecture, Discussion, Homework, Quiz	[1] Chapter 5
7	Logical fallacies II	4	HW 7/Quiz 7	Lecture, Discussion, Homework, Quiz	[1] Chapter 6
8	Review for midterm exam + sample test				
9 + 10	MIDTERM EXAM: Chapters 1, 2, 3, 9, 10				
11	Analyzing arguments	5	HW 8/Quiz 8	Lecture, Discussion, Homework	[1] Chapter 7
12	Evaluating arguments and truth claims	5	HW 9/Quiz 9	Lecture, Discussion, Homework	[1] Chapter 8
13	Inductive reasoning	2	HW 10/Quiz 10	Lecture, Discussion, Homework	[1] Chapter 11
14	Project: Group presentation	6	Group work	Presentation, Discussion	
15	Project: Group presentation	6	Group work	Presentation, Discussion	
16	Project: Group presentation	6	Group work	Presentation, Discussion	
17	Review for final exam + sample test				
18	Reserved week				
19+20	**FINAL EXAM: Chapters 5, 6, 7, 8, 11**				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO 5	CLO 6	CLO 7	CLO 8	CLO 9
Class participation and Assignments (30%)	80% Pass	80% Pass	80% Pass	80% Pass	80% Pass				80% Pass
Midterm exam (30%)						80% Pass	80% Pass	80% Pass	
Final exam (40%)						80% Pass	80% Pass	80% Pass	

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

Date revised: 15 August, 2022
By coordinator: Đỗ Thị Diệu Ngọc
Contact details:
Email: dtdngoc@hcmiu.edu.vn
Mobile: 0904361717

PROJECT MANAGEMENT

Course Code: **PH056IU**

1. General information

Course Title	PROJECT MANAGEMENT *(Quản lý dự án)*
Course designation	*This course is developed to provide the principal concept on project management which was characterized by the project management body of knowledge guide (PMBOK Guide). This guide emphasizes the five project process groups of initiating, planning, executing, controlling and closing, and the nine knowledge areas of project integration, scope, time, cost, quality, human resources, communication, risk, and procurement management. Students will also apply all project management knowledge in a specific satellite development project to understand more about satellite life cycle via a mini project and final report. In addition, this course also provides computer aid for project management by introducing the application of Microsoft Project and project scheduling.*
Semester(s) in which the course is taught	1, 2, summer semester
Person responsible for the course	Dr. Lê Xuân Huy
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	None
Course objectives	This course will provide students with: ● Solid foundation knowledge in project management, which strengthens their competence in the competitive labor market, as well as equipping them with essential skills to formulate, organize and manage projects in their future career.

<table>
<tr><td></td><td>

- Essential skills to formulate, organize and manage projects.
- An awareness of the commitment to professional ethics and responsibilities in formulating, managing and executing projects.

</td></tr>
<tr><td>Course learning outcomes</td><td>
Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Show the understanding of important aspects of project management</td></tr>
<tr><td>Skill</td><td>CLO2. Show the abilities of formulating, organizing and managing projects.
CLO3. Show the abilities of team working</td></tr>
<tr><td>Attitude</td><td>CLO4. Show the recognition of professional ethics and responsibilities in formulating, managing and executing projects.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>
The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>+ Course introduction
+ Introduction of Project management
+ The project life cycle and organization</td><td>1</td><td>I</td></tr>
<tr><td>- Project management processes for a project
+ Stakeholders Interaction
+ Project Planning & Control</td><td>1</td><td>T, U</td></tr>
<tr><td>Project Planning Phase
- Communication
- Stakeholders
- Scope
- Work breakdown structure (WBS)</td><td>1</td><td>T, U</td></tr>
<tr><td>- Resource management
+ Critical path method – Crashing a project
+ Resource allocation problem
+ Resource loading
+ Resource leveling
+ Constrained resource scheduling</td><td>1</td><td>T, U</td></tr>
</table>
</td></tr>
<tr><td></td><td>
<table>
<tr><td>- Schedule management.
+ Constructing the network: AON & AOA
+ Gannt chart
+ Solving the network</td><td>1</td><td>T, U</td></tr>
<tr><td>- Project cost management
Project budgeting & Cost estimation
+ Top-Down budgeting</td><td>1</td><td>T, U</td></tr>
</table>
</td></tr>
</table>

	+ Bottom-Up budgeting + Improving the process of cost estimation		
	- Mini project (for a pico satellite development project) - Planning Phase - Review	1	T, U
	- Mini project (for a pico satellite development project) - Planning Phase - Review	1	T, U
	- Risk management. + Risk management planning + Risk identification + Risk analysis + Risk monitoring and control + Using Crystal Ball software	1	T, U
	- Project quality management + Plan quality + Perform quality assurance + Perform quality control	1	T, U
	- Project human resource management + Develop human resource plan + Acquire project team + Develop project team + Manage project team	1	T, U
	- Project procurement management + Plan procurements + Conduct procurements + Administer procurements + Close procurements	1	T, U
	- Project control Phase. + Gather data + Integrate and analyze data + Access & recommendation actions + Implementation and Monitor Impact.	1	T, U
	- Project (for a pico satellite development project) closing - Presentation of term project (part 1)	1	T, U
	- Presentation of term project (part 2) - Review	1	T, U
Examination forms	Project		
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.		

Reading list	Textbooks: [1] A Guide to the project management body of knowledge (PMBOK® Guide). 4th Edition, Newtown Square, Pa.: Project Management Institute, Inc., 2008. [2] Jack R. Meredith; Samuel J Mantel, Project management: a managerial approach. 7th edition, Hoboken, N.J.: Wiley; Chichester: John Wiley [distributor], 2018. References: [3] Jason Westland, The project management life cycle. Kogan Page Limited, 2006.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										
2										
3						x				
4								x		

ILO6. Work effectively in a team in space engineering and interdisciplinary areas.
ILO8. Show an understanding of the role and responsibility of an engineer in society.

3. Planned learning activities and teaching methods

Note:
As: Assignment; Midterm: Mid; Final: Fin; Quiz: Qz; Homework: HW

Week	**Topic**	**CLO**	**Assessments**	**Learning activities**	**Resources**
1	+ Course introduction + Introduction of Project management + The project life cycle and organization	1, 4	Qz1	Lecture, Discussion, Inclass-Quiz	
2	- Project management processes for a project + Stakeholders Interaction + Project Planning & Control	3	HW1	Lecture, HW	
3	Project Planning Phase - Communication - Stakeholders - Scope	3	Qz2	Lecture, Group work Inclass-Quiz,	

	- Work breakdown structure (WBS)				
4	- Resource management + Critical path method – Crashing a project + Resource allocation problem + Resource loading + Resource leveling + Constrained resource scheduling	2	HW2, Qz3	Lecture, Inclass-Quiz, HW	
5	- Schedule management. + Constructing the network: AON & AOA + Gannt chart + Solving the network		Mid	Lecture, Group work	
6	- Project cost management Project budgeting & Cost estimation + Top-Down budgeting + Bottom-Up budgeting + Improving the process of cost estimation		Mid	Lecture, Group work	
7	- Mini project (for a pico satellite development project) - Planning Phase - Review		HW2	Lecture, Group work, HW	
8	- Mini project (for a pico satellite development project) - Planning Phase - Review	3	Mid	Lecture, Group work	
	MIDTERM EXAM				
9	- Risk management. + Risk management planning + Risk identification + Risk analysis + Risk monitoring and control + Using Crystal Ball software	3	HW3	Lecture, Group work, HW	
10	- Project quality management + Plan quality + Perform quality assurance	3	Fin	Lecture, Group work	

	+ Perform quality control				
11	- Project human resource management + Develop human resource plan + Acquire project team + Develop project team + Manage project team	3	HW4	Lecture, Discussion, HW	
12	- Project procurement management + Plan procurements + Conduct procurements + Administer procurements + Close procurements		Fin	Lecture, Discussion	
13	- Project control Phase. + Gather data + Integrate and analyze data + Access & recommendation actions + Implementation and Monitor Impact.		Fin	Lecture, Discussion	
14	- Project (for a pico satellite development project) closing - Presentation of term project (part 1)		Present	Presentation	
15	- Presentation of term project (part 2) - Review	3,4	Present	Presentation	
	FINAL PROJECT				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Homework (15%)	HW1, HW2, HW3, HW4 70% Pass	HW1, HW2, HW3, HW4 70% Pass	HW1, HW2, HW3, HW4 70% Pass
Quiz (25%)	Qz.1, Qz.2 70% Pass	Qz.3 70% Pass	Qz.4 70% Pass
Midterm exam (30%)	Mid.Q1 %Pass 70%	Mid.Q2 %Pass 70%	Mid.Q3 %Pass 70%
Final project (30%)	Fin.Q1 70% Pass	Fin.Q2 70% Pass	Fin.Q3 70% Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

GENERAL LAW

Course Code: **PE021IU**

1. General information

Department	Office of Academic Affairs
Course classification	Foundation course
Course designation	Face to face
Semester(s) in which the course is taught	All semesters in each academic year
Person responsible for the course	Dr. Võ Tường Huân; LLM. Bùi Đoàn Danh Thảo
Language	English
Relation to curriculum	Compulsory
Teaching methods	Student-centered approach
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 hours) Contact hours (lecture, in class discussions): 37.5 hours (=45 periods) Private study including examination preparation, specified in hours: 90 hours
Credit points	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	N/A
Course objectives	The overarching aims of this course are to: • Provide essential knowledge of Vietnamese legal system through integrated technology and real cases for social and cultural sustainability. • Raise awareness of responsibility toward others and how to stand for ending all types of legal violations, especially corruption in various social contexts. • Practice necessary skills to act as an ambassador to ensure social fairness and global equitable rights. • Use integrated online legal resources and communication tools to help the community to identify issues and develop countermeasures.
Course learning outcomes	Upon the successful completion of this course, students will be able to: <table><tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr><tr><td>Knowledge</td><td>CLO1. Apply appropriate legal knowledge in the Vietnamese legal system to solve legal issues in various social contexts for a fair sustainable lifelong being.</td></tr></table>

<table>
<tr><td></td><td>
<table>
<tr><td></td><td>CLO1.1. Apply general knowledge on state and law to solve legal issues in various social contexts for a fair sustainable lifelong being.
CLO1.2. Apply principle legal norms in some law branches such as constitution, civil, criminal, labor and administrative law to solve legal issues in various social contexts for a fair sustainable lifelong being.</td></tr>
<tr><td>Skill</td><td>CLO2. Communicate knowledge in the Vietnamese legal system to encourage people to raise their legal rights aiming for fair social/cultural moves.
CLO3. Integrate ICTs to solve legal issues in various social contexts.</td></tr>
<tr><td>Attitude</td><td>CLO4. Detect the responsibility to ensure social and cultural fairness, including ending corruption, in various social contexts through understanding importance of law in social contexts.
CLO5. Respond to the base for coexistence in various social contexts.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The course will introduce students to Vietnamese legal systems. In particular, students will understand their rights and obligations in the Constitution, Criminal law, administrative law, civil law, labor law and enterprise law of Vietnam. From this, students will raise awareness towards their responsibility to ensure justice, including ending corruption, in society.</td></tr>
<tr><td>Examination forms</td><td>Multiple choice questions
Case-based exams
Essay exams
Oral exams</td></tr>
<tr><td>Study and examination requirements</td><td>To pass this course, the students must:
Achieve a composite mark of at least 50; and
Make a satisfactory attempt at all assessment tasks (see below).
GRADING POLICY
Grades can be based on the following:
<table>
<tr><td>Assignment</td><td>20%</td></tr>
<tr><td>Midterm examination</td><td>30%</td></tr>
<tr><td>Final examination</td><td>50%</td></tr>
<tr><td>Total</td><td>100%</td></tr>
</table>
COURSE POLICIES
Attendance
Regular and punctual attendance at lectures and seminars is expected in this course. University regulations indicate that if students attend less than eighty</td></tr>
</table>

	percent of scheduled classes, they may be refused final assessment. Exemptions may only be made on eligible medical grounds. Workload It is expected that the students will spend at least *six* hours per week studying this course. This time should be made up of reading, research, working on exercises and problems, and attending classes. In periods where they need to complete assignments or prepare for examinations, the workload may be greater. Over-commitment has been a cause of failure for many students. They should take the required workload into account when planning how to balance study with part-time jobs and other activities. General Conduct and Behaviour The students are expected to conduct themselves with consideration and respect for the needs of fellow students and teaching staff. Conduct which unduly disrupts or interferes with a class, such as ringing or talking on mobile phones, is not acceptable and students will be asked to leave the class. The use of laptops is also encouraged during law lessons only to search for materials online. More information on student conduct is available on the university webpage. Keeping informed The students should take note of all announcements made in lectures or on the course's Blackboard, and another announced mean of communications. From time to time, the university will send important announcements to their university e-mail addresses without providing a paper copy. The students will be deemed to have received this information. Academic honesty and plagiarism Plagiarism is the presentation of the thoughts or work of another as one's own. Students are also reminded that careful time management is an important part of the study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items. The university regards plagiarism as a form of academic misconduct and has very strict rules regarding plagiarism. Special consideration Requests for special consideration (for final examination only) must be made to the Office of Academic Affairs within one week after the examination. General policy and information on special consideration can be found at the Office of Academic Affairs. Absence on the Mid-term is not allowed, or in special cases approved by the Lecturer can be replaced with relevant Assignment. Meeting up with the lecturers after classes Students must make an appointment via email if they want to meet up with the lecturer after classes and be on time. If there are any changes to the scheduled time, students must inform the lecturer immediately.
Reading list	Please note that it is very important to gain familiarity with the subject matter in the readings and cases available on Blackboard and the internet *before* attending classes. Required Course Texts and Materials

	Legal Texts: 1. Constitution of Vietnam - 2013 2. Civil Code of Vietnam - 2015 3. Criminal Code of Vietnam – 2015 (amended in 2017) 4. Law on Law on Handling of Administrative Violations 2012 5. Law on Enterprises – 2020 6. Labour Code 2019 7. Law on anti-corruption 2018 Available at https://luatvietnam.vn/ or Blackboard Books: • PGS.TS. Phan Trung Hien, *Giáo trình Pháp Luật Đại cương*, NXB Chính Trị Quốc Gia Sự Thật 2022. • Mai Hong Quy (Chief Editor) (2nd 2017), *Introduction to Vietnamese Law*, Hong Duc Publishing House. Additional materials provided in Blackboard The lecturer will attempt to make lecture notes and additional reading available on Blackboard. However, this is not an automatic entitlement for students doing this subject. Note that this is not a distance learning course, and you are expected to attend lectures and take notes. This way, you will get the added benefit of class interaction and demonstration. Optional Course Texts and Materials Recommended Internet sites UNCTAD (United Nations Conference on Trade and Development) WTO (World Trade Organization) MOIT - Vietnam (Official website of Ministry of Industry and Trade) MPI - Vietnam (Official website of Ministry of Planning and Investment) Other Resources, Support and Information Additional learning assistance is available for students on this course and will be made available on Blackboard. Academic journal articles are available through connections via the VNU - Central Library. Recommended articles will be duly informed to the students. Books: • Nguyen Phu Trong, *Kiên quyết, kiên trì đấu tranh phòng, chống tham nhũng, tiêu cực, góp phần xây dựng đảng và nhà nước ta ngày càng trong sạch, vững mạnh*, NXB Chính Trị Quốc Gia Sự Thật 2023. • University of Law Ho Chi Minh City, *Giáo trình luật Hiến pháp Việt nam*, NXB Hồng Đức 2023. • University of Law Ho Chi Minh City, *Giáo trình Luật hành chính*, NXB Hồng Đức 2022.

	• University of Law Ho Chi Minh City, *Giáo trình Luật hình sự Việt Nam*, NXB Hồng Đức 2022. • University of Law Ho Chi Minh City, *Giáo trình Luật dân sự Việt Nam*, NXB Hồng Đức 2022. • University of Law Ho Chi Minh City, *Giáo trình Luật lao động Việt Nam*, NXB Hồng Đức 2022. • University of Law Ho Chi Minh City, *Giáo trình pháp luật về chủ thể kinh doanh*, NXB Hồng Đức 2022.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1								R, M		
2								R, M		
3								R, M		
4								R, M		
5								R, M		

ILO8. Show an understanding of the role and responsibility of an engineer in society.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Introduction to State · What is State? · Nature of state · Forms of state · Functions of state · Introduction to structure of Vietnamese state	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT - Introduction to Vietnamese legal system available on Blackboard
2	Introduction to law? · What is law? · Nature of law · Forms of law · Structure of law · Categorization of legal system. · Enforcement	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT - Introduction to Vietnamese legal system available on Blackboard

	· Breach of law and liabilities for breach of law · Introduction to structure of Vietnamese legal system				
3	Constitutional Law · General introduction on Vietnamese Constitution and its nature and basic principles. · Political, economic and other regimes of Vietnam · Basic rights and responsibilities of citizens. Relationship between citizens and the State. · Structure, functions and duties of Vietnamese state, especially in prevention of corruption	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPTs – Constitutional law available on Blackboard Constitution 2013 available on Blackboard
4	Constitutional Law (Cont) · Structure and functions and duties of Vietnamese state · Duties of the state in prevention of corruption	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPTs – Constitutional law available on Blackboard Constitution 2013 available on Blackboard
5	Administrative Law · Definition and nature of administrative law · Administrative law violations · Liabilities for breach of administrative law, exemption from the liability	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies and law on anti-corruption	PPT– Administrative law available on Blackboard Law on handling administrative violations 2012, and Law on anticorruption 2018 available on Blackboard
6	Criminal Law • Definition and nature of criminal law • Crimes • Punishments	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies, especially cases related to corruption	PPT– Criminal law available on Blackboard Criminal code 2015 available on Blackboard
7	Criminal Law (Cont) • Crimes related to corruption • Punishments for corruption	1-5	Tests Peer evaluations Class	Discussions Case studies, especially cases related	PPT– Criminal law available on Blackboard Criminal code

			performance evaluations	to corruption	2015 available on Blackboard
8	Revision for mid-term exam		Quizzes Projects		
	MIDTERM EXAM				
9	Civil Law (Part I) · Definition and nature Civil law relationship · Subject of civil law · Property and ownership · Civil transactions	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT– Civil law available on Blackboard Civil code 2015 available on Blackboard
10	Civil Law (Part II) · Contracts – Definitions - Formation of contracts - Validity of contracts - Liability for breach of contracts	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT– Civil law available on Blackboard Civil code 2015 available on Blackboard
11	Civil Law (Part III) · Inheritance - Testamentary inheritance - Intestacy	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT– Civil law available on Blackboard Civil code 2015 available on Blackboard
12	Law on Enterprises · Introduction to law on enterprises · Introduction to forms, features, establishment, reorganization and dissolution of an enterprise	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT– Law on enterprises available on Blackboard Law on enterprises 2020 available on Blackboard
13	Labor Law · Definition, and nature of labour law · Employees and employers · Working time, and resting time · Salary (including salary for overtime working hours)	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT– Labor law available on Blackboard Labor code 2019 available on Blackboard
14	Labour Law (Cont.) · Employment contracts · Labor disciplines · Dispute settlements	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT– Labor law available on Blackboard Labor code 2019 available on Blackboard
15	Revision/ Tutoring classes		Quizzes Projects		

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5
In class evaluation (20%)	70% Pass	80% Pass	100% Pass	100% Pass	100% Pass
Midterm examination (30%)	70% Pass	80% Pass	100% Pass	100% Pass	100% Pass
Final examination (50%)	70% Pass	80% Pass	100% Pass	100% Pass	100% Pass

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics

No.	CLOs	Criteria	COMPLETELY FAIL Below 30%	INADEQUATE 30% – 49%	ADEQUATE 50% - 69%	ABOVE AVERAGE 70% - 89%	EXEMPLARY ≥ 90%
1	CLO1	Organisation and clarification	No evidence of organization and coherence	Does not organise ideas logically and with clarification Limited evidence of coherence Ideas lack consistence	Generally organised logically, with evidence of progression Occasionally, there may be a lack of focus or ideas may be tangential	Clear organization and progression. Responds appropriately and relevantly, although some ideas are underdevelop ed	Response is focused, detailed and nontangential. Shows a high degree of attention to logic and reasoning of points. Clearly leads the reader to the conclusion and stirs thought rega
2		Originality and usefulness of the analysis	Shows no ability to identify legal issues or a clear inability to gather the facts	Demonstrates an incomplete grasp of the task. There is no overall sense of creative coherence. Arguments are addressed incompletely.	Shows ability to identify legal issues, gather the facts and develop claims. Argument is addressed well but no links with evidence	Shows strong ability to identify legal issues, gather the facts and develop claims as well as link claims with evidence. Overall, an acceptable solution is offered and explained	Shows strong ability to identify legal issues, gather the facts and develop claims as well as link claims with evidence. Satisfactory solutions are offered and supported
3		Use of data/ information	Shows no effort to incorporate information from primary and	Shows little information from sources. Poor	Shows moderate amount of source	Draws upon sources to support most points. Some	Draws upon primary and secondary source

			secondary sources	handling of sources	information incorporated. Some key points supported by sources. Quotations may be poorly integrated into paragraphs. Some possible problems with source citations	evidence may not support arguments or may appear inappropriate. Quotations integrated well into paragraphs. Sources cited correctly	information in useful and illuminating ways to support key points. Excellent integration of quoted material into paragraphs. Source cited correctly
4		Use of data/ information	Shows no effort to incorporate information from primary and secondary sources	Shows little information from sources. Poor handling of sources	Shows moderate amount of source information incorporated. Some key points supported by sources. Quotations may be poorly integrated into paragraphs. Some possible problems with source citations	Draws upon sources to support most points. Some evidence may not support arguments or may appear inappropriate. Quotations integrated well into paragraphs. Sources cited correctly	Draws upon primary and secondary source information in useful and illuminating ways to support key points. Excellent integration of quoted material into paragraphs. Source cited correctly
5	CLO2	Use of frameworks	Shows no effort to structure problems in correspondence to theoretical frameworks	Shows limited ability to structure problems in correspondence to theoretical frameworks	Shows effort to link problems with the theoretical frameworks. There are still some mistakes	Shows ability to structure problems in correspondence to theoretical frameworks correctly. Minor mistakes in resolving problems	Shows ability to structure problems in correspondence to theoretical frameworks correctly. The problems are well resolved
6		Quality of arguments	Shows no effort to construct logical arguments. Fails to support analysis	Shows little attempt to offer support for key claims or to relate evidence to	Shows argument of poor quality. Weak, undeveloped reasons are	Shows clear, relevant and logical arguments.	Shows identifiable, reasonable and sound arguments. Clear reasons

				analysis. Reasons offered are irrelevant.	offered to support key claims		are offered to support key claims.

6. Date revised: May 2023

INTRODUCTION TO SPACE ENGINEERING

Course Code: **PH018IU**

1. General information

Course title	INTRODUCTION TO SPACE ENGINEERING *(Giới thiệu về kỹ thuật không gian)*
Course designation	*This introductory course will bring a general overview of Space Science and Engineering to students, including the background of space and solar physics and the historical development of Space Engineering throughout the XX century. Since the course is designed from the engineers' point of view, prospective students with strong interests in Space Science and Engineering will be provided with solid foundations of the field, as well as the finest motivations for the needs of Vietnam for space science, space technology and applications in the XXI century.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Assoc. Prof. Phan Bảo Ngọc
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	None
Course objectives	This course will provide students with: ● Fundamental space and solar physics that is necessary for studying Space Science and Space Engineering. ● Important skills to develop critical thinking in identifying and formulating communication contexts and using tools in expressing the idea in written, oral and presenting forms. ● The finest motivations for the study of space science, space technology

<table>
<tr><td></td><td>and applications.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Describe basic concepts and roles of Space Science and Engineering in the era of Space Exploration.</td></tr>
<tr><td>Skill</td><td>CLO2. Express ideas by using the appropriate means of graphical communications or oral presentations.</td></tr>
<tr><td>Attitude</td><td>CLO3. Recognize the need of further self-learning in Space Science and Engineering.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (2 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction and History</td><td>1</td><td>I, T</td></tr>
<tr><td>Part 1: Space Science
Chapter 1: Orbital Mechanics</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 2: Planetary Science</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 3: Space Physics</td><td>3</td><td>I, T</td></tr>
<tr><td>Part 2: Satellite Technology
Chapter 4: Introduction to Satellites and their Applications</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 5: Remote Sensing</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 6: Navigation Systems</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 7: Space Telescopes</td><td>1</td><td>I, T</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written Examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Tools of Radio Astronomy, T. L. Wilson, K. Rohlfs, S. Huttemeister, 5th Edition, Springer
[2] Anil K. Maini & Varsha Agrawal (2014). Satellite Technology Principles and Applications, A John Wiley and Sons, Ltd., Publication.
References:
[3] Galactic Astronomy (Princeton Series in Astrophysics), James Binney and Michael Merrifield, Princeton University Press</td></tr>
</table>

	[4] *Galactic Dynamics*, James Binney and Scott Tremaine, Princeton University Press [5] *Remote Sensing and Image Interpretation*, Thomas M. Lillesand and Ralph W. Kiefer, Wiley.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1		x								
2							x			
3									x	

ILO2. Apply knowledge of physics and space science for solving problems in satellite technology applications.

ILO7. Communicate effectively in career.

ILO9. Show abilities of further self-learning and lifelong learning.

3. Planned learning activities and teaching methods

Note:

As: Assignment; Mid: Midterm exam; Fin: Final exam

Week	**Topic**	**CLO**	**Assessments**	**Learning activities**	**Resources**
1	Introduction and History	1,3	As	Lecture Discussion	Chapter 1, [2]
2+3	Part 1: Space Science Chapter 1: Orbital Mechanics	1, 3	As Mid	Lecture Discussion	Chapter 2, [2]
4+5	Chapter 2: Planetary Science	1-3	As Mid	Lecture Discussion	Chapter 4, [2]
6+7+8	Chapter 3: Space Physics	1-3	As Mid	Lecture Discussion	
	MIDTERM EXAM				
9+10	Part 2: Satellite Technology Chapter 4: Introduction to Satellites and their Applications	1-3	As Mid	Lecture Discussion	
11+12	Chapter 5: Remote Sensing	1-3	As Fin	Lecture Discussion	Chapter 9, [2]
13+14	Chapter 6: Navigation Systems	1-3	As Fin	Lecture Discussion	Chapter 10, [2]
15	Chapter 7: Space Telescopes	1-3	As Fin	Lecture Discussion	Chapter 12, [2]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1		CLO2		CLO3	
Attendance/ quiz/Lab (20%)						
Assignment (10%)	As. Part 1 60%Pass	As. Part 2 60%Pass	As. Part 1 60%Pass	As. Part 2 60%Pass	As. Part 1 60%Pass	As. Part 2 60%Pass
Midterm exam (30%)	Mid. Q1 60%Pass		Mid. Q2 60%Pass		Mid. Q3 60%Pass	
Final exam (40%)	Fin. Q1 60%Pass		Fin. Q2 60%Pass		Fin. Q3 60%Pass	

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

EARTH OBSERVATION AND THE ENVIRONMENT

Course Code: **PH061IU**

1. General information

Course title	EARTH OBSERVATION AND THE ENVIRONMENT *(Quan sát Trái đất và môi trường)*
Course designation	*This course gives students an understanding of the Earth's climate system, an appreciation of the environmental issues (water pollution, air pollution, soil pollution, etc), and also sheds light on the role of Earth's climate system, which may have on the space systems, especially the negative impacts. Some engineering approaches are suggested to suppress these negative impacts in maintaining the lifetime of the space systems in their services.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Assoc. Prof. Hồ Quốc Bằng
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Introduction to Space Engineering (PH018IU)
Course objectives	This course will provide students with: ● A basic knowledge of the Earth's climate system: its importance and how it impacts a variety of environmental issues. ● Earth's observational strategies to identify and solve the negative impacts of the Earth's climate system. ● An awareness of the Earth's climate system's impacts in societal and environmental contexts and engineering solutions.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Describe components of the Earth’s climate system and its impacts on environmental issues.</td></tr>
<tr><td>Skill</td><td>CLO2. Explain environmental issues using the Earth’s observations.</td></tr>
<tr><td>Attitude</td><td>CLO3. Identify the impact of the Earth’s climate change and observation techniques on society and environmental issues.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (2 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Introduction
Overview of the environment
Importance of environment for quality of life
Importance of Earth observation to solve environmental issues</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 2: Earth's environment
Description Earth’s environment as a system
Identification of the key environment system components and their characteristics and interactions</td><td>3</td><td>I, T</td></tr>
<tr><td>Chapter 3: Key environmental issues relevant to Earth observation
Local (pollution), regional (acid rain), and global (ozone depletion, climate change)</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 4: Earth observation techniques
Methods of measuring key geophysical parameters ($PM_{2.5}$, weather, etc) by satellite</td><td>3</td><td>I, T</td></tr>
<tr><td>Chapter 5: Applications of Earth observation
Overview of different sectors (agriculture, etc.)</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 6: Climate change
Science, impacts and policy</td><td>3</td><td>I, T</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Satellite Technology, Principles and Applications, Anil K. Maini & Varsha A., Wiley, 2014.</td></tr>
</table>

	[2] *Remote sensing: Principles and Applications,* Floyd F. Sabins, Waveland Press, Inc. (1997) References: [3] Quoc Bang Ho. 2016. *Urban Air Pollution: from theory to practice*. 420 pages. NXB ĐHQG Tp.HCM, 2016 [4] Quoc Bang Ho. 2016. *Climate change and response measures* 520 pages. VNU HCM Presse, 2016 [5] Quoc Bang Ho, Hoang Ngoc Khue Vu, Thoai Tam Nguyen, Thi Thuy Hang Nguyen, Nguyen Thi Thu Thuy. 2019. *A combination of bottom-up and top-down approaches for calculating air emission for developing countries: A case of Ho Chi Minh city, Vietnam. Air Quality, Atmosphere & Health* volume 12, pages 1059–1072(2019).

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1		x								
2					x					
3										x

ILO2. Apply knowledge of physics and space science for solving problems in satellite technology applications

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications

ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society

3. Planned learning activities and teaching methods

Note: As: Assignment; Mid: Midterm exam; Fin: Final exam

Week	Topic	CLO	Assessments	Learning activities	Resource s
1-2	Chapter 1: Introduction Overview of the environment Importance of environment for quality of life Importance of Earth observation to solve environmental issues	1,3	As	Lecture, Discussion	
3-5	Chapter 2: Earth's environment Description Earth's environment as a system Identification of the key environment system components and their characteristics and interactions	1, 3	As Mid	Lecture, Discussion	
6-8	Chapter 3: Key environmental issues relevant to Earth observation	1-3	As Mid Fin	Lecture, Discussion	

	Local (pollution), regional (acid rain), and global (ozone depletion, climate change)				
	MIDTERM EXAM	1, 2			
9-10	Chapter 4: Earth observation techniques Methods of measuring key geophysical parameters ($PM_{2.5}$, weather, etc) by satellite	2, 3	As Fin	Lecture, Discussion	
11-12	Chapter 5: Applications of Earth observation Overview of different sectors (agriculture, etc.)	2, 3	As Fin	Lecture, Discussion	
13-15	Chapter 6: Climate change Science, impacts and policy	1, 3	As Fin	Lecture, Discussion	
	FINAL EXAM	1-3			

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (10%)			
Assignment (20%)	As. Q1 50%Pass	As. Q2 50%Pass	As. Q3 50%Pass
Midterm exam (30%)	Mid. Q1 60%Pass	Mid. Q2 60%Pass	
Final exam (40%)	Fin. Q1 60%Pass	Fin. Q2 60%Pass	Fin. Q3 60%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 10, 2023

Ho Chi Minh City, 21/01/2023
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

INTRODUCTION TO RELATIVITY AND MODERN PHYSICS

Course Code: **PH029IU**

1. General information

Course title	INTRODUCTION TO RELATIVITY AND MODERN PHYSICS *(Giới thiệu thuyết tương đối và vật lý hiện đại)*
Course designation	*This course is introductory to all theoretically fundamental aspects of Special Relativity and Early Quantum Theory. In the first part of the course, students are brought up with some experiments that lead to the special relativity concepts of objects moving at speed close to the speed of light. From there, they can develop the formalism of special relativity in both kinematics and dynamics via the discussion of moving frames of reference, Galilean and Lorentz transformations, and electromagnetism. The second part of the course will also introduce the other pillar of modern physics, quantum theory, in its early stage. Again, students will get acquainted with some experiments that led to the thoughts of quantization, the duality characteristics of the particle-wave nature of radiation, and the principle of uncertainty; and apply these foundation physics backgrounds to the quantum theory of the atom then.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Assoc. Prof. Phan Bảo Ngọc
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: General Physics 3 (PH023IU), Calculus 2 (MA003IU)
Course objectives	This course will provide students with: • A basic knowledge of Special Relativity and Early Quantum Theory and their applications for objects moving at the speed of light and for physics

<table>
<tr><td></td><td>at the atomic scale, respectively.
• Essential presentation skills to convey the ideas to various audiences, including professionals and the general public in both the written and oral presenting forms.
• Motivations to study Special Relativity and Early Quantum Theory and their applications at higher levels in Space Science and Space Engineering.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Solve physics problems of objects moving at speeds comparable to the speed of light and objects having sizes comparable to the atomic scale by using basic concepts of Special Relativity and Quantum Theory.</td></tr>
<tr><td>Skill</td><td>CLO2. Express ideas by using the appropriate means of graphical communications or oral presentations</td></tr>
<tr><td>Attitude</td><td>CLO3. Recognize the need of further self-learning in Special Relativity and Quantum Theory.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Background of Special Relativity</td><td>3</td><td>I, T</td></tr>
<tr><td>Chapter 2: Relativistic Kinematics</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 3: Relativistic Dynamics</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 4: Quantization of Energy</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 5: The Particle Nature of Radiation</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 6: Wave Nature of Matter and Uncertainty Principle</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 7: Early Quantum Theory of Atom</td><td>2</td><td>I, T</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Basic Concepts in Relativity and Early Quantum Theory, Resnick & Halliday – 2nd Edition.
References:
[2] Becchi, Carlo M., and Massimo D'Elia. Introduction to the Basic Concepts of Modern Physics. Springer (2007).</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1		x								
2							x			
3									x	

ILO2. Apply knowledge of physics and space science for solving problems in satellite technology applications.
ILO7. Communicate effectively in career.
ILO9. Show abilities of further self-learning and lifelong learning.

3. Planned learning activities and teaching methods

Note:
As: Assignment; Mid: Midterm exam; Fin: Final exam

Week	Topic	CLO	Assessments	Learning activities	Resources
1-3	Chapter 1: Background of special relativity Galilean transformations Newtonian Relativity Postulates of Special Relativity Theory Einstein and the Origin of Relativity Theory	1,3	As	Lecture Discussion	Chapter 1, [1]
4-5	Chapter 2: Relativistic Kinematics Lorentz Equation and Transformation Doppler Effect	1, 3	As Mid	Lecture Discussion	Chapter 2, [1]
6-8	Chapter 3: Relativistic Dynamics Relativistic Momentum Relativistic Force Law & the Dynamics of a Single Particle Relativity & Electromagnetism	1-3	As Mid	Lecture Discussion	Chapter 3, [1]
	MIDTERM EXAM				
9, 10	Chapter 4: Quantization of Energy Thermal Radiation Rayleigh-Jeans Radiation Law Quantization of Energy	1-3	As Fin	Lecture Discussion	Chapter 4, [1]
11-12	Chapter 5: The Particle Nature of Radiation Photoelectric effect	1-3	As Fin	Lecture Discussion	Chapter 5, [1]

	Compton Effect Pair Production Photons				
13-14	Chapter 6: Wave Nature of Matter and Uncertainty Principle Matter Waves The Wave-Particle Duality The Uncertainty Principle	1-3	As Fin	Lecture Discussion	Chapter 6, [1]
15	Chapter 7: Early Quantum Theory of Atom Thompson Model Bohr Atom	1-3	As Fin	Lecture Discussion	Chapter 7, [1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1			CLO2	CLO3
Attendance/Quiz (20%)					
Assignment (10%)	As. 1 70%Pass			As. 2 70%Pass	As 3 70% Pass
Midterm exam (30%)	Mid Q2 70%Pass	Mid Q4 70%Pass	Mid Q5 70%Pass	Mid Q1 70%Pass	Mid Q3 70%Pass
Final exam (40%)	Fin Q2 70%Pass	Fin Q3 70%Pass	Fin Q5 70%Pass	Fin Q4 70%Pass	Fin Q1 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

INTRODUCTION TO SIGNALS AND SYSTEMS

Course Code: **PH032IU**

1. General information

Course title	INTRODUCTION TO SIGNALS AND SYSTEMS *(Giới thiệu về tín hiệu và hệ thống)*
Course designation	*Introduction to continuous- and discrete-time systems and signals, basis function representation of signals, convolution, Fourier Series, Fourier, Laplace, Z-transform theory, state space variable analysis of linear systems, basic feedback concepts.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Tôn Thất Long
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: General Physics 2 (PH021IU), Differential Equations (PH026IU)
Course objectives	This course will provide students with: ● Fundamentals of signals and systems. ● Skills to analyze linear dynamic systems in both continuous and discrete-time domains. ● Further self-learning in signals and systems.
Course learning outcomes	Upon the successful completion of this course students will be able to: <table><tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr><tr><td>Knowledge</td><td>CLO1. Understand the fundamentals of signals and systems in both discrete time and continuous time domains and</td></tr></table>

<table>
<tr><td rowspan="3"></td><td></td><td>their representatives in practice and apply knowledge of methods (Fourier transform, Laplace transform, z transform) to analyze the characteristics of signals and system.</td></tr>
<tr><td>Skill</td><td>CLO2. Differentiating the nature of discrete time and continuous time systems in order to devise proper methods to solve engineering problems related to these systems</td></tr>
<tr><td>Attitude</td><td>CLO3. Recognize the need of further self-learning in signals and systems.</td></tr>
<tr><td>Content</td><td colspan="2">The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction of signal</td><td>1</td><td>I, T, U</td></tr>
<tr><td>System & System Properties</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Discrete time and Continuous time Convolution methods</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Linear Time Invariant System Properties</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Fourier Series and Fourier Transforms</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Laplace Transform</td><td>2</td><td>I, T, U</td></tr>
<tr><td>z-Transform and its properties</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Sampling</td><td>1</td><td>I, T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td colspan="2">Written examination</td></tr>
<tr><td>Study and examination requirements</td><td colspan="2">Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td colspan="2">Textbook:
[1] A. Poularikas, Signals and Systems with Primer with MATLAB, CRC Press, 2007.
[2] V. Oppenheim, A. S. Willsky with S. Hamid, Signals and Systems, Prentice Hall, 2nd ed., 1996.
Other supplemental materials
[1] B.P. Lathi, Linear Systems and Signals, Oxford University Press Inc., 2005.
[2] Lecture notes</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10

1			x							
2										
3										

ILO3. Apply knowledge and skills of digital signal processing for analyzing satellite communication signals.

3. Planned learning activities and teaching methods

Week	**Topic**	**CLO**	**Assessments**	**Learning activities**
1	Introduction: Mathematical background; Time vs. Frequency domains; Common signals and delta impulse function	1, 2, 3	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz
2-3	System & System Properties	1, 2, 3	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz
4-5	Discrete time and Continuous time Convolution methods	1, 2, 3	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz
6-7	Linear Time Invariant System Properties	1, 2, 3	Assignment/Quiz	Lecture, Discussion, Inclass-Quiz
	MIDTERM EXAM			
8-10	Fourier Series and Fourier Transforms	1, 2, 3	Assignment/Quiz Final	
11-12	Laplace Transform	1, 2, 3	Assignment/Qui z Final	Lecture, Discussion, Inclass-Quiz
13-14	z-Transform and its properties	1, 2, 3	Assignment/Quiz Final	
15	Sampling	1, 2, 3	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
	FINAL EXAM			

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
In-class exercises/ quizzes (10%)	Qz1->Qz4 80% Pass	Qz5->Qz8 80%Pass	Qz1->Qz4 80% Pass
Homework exercises (10%)	HW1->H3 70% Pass	HW4, HW5 70%	HW1->HW3 70% Pass

Midterm exam (30%)	Q1, Q2 80% Pass		Q3, Q4 70% Pass
Final exam (50%)	Q3, Q4 70%Pass	Q1, Q2 80%Pass	

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics (optional)

6. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

VIETNAM NATIONAL UNIVERSITY HCMC-INTERNATIONAL UNIVERSITY
Department of Physics - Space Engineering Program

SIGNALS AND SYSTEMS LABORATORY

Course Code: **PH033IU**

1. General information

Course title	SIGNALS AND SYSTEMS LABORATORY *(Thực hành tín hiệu và hệ thống)*
Course designation	*Experimental exercises via simulation using MATLAB to get understanding of frequency and time domain analysis of linear dynamic systems and corresponding signals. Finding the response of continuous- and discrete-time linear systems via simulation.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Huỳnh Võ Trung Dũng
Language	English
Relation to curriculum	Compulsory
Teaching methods	Experiment, writing report
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credits/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Introduction to Signals and Systems (PH032IU)
Course objectives	This course will provide students with: • Design and conduct experiments, analyze results. • Skills to use MATLAB software to write programs about some signals and systems topics and know how to write lab report. • Understand the basic knowledge about the main parts of a typical communication system. • Have an opportunity to exam case studies to understand the professional and ethical responsibility as an engineer
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

	Knowledge	CLO1. Review the fundamentals of signals and systems.
	Skill	CLO2. Design and conduct experiment, analyze results CLO3. Use MATLAB software to write programs about some signals and systems topics and know how to write lab report
	Attitude	CLO4. Understand the professional and ethical responsibility as an engineer
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: laboratory session (4 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)	
Examination forms	Experiment, writing report	
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.	
Reading list	*Textbook:* [1] Laboratory Manual supplied by the instructor. *Reference:* [2] Z. Gajic, Linear Dynamic Systems and Signals, Prentice-Hall, 2003	

Content topics:

Topic	Weight	Level
Introduction to MATLAB	1	I, T, U
Elementary Signals	1	I, T, U
Mathematical Description of Signals	1	I, T, U
Systems	1	I, T, U
Fourier Series	1	I, T, U
Time-Domain System Analysis and Laplace Transform	1	I, T, U
Fourier Transform and Fourier Analysis Discrete-Time Signals	1	I, T, U
Review and Final Examination	1	I, T, U

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										
2					x					
3					x					

4										

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities
1	Introduction to MATLAB	1, 2, 3	Pre-Lab Lab Test and Report final examination	Exercises
2	Elementary Signals	1, 2, 3	Pre-Lab Lab Test and Report final examination	Exercises
3	Mathematical Description of Signals	1, 2, 3	Pre-Lab Lab Test and Report final examination	Exercises
4	Systems	1, 2, 3	Pre-Lab Lab Test and Report final examination	Exercises
5	Fourier Series		Pre-Lab Lab Test and Report final examination	Exercises
6	Time-Domain System Analysis and Laplace Transform	1, 2, 3	Pre-Lab Lab Test and Report final examination	Exercises
7	Fourier Transform and Fourier Analysis Discrete-Time Signals	1, 2, 3	Pre-Lab Lab Test and Report final examination	Exercises
8	Review and Final Examination	1, 2, 3	Pre-Lab Lab Test and Report final examination	Exercises

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Pre-Lab (10%)	80% Pass	80% Pass	80% Pass	80% Pass
Lab Test and Report (60%)	80% Pass	80% Pass	80% Pass	80% Pass
Final examination (30%)	80% Pass	80% Pass	80% Pass	80% Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

INTRODUCTION TO SPACE COMMUNICATIONS

Course Code: **PH063IU**

1. General information

Course title	INTRODUCTION TO SPACE COMMUNICATIONS (*Giới thiệu về liên lạc không gian*)
Course designation	*This course is introductory to all fundamental aspects of Space Communications between a spacecraft (or satellites) and the ground stations. The scopes of the course cover a wide range of discussions from the satellite's technological designs and technical solutions to its communications with the controlled-ground stations. In the first part of the course, students will study the essential characteristics and components of satellites, the satellite launching methods, the satellite orbits (mainly concentrating on the geostationary satellites), and the satellite orbital perturbations; nevertheless, in the second part, the learning contents will focus on the analog and digital signals, transmissions, receptions, link equations, and satellite services.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Ngọc Trường Minh
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: General Physics 2 (PH021IU)
Course objectives	This course will provide students with: ● All based knowledge and skills of space communication by investigating satellite technological designs and solutions. ● Essential presentation skills in written and oral forms to convey their works to various audiences, including professionals and the public.

	• The role and responsibilities of an engineer in society.
Course learning outcomes	Upon the successful completion of this course students will be able to: **Competency level** — **Course learning outcome (CLO)** Knowledge — CLO1. Apply the knowledge of mathematics and physics to solve engineering problems. CLO2. Demonstrate the understanding of the fundamental principles of satellite communications, satellite orbits, and satellite designs. Skill — CLO3. Show abilities of expressing ideas using graphical communications or oral presentations Attitude — CLO4. Show the role and responsibility of an engineer in society
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (2 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)
Examination forms	Written examination
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	Textbooks: [1] D. Roddy, *Satellite Communications,* 4th edition, McGraw–Hill, 2006 [2] Lecture notes

Course learning outcomes:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Apply the knowledge of mathematics and physics to solve engineering problems. CLO2. Demonstrate the understanding of the fundamental principles of satellite communications, satellite orbits, and satellite designs.
Skill	CLO3. Show abilities of expressing ideas using graphical communications or oral presentations
Attitude	CLO4. Show the role and responsibility of an engineer in society

Content:

Topic	Weight	Level
Overview of Satellite Systems	1	I
Orbital and Launching Methods	1	I, T
The Geostationary Orbit	1	I, T
Polarization	1	I, T
Introduction to Antennas	1	I, T
Antenna Fundamental Parameters	1	I, T
The Space and Earth Segment	1	I, T
Analog Signals	1	I, T
Digital Signals	1	I, T
Error Correcting Codes	2	I, T
Interference Satellite Network	1	I, T
Direct Broadcast Satellite (DBS) Television Satellite mobile and Specialized Services	2	I, T
Group Presentation Review 2	1	U

	[3] T. Prat, C. W. Bostian, *Satellite Communications*, 2nd edition, John Wiley & Sons, 2002 References: [4] *Satellite Technology, Principles and Technology*, Anil K. Maini & Varsha A., Wiley, 2011. [5] *Satellite Communications Payload and System*, T.M. Braun, Weyley, 2012 [6] *Satellite Communication Systems Engineering*, 2nd edition, W. L. Pritchard, H. G. Suyderhoud, R. A. Nelson, Prentice Hall, 1992

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2			x							
3							x			
4								x		

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.
ILO3. Apply knowledge and skills of digital signal processing for analyzing satellite communication signals.
ILO7. Communicate effectively in career.
ILO8. Show an understanding of the role and responsibility of an engineer in society.

3. Planned learning activities and teaching methods

Note: As: Assignment; Mid: Midterm exam; Fin: Final exam

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Overview of Satellite Systems	1-4	As	Lecture Class discussion	Chapter 1, [1]
2	Orbital and Launching Methods	1-4	As Mid	Lecture Class discussion	Chapter 2, [1]
3	The Geostationary Orbit	1-4	Mid	Lecture Class discussion	Chapter 3, [1]
4	Polarization	1-4	As Mid	Lecture Class discussion	Chapter 5, [1]
5	Introduction to Antennas	1-4	Mid	Lecture Class discussion	Chapter 6, [1]
6	Antenna Fundamental Parameters	1-4	As Mid	Lecture Class discussion	Chapter 6, [1]
7	The Space and Earth Segment	1-4	As Mid	Lecture Class discussion, quiz	Chapter 7, 8, [1]
8	Analog Signals	1-4	As	Lecture	Chapter 9, [1]

			Fin	Class discussion	
	MIDTERM EXAM				
9	Digital Signals	1-4	As Fin	Lecture Class discussion, quiz	Chapter 10, [1]
10	Error Correcting Codes	1-4	As Fin	Lecture Class discussion	Chapter 11, [1]
11-12	Interference Satellite Network	1-4	As Fin	Lecture Class discussion	Chapter 13, [1]
13	Direct Broadcast Satellite (DBS) Television Satellite mobile and Specialized Services	1-4	As Fin	Lecture Class discussion	Chapter 16, [1]
14-15	Group Presentation Review 2	3	As	Class discussion Presentation	
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (10%)				
Assignment/Homework (40%)	As. Part 1 70%Pass	As. Part 2, 4, 5 70%Pass	As. Part 3 70%Pass	As. Part 3 70%Pass
Midterm exam (20%)	Mid. Q1 60%Pass	Mid. Q2 60%Pass	Mid. Q3 60%Pass	Mid. Q4 60%Pass
Final exam (30%)	Fin. Q1 60%Pass	Fin. Q2 60%Pass	Fin. Q3 60%Pass	Fin. Q4 60%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2023

Ho Chi Minh city, 21/01/2023

CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

REMOTE SENSING

Course Code: **PH036IU**

1. General information

Course title	REMOTE SENSING (*Viễn thám*)
Course designation	*In this course, students will be able to extract physical information of the Earth's surface using remote sensing, applying for forestry, agriculture, water resources, and environment. Wavelength ranges used in this course are ultraviolet, visible, short-wavelength infrared, thermal infrared, and microwave.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Phan Hiền Vũ
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: General Physics 3 (PH023IU) Parallel Course: General Physics 3 Laboratory (PH024IU)
Course objectives	This course will provide students with: ● Theories of imaging processes with camera, multi-spectral scanner, and scattering imagers which work with the ultraviolet, visible, infrared and microwave range of the electromagnetic radiation. ● Techniques and skills to analyze and interpret diverse types of remote sensing images. ● Applications in forestry, agriculture, water resources, and environment from physical information extracted from remote sensing images.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Explain geophysical measurements derived from remotely sensed data with a wide range from visible to microwave wavelengths
CLO2. Develop applications in forest, agriculture, water resources and environment using remote sensing data</td></tr>
<tr><td>Skill</td><td>CLO3. Classify land surface from optical and thermal remote sensing images</td></tr>
<tr><td>Attitude</td><td>CLO4. Show the impact of remote sensing techniques for natural resource and environmental management, and sustainable development.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Introduction to Concepts and Systems</td><td>2</td><td>T</td></tr>
<tr><td>Chapter 2: Photographs and Digital Images from Aircraft and Satellites</td><td>3</td><td>T</td></tr>
<tr><td>Chapter 3: Earth Resource and Environmental Satellites</td><td>3</td><td>T</td></tr>
<tr><td>Chapter 4: Thermal Infrared Images</td><td>2</td><td>T</td></tr>
<tr><td>Chapter 5: Radar Technology and Terrain Interactions</td><td>2</td><td>T</td></tr>
<tr><td>Chapter 6: Forest, agricultural, water resources and environmental applications</td><td>3</td><td>T</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] F. F. Sabins, Remote sensing: Principles and Applications, Waveland Press, Inc. (2007).
References:
[2] W.G. Rees, Physical principles of remote sensing, Cambridge University Press (2012).
[3] Q. Weng, Advances in environmental remote sensing: sensors, algorithms, and applications, CRC Press (2011).</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2				x						
3					x					
4										x

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.
ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society.

3. Planned learning activities and teaching methods

Note:
As: Assignment; Midterm: Mid; Final: Fin

Week	Topic	CLO	Assessments	Learning activities	Resources
1-2	Chapter 1: Introduction to Concepts and Systems ○ Units of Measure ○ Electromagnetic Energy ○ Electromagnetic Spectrum ○ Image Characteristics ○ Remote Sensing Systems ○ Spectral Reflectance Curves ○ Multispectral Imaging Systems ○ Hyperspectral Scanning Systems ○ Sources of Remote Sensing Information	1, 3	As Mid	- Lecture - Class discussion	Chapter 1 [1]
3-4-5-6	Chapter 2: Photographs and Digital images from Aircraft and Satellites ○ Interactions between Light and Matter ○ Film Technology and Photomosaic ○ Low-Sun-Angle Photographs ○ Black-and-White Photographs ○ Normal Color Photographs ○ IR Color Photographs ○ Image digital from Satellites ○ Multispectral scanning ○ Digital image description and interpretation	1-4	As Mid	- Lecture - Class discussion	Chapter 2 [1]
7-8	Chapter 3: Earth Resource and Environmental Satellites	1-4	As Mid	- Lecture	Chapter 3 [1]

	○ Geostationary Environmental Satellites ○ Environmental and Earth Resources Images Compared ○ Future Satellite System			- Class discussion	
9-10	MIDTERM EXAM				
11	Chapter 4: Thermal Infrared Images ○ Thermal Processes and Properties ○ TIR Detection and Imaging Technology ○ Characteristics of TIR Images ○ Conducting Airborne TIR Surveys ○ Satellite Thermal IR Images ○ Thermal IR Spectra ○ Thermal IR Multispectral Scanner	1-4	As Fin	- Lecture - Class discussion, quiz	Chapter 10, [1]
12	Chapter 5: Radar Technology and Terrain Interactions ○ Radar Systems ○ Characteristics of Radar Images ○ Radar Return and Image Signatures ○ Polarization ○ Interferometry	1-4	Fin	- Lecture - Class discussion	Chapter 11, [1]
13-14-15	Chapter 6: Digital image processing ○ Image correction: radiometric, atmospheric, and geometric ○ Image conversion: enhancing, filtering ○ Image classification: unsupervised and supervised	1, 2, 3, 4	As Fin	- Lecture - Class discussion	Chapter 4, [1]
16-17	Chapter 7: Forest, Agricultural, Water Resources, and Environmental Applications ○ Land Use and Land Cover, Forestry, Agriculture ○ Water Resources, Ocean Productivity ○ Environmental Pollution	1, 2, 3, 4	As Fin	- Lecture - Class discussion	Chapter 13, [1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance / Homework (10%)				
Assignment (30%)	As.Q1 70%Pass	As.Q2 70%Pass	As.Q3 70%Pass	As.Q2 70%Pass
Midterm exam (30%)	Mid.Q1 70%Pass	Mid.Q2 70%Pass	Mid.Q3 70%Pass	Mid.Q4 70%Pass
Final exam (30%)	Fin.Q1 70%Pass	Fin.Q2 70%Pass	Fin.Q3 70%Pass	Fin.Q4 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

SPACE ENVIRONMENT

Course Code: **PH037IU**

1. General information

Course title	SPACE ENVIRONMENT *(Môi trường Không gian)*
Course designation	*This is an introductory course of physical properties of plasma; the solar atmosphere; the solar dynamo; the magnetic field and the ionosphere of the Earth; the interaction between the solar wind and the magnetic field of the Earth; the impact of the ionosphere on satellite communication.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Assoc. Prof. Phan Bảo Ngọc
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, practice
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: General Physics 2 (PH021IU)
Course objectives	This course will provide students with: • Basic knowledge of physical phenomena and processes occurring in space. • Engineering strategies to identify and interpret the physical processes happening in space. • Awareness of the impact of the ionosphere on satellite communication and the emerging technology in space science.
Course learning outcomes	Upon the successful completion of this course students will be able to: <table><tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr></table>

<table>
<tr><td></td><td><table>
<tr><td>Knowledge</td><td>CLO1: Demonstrate fundamental concepts of plasma, solar physics such as solar atmosphere, solar activities, and solar dynamo, geomagnetism and Earth’s ionosphere.</td></tr>
<tr><td>Skill</td><td>CLO2: Explain the physical processes in space such as the interaction between the solar wind and Earth's magnetic fields.</td></tr>
<tr><td>Attitude</td><td>CLO3: Identify the impact of space environment on satellite communication, emerging space technologies, and solutions to typical problems in space engineering.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Plasma Physics</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 2: Solar physics</td><td>3</td><td>I, T</td></tr>
<tr><td>Chapter 3: Solar Wind</td><td>3</td><td>I, T</td></tr>
<tr><td>Chapter 4: Geomagnetism</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 5: Magnetosphere</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 6: Neutral Atmosphere</td><td>2</td><td>I, T</td></tr>
<tr><td>Chapter 7: Ionosphere</td><td>1</td><td>T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Tamas I. Gombosi, Physics of the Space Environment (Cambridge Atmospheric and Space Science Series), Cambridge University Press; Revised ed. edition (2004)
References:
[2] Francis F. Chen, Introduction to Plasma Physics and controlled fusion, second edition (1974)
[3] Davies, Kenneth. Ionospheric radio. No. 31. IET (1990)
[4] Hargreaves, John Keith. The solar-terrestrial environment: an introduction to Geospace-the science of the terrestrial upper atmosphere, ionosphere, and magnetosphere. Cambridge university press (1992)</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1		x								
2					x					
3										x

ILO2. Apply knowledge of physics and space science for solving problems in satellite technology applications

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications

ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society

3. Planned learning activities and teaching methods

Note:

As: Assignment; Mid: Midterm exam; Fin: Final exam

Week	**Topic**	**CLO**	**Assessments**	**Learning activities**	**Resources**
1-2	Chapter 1: Plasma Physics Plasma, Plasma criteria Principles of plasma physics Single particle motion of charges Fluid approximation for plasmas	1-3	Mid	Lecture Discussion	Chapter 2, [2]
3-4-5	Chapter 2: Solar physics A brief overview of the Sun The solar structure The solar activity, sunspot number and solar cycle The solar eruption	1-3	Mid	Lecture Discussion	Chapter 11, [1]
6-7-8	Chapter 3: Solar Wind Historical background Types of solar winds Interplanetary magnetic field and interplanetary current sheet	1-3	As1 Mid	Lecture Discussion	Chapter 12, [1]
	MIDTERM EXAM				
9-10	Chapter 4: Geomagnetism The main field of the Earth Measuring the magnetic field of the Earth. Temporal variations of the magnetic field	1-3	Final	Lecture Discussion	Chapter 13, [1]
11-12	Chapter 5: Magnetosphere The magnetosphere	1-3	Final	Lecture Discussion	Chapter 14, [1]

	Magnetospheric current systems Magnetic storms				
13-14	Chapter 6: Neutral Atmosphere Composition-Density-Temperature Stratospheric Dynamics Mesospheric Dynamics Thermospheric Dynamics	1-3	Final	Assignment Discussion	Chapter 4, [4]
15	Chapter 7: Ionosphere Ionospheric Variability Radio wave Propagation in the ionosphere	1-3	As2 Fin	Lecture Discussion	Chapter 10, [1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (6%)			
Assignment (24%)	As1, As2, As3, As4 60%Pass	As1, As2, As3, As4 60%Pass	As1, As2, As3, As4 60%Pass
Midterm exam (30%)	Mid Q1 70%Pass	Mid Q2 70%Pass	Mid Q3 70%Pass
Final exam (40%)	Fin Q1 70%Pass	Fin Q2 70%Pass	Fin Q3 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

SATELLITE TECHNOLOGY

Course Code: **PH040IU**

1. General information

Course title	SATELLITE TECHNOLOGY *(Công nghệ vệ tinh)*
Course designation	*This course is introductory to general knowledge about satellites, including two parts separately of satellite technology and applications. The first part of the course will introduce students to the fundamental topics of satellite technology, satellite orbits, and satellite launching. The second part of the course focuses mostly on satellite applications, including communication techniques, remote sensing, navigation, weather satellites, and military satellites.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Lê Xuân Huy
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Introduction to Space Engineering (PH018IU)
Course objectives	This course will provide students with: ● Principles of radiation phenomenon and the radiation characteristics of antennas (input impedance, gain, half-power beam width, polarization, dipoles, loop, and radiation power) and their applications in analyzing and designing microwave engineering such as transmission line, scattering matrix, filters. ● Ability to work homogeneously in multidisciplinary science teams. ● An awareness of the space business and space industry in the world and in Vietnam.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Show the understanding of main satellite applications for developing and functioning satellite/spacecraft systems.
CLO2. Show basic knowledge of designing payloads, instruments, and bus systems of a satellite/spacecraft mission</td></tr>
<tr><td>Skill</td><td>CLO3. Express the ability of teamwork skills</td></tr>
<tr><td>Attitude</td><td>CLO4. Recognize the state of space business and space industry in the world and in Vietnam.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction to Satellite technologies and Application</td><td>1</td><td>I, T</td></tr>
<tr><td>Space Environments</td><td>1</td><td>I, T</td></tr>
<tr><td>Satellite Orbits</td><td>1</td><td>I, T</td></tr>
<tr><td>Satellite System Engineering</td><td>1</td><td>I, T</td></tr>
<tr><td>Mission Design</td><td>1</td><td>I, T</td></tr>
<tr><td>Power subsystem</td><td>1</td><td>I, T</td></tr>
<tr><td>Communications subsystem</td><td>1</td><td>I, T</td></tr>
<tr><td>Command and data-handling subsystem</td><td>1</td><td>I, T</td></tr>
<tr><td>Attitude determination and Control System 1</td><td>1</td><td>I, T</td></tr>
<tr><td>Attitude determination and Control System 2</td><td>1</td><td>I, T</td></tr>
<tr><td>Assembly, Integration and Test</td><td>1</td><td>I, T</td></tr>
<tr><td>Ground station and Mission control and operation</td><td>1</td><td>I, T</td></tr>
<tr><td>Space Project Management</td><td>1</td><td>I, T</td></tr>
<tr><td>New Space and Traditional space 1</td><td>1</td><td>I, T</td></tr>
<tr><td>New Space and Traditional space 2</td><td>1</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Project</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Anil K. Maini & Varsha Agrawal (2011). Satellite Technology: Principles and Applications, A John Wiley and Sons, Ltd., Publication)
References:
[2] James R. Wertz, Wiley J. Larson, Space Mission Analysis and Design, Third Edition</td></tr>
</table>

	[3] Miguel A. Aguirre, *Introduction to Space Systems: Design and Synthesis*, 2013th Edition [4] Wilfried Ley, Klaus Wittmann, Willi Hallmann, *Handbook of Space Technology*, Aerospace Series, 2009

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1			x							
2			x							
3						x				
4										x

ILO3. Apply knowledge and skills of digital signal processing for analyzing satellite communication signals.

ILO6. Work effectively in a team in space engineering and interdisciplinary areas.

ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society.

3. Planned learning activities and teaching methods

Note:

As: Assignment; Mid: Midterm exam; Fin: Final exam

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Introduction to Satellite technologies and Application	1,3	As	Lecture, Discussion	Chapter 1, [1]
2	Space Environments	1, 3	As, Mid	Lecture, Discussion	Chapter 2, [1]
3	Satellite Orbits	1-4	As, Mid	Lecture, Discussion	Chapter 3, [1]
4	Satellite System Engineering	1-4	As, Mid	Lecture, Discussion	Chapter 4, [1]
5	Mission Design	1-4	As, Mid	Lecture, Discussion	Chapter 5, [1]
6	Power subsystem	1-4	As, Mid	Lecture, Discussion	Chapter 6, [1]
7	Communications subsystem	1-4	As, Mid, Fin	Lecture, Discussion	Chapter 7, [1]
8	Command and data-handling subsystem	1-4	As, Mid, Fin	Lecture, Discussion	Chapter 8, [1]
	MIDTERM EXAM				
9	Command and data-handling subsystem	1-4	As, Fin	Lecture, Discussion	Chapter 9, [1]
10	Attitude determination and Control System 1	1-4	As, Fin	Lecture, Discussion	Chapter 10, [1]

11	Attitude determination and Control System 2	1-4	As, Fin	Lecture, Discussion	Chapter 11, [1]
12	Assembly, Integration and Test	1-4	As, Fin	Lecture, Discussion	Chapter 12, [1]
13	Ground station and Mission control and operation	1-4	As, Fin	Lecture, Discussion	Chapter 13, [1]
14	Space Project Management	1-4	As, Fin	Lecture, Discussion	Chapter 14, [1]
15	New Space and Traditional space 1-2	1-4	As, Fin	Lecture, Discussion	Chapter 15, [1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance/quiz (10%)				
Assignment (20%)	As. Q1 70%Pass	As. Q2 70%Pass	As. Q3 70%Pass	As. Q3 70%Pass
Midterm project (30%)	Mid. Q1 70%Pass	Mid. Q2 70%Pass	Mid. Q3 70%Pass	Mid. Q3 70%Pass
Final project (40%)	Fin. Q1 70%Pass	Fin. Q2 70%Pass	Fin. Q3 70%Pass	Fin. Q3 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

iOS PROGRAMMING FUNDAMENTALS

Course Code: **PH062IU**

1. General information

Course title	iOS PROGRAMMING FUNDAMENTALS (*Nền tảng lập trình iOS*)
Course designation	*This course provides students with an introduction to programming on the iOS platform with Swift Programming language including: environment, syntax, data types, variables, tuples, constants, literals, operators, decision making, loops, strings, arrays, sets, functions, classes, properties, methods, OOP concepts, App development methodologies, UI designs.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	MSc. Trương Thị Ngọc Phượng
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, project, practice
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 140 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25, laboratory: 25 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits (2 theory and 1 practice)/5.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Programming for Engineers (EE057IU)
Course objectives	This course will provide students with: • A basic knowledge about fundamentals of Object – oriented programming and be able to apply into iOS projects. • Understanding the software engineering process to develop an iOS application from scratch. • An awareness of the legal issues and responsibilities
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

Knowledge	CLO1. Apply the knowledge of informatics to solve engineering problems. CLO2. Apply the Swift Language to develop iOS applications.
Skill	CLO3. Implement programs on iOS using the Swift language and app development tools.
Attitude	CLO4. Recognize the legality, professional ethics and responsibilities, and norms of developing and using the software.

Content

The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture session (4 periods)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Introduction to Swift Language Architecture of Swift Functions Variable and Simple Types Object Type Flow Control and More	3	I, T
OOP Concepts & Practices Objects, Properties, Classes, methods. Constructor. Inheritance Polymorphism Abstraction Encapsulation.	3	T
Xcode Project Anatomy of an Xcode Project Nib Management Documentation Life Cycle of a Project MVC Concepts	2	T, U
Build the UI UIKit and Interface Builder Build a basic UI Connect the UI to code. Working with View Controllers. Implement custom controls. Define your data model	2	T, U
Working with Multiple View Controllers and Navigation. TableView Navigation Controller.	2	T, U

		Working with Core Data. Core Data Entities and Attributes. Data saving Data fetching Data deleting.	1	T, U	
		Working with Networking Networking services GET request. REST & CRUD Decoding, Async, and POST Request Test and publish apps on App Store	2	T, U	
Examination forms	Project				
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.				
Reading list	Textbook: [1] Neuburg, Matt, *iOS 10 programming fundamentals with Swift*: *Swift, Xcode, and Cocoa basics*, Beijing: O'Reilly, 2017. Reference: [2] Greg Lim, *Beginning iOS 13 & Swift App Development: Develop iOS Apps with Xcode 11*, Swift 5, Core ML, ARKit and more, independently published. [3] *Beginning Android*, 5th edition, Grant Allen [4] Learning *Android Google Maps*, Raj Amal W.				

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2				x						
3					x					
4								x		

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.

ILO8. Show an understanding of the role and responsibility of an engineer in society.

3. Planned learning activities and teaching methods

I: Introduce; T: Teach; U: Utilize

Part A: Theory section

Week	**Topic**	**CLO**	**Learning activities**	**Resources**	**Teaching level (I, T, U)**
1+2+3	Introduction to Swift Language ○ Architecture of Swift ○ Functions ○ Variable and Simple Types ○ Object Type ○ Flow Control and More	1-4	Lecture Discussion	Chapter 2, [1]	I, T
4+5+6	OOP Concepts & Practices ○ Objects, Properties, Classes, methods. ○ Constructor. ○ Inheritance ○ Polymorphism ○ Abstraction ○ Encapsulation.	1-4	Lecture Practice using learnt theories	Chapter 3, [1]	I, T
7+8	Xcode Project ○ Anatomy of an Xcode Project ○ Nib Management ○ Documentation ○ Life Cycle of a Project ○ MVC Concepts	1-4	Lecture Practice using learnt theories	Chapter 1, [2]	T, U
	MIDTERM EXAM				
9+10	Build the UI ○ UIKit and Interface Builder ○ Build a basic UI ○ Connect the UI to code. ○ Working with View Controllers. ○ Implement custom controls. ○ Define your data model.	1-4	Lecture Practice using learnt theories	Chapter 6, [1]	T, U
11+ 12	Working with Multiple View Controllers and Navigation. ○ TableView ○ Navigation Controller.	1-4	Lecture Practice using learnt theories	Chapter 8, [1]	T, U
13	Working with Core Data. ○ Core Data Entities and Attributes. ○ Data saving ○ Data fetching ○ Data deleting	1-4	Lecture Practice using learnt theories	Chapter 4, [2]	T, U
14+15	Working with Networking	1-4	Lecture	Chapter 9, [2]	T, U

	○ Networking services ○ GET request ○ REST & CRUD ○ Decoding, Async, and POST Request ○ Test and publish apps on App Store		Practice using learnt theories		
	FINAL EXAM				

Part B: Practical section

Week	Topic	CLO	Learning activities	Resources	Teaching level (I, T, U)
1+2+3	Introduction to Swift Language ○ Architecture of Swift ○ Functions ○ Variable and Simple Types ○ Object Type ○ Flow Control and More	1-4	Do exercises	Chapter 2, [1]	I, T
4+5+6	OOP Concepts & Practices ○ Objects, Properties, Classes, methods. ○ Constructor. ○ Inheritance ○ Polymorphism ○ Abstraction ○ Encapsulation.	1-4	Do exercises	Chapter 3, [1]	I, T
7+8	Xcode Project ○ Anotomy of an Xcode Project ○ Nib Management ○ Documentation ○ Life Cycle of a Project ○ MVC Concepts	1-4	Project Discussion	Chapter 1, [2]	T, U
	MID TERM				
9+10	Build the UI ○ UIKit and Interface Builder ○ Build a basic UI ○ Connect the UI to code. ○ Working with View Controllers. ○ Implement custom controls. ○ Define your data model.	1-4	Project Discussion	Chapter 6, [1]	T, U
11+12	Working with Multiple View Controllers and Navigation. ○ TableView ○ Navigation Controller.	1-4	Project Discussion	Chapter 8, [1]	T, U

13	Working with Core Data. ○ Core Data Entities and Attributes. ○ Data saving ○ Data fetching ○ Data deleting	1-4	Project Discussion	Chapter 4, [2]	T, U
14+15	Working with Networking ○ Networking services ○ GET request ○ REST & CRUD ○ Decoding, Async, and POST Request ○ Test and publish apps on App Store	1-4	Project Discussion	Chapter 9, [2]	T, U
	FINAL EXAM				

Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (10%)				
Practice (20%)	As. Q1 70%Pass	As. Q2 70%Pass	As. Q3 70%Pass	As. Q3 70%Pass
Midterm exam (30%)	Mid. Q1 60%Pass	Mid. Q2 60%Pass	Mid. Q3 60%Pass	Mid. Q3 60%Pass
Final project (40%)	Fin. Q1 60%Pass	Fin. Q2 60%Pass	Fin. Q3 60%Pass	Fin. Q3 60%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

4. Date revised: January 12, 2023

Ho Chi Minh City, 21/01/2023

CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

INTRODUCTION TO DIGITAL IMAGE PROCESSING

Course Code: **PH038IU**

1. General information

Course Title	INTRODUCTION TO DIGITAL IMAGE PROCESSING (*Giới thiệu về xử lý ảnh số*)
Course designation	*This course will introduce students to essential basic knowledge of creating, visualizing, and manipulating digital images by computer. Topics will include representation of two-dimensional (2D) data, time and frequency domain representations, filtering and enhancement, the Fourier transform, convolution, interpolation, color images, and preliminary knowledge in object recognition and description.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Ngọc Trường Minh
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, homework
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 85 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25 Private study including examination preparation, specified in hours: 60
Credit points/ECTS	2 credits/ 3.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Programming for Engineers (EE057IU)
Course objectives	This course will provide students with: • The theoretical and practical aspects of creating, visualizing, and manipulating digital images via computer using a various technique of representations (2D, time domain, and frequency domain), filtering and enhancement, Fourier transformation and convolution, and coloring and animating. • Essential skills of creating, visualizing, and manipulating digital images via the professional technique of presentations, enhancement, transformation and convolution, and coloring and animating. • The role and responsibilities of an engineer in related fields.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1: Apply systematically the theoretical aspects of imaging systems in designing, manipulating, and creating 2D digital images.</td></tr>
<tr><td>Skill</td><td>CLO2: Use advanced imaging techniques to create, visualize and manipulate digital images.</td></tr>
<tr><td>Attitude</td><td>CLO3: Show the role and responsibilities of an engineer in related fields.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (2 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction and organization, physics of vision, resolution, impulse response</td><td>1</td><td>I, T</td></tr>
<tr><td>Linear systems, matrix transformations, scaling, translation, rotations and other geometric transformation; image registration and interpolation</td><td>1</td><td>I, T</td></tr>
<tr><td>Contrast and grey levels, histograms, Gaussian, and other non-linear stretches</td><td>1</td><td>I, T</td></tr>
<tr><td>Convolution, simple filters, edge detection</td><td>1</td><td>I, T</td></tr>
<tr><td>The frequency domain, power spectral density, the FFT</td><td>1</td><td>I, T</td></tr>
<tr><td>Digital filtering, image enhancement, noise</td><td>1</td><td>I, T</td></tr>
<tr><td>The fast Fourier transforms</td><td>1</td><td>I, T</td></tr>
<tr><td>The convolution theorem</td><td>1</td><td>I, T</td></tr>
<tr><td>Colour representation, RGB, HSI, 24 bit and 8-bit colour tables</td><td>1</td><td>I, T</td></tr>
<tr><td>3D information, perspective plots</td><td>1</td><td>I, T</td></tr>
<tr><td>Topography and shaded relief display, contours, parallax, and stereo</td><td>1</td><td>I, T</td></tr>
<tr><td>Image morphing</td><td>1</td><td>I, T</td></tr>
<tr><td>Interpolation</td><td>1</td><td>I, T</td></tr>
<tr><td>Fitting smooth functions to sparse data, least-squares</td><td>1</td><td>I, T</td></tr>
<tr><td>False color images, principal components analysis</td><td>1</td><td>I, T</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Handouts</td></tr>
</table>

	[2] Scott Umbaugh (1998). *Computer Vision and Image Processing,* Prentice-Hall, Inc., Upper Saddle River, New Jersey. References: [3] Abramowitz, M., and I. A. Stegun (1964). *Handbook Of Mathematical Functions with Formulas, Graphs, And Mathematical Tables,* U.S. Govt. Print. Off., Washington. [4] Bracewell, R. N. (1986). *The Fourier Transform and Its Applications,* McGraw-Hill, New York, 2nd edition. [5] Goodman, J.W. (1968). *Introduction to Fourier Optics*, McGraw-Hill, New York. [6] Pratt, W.K. (1978). *Digital Image Processing,* John Wiley and Sons, New York. [7] Lillesand and Kiefer (1994). *Remote Sensing and Image Interpretation,* Third Edition, Wiley, New York.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3								x		

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO8. Show an understanding of the role and responsibility of an engineer in society.

3. Planned learning activities and teaching methods

Note:
HW: Homework; Mid: Midterm exam; Fin: Final exam

Week	Topic	CLO#	Assessments	Learning activities	Resources
1	Introduction and organization, physics of vision, resolution, impulse response	1-3	Mid	Lecture Discussion	Chapter 1, [1]
2	Linear systems, matrix transformations, scaling, translation, rotations and other geometric transformation; image registration and interpolation	1-3	HW1 Mid	Lecture Discussion	Chapter 8, [4]
3	Contrast and grey levels, histograms, Gaussian, and other non-linear stretches	1-3	Mid	Lecture Discussion	Chapter 1, [5]

4	Convolution, simple filters, edge detection	1-3	HW2 Mid	Lecture Discussion	Chapter 3, [3]
5	The frequency domain, power spectral density, the FFT	1-3	HW3 Mid	Lecture Discussion	Chapter 2, [3]
6	Digital filtering, image enhancement, noise	1-3	Mid	Lecture Discussion	Chapter 4, [5]
7	The fast Fourier transforms	1-3	Mid	Lecture Discussion	Chapter 2, [3]
8	The convolution theorem	1-3	Mid	Lecture Discussion	Chapter 6, [3]
	MIDTERM EXAM				
9	Colour representation, RGB, HSI, 24 bit and 8-bit colour tables	1-3	HW 4 Fin	Lecture Discussion	Chapter 3, [5]
10-11	Topography and shaded relief display, contours, parallax, and stereo	1-3	Fin	Lecture Discussion	Chapter 5, [5]
12-13	Image morphing	1-3	HW5 Fin	Lecture Discussion	Chapter 5, [5]
14-15	False color images, principal components analysis	1-3	Fin	Lecture Discussion	[1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (10%)			
Assignment/Homework (20%)	HW1-5. Q1 70%Pass	HW1-5. Q2 70%Pass	HW1-5. Q3 70%Pass
Midterm exam (30%)	Mid. Q1 70%Pass	Mid. Q2 70%Pass	Mid. Q3 70%Pass
Final exam (40%)	Fin. Q1 70%Pass	Fin. Q2 70%Pass	Fin. Q3 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2023

Ho Chi Minh City, 21/01/2023
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

DIGITAL IMAGE PROCESSING LABORATORY

Course Code: **PH039IU**

1. General information

Course Title	DIGITAL IMAGE PROCESSING LABORATORY *(Thực hành xử lý ảnh số)*
Course designation	*This course gives students computer-based laboratory exercises designed to introduce methods of real-world data manipulation. The lab exercises will introduce various imaging processing topics, which could be completed with many widely used programming languages such as Matlab, C, or Python.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Ngọc Trường Minh
Language	English
Relation to curriculum	Compulsory
Teaching methods	Experiment, writing report
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credits/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Introduction to digital image processing (PH038IU)
Course objectives	This course will provide students with: ● A practical framework in using a variety of programming languages such as Matlab, C/C++, or Fortran to create, visualize, and manipulate digital images. ● Essential skills of these above programming languages. ● The role and responsibilities of an engineer in related fields.
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Apply the basic knowledge of digital imaging processing and manipulating on computers in designing, manipulating, and creating 2D digital images.

	Skill: CLO2. Use many widely used programming languages such as Matlab, C/C++, or Python at advanced levels. Attitude: CLO3. Show the legal issues and responsibilities in engineering practice.
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: laboratory session (4 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)
Examination forms	Experiment, writing report
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	Textbooks: [1] Handouts References: [2] Scott Umbaugh (1998). *Computer Vision and Image Processing,* Prentice-Hall, Inc., Upper Saddle River, New Jersey. [3] Pratt, W.K. (1978). *Digital Image Processing,* John Wiley and Sons, New York

Content topics:

Topic	Weight	Level
Viewing digital images, bits and bytes, raster scan format, quantization	1	T, U
Scaling, translation and rotation, sums and differences	1	T, U
Histograms and stretches, convolutional filters	1	T, U
Fourier transforms and the frequency domain, filters	1	T, U
FFTs, Image filtering: smoothing and sharpening	1	T, U
2D convolution and correlation	1	T, U
Color and color tables	1	T, U
Creating multiple image sequences for the project	1	T, U

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3								x		

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO8. Show an understanding of the role and responsibility of an engineer in society.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
5	Viewing digital images, bits and bytes, raster scan format, quantization	1, 2, 3	Report Final report	Lecture Practice	[1]
6	Scaling, translation and rotation, sums and differences	1, 2, 3	Report Final report	Lecture Practice	[1]
7	Histograms and stretches, convolutional filters	1, 2, 3	Report Final report	Lecture Practice	[1]
8	Fourier transforms and the frequency domain, filters	1, 2, 3	Report Final report	Lecture Practice	[1]
9	**Break**				
10	FFTs, Image filtering: smoothing and sharpening	1, 2, 3	Report Final report	Lecture Practice	[1]
11	2D convolution and correlation	1, 2, 3	Report Final report	Lecture Practice	[1]
12	Color and color tables	1, 2, 3	Report Final report	Lecture Practice	[1]
13	Creating multiple image sequences for the project	1, 2, 3	Report Final report	Lecture Practice	[1]
14	**FINAL EXAM**				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (20%)			
Report (50%)	Report 1-8. Q1 70%Pass	Report 1-8. Q2 70%Pass	Report 1-8. Q3 70%Pass
Final report (30%)	Q1 70%Pass	Q2 70 %Pass	Q3 70 %Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2023

Ho Chi Minh City, 21/01/2023
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

PRINCIPLES OF DATABASE MANAGEMENT

Course Code: **IT079IU**

1. General information

Course title	PRINCIPLES OF DATABASE MANAGEMENT *(Nguyên tắc quản lý cơ sở dữ liệu)*
Course designation	*This subject introduces the students to basic database design and implementation concepts. Database design techniques, including relational design and E-R analysis, are presented. Database queries using SQL are covered in lectures and supported by practical exercises.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Thị Thanh Sang/ Assoc. Prof. Nguyễn Thị Thúy Loan
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project, seminar.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 182.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5, laboratory: 25 Private study including examination preparation, specified in hours: 120
Credit points/ECTS	4 credits (3 theory and 1 practice)/6.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: C/C++ programming (IT116IU) or Programming for Engineers (EE057IU)
Course objectives	This subject introduces the students to basic database design and implementation concepts. Database design techniques, including relational design and E-R analysis, are presented. Database queries using SQL are covered in lectures and supported by practical exercises.
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Produce an (Extended) Entity-Relationship (E-R) model from specifications.
Skill	CLO2. Apply data normalization principles to transforming an ER model into a database schema.

	Attitude: CLO3. Construct efficient SQL queries to retrieve and manipulate data as required.
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture and laboratory sessions (5 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize) Topic / Weight / Level: Introduction to Database Systems / 1 / I Relational Model and Relational Algebra / 2 / T, U Structured Query Language / 2 / T, U (Extended) Entity Relationship Model / 2 / T, U Relational Database Design / 3 / T, U Normalization / 2 / T, U Advanced SQL / 2 / T, U Review / 1 / I, U
Examination forms	Written Examination
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	[1] Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 7th, 2020 [2] Jeffrey A. Hoffer, Ramesh Venkataraman, Heikki Topi, Modern Database Management, 13th, 2019 [3] Ramez Elmasri, Shamkant Navathe, Fundamentals of Database Systems, 7th, 2016

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2										
3										

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Introduction to Database Systems	1	Quiz	Lecture	[1, 3]

2+3	Relational Model and Relational Algebra	2	Quiz, Midterm, Project	Lecture, Discussion, In-class exercise	[1, 3]
4+5	Structured Query Language	3	Quiz, Lab, Project, Midterm	Lecture, Discussion, In-class exercise	[1, 2, 3]
6+7	(Extended) Entity Relationship Model	2	Quiz, Project, Midterm	Lecture, Discussion, In-class exercise	[1, 2, 3]
	MIDTERM EXAM				
8+9+10	Relational Database Design	2, 3	Project, Final, Quiz, Lab	Lecture, Discussion, In-class exercise	[1, 2]
11+12	Normalization	2, 3	Quiz, Project, Final	Lecture, Discussion, In-class exercise	[2, 3]
13+14	Advanced SQL	3	Quiz, Project, Final	Lecture, Discussion, In-class exercise	[1, 3]
15	Review	2, 3	Quiz	Discussion, In-class exercise	[1, 2, 3]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Labs (10%)		10%	20%
Midterm examination (25%)	40%		20%
Quiz (5%)	10%	20%	
Projects/Presentations/ Report (20%)	30%	20%	30%
Final examination (40%)	20%	50%	30%

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: February 15, 2022

DISCRETE MATHEMATICS

Course Code: **IT153IU**

1. General information

Course title	DISCRETE MATHEMATICS (*Toán rời rạc*)
Course designation	The course provides students the ability to reason and think mathematically and logically; and apply this ability to analyze and solve discrete practical problems in Computer Science and IT.
Semester(s) in which the course is taught	2
Person responsible for the course	Assoc. Prof. Nguyễn Văn Sinh
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project, seminar.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Calculus 1 (MA001IU), Calculus 2 (MA003IU), C/C++ programming (IT116IU) or Programming for Engineers (EE057IU)
Course objectives	This course provides students with a based knowledge of discrete mathematics. To develop the ability to reason and think mathematically and logically; and to apply this ability to analyzing and solving discrete practical problems in computer science. This is an application-oriented course based upon the study of events that occur in small, or discrete computer science, segments in business, industry, government, and the digital areas. Students will be introduced to the mathematical tools of logic and set theory, counting, number theory, and graph theory. Practical applications will be introduced throughout the course.
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

<table>
<tr><td></td><td>
<table>
<tr><td>Knowledge</td><td>CLO1. Understand and apply count/enumerate objects in a systematic way.
CLO2. Understand mathematical reasoning in order to read, comprehend and construct mathematical arguments; Understand to work with discrete structures and practical problems in computer science and IT</td></tr>
<tr><td>Skill</td><td>CLO3. Apply algorithm thinking and modeling; Apply knowledge in computer science for problems solving.</td></tr>
<tr><td>Attitude</td><td>CLO4. Have a sense of preparation of good mathematical knowledges to approach and solve problems in computer science and information technology.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Week 1: Course syllabus and introduction; Logic and propositions</td><td>1</td><td>I, T</td></tr>
<tr><td>Week 2: Logic and propositions (continue)</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 3: Propositional Equivalences; predicates and quantifiers</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 4: Nested Quantifiers and Methods of Proof</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 5: Induction and recursion</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 6&7: Number of theory</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 8: Counting: part 1, 2; midterm review</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 9: Counting: part 3</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 10: Advanced counting</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 11: Boolean algebras</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 12: Graph theory</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 13: Optimal problem solving on graphs</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 14: Introduction and application of tree</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Week 15: Search on tree; review for final exam</td><td>1</td><td>I, T, U</td></tr>
</table>
</td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>1. Kenneth H. Rosen, Discrete Mathematics and Its Applications 8th edition, 2019.
2. Oscar Levin, Discrete mathematics An Open Introduction. 3rd edition, 2019.
3. Vietnamese book: N.V.Sinh, T.M.Hà, N.T.T.Sang, N.M.Quân, “Nền</td></tr>
</table>

	tảng Toán học trong Công nghệ Thông tin", NXB - Đại học Quốc gia TPHCM, ISBN: 978-604-73-6518-0, 2018.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1	x									
2										
3										
4										

ILO1. Apply knowledge of mathematics, physics, and informatics for solving space engineering problems.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Course syllabus and introduction; Logic and propositions	1,2	Questions and Answers	Lecture, Discussion, In-class exercises	[1, 2]
2	Logic and propositions (continue)	2,3,4	Quiz, Homework, Midterm exam	Lecture, Discussion, In-class exercises	[1, 2]
3	Propositional Equivalences; predicates and quantifiers	2,3,4	Quiz, Homework, Midterm exam	Lecture, Discussion, In-class exercises	[1, 2]
4	Nested Quantifiers and Methods of Proof	2,3,4	Quiz, Homework, Midterm exam	Lecture, Discussion, In-class exercises	[1, 2]
5	Induction and recursion	2,3,4	Quiz, Homework, Midterm exam	Lecture, Discussion, In-class exercises	[1, 2]
6	Number of theory	2,3,4	Quiz, Homework, Midterm exam	Lecture, Discussion, In-class exercises	[1, 2]
7	Number of theory (continue)	2,3,4	Quiz, Homework, Midterm exam	Lecture, Discussion, In-class exercises	[1, 2]
8	Counting: part 1, 2; midterm review	2,3,4	Quiz, Homework, Midterm exam	Lecture, Discussion, In-class exercises	[1, 2, 3]
	MIDTERM EXAM				
9	Counting: part 3	2,3,4	Quiz,	Lecture, Discussion,	[1, 2]

			Homework, Final exam	In-class exercises	
10	Advanced counting	2,3,4	Quiz, Homework, Final exam	Lecture, Discussion, In-class exercises	[1, 2]
11	Boolean algebras	2,3,4	Quiz, Homework, Final exam	Lecture, Discussion, In-class exercises	[1, 2, 3]
12	Graph theory	2,3,4	Quiz, Homework, Final exam	Lecture, Discussion, In-class exercises	[1, 2, 3]
13	Optimal problem solving on graphs	2,3,4	Quiz, Homework, Final exam	Lecture, Discussion, In-class exercises	[1, 2, 3]
14	Introduction and application of tree	2,3,4	Quiz, Homework, Final exam,	Lecture, Discussion, In-class exercises	[1, 2, 3]
15	Search on tree; review for final exam	2,3,4	Quiz, Homework, Final exam	Lecture, Discussion, In-class exercises	[1, 2, 3]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Quiz/Homework/Assignment (25%)	20%	30%	30%	20%
Midterm examination (30%)	25%	25%	25%	25%
Final examination (45%)		30%	40%	30%

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Rubrics (optional)

5.1. Grading checklist

Grading checklist for Written Reports			
Student: …………………………….. Date: …………………………………	HW/Assignment: ……………… Evaluator: ………………………		
	Max.	Score	Comments
Technical content (60%)			
Abstract clearly identifies purpose and summarizes principal content	10		
Introduction demonstrates thorough knowledge of relevant background and prior work	15		
Analysis and discussion demonstrate good subject mastery	30		
Summary and conclusions appropriate and complete	5		
Organization (10%)			
Distinct introduction, body, conclusions	5		
Content clearly and logically organized, good transitions	5		
Presentation (20%)			
Correct spelling, grammar, and syntax	10		

Clear and easy to read	10		
Quality of Layout and Graphics (10%)	10		
TOTAL SCORE	100		

5.2. Holistic rubric

Holistic rubric for evaluating the entire document, e.g., exercises/quizzes/HW	
Score	Description
5	Demonstrates complete understanding of the problem. All requirements of task are included in response
4	Demonstrates considerable understanding of the problem. All requirements of task are included.
3	Demonstrates partial understanding of the problem. Most requirements of task are included.
2	Demonstrates little understanding of the problem. Many requirements of task are missing.
1	Demonstrates no understanding of the problem.
0	No response/task not attempted

Note: this rubric is also used to evaluate questions in an exam.

5.3. Analytic rubric

Critical thinking value rubric for evaluating questions in exams:

	Capstone	Milestone		Benchmark
	4	3	2	1
Explanation of issues	Issue/ problem to be considered critically is stated clearly and described comprehensively, delivering all relevant information necessary for full understanding.	Issue/ problem to be considered critically is stated, described, and clarified so that understanding is not seriously impeded by omissions.	Issue/ problem to be considered critically is stated but description leaves some terms undefined, ambiguities unexplored, boundaries undetermined, and/ or backgrounds unknown.	Issue/ problem to be considered critically is stated without clarification or description.
Evidence *Selecting and using information to investigate a point of view or conclusion*	Information is taken from source(s) with enough interpretation/ evaluation to develop a comprehensive analysis or synthesis. Viewpoints of experts are questioned thoroughly.	Information is taken from source(s) with enough interpretation/ evaluation to develop a coherent analysis or synthesis. Viewpoints of experts are subject to questioning.	Information is taken from source(s) with some interpretation/ evaluation, but not enough to develop a coherent analysis or synthesis. Viewpoints of experts are taken as mostly fact, with little questioning.	Information is taken from source(s) without any interpretation/ evaluation. Viewpoints of experts are taken as fact, without question.
Influence of context and assumptions	Thoroughly (systematically and methodically) analyzes own and others' assumptions and carefully evaluates the relevance of contexts when presenting a position.	Identifies own and others' assumptions and several relevant contexts when presenting a position.	Questions some assumptions. Identifies several relevant contexts when presenting a position. May be more aware of others' assumptions than one's own (or vice versa).	Shows an emerging awareness of present assumptions (sometimes labels assertions as assumptions). Begins to identify some contexts when presenting a position.
Student's position (perspective, thesis/hypothesis)	Specific position (perspective, thesis/ hypothesis) is imaginative, taking into account the complexities of an issue. Limits of position (perspective, thesis/ hypothesis) are acknowledged. Others' points of view are synthesized within position (perspective, thesis/ hypothesis).	Specific position (perspective, thesis/hypothesis) takes into account the complexities of an issue. Others' points of view are acknowledged within position (perspective, thesis/ hypothesis).	Specific position (perspective, thesis/ hypothesis) acknowledges different sides of an issue.	Specific position (perspective, thesis/ hypothesis) is stated, but is simplistic and obvious.

Conclusions and related outcomes (implications and consequences)	Conclusions and related outcomes (consequences and implications) are logical and reflect student's informed evaluation and ability to place evidence and perspectives discussed in priority order.	Conclusion is logically tied to a range of information, including opposing viewpoints; related outcomes (consequences and implications) are identified clearly.	Conclusion is logically tied to information (because information is chosen to fit the desired conclusion); some related outcomes (consequences and implications) are identified clearly.	Conclusion is inconsistently tied to some of the information discussed; related outcomes (consequences and implications) are oversimplified.

Source: Association of American Colleges and Universities

Oral communication value rubric for evaluating presentation tasks:

	Capstone	Milestone		Benchmark
	4	3	2	1
Organization	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable and is skillful and makes the content of the presentation cohesive.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is clearly and consistently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is intermittently observable within the presentation.	Organizational pattern (specific introduction and conclusion, sequenced material within the body, and transitions) is not observable within the presentation.
Language	Language choices are imaginative, memorable, and compelling, and enhance the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are thoughtful and generally support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are mundane and commonplace and partially support the effectiveness of the presentation. Language in presentation is appropriate to audience.	Language choices are unclear and minimally support the effectiveness of the presentation. Language in presentation is not appropriate to audience.
Delivery	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation compelling, and speaker appears polished and confident.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation interesting, and speaker appears comfortable.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) make the presentation understandable, and speaker appears tentative.	Delivery techniques (posture, gesture, eye contact, and vocal expressiveness) detract from the understandability of the presentation, and speaker appears uncomfortable.
Supporting Material	A variety of types of supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that significantly supports the presentation or establishes the presenter's credibility/ authority on the topic.	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that generally supports the presentation or establishes the presenter's credibility/ authority on the topic.	Supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make appropriate reference to information or analysis that partially supports the presentation or establishes the presenter's credibility/ authority on the topic.	Insufficient supporting materials (explanations, examples, illustrations, statistics, analogies, quotations from relevant authorities) make reference to information or analysis that minimally supports the presentation or establishes the presenter's credibility/ authority on the topic.
Central Message	Central message is compelling (precisely stated, appropriately repeated, memorable, and strongly supported.)	Central message is clear and consistent with the supporting material.	Central message is basically understandable but is not often repeated and is not memorable.	Central message can be deduced but is not explicitly stated in the presentation.

Source: Association of American Colleges and Universities

6. Date revised: February 15, 2022

REMOTE SENSING UTILIZING BIG DATA ANALYTICS

Course Code: **PH070IU**

1. General information

Course title	REMOTE SENSING UTILIZING BIG DATA ANALYTICS *(Viễn thám sử dụng Phân tích dữ liệu lớn*)
Course designation	*The aim of the course is to get students familiar with big data analytics tools for remote sensing. Students will learn how to discover knowledge from remote sensing data with high-performance distributed computing approaches and machine learning tools (Apache Hadoop, parallel Python, R, and Google Earth Engine).*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Lê Thanh Vân
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, assignment, project.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 170 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 50 Private study including examination preparation, specified in hours: 120
Credit points/ECTS	4 credits/ 6.18 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Programming for engineers (EE057IU), Earth Observation and Environment (PH061IU), Parallel course: Remote Sensing (PH036IU)
Course objectives	This course will provide students with: ● Knowledge in handling big remote sensing image database on high-performance computing platform. ● Advanced foundations to develop essential experiments in analyzing and interpreting big databases applied to remote sensing. ● The need for further learning big databases for remote sensing.
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

<table>
<tr><td></td><td><table>
<tr><td>Knowledge</td><td>CLO1. Develop algorithms of analyzing big data in remote sensing using high-performance and distributed computing tools.</td></tr>
<tr><td>Skill</td><td>CLO2. Analyze data to make conclusions to engineering problems in big data and remote sensing with data analytics and machine learning tools.</td></tr>
<tr><td>Attitude</td><td>CLO3. Show abilities of further self-learning and lifelong learning.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (4 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction to big data</td><td>1</td><td>I, T</td></tr>
<tr><td>Infrastructure and high-performance computing for remote sensing data: Hadoop and Map Reduce techniques</td><td>3</td><td>I, T</td></tr>
<tr><td>Introduction to Distributed database</td><td>1</td><td>T, U</td></tr>
<tr><td>The computing platforms: distributed computing (CPUs and GPUs), Cloud computing</td><td>2</td><td>T, U</td></tr>
<tr><td>Big data analysis with Python</td><td>2</td><td>T, U</td></tr>
<tr><td>Remote sensing image handling: Image classification and segmentation using Machine learning</td><td>3</td><td>T, U</td></tr>
<tr><td>The open platform: Google Earth Engine</td><td>2</td><td>T, U</td></tr>
<tr><td>Final project: Thematic mapping from remote sensing big data</td><td>1</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination, project.</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Big Data: Techniques and Technologies in Geoinformatics, Hassan A. Karimi (editor), 2014, CRC Press.
References:
[2] High Performance Computing in Remote Sensing, Antonio J. Plaza and Chein-I Chang (editors), 2008, Chapman & Hall/CRC Computer and Information Science Series.
[3] Hadoop: The Definitive Guide, 2nd edition, Tom White, 2011, O'Reilly.
References:
[4] An Introduction to R for Spatial Analysis and Mapping (Spatial Analytics and GIS), Chris Brunsdon, Lex Comber, second edition</td></tr>
</table>

	[5] *Big Data Analysis with Python: Combine Spark and Python to unlock the powers of parallel computing and machine learning*, Ivan Marin, Ankit Shukla, Sarang VK, 2019 [6] Artificial Intelligence Techniques for Satellite Image Analysis (Remote Sensing and Digital Image Processing, 24), D. Jude Hemanth, Springer. 2020 Software: Python, Google Earth Engine

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3									x	

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO9. Show abilities of further self-learning and lifelong learning

3. Planned learning activities and teaching methods

I: Introduce; T: Teach; U: Utilize

Week	Topic	CLO	Learning activities	Resources	Teaching level (I, T, U)
1	Introduction big data	1-3	Lecture Discussion	Chapter 1, [2]	I, T
2+3+4	Infrastructure and high-performance and distributed computing for big data: Hadoop and Map Reduce	1-3	Lecture Discussion	Chapter 2, [2], Chapter 2, [3]	I, T
5	Introduction to Distributed database	1-3	Lecture Discussion	Chapter 3, [3]	T, U
7	The computing platforms: distributed computing (CPUs and GPUs), Cloud computing	1-3	Lecture Discussion	Chapter 3, [1]	T, U
8	Big data analysis with Python	1-3	Lecture Discussion	Chapter 1,8,11 [6]	T, U
	MIDTERM EXAM				
9	Remote sensing image classification using Machine learning	1-3	Lecture Discussion	Chapter 1,8,11 [6]	T, U
10 + 11	Remote sensing image segmentation using Machine learning	1-3	Lecture Discussion	Chapter 10, [1]	T, U

12+13	The open platform: Google Earth Engine	1-3	Lecture Discussion		T, U
14+15	Final project: Thematic mapping from remote sensing big data	1-3	Lecture Project		U
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (10%)			
Quiz/In class assessment (20%)	Qz1-3 60%Pass	Qz1-3 60%Pass	Qz1-3 60%Pass
Midterm exam (30%)	Q1 60%Pass	Q2 60%Pass	Q3 60%Pass
Final project (40%)	Part I 60%Pass	Part II. 1 60%Pass	Part II.2 60%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: July 10, 2024

Ho Chi Minh City, 20/07/2024
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

REMOTE SENSING UTILIZING BIG DATA ANALYTICS LABORATORY

Course Code: **PH071IU**

1. General information

Course title	REMOTE SENSING UTILIZING BIG DATA ANALYTICS LABORATORY *(Thực hành Viễn thám sử dụng Phân tích dữ liệu lớn*)
Course designation	*This course provides students with hands-on experience of handling remote sensing big data. Students will work with the latest development tools and platforms such as Apache Hadoop, parallel Python, R, Google Earth Engine.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Lê Thanh Vân
Language	English
Relation to curriculum	Compulsory
Teaching methods	Experiment, writing report
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credits/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Remote Sensing Utilizing Big Data Analytics (PH070IU)
Course objectives	This course will provide students with: ● Skills and software to analyze and process satellite images and big databases. ● Advanced foundations to develop essential experiments in analyzing and interpreting big databases applied to remote sensing. ● The need for further learning big databases for remote sensing.
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

<table>
<tr><td></td><td><table><tr><td>Knowledge</td><td>CLO1. Apply the knowledge of the latest tools of big data analytics in remote sensing.</td></tr><tr><td>Skill</td><td>CLO2. Analyze data to make conclusions to engineering problems in big data and remote sensing with data analytics and machine learning tools.</td></tr><tr><td>Attitude</td><td>CLO3. Show the need of for further self-learning of big data analytics for remote sensing.</td></tr></table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: laboratory session (4 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)<table><tr><td>Topic</td><td>Weight</td><td>Level</td></tr><tr><td>Getting started with computing resources.
o Parallel computing: CPUs and GPUs
o Cloud computing</td><td>1</td><td>T, U</td></tr><tr><td>Big data analysis with Python</td><td>1</td><td>T, U</td></tr><tr><td>Remote sensing image handling: Image classification</td><td>2</td><td>T, U</td></tr><tr><td>Remote sensing image handling: Image segmentation</td><td>2</td><td>T, U</td></tr><tr><td>Remote sensing thematic mapping on Google Earth Engine platform</td><td>2</td><td>T, U</td></tr></table></td></tr>
<tr><td>Examination forms</td><td>Experiment, writing report</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Handouts
References:
[2] Hadoop: The Definitive Guide, 2nd edition, Tom White, 2011, O'Reilly.
[3] Big Data: Techniques and Technologies in Geoinformatics, Hassan A. Karimi (editor), 2014, CRC Press.
[4] High Performance Computing in Remote Sensing, Antonio J. Plaza and Chein-I Chang (editors), 2008, Chapman & Hall/CRC Computer and Information Science Series
[5] Artificial Intelligence Techniques for Satellite Image Analysis (Remote Sensing and Digital Image Processing, 24), D. Jude Hemanth, Springer. 2020
Software: Python, Google Earth Engine</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						

2					x					
3									x	

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO9. Show abilities of further self-learning and lifelong learning

3. Planned learning activities and teaching methods

I: Introduce; T: Teach; U: Utilize

Week	Topic	CLO	Learning activities	Resources	Teaching level (I, T, U)
5+6	Getting started with computing resources. Parallel computing: CPUs and GPUs Cloud computing	1-3	Lecture Practice	[1], [2]	T, U
7	Big data analysis with Python	1-3	Lecture Practice	[1], [2]	T, U
8+9	Remote sensing Image classification using Machine learning	1-3	Lecture Practice	[2], [5]	T, U
10+11	Remote sensing Image segmentation using Machine learning	1-3	Lecture Practice	[2] [5]	T, U
12	Remote sensing thematic mapping on Google Earth Engine platform	1-3	Lecture Practice	[2]	T, U
13	**FINAL EXAM**				

Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (20%)			
In-class exercises/quizzes/prelab (20%)	Prelab 1-7 60%Pass	Prelab 1-7 60%Pass	Prelab 1-7 60%pass
Report (30%)	Report 1-7 60%Pass	Report 1-7 60%Pass	Report 1-7 60%Pass
Final exam (30%)	Part I 60%Pass	Part II 60%Pass	Part III 60%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

4. Date revised: July 10, 2024

Ho Chi Minh City, 20/07/2024
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

VIETNAM NATIONAL UNIVERSITY HCMC-INTERNATIONAL UNIVERSITY
Department of Physics - Space Engineering Program

NAVIGATION SYSTEMS

Course Code: **PH047IU**

1. General information

Course title	NAVIGATION SYSTEMS *(Hệ thống điều hướng)*
Course designation	*This course introduces the principles of space navigation systems based on inertial sensors and satellite navigation. Students will start with a development history of many global navigation satellite systems (GNSS) such as GPS, GLONASS, EGNOS, Galileo, etc. and then will build upon the modern navigation systems, GPS, with Coordinate Frames, Time Reference, and Orbits to estimate the position, velocity, and times, as well as their errors. Besides, the course also provides the learners with based knowledge of GPS signals and GPS Signal Conditioning and Acquisition utilizing the Fourier transformation and convolution.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Chánh Nghiệm, Dr. Lương Bảo Bình
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, project.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Introduction to Space Engineering (PH018IU)
Course objectives	Students will be provided with: ● Principles of space navigation systems based on inertial sensors and satellite navigation by introducing the modern navigation system, GPS. ● Navigation framework in the context of space engineering to build up essential skills in identifying, formulating, and solving navigation problems with data obtained from satellites.

<table>
<tr><td></td><td>An awareness of the impact of navigation in the contemporary societal and environmental context.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1: Show the understanding of operation of global navigation satellite systems, e.g. GPS.</td></tr>
<tr><td>Skill</td><td>CLO2: Analyze the GPS data for geolocation on the Earth surface from receivers e.g. handheld devices, base stations and RTK rovers.</td></tr>
<tr><td>Attitude</td><td>CLO3: Show the impact of GNSS in society and environments.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Part 1: Fundamentals
Chapter 1: Introduction
Overview of navigation principles
Typical applications
Axis systems and projections</td><td>1</td><td>I, T</td></tr>
<tr><td>Chapter 2: Inertial Navigation Systems
Principles of inertial navigation
Accelerometers, gyroscopes, specific technologies such as Ring Laser Gyros
Axis transformations and mechanization of IN equations
Errors in inertial navigation</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 3: GPS: An overview
Objectives, Policies, and Status
System Architecture
Signals
Receivers, Measurements, and Performance
Applications</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 4: GNSS
Development history: GNSS, GPS, GLONASS, EGNOS, Galileo
GPS system architecture (ground, space, user segment)
Code (CDMA) and carrier techniques</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 5: GPS Coordinate Frames, Time Reference, and Orbits
Global Coordinate Systems
Time References and GPS Time
GPS Orbits and Satellite Position Determination</td><td>2</td><td>T, U</td></tr>
<tr><td>Part 2: Estimation of Position, Velocity, and Time
Chapter 6: GPS Measurements and Error Sources
Measurement Models
Control Segment Errors: Satellite Clock and Ephemeris
Signal Propagation Modeling Errors</td><td>1</td><td>U</td></tr>
</table></td></tr>
</table>

	Measurement Errors		
	Chapter 7: PVT Estimation Position Estimation with Pseudoranges Position and Velocity from Pseudorange Rates Time Transfer	1	T, U
	Part 3: GPS Signals Chapter 8: Signals and Linear Systems Overview Convolution Transfer Functions and Basis Functions Fourier Series Fourier Transform Random Signals Laplace Transform	1	T, U
	Chapter 9: GPS Signals	1	T, U
	Chapter 10: Signal-to-Noise Ratio and Ranging Precision	2	T, U
	Part 4: Receivers Chapter 11: Signal Conditioning and Acquisition Signal Conditioning Signal Acquisition Statistical Analysis of Signal Acquisition	2	T, U
Examination forms	Project/Written examination		
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.		
Reading list	Textbooks: [1] *Global Positioning System, Signals Measurements, and Performance,* 2nd Edition, by P. Misra and P. Enge, Ganga-Jamuna Press. References: [2] *Leick, A. GPS satellite surveying. New York:* Wiley & Sons, 1994. 19 p. ISBN 0-471-30626-6 [3] Elliott Kaplan, Christopher J. Hegarty, *Understanding GPS/GNSS: Principles and Applications,* Third edition.		

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3										x

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society.

3. Planned learning activities and teaching methods

Note:
As: Assignment; Mid: Midterm exam; Fin: Final project

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Part 1: Fundamentals Chapter 1: Introduction Overview of navigation principles Typical applications Axis systems and projections	1-3	Mid	Lecture, Discussion	Chapter 1, [1]
2	Chapter 2: Inertial Navigation Systems Principles of inertial navigation Accelerometers, gyroscopes, specific technologies such as Ring Laser Gyros Axis transformations and mechanization of IN equations Errors in inertial navigation	1-3	As1 Mid	Lecture, Discussion	Chapter 1, [1]
3	Chapter 3: GPS: An overview Objectives, Policies, and Status System Architecture Signals Receivers, Measurements, and Performance Applications	1-3	Mid	Lecture, Discussion	Chapter 2, [1]
4+5	Chapter 4: GNSS Development history: GNSS, GPS, GLONASS, EGNOS, Galileo GPS system architecture (ground, space, user segment) Code (CDMA) and carrier techniques	1-3	Mid	Lecture, Discussion	Chapter 3, [1]
6+7	Chapter 5: GPS Coordinate Frames, Time Reference, and Orbits Global Coordinate Systems Time References and GPS Time	1-3	As2 Mid	Lecture, Discussion	Chapter 4, [1]

	GPS Orbits and Satellite Position Determination				
8	Part 2: Estimation of Position, Velocity, and Time Chapter 6: GPS Measurements and Error Sources Measurement Models Control Segment Errors: Satellite Clock and Ephemeris Signal Propagation Modeling Errors Measurement Errors	1-3	Fin	Lecture, Discussion	Chapter 5, [1]
	MIDTERM EXAM				
9	Chapter 7: PVT Estimation Position Estimation with Pseudoranges Position and Velocity from Pseudorange Rates Time Transfer	1-3	Fin	Lecture, Discussion	Chapter 6, [1]
10	Part 3: GPS Signals Chapter 8: Signals and Linear Systems Overview Convolution Transfer Functions and Basis Functions Fourier Series Fourier Transform Random Signals Laplace Transform	1-3	Fin	Lecture, Discussion Practice	Chapter 8, [1]
11	Chapter 9: GPS Signals	1-3	Fin	Lecture, Discussion Practice	Chapter 9, [1]
12+13	Chapter 10: Signal-to-Noise Ratio and Ranging Precision	1-3	As3 Fin	Lecture, Discussion Practice	Chapter 10, [1]
14+15	Part 4: Receivers Chapter 11: Signal Conditioning and Acquisition Signal Conditioning Signal Acquisition Statistical Analysis of Signal Acquisition	1-3	Fin	Lecture, Discussion Practice	Chapter 11, [1]
	FINAL PROJECT/EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (10%)			
Assignment/Homework (20%)	As1 50%Pass	As2 50%Pass	As3 50%Pass
Midterm exam (30%)	Q1 60%Pass	Q2 60%Pass	Q3 60%Pass
Final project (40%)	Part I 70%Pass	Part II. 1 70%Pass	Part II.2 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

GEOLOCATION APP DEVELOPMENT FOR iOS

Course Code: **PH065IU**

1. General information

Course title	GEOLOCATION APP DEVELOPMENT FOR iOS (*Phát triển ứng dụng định vị trên HĐH iOS*)
Course designation	*This course provides students with an introduction to programming on the iOS platform with Swift Programming language for location-based services apps, including Core Location services, Maps, Region monitoring, iBeacon, Compass Heading, Geocoding, Error Handling, and Firebase. In addition, this course gives students skills to design, implement & debug a program for the iOS platform.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	MSc. Trương Thị Ngọc Phượng
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, laboratory, project.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 140 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25, laboratory: 25 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits (2 theory and 1 practice)/5.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: iOS programming fundamentals (PH062IU)
Course objectives	Students will be provided essential skills in: • Using Xcode tool to implement iOS applications in designing, implementing, and debugging programs. • Working effectively with teammates to build up iOS app from scratch • Recognizing the need for further study with other computer platforms.
Course learning outcomes	Upon the successful completion of this course students will be able to:

<table>
<tr><td></td><td>
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Integrate Core Data Framework, Core Location Framework, and Map Kit into iOS apps.</td></tr>
<tr><td>Skill</td><td>CLO2. Develop applications using iOS programming platform with the Swift language.
CLO3. Write Software Engineering reports in English and explain diagrams</td></tr>
<tr><td>Attitude</td><td>CLO4: Cooperate effectively with teammates to achieve project goals</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>
The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (4 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction to Core Location Essentials</td><td>1</td><td>I, T</td></tr>
<tr><td>Region Monitoring</td><td>2</td><td>T</td></tr>
<tr><td>iBeacon</td><td>2</td><td>T, U</td></tr>
<tr><td>Compass Heading</td><td>1</td><td>T, U</td></tr>
<tr><td>Geocoding & Maps</td><td>2</td><td>T, U</td></tr>
<tr><td>Error Handling and App Development</td><td>1</td><td>U</td></tr>
<tr><td>Swift language</td><td>2</td><td>T, U</td></tr>
<tr><td>Xcode Project</td><td>2</td><td>T, U</td></tr>
<tr><td>GPS Programming</td><td>2</td><td>T, U</td></tr>
</table>
</td></tr>
<tr><td>Examination forms</td><td>Project</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] iOS 10 Programming Fundamentals with Swift, third edition, Matt Neuburg.
[2] Geolocation in iOS, Alasdair Allan
References:
[3] Beginning Android, 5th edition, Grant Allen
[4] Learning Android Google Maps, Raj Amal W</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3							x			
4						x				

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO6. Work effectively in a team in space engineering and interdisciplinary areas.
ILO7. Communicate effectively in career.

3. Planned learning activities and teaching methods

Note:
As: Assignment; Mid: Midterm exam; Fin: Final project

Part A: Theory section

Week	**Topic**	**CLO**	**Assessments**	**Learning activities**	**Resources**
1-4	Introduction to Core Location Essentials ● Add location services to apps. ● Request authorization for location services. ● Respond to changes in authorization status. ● Configure devices to get location from GPS. ● Get user's location. ● Track user's movement. Introduction to Core Data framework Read and write data in files	1-4	As Mid	Lecture, Discussion, Exercise	Chapter 1, 2 [2]
5-7	Region Monitoring ● Monitoring the User's proximity to Geographic Regions. ● Receive notification.	1-4	As Mid	Lecture, Group work, Exercise	Chapter 2, [2]
8, 9	iBeacon ● Ranging for Beacons. ● Determine proximity to an iBeacon device. Turning an iOS device into an iBeacon device.	1-4	As Fin	Lecture, Group work	
	MIDTERM EXAM				

10	Compass Heading Get device orientation relative to magnetic or true north.	1-4	As Fin	Lecture, Group work	Chapter 4 [2]
11-12	Geocoding & Maps - Convert coordinates and place names. - Display on maps. - Pin a location on Map - Draw routes between 2 locations on maps.	1-4	As Fin	Lecture Project	Chapter 5, 6 [2]
13-15	Error Handling and App Development - Handle errors in processing location data. Finalize the Team's App.	1-4	As Fin	Lecture Report	
	FINAL PROJECT				

B: Practical section

Week	Topic	CLO	Assessment	Learning activities	Resources
5	Swift language: Architecture Functions	1-4	As Fin	Lecture Group work	Chapter 1, 2 [1]
6	Swift language: Variable and Simple Types Object Type Flow Control and More	1-4	As Fin	Lecture Group work	Chapter 1, 2, 3 [1]
7	Xcode Project Anatomy of an Xcode Project Nib Management	1-4	As Fin	Lecture Group work	Chapter 6, 7 [1]
8	Xcode Project Documentation Life Cycle of a Project	1-4	As Fin	Lecture Group work	Chapter 8, 9 [1]
	Break				
9	GPS Programming Core Location Map Kit Digital Compass	1-4	As Fin	Lecture Group work	Chapter 2, [2]
10	GPS Programming Geocoding Drawing Heat Maps Further Information and Third-Party SDKs	1-4	As Fin	Lecture Group work	Chapter 5, 6, 7 [2]
11	Case study	1-4	As Fin	Group work	

12	Build your own application	1-4	As Fin	Group work Project	

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (10%)				
In-class exercises/quizzes (10%)	Exercise 1-5 80%Pass	Exercise 6-10 80%Pass	Exercise 1-5 80%Pass	Exercise 6-10 80%Pass
Midterm exam (30%)	Q1 60%Pass	Q2 60%Pass	Q3 60%Pass	Q4 60%Pass
Final project (40%)	Part I 70%Pass	Part II. 1 70%Pass	Part II.2 70%Pass	Part II.3 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2023

Ho Chi Minh City, 21/01/2023
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

VIETNAM NATIONAL UNIVERSITY HCMC-INTERNATIONAL UNIVERSITY
Department of Physics - Space Engineering Program

DIGITAL SIGNAL PROCESSING

Course Code: **EE092IU**

1. General information

Course title	DIGITAL SIGNAL PROCESSING *(Xử lý dữ liệu số)*
Course designation	*This course is an introduction to the basic principles, methods, and applications of digital signal processing, emphasizing its algorithmic, computational, and programming aspects. In particular, the students will learn the conversion from analog to digital, the concepts of discrete time linear systems, filtering, spectral analysis of discrete time signals and filter design.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Huỳnh Võ Trung Dũng
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Introduction to Signals and Systems (EE088IU)
Course objectives	This course will provide students with: ● The sampling, quantization process as well as the basic discrete-time systems concepts. ● The design of digital filter by various methods to meet prescribed specifications. ● Confidence and fluency in discussing digital signal processing in English.
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

	Knowledge	CLO1. Apply knowledge of mathematics, science and engineering to solve digital signal processing problem.
	Skill	CLO2. Understand the sampling, quantization process as well as the basic discrete-time systems concepts. CLO3. Illustrate the design of digital filter by various methods to meet prescribed specifications
	Attitude	CLO4. Confidence and fluency in discussing digital signal processing in English

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (3 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Introduction. Sampling and reconstruction	1	I, T, U
Quantization	2	I, T, U
Discrete-time systems	1	I, T, U
FIR filtering and convolution	2	I, T, U
Z- transforms	1	I, T, U
Transfer function	1	I, T, U
Digital filter realization	2	I, T, U
DFT/FFT algorithms	1	I, T, U
Signal processing applications. Class project	2	I, T, U
Filter design techniques (FIR, IIR)	2	I, T, U

Examination forms	Written examination
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	Textbook: [1] S. J. Orfanidis, Introduction to Signal Processing, 2nd Ed, Prentice –Hall, 1996 [2] Class notes Reference: [3] A. V. Oppenheim, R. W. Schafer, *Discrete-time Signal Processing*, 2nd Ed, Prentice Hall [4] V. K. Ingle and J. G. Proakis, *Digital Signal Processing Using Matlab*, PWS Publishing Company

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO

CLO	1	2	3	4	5	6	7	8	9	10
1			x							
2										
3										
4										

ILO3. Apply knowledge and skills of digital signal processing for analyzing satellite communication signals.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities
1	Introduction. Sampling and reconstruction	1-4	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz
2-3	Quantization	1-4	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz
4	Discrete-time systems	1-4	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz
5-6	FIR filtering and convolution	1-4	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz
7	Z- transforms	1-4	Assignment/Quiz Midterm	Lecture, Discussion, Inclass-Quiz
8	Transfer function	1-4	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
9-10	Digital filter realization	1-4	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
11	DFT/FFT algorithms	1-4	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
12-13	Signal processing applications. Class project	1-4	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
14-15	Filter design techniques (FIR, IIR)	1-4	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
	FINAL EXAM			

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
In-class exercises/ quizzes (10%)	Qz1->Qz4 80% Pass	Qz5->Qz8 80%Pass	Qz1->Qz4 80% Pass	Qz5->Qz8 80%Pass
Homework exercises (20%)	HW1->H3 70% Pass	HW4, HW5 70%	HW1->HW3 70% Pass	Qz5->Qz8 80%Pass
Midterm exam (30%)	Q1, Q2 80% Pass	Q1, Q2 80% Pass	Q3, Q4 70% Pass	Q3, Q4 70% Pass
Final exam (40%)	Q3, Q4 70%Pass	Q1, Q2 80%Pass	Q3, Q4 70%Pass	Q1, Q2 80%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

DIGITAL SIGNAL PROCESSING LABORATORY

Course Code: **EE093IU**

1. General information

Course title	DIGITAL SIGNAL PROCESSING LABORATORY (*Thực hành xử lý dữ liệu số*)
Course designation	*This course is an introduction to the basic principles, methods, and applications of digital signal processing, emphasizing its algorithmic, computational, and programming aspects.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Huỳnh Võ Trung Dũng
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, Experiment, assignment
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credits/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Digital Signal Processing (EE092IU)
Course objectives	This course will provide students with: ● Digital signal processing algorithms in MATLAB software. ● The programming code for having better performance of DSP projects. ● The application of DSP algorithms in signal processing filed. ● Solving the problems efficiently by individual and by group
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Design and implement digital signal processing algorithms in MATLAB software.
Skill	CLO2. Optimize the programming code for having better performance of DSP projects.

		CLO3. Solve the problems efficiently by individual and by group. CLO4. Present the application of DSP algorithms in signal processing filed
	Attitude	CLO5. Confidence and fluency in discussing digital signal processing in English

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (2 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Sampling and reconstruction of analog signals.	1	I, T, U
Sampling, Quantizing and Coding	1	I, T, U
Z transform	1	I, T, U
Z transform and Transfer Function	1	I, T, U
Fourier Analysis of Discrete-Time Signals	1	I, T, U
Frequency Response	1	I, T, U
Review and Final Exam	2	I, T, U

Examination forms	Experiment, writing report
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	[1] S. J. Orfanidis, Introduction to Signal Processing, 2nd Ed, Prentice –Hall, 1996 [2] M. D. Lutovac, D. V. Tošić, B. L. Evans, *Filter Design for Signal Processing Using MATLAB and Mathematica*, Prentice Hall, 2001 [3] Lab manual

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1					x					
2					x					
3					x					
4					x					

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities
1	Sampling and reconstruction of analog signals.	1-5	Lab report Pre Lab Lab test Final examination	Lecture Do exercise Discussion
2	Sampling, Quantizing and Coding	1-5	Lab report Pre Lab Lab test Final examination	Lecture Do exercise Discussion
3	Z transform	1-5	Lab report Pre Lab Lab test Final examination	Lecture Do exercise Discussion
4	Z transform and Transfer Function	1-5	Lab report Pre Lab Lab test Final examination	Lecture Do exercise Discussion
5	Fourier Analysis of Discrete-Time Signals	1-5	Lab report Pre Lab Lab test Final examination	Lecture Do exercise Discussion
6	Frequency Response	1-5	Lab report Pre Lab Lab test Final examination	Lecture Do exercise Discussion
7	Review	1-5		
	FINAL EXAM			

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5
Pre-Lab (10%)					
Lab test and report (60%)	Report 1-3 80% Pass	Report 4-5 80% Pass	Report 6-7 80% Pass	Report 1-3 80% Pass	Report 4-5 80% Pass
Final exam (30%)		Q1, Q2 70% Pass	Q3, Q4 70% Pass		

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

DIGITAL IMAGE PROCESSING

Course Code: **PH041IU**

1. General information

Course title	DIGITAL IMAGE PROCESSING (*Xử lý ảnh số*)
Course designation	*This course provides advanced topics in digital image processing. In-class students will be provided in-depth theoretical knowledge of professional themes, including segmentation, morphological image processing, linear image filtering, imaging correlation, and imaging transforms, eigenimage, multiresolution image processing, noise reduction and restoration, feature extraction, and recognition tasks.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Ngọc Trường Minh
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Introduction to digital image processing (PH038IU)
Course objectives	This course will provide students with: ● Advanced topics in digital image processing, which are useful for analyzing and developing algorithms. ● Advanced skills and essential tools in digital image processing, which are necessary to collect, analyze and interpret digital images. ● Ability to study other similar algorithms or programming languages based on the foundations provided by this course.
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

	Knowledge	CLO1. Develop algorithms for digital image analysis and interpretation in engineering areas.
	Skill	CLO2. Analyze digital images using various platforms and programming languages.
	Attitude	CLO3. Show abilities of further self-learning and lifelong learning.
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (3 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)	

Topic	Weight	Level
Introduction	1	I, T
Point Operations, local and global operations for image segmentation.	1	I, T
Differential operators for segmentation: Gradient and Laplacian.	1	I, T
Histograms revisited and Statistics-based segmentation.	1	I, T
Color Science.	1	I, T
Feature representation.	1	I, T
Morphological Image Processing.	1	I, T
Linear Image Processing and Filtering.	1	I, T
Template Matching.	1	I, T
Eigen images.	1	I, T
Feature descriptors.	1	I, T
Fourier and Morphology-based descriptors.	1	I, T
Scale-Space Image Processing.	1	I, T
Feature-based Methods for Image Matching.	1	I, T
Image classification and simple recognition.	1	U

Examination forms	Written examination/Project
Study and examination requirements	*Attendance:* A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. *Assignments/Examination:* Students must have more than 50/100 points overall to pass this course.
Reading list	Textbook: [1] Scott Umbaugh (1998). *Computer Vision and Image Processing*, Prentice-Hall, Inc., Upper Saddle River, New Jersey. [2] Lecture notes References: [3] Abramowitz, M., and I. A. Stegun (1964). *Handbook Of Mathematical Functions with Formulas, Graphs, And Mathematical Tables*, U.S. Govt. Print. Off., Washington. [4] Bracewell, R. N. (1986). *The Fourier Transform and Its Applications*, McGraw-Hill, New York, 2nd edition.

	[5] Goodman, J.W. (1968). *Introduction to Fourier Optics*, McGraw-Hill, New York. [6] Pratt, W.K. (1978). *Digital Image Processing*, John Wiley and Sons, New York. [7] Lillesand and Kiefer (1994). *Remote Sensing and Image Interpretation*, Third Edition, Wiley, New York [8] Gonzalez, R. & Woods R (2008). *Digital Image Processing*, 3rd Edition, Addison Wesley.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3									x	

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO9. Show abilities of further self-learning and lifelong learning

3. Planned learning activities and teaching methods

Note:
As: Assignment; Mid: Midterm exam; Fin: Final exam

Week	**Topic**	**CLO**	**Assessments**	**Learning activities**	**Resources**
1	Introduction	1,3	As	Lecture Discussion	
2	Point Operations, local and global operations for image segmentation.	1, 3	As Mid	Lecture Discussion	Chapter 2, [2]
3	Differential operators for segmentation: Gradient and Laplacian.	1-3	As Mid	Lecture Discussion	Chapter 2, [2]
4	Histograms revisited and Statistics-based segmentation.	1-3	As Mid	Lecture Discussion	Chapter 3, [2]
5	Color Science.	1-3	As Mid	Lecture Discussion	Chapter 6, [2]
6	Image Segmentation.	1-3	As Mid	Lecture Discussion	Chapter 10, [2]
7	Morphological Image Processing.	1-3	As Mid	Lecture Discussion	Chapter 9, [2]
8	Linear Image Processing and Filtering.	1-3	As Mid	Lecture Discussion	

	MIDTERM EXAM				
9	Template Matching.	1-3	As Fin	Lecture Discussion	
10	Eigen images.	1-3	As Fin	Lecture Discussion	
11	Feature descriptors.	1-3	As Fin	Lecture Discussion	Chapter 10, [2]
12	Fourier and Morphology-based descriptors.	1-3	As Fin	Lecture Discussion	Chapter 10, [2]
13	Scale-Space Image Processing.	1-3	As Fin	Lecture Discussion	Chapter 11, [2]
14-15	Feature-based Methods for Image Matching, Image classification and simple recognition.	1-3	As Fin	Lecture Discussion	Chapter 11, [2]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance/quiz (10%)			
Assignment (20%)	As. Q1 70%Pass	As. Q2 70%Pass	As. Q3 70%Pass
Midterm exam (30%)	Mid. Q1 60%Pass	Mid. Q2 60%Pass	Mid. Q3 60%Pass
Final project/Exam (40%)	Fin. Q1 60%Pass	Fin. Q2 60%Pass	Fin. Q3 60%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2023

Ho Chi Minh City, 21/01/2023
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

SATELLITE SIGNAL AND IMAGE PROCESSING LABORATORY

Course Code: **PH043IU**

1. General information

Course title	SATELLITE SIGNAL AND IMAGE PROCESSING LABORATORY (*Thực hành xử lý tín hiệu và ảnh vệ tinh)*
Course designation	*This course provides students with knowledge of satellite system design, verification, and validation processes, and experiments on transmitting the collected data from satellites to ground-based stations, then performing post-processing data on the ground. Participating students will have a chance to learn how to operate and control satellites and equip them with project management skills.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Lê Xuân Huy
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, experiment, project.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 152.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 12.5; laboratory session: 50 Private study including examination preparation, specified in hours: lecture: 30; laboratory session: 60
Credit points/ECTS	3 credits (1 theory + 2 laboratory)/5.55 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Digital signal processing (EE092), Introduction to digital image processing (PH038IU)
Course objectives	This course will provide students with: ● Knowledge of satellite system design, verification, and validation processes. ● A framework to perform post-processing the transmitting data from satellites to ground-based stations. ● Hand-on students with useful techniques, skills, and modern engineering tools necessary for digital signal practice, Printed Circuit

<table>
<tr><td></td><td>Board (PCB) design and satellite integration process.
Advanced skills in project management, specifying for any space engineering projects.
An awareness of the legal issues and responsibilities in developing and using satellite technology and the impact of satellite technological solutions supporting the societal and environmental context.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Analyze processes of designing, verifying, operating, and validating a satellite system.</td></tr>
<tr><td>Skill</td><td>CLO2. Design basic PCBs from circuit schematic, and control components of a satellite system model and processing its data.
CLO3. Show abilities of team working.</td></tr>
<tr><td>Attitude</td><td>CLO4. Show the impact of satellite-based technological solutions in support of societal and environmental management.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
Part A: Theory section
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>An introduction of satellite system design, verification and validation process</td><td>1</td><td>I, T</td></tr>
<tr><td>An introduction to PCB design process</td><td>1</td><td>I, T</td></tr>
<tr><td>Function: Electrical Power Unit, On-board computer, signal transmission</td><td>2</td><td>I, T</td></tr>
<tr><td>An introduction to function test process and system integration design process</td><td>1</td><td>I, T</td></tr>
</table>
Part B: Practical section
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Bus System Integration: Onboard Computer, Signal Transmitter and Power Supply Unit.</td><td>2</td><td>T, U</td></tr>
<tr><td>Bus System Integration: ADCS components</td><td>2</td><td>T, U</td></tr>
<tr><td>Payload System Integration</td><td>1</td><td>T, U</td></tr>
<tr><td>PCB design practice</td><td>1</td><td>T, U</td></tr>
<tr><td>System test in practice: ADCS: Earth pointing, Mission Scenarios planning, Payload operation: Image capture, Data transmission: S-band transmitting, Data post processing</td><td>4</td><td>T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Project, report.</td></tr>
</table>

Study and examination requirements	*Attendance:* A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. *Assignments/Examination:* Students must have more than 50/100 points overall to pass this course.
Reading list	Textbooks: [1] *MicroSatKit Manual or equivalent satellite kit for laboratory*. References: [2] INCOSE Systems Engineering Handbook. *A Guide for System Life Cycle Processes and Activities*. [3] Wertz, J. R., Everett, D. F., & Puschell, J. J. (2011). *Space mission engineer The new SMAD*. Hawthorne, CA: Microcosm Press. [4] *Charles D. Brown: Elements of spacecraft design*, AIAA, 2002. [5] Development of MicroDragon, *the First Vietnamese Micro-Satellite*, 30th International Symposium on Space Technology and Science (ISTS), Kobe, Japan, 2015.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1			x							
2					x					
3						x				
4										x

ILO3. Apply knowledge and skills of digital signal processing for analyzing satellite communication signals.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO6. Work effectively in a team in space engineering and interdisciplinary areas.
ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society.

3. Planned learning activities and teaching methods

I: Introduce; T: Teach; U: Utilize

Part A: Theory section

Week	Topic	CLO	Learning activities	Resources	Teaching level (I, T, U)
1	An introduction of satellite system design, verification and validation process	CLO1, CLO2	Lecture Discussion	[1]	I, T

2	An introduction to PCB design process	CLO1, CLO2 CLO3, CLO4	Lecture Discussion	[1]	I, T
3+4	Function Test in practice: Electrical Power Unit, On-board computer, signal transmission	CLO1, CLO2 CLO3, CLO4	Lecture Discussion	[1]	I, T
5	An introduction to Functions Test Process and system integration design process	CLO1, CLO2 CLO3, CLO4	Lecture Discussion	[1]	I, T

Part B: Practical section

Week	Topic	CLO	Learning activities	Resources	Teaching level (I, T, U)
6+7	Bus System Integration: Onboard Computer, Signal Transmitter and Power Supply Unit.	CLO1, CLO2 CLO3, CLO4	Group work Discussion	[1]	T, U
8+9	Bus System Integration: ADCS components	CLO1, CLO2 CLO3, CLO4	Group work Discussion	[1]	T, U
	Break				
10	Payload System Integration	CLO1, CLO2 CLO3, CLO4	Group work Discussion	[1]	T, U
11	PCB design practice	CLO1, CLO2 CLO3, CLO4	Group work Discussion	[1]	T, U
12-15	System test in practice: ADCS: Earth pointing, Mission Scenarios planning, Payload operation: Image capture, Data transmission: S-band transmitting, Data post processing	CLO1, CLO2 CLO3, CLO4	Group work Discussion	[1]	T, U
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (10%)				
Performance/Quiz (15%)	As1 60%Pass	As2 60%Pass	As1 60%Pass	As2 60%Pass
Practice report (35%)	Report 60%Pass	Report 60%Pass	Report 60%Pass	Report 60%Pass
Final project (40%)	Part I 60%Pass	Part II. 1 60%Pass	Part II.2 60%Pass	Part III 60%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: December 10, 2023

Ho Chi Minh City, 15/12/2023
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

ANTENNA AND MICROWAVE ENGINEERING

Course Code: **EE105IU**

1. General information

Course title	ANTENNA AND MICROWAVE ENGINEERING *(Kỹ thuật vi sóng và ăng ten)*
Course designation	*The course provides students with the understanding of radiation fundamentals, linear antennas, point source arrays, aperture antennas, antenna impedance, and antenna systems. Basic concepts of microware engineering such as transmission lines, Smith plot, microwave circuits, analysis techniques, design and applications.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	M.Eng Trần Văn Sư
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, assignment.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: General Physics 2 (PH021IU)
Course objectives	This course will provide students with: ● The principles of antenna radiation and radiation characteristics (input impedance, gain, half power beam width, and radiation power…). ● The specific antennas such as: dipoles, loop, parabolic antennas. ● Analyzing the antenna arrays, RF filters and amplifiers ● Design topics of microwave engineering such as transmission line, Smith chart, scattering matrix

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Collect in depth the principles of antenna radiation and radiation characteristics (input impedance, gain, half power beam width, and radiation power…).</td></tr>
<tr><td>Skill</td><td>CLO2. Analyze the specific antennas such as: dipoles, loop, parabolic antennas and the antenna arrays</td></tr>
<tr><td>Attitude</td><td>CLO3. Analyze and design topics of microwave engineering such as transmission line, Smith chart, scattering matrix</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction and a Historical Perspective</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Antenna radiation characteristics: Input impedance, efficiency, radiation power</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Antenna radiation characteristics: radiation patterns, wave polarization, half power beamwidth, gain, receiving antenna and antenna link.</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Current radiate field, Maxwell's Equations and Source-Field Relationships, Hertzian dipoles, small loop antennas.</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Finite length dipoles, line sources, ground planes and monopoles.</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Linear arrays, array factor.</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Broadside and endfire arrays. Planar arrays and pattern multiplication.</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Transmission line equations and properties. Standing Wave Patterns And VSWR. Introduction to Smith chart.</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Impedance matching techniques.</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Microwave engineering, scattering matrix.</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Low noise amplifier, power amplifier, Power divider, couplers, filters.</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Review</td><td>1</td><td></td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
</table>

Reading list	Textbook: [1] Class notes Reference: [2] C.A. Balanis, *Antenna Theory Analysis and Design*, John Wiley & Sons, 1997

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1			x							
2										
3										

ILO3. Apply knowledge and skills of digital signal processing for analyzing satellite communication signals.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities
1	Introduction and a Historical Perspective	1-3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
2-3	Antenna radiation characteristics: Input impedance, efficiency, radiation power	1-3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
4	Antenna radiation characteristics: radiation patterns, wave polarization, half power beamwidth, gain, receiving antenna and antenna link.	1-3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
5	Current radiate field, Maxwell's Equations and Source-Field Relationships, Hertzian dipoles, small loop antennas.	1-3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
6	Finite length dipoles, line sources, ground planes and monopoles.	1-3	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
7	Linear arrays, array factor.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
8, 9	Broadside and endfire arrays. Planar arrays and pattern multiplication.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
	MIDTERM EXAM			
10	Transmission line equations and properties. Standing Wave Patterns And VSWR. Introduction to Smith chart.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz

11-12	Impedance matching techniques.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
13	Microwave engineering, scattering matrix.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
14	Low noise amplifier, power amplifier, Power divider, couplers, filters.	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
15	Review	1-3	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
	FINAL EXAM			

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
In-class exercises/ quizzes (10%)	Qz1->Qz4 80% Pass	Qz5->Qz8 80%Pass	Qz1->Qz4 80% Pass
Homework exercises (20%)	HW1->H3 70% Pass	HW4, HW5 70%	HW1->HW3 70% Pass
Midterm exam (30%)	Q1, Q2 80% Pass	Q1, Q2 80% Pass	Q3, Q4 70% Pass
Final exam (40%)	Q3, Q4 70%Pass	Q1, Q2 80%Pass	Q3, Q4 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Rubrics (optional)

6. Date revised: January 12, 2022

ANTENNA AND MICROWAVE ENGINEERING LABORATORY

Course Code: **EE124IU**

1. General information

Course title	ANTENNA AND MICROWAVE ENGINEERING LABORATORY *(Thực hành Kỹ thuật vi sóng và ăng ten)*
Course designation	*Antenna & Microwave Engineering Practical Workbook covers a variety of experiments that are designed to aid students in their profession and theory. They include a variety of topics which include antennas, transmission lines and microwave waveguides. A practical exposure to such equipment is necessary as it builds on the theory taught to students.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	M.Eng Trần Văn Sư
Language	English
Relation to curriculum	Compulsory
Teaching methods	Experiment, writing report
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credits/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Antenna and Microwave Engineering (EE105IU)
Course objectives	This course will provide students with: ● Simulation software to design antennas. ● The radiation characteristics of antennas (input impedance, gain, half power beam width, and radiation power, polarization). ● Measuring and recording the experimental data, analyze the results, and prepare a formal laboratory report. ● Design topics of microwave engineering such as transmission line, Smith chart, scattering matrix

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Use simulation software to design antennas</td></tr>
<tr><td>Skill</td><td>CLO2. Define and analyze the radiation characteristics of antennas (input impedance, gain, half power beam width, and radiation power, polarization...).
CLO3. Measure and record the experimental data, analyze the results, and prepare a formal laboratory report.
CLO4. Explain to colleagues, through both written and verbal presentations, technical materials as presented in this course</td></tr>
<tr><td>Attitude</td><td>CLO5. Analyze and design topics of microwave engineering such as transmission line, Smith chart, scattering matrix</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: laboratory session (4 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Dipole antenna simulation using HFSS</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Patch antenna simulation using HFSS</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Experimentation with Pyramidal horn and Helical antennas</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Standing Wave & SWR Measurements.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Transmission lines</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Matching and transformation network.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Introduction to RF Anechoic chamber and Network analyzer equipment</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Review</td><td>1</td><td>T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Experiment, writing report</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbook:
[1] Class notes
[2] Laboratory Manual supplied by the instructor.
Reference:
[3] Antenna Fundamentals – Lab-Volt's Document.
[4] Microwave Fundamentals – Lab-Volt's Document.</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1										
2										
3					x					
4										
5										

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.

3. Planned learning activities and teaching methods

Week	Topic	CLO	Assessments	Learning activities
5	Dipole antenna simulation using HFSS	1-5	Do exercise Lab report	Lecture, Discussion, Do exercise
6	Patch antenna simulation using HFSS	1-5	Do exercise Lab report	Lecture, Discussion, Do exercise
7	Experimentation with Pyramidal horn and Helical antennas	1-5	Do exercise Lab report	Lecture, Discussion, Do exercise
8	Standing Wave & SWR Measurements.	1-5	Do exercise Lab report	Lecture, Discussion, Do exercise
9	Transmission lines	1-5	Do exercise Lab report	Lecture, Discussion, Do exercise
10	Matching and transformation network.	1-5	Do exercise Lab report	Lecture, Discussion, Do exercise
11	Introduction to RF Anechoic chamber and Network analyzer equipment	1-5	Do exercise Lab report	Lecture, Discussion, Do exercise
12	Review	1-5		

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Lab report (30%)	Rp1->Rp4 80% Pass	Rp5->Rp8 80%Pass	Rp1->Rp4 80% Pass

Lab participation (40%)			
Final exam (30%)	Q3, Q4 70%Pass	Q1, Q2 80%Pass	Q3, Q4 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

FUNDAMENTAL OF SURVEYING

Course Code: **PH045IU**

1. General information

Course title	FUNDAMENTAL OF SURVEYING (*Trắc địa đại cương*)
Course designation	*This subject is related to some definitions of the Earth's shapes and coordinate systems and is also related to an introduction to measurement equipment, such as theodolite, level, etc. Moreover, it presents ways to conduct basic measurements and methods for estimating the accuracy of measured results. Besides, the course represents the procedures for creating coordinate and leveling traverses in creating topographic maps.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Đình Hùng/MSc. Angeli Calbatica
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, lesson, practice, report.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 140 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25, laboratory: 25 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits (2 theory and 1 practice)/5.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Calculus 2 (MA003IU)
Course objectives	Students will be provided with: ● Knowledge about shapes of the Earth, Earth coordinate systems, and measurement equipment. ● Basic measurements and methods for estimating the accuracy of measured results in surveying. ● An awareness of the legal issues and responsibilities of engineering practice and commitment to professional ethics and responsibilities, and the norms of engineering practice.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1: Apply knowledge of the Earth’s shape, the Earth’s coordinate systems, and surveying methods to obtain high accuracy measurements.</td></tr>
<tr><td>Skill</td><td>CLO2: Practice basic measurements in surveying such as distance, angle, and leveling and traverse with appropriate surveying devices.</td></tr>
<tr><td>Attitude</td><td>CLO3. Show the impact of modern surveying devices and technical solutions for sustainable community planning and development.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level. Weight: lecture and laboratory session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Introduction to Surveying</td><td>1</td><td>I, T</td></tr>
<tr><td>Chapter 2: Basic definitions in Surveying
Shape of the earth, coordinate systems</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 3: Basic measurements in Surveying
Principles for angle measurement, measurement equipment: theodolite, level
Distance measurement
Angle measurement: horizontal angle and vertical angle
Leveling: differential leveling, benchmarks & turning points, trigonometric leveling</td><td>3</td><td>T, U</td></tr>
<tr><td>Chapter 4: Errors in Surveying
Error classification
Accuracy estimation for results of direct measurement
Accuracy estimation for results of indirect measurement</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 5: Azimuth, first and second geodetic problems</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 6: Traverse
Coordinate traverse
Leveling traverse</td><td>2</td><td>T, U</td></tr>
<tr><td>Part B: Practical section
Introduction to theodolite and level and how to use this equipment</td><td>1.25</td><td>T, U</td></tr>
<tr><td>Measuring differential leveling</td><td>1.25</td><td>T, U</td></tr>
<tr><td>Checking accuracy of theodolite</td><td>1.25</td><td>T, U</td></tr>
<tr><td>Benchmarks and turning points</td><td>1.25</td><td>T, U</td></tr>
<tr><td>Distance measurement</td><td>1.25</td><td>T, U</td></tr>
<tr><td>Angle measurement
Area measurement</td><td>1.25</td><td>T, U</td></tr>
<tr><td>Trigonometric leveling</td><td>1.25</td><td>T, U</td></tr>
<tr><td>Creating a simple traverse</td><td>1.25</td><td>U</td></tr>
</table></td></tr>
</table>

Examination forms	Written examination
Study and examination requirements	*Attendance:* A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. *Assignments/Examination:* Students must have more than 50/100 points overall to pass this course.
Reading list	Textbooks: [1] Tom Mastin Barry Kavanagh. (2014). *Surveying: Principles and Applications*, 9th Edition, Pearson India. References: [2] Barry Kavanagh, Diane Slattery. (2013). *Surveying with Construction Applications*, 8th Edition, Pearson India. [3] Wesley G. Crawford. (2002). *Construction Surveying and Layout: A Step-By-Step Field Engineering Methods Manual*, 3rd Edition

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3										x

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society.

3. Planned learning activities and teaching methods

Part A: Theory section

Note:
As: Assignment; Midterm: Mid; Final: Fin

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Chapter 1: Introduction to Surveying	1, 2	Mid	Lecture, Discussion	
2	Chapter 2: Basic definitions in Surveying Shape of the earth, coordinate systems	1-3	Mid	Lecture, Discussion	Chapter 1 [1]

3-5	Chapter 3: Basic measurements in Surveying Principles for angle measurement, measurement equipment: theodolite, level Distance measurement Angle measurement: horizontal angle and vertical angle Leveling: differential levelling, benchmarks & turning points, trigonometric leveling	1-3	Mid	Lecture, Practice Discussion	Chapter 2, 3 [1]
6-7	Chapter 4: Errors in Surveying Error classification Accuracy estimation for results of direct measurement Accuracy estimation for results of indirect measurement	1-3	Fin	Lecture, Practice Discussion	Chapter 2 [1]
8	Chapter 5: Azimuth, first and second geodetic problems	1-3	Fin	Lecture, Practice Discussion	Chapter 4 [1]
	MIDTERM EXAM				
9-10	Chapter 6: Traverse Coordinate traverse Leveling traverse	1-3	Fin	Lecture, Practice Discussion	Chapter 6 [1]
	FINAL EXAM				

B: Practical section

Week	**Topic**	**CLO**	**Assessments**	**Learning activities**	**Resources**
8	Part B: Practical section Introduction to theodolite and level and how to use this equipment	1-3	Report	Lecture, Group work	Chapter 5 [1]
9	Measuring differential leveling	1-3	Report	Lecture, Group work	Chapter 3 [1]
10	Checking accuracy of theodolite	1-3	Report	Lecture, Group work	Chapter 5 [1]
11	Benchmarks and turning points	1-3	Report	Lecture, Group work	Chapter 3 [1]
	Break				
12	Distance measurement	1-3	Report	Lecture, Group work	Chapter 2 [1]
13	Angle measurement Area measurement	1-3	Report	Lecture, Group work	Chapter 2 [1]

14	Trigonometric leveling	1-3	Report	Lecture, Group work	Chapter 3 [1]
15	Creating a simple traverse	1-3	Report	Lecture, Group work	Chapter 6 [1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance and activity in class (10%)			
Homework (10%)	HW1, 2 and 4	HW3 and 5	HW1, 2, 3, 4, 5
Practice (30%)	Report 50%Pass	Report 50%Pass	Report 50%Pass
Midterm exam (20%)	Q1 50%Pass	Q2 50%Pass	Q1&Q2 50%Pass
Final exam (30%)	Q1(a) 50%Pass	Q1(b) 50%Pass	Q1 50%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2023

Ho Chi Minh City, 21/01/2023
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

GEOGRAPHIC INFORMATION SYSTEM (GIS) AND SPATIAL ANALYSIS

Course Code: **PH046IU**

1. General information

Course title	GEOGRAPHIC INFORMATION SYSTEM (GIS) AND SPATIAL ANALYSIS (*Hệ thống thông tin địa lý (GIS) và phân tích không gian*)
Course designation	*This course will focus on the concepts and techniques of GIS. Students will be familiar with data models and structures, database management and spatial analysis and modeling.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Phan Hiền Vũ
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, lesson, homework.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 140 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 25, laboratory: 25 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits (2 theory and 1 practice)/5.09 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Calculus 2 (MA003IU)
Course objectives	This course will provide students with: ● The computer-based GIS concepts and techniques, data models and structures, database management, and spatial analysis. ● Hand on skills to analyze and interpret geospatial data with QGIS software. ● Basic foundations to manipulate and visualize the Earth surface and natural phenomena.
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

<table>
<tr><td></td><td>
<table>
<tr><td>Knowledge</td><td>CLO1. Design geospatial data structure for management information systems.</td></tr>
<tr><td>Skill</td><td>CLO2. Analyze geospatial data using QGIS tools</td></tr>
<tr><td>Attitude</td><td>CLO3. Show an understanding of the role and responsibility of an engineer in fields related to geospatial data.
CLO4. Show abilities of further self-learning and long-life learning.</td></tr>
</table>
</td></tr>
<tr><td>Content</td><td>
The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Introduction to Geographic Information Systems (GIS)</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 2: Maps and Geospatial Data</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 3: Digital Representation and Organization of Geospatial Data</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 4: Geospatial Data Quality and Standards</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 5: Raster Geo-processing</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 6: Vector Geo-processing</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 7: Geo-visualization and Geospatial Information Products</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 8: Digital Terrain Modeling, Management of Imagery and Elevation Data</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 9: Spatial Data Analysis, Modeling and Mining</td><td>3</td><td>T, U</td></tr>
<tr><td>Chapter 10: Remote Sensing and GIS Integration</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 11: GIS Implementation and Project Management</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 12: GIS Issues and Prospects</td><td>1</td><td>T</td></tr>
</table>
</td></tr>
<tr><td>Examination forms</td><td>Written examination, project, report.</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
<tr><td>Reading list</td><td>Textbooks:
[1] Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind. Geographic Information Science and Systems, 4th Edition, Wiley, 2015.
References:
[2] Keith C. Clarke, Getting Started with Geographic Information Systems, Prentice Hall, 1999.
[3] Yue-Hong Chou, Exploring Spatial analysis in Geographic Information Systems, On Word Press, 1997.</td></tr>
</table>

	[4] Aronoff, S., *Geographic Information Systems: A Management Perspective*, WDL Publications, Ottawa, 1991. [5] Bernhardsen, T., *Geographic Information Systems: An Introduction*, John Wiley and Sons, New York, 2002. [6] Bolstad, P., *GIS Fundamentals, A First Text on Geographic Information Systems*, Eider Press, White Bear Lake, Minnesota, 2005. [7] Chang, K., *Introduction to Geographic Information Systems,* McGraw Hill Higher Education, 2008. Software: QGIS

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3								x		
4									x	

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications
ILO8. Show an understanding of the role and responsibility of an engineer in society
ILO9. Show abilities of further self-learning and lifelong learning

3. Planned learning activities and teaching methods

Note:
As: Assignment; Midterm: Mid; Final: Fin; Homework: HW

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Chapter 1: Introduction to Geographic Information Systems	1, 3	Mid	Lecture, Discussion	Chapter 1 [1]
2	Chapter 2: Maps and Geospatial Data	1-3	HW1, Mid	Lecture, Discussion	Chapter 1 [1]
3	Chapter 3: Digital Representation and Organization of Geospatial Data	1-3	Mid	Lecture, Discussion	Chapter 3 [1]
4	Chapter 4: Geospatial Data Quality and Standards	1-3	Mid	Lecture, Discussion	Chapter 2 [1]
5	Chapter 5: Raster Geo-processing	1-3	HW 2 Mid	Lecture, Discussion	Chapter 3 [1]
6	Chapter 6: Vector Geo-processing	1-3	HW 3 Mid	Lecture, Discussion	Chapter 3 [1]
7-8	Chapter 7: Geo-visualization and Geospatial Information Products	1-3	HW 4 Mid	Lecture, Discussion	Chapter 12 [1]
	MIDTERM EXAM				

9	Chapter 8: Digital Terrain Modeling, Management of Imagery and Elevation Data	1-3	HW 5 Fin	Lecture, Discussion	Chapter 15 [1]
10-11	Chapter 9: Spatial Data Analysis, modeling and mining - Layer operations - Point pattern - Interpolation - Network analysis	1-3	HW 6, 7, 8 Fin	Lecture, Discussion	Chapter 13 [1]
12-13	Chapter 10: Remote Sensing and GIS Integration	1-3	Fin	Lecture, Discussion	Chapter 15 [1]
14	Chapter 11: GIS Implementation and Project Management	1-3	Fin	Lecture, Discussion	Chapter 15 [1]
15	Chapter 12: GIS Issues and Prospects	1-3	Fin	Lecture, Discussion	Chapter 16 [1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Homework (30%)	HW2, HW3, HW6, HW7, HW8 70%Pass	HW1, HW4, HW5 70%Pass	HW1, HW2, HW3, HW4, HW5 70%Pass	HW1, HW2, HW3, HW4, HW5 70%Pass
Midterm exam (30%)	Q1 70%Pass	Q2 70%Pass	Q3 70%Pass	Q4 70%Pass
Final exam (40%)	Q1 70%Pass	Q2 70%Pass	Q3 70%Pass	Q4 70%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022

CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

EMERGING ENGINEERING TECHNOLOGIES

Course code: **EE133IU**

1. General Information

Course title	EMERGING ENGINEERING TECHNOLOGIES (*Công nghệ kỹ thuật mới nổi*)
Course designation	*This course will explore current breakthrough technologies and disruptive innovations that have recently emerged in the past few years. A close examination of the technology will be conducted to understand the application using the new technologies. The class is a series of seminars on each of the emerging technologies.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Nguyễn Đình Uyên
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, lesson, homework.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	None
Course objectives	This course will provide students with: ● the depth of students' knowledge in new and recently emerged technologies. ● the introduction into the applications for the emerging technologies.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Provide the depth of students' knowledge in a new and recently emerged technologies
CLO2. Provide the introduction into the applications for the emerging technologies</td></tr>
<tr><td>Skill</td><td>CLO3. To apply the new and emerging technology in an application</td></tr>
<tr><td>Attitude</td><td></td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Humanoid Robot.</td><td>1</td><td>I, T</td></tr>
<tr><td>Drone Technology</td><td>1</td><td>I, T</td></tr>
<tr><td>Artificial Intelligent Control System</td><td>1</td><td>I, T</td></tr>
<tr><td>Microsoft Azure Cloud Computing Platform</td><td>1</td><td>I, T</td></tr>
<tr><td>Hyperspectral Imaging</td><td>1</td><td>I, T</td></tr>
<tr><td>3D printing technology</td><td>1</td><td>I, T</td></tr>
<tr><td>Nano Technology</td><td>1</td><td>I, T</td></tr>
<tr><td>IOT platforms</td><td>1</td><td>I, T</td></tr>
<tr><td>5G communication system</td><td>1</td><td>I, T</td></tr>
<tr><td>Blockchain applications</td><td>1</td><td>I, T</td></tr>
<tr><td>Virtual Reality</td><td>1</td><td>I, T</td></tr>
<tr><td>Sustainable engineering</td><td>1</td><td>I, T</td></tr>
<tr><td>Environmental Ethics</td><td>1</td><td>I, T</td></tr>
<tr><td>Lifelong Learning Competencies</td><td>1</td><td>I, T</td></tr>
<tr><td>Case Studies</td><td>1</td><td>I, T</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Assignments: All assignments need to be submitted on the due date. Otherwise, a penalty of 20% per day can be considered for each assignment.
Policy on dishonesty: Students are expected to do their own work at all times. Any evidence of plagiarism or cheating will be treated as grounds for failure in the class.
Grading: The overall course grades will be assigned based on required standard or overall class distribution. The weights of the assignments and the examinations are:
- 30% for participation, attendance, Quiz, HW, project, and presentation
- 30% for midterm examination
- 40% for final examination</td></tr>
</table>

Reading list	Textbooks:

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3								x		
4									x	

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications

ILO8. Show an understanding of the role and responsibility of an engineer in society

ILO9. Show abilities of further self-learning and lifelong learning

3. Planned learning activities and teaching methods

Note:

As: Assignment; Midterm: Mid; Final: Fin; Homework: HW

Week	Content	Learning outcome	Teaching and learning activities	Assessment
1	Humanoid Robot.	1, 2, 3	-Lecture -Class discussion	Homework In class assignment
2	Drone Technology	1, 2, 3	- Lecture - Class discussion	Homework In class assignment
3	Artificial Intelligent Control System	1, 2, 3	- Lecture - Class discussion	Quiz 1 Homework In class assignment
4	Microsoft Azure Cloud Computing Platform	1, 2, 3	- Lecture - Class discussion	Project 1 Homework In class assignment
5	Hyperspectral Imaging	1, 2, 3	- Lecture - Class discussion	Quiz 2 Homework In class assignment
6	3D printing technology	1, 2, 3	- Lecture - Class discussion	Homework In class assignment
7	Nano Technology	1, 2, 3	- Lecture - Class discussion	Homework In class assignment
MIDTERM EXAM				
8	IOT platforms	1, 2, 3	- Lecture - Class discussion	Project 2 Homework

				In class assignment
9	5G communication system	1, 2, 3	- Lecture - Class discussion	Homework In class assignment
10	Blockchain applications	1, 2, 3	- Lecture - Class discussion	Quiz 3 Homework In class assignment
11	Virtual Reality	1, 2, 3	- Lecture - Class discussion	Homework In class assignment
12	Sustainable engineering	1, 2, 3	- Lecture - Class discussion	Homework In class assignment
13	Environmental Ethics	1, 2, 3	- Lecture - Class discussion	Homework In class assignment
14	Lifelong Learning Competencies	1, 2, 3	- Lecture - Class discussion	Homework In class assignment
15	Case Studies	1, 2, 3	- Lecture -Class discussion	Quiz 4 Homework In class assignment
FINAL EXAM				

4. Assessment plan

Assessment component (1)	Assessment (A.x.x) (2)	Learning Outcome (3)	Percentage % (4)
A1. Process assessment	A1.1Quiz	1, 2, 3	10%
	A1.2 Homework	1, 2, 3	10%
A2. Midterm assessment	A2.1 Mid-term Exam	1, 2, 3	30%
	A2.2 Seminar(s) & Quiz	1, 2, 3	10%
A3. Final assessment	A3.1 Final exam	1, 2, 3	40%

5. Date revised: 2022

RADIO ASTROPHYSICS

Course Code: **PH048IU**

1. General information

Course title	RADIO ASTROPHYSICS *(Vật lý thiên văn vô tuyến)*
Course designation	*The purpose of this course is to broaden students' knowledge in space science, to clearly understand how to use antennas in doing research in Astrophysics.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Assoc. Prof. Phan Bảo Ngọc
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, assignment, homework
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Antenna and microwave engineering (EE105IU), Antenna and microwave engineering laboratory (EE124IU)
Course objectives	This course will provide students with: ● Knowledge in space science, to clearly understand how to use antennas in doing research in Astrophysics ● Hands-on skills on analyzing real signals and images of objects in space through the Earth atmospheres
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Apply knowledge of antenna theory in designing radio antennas for science purposes
Skill	CLO2. Analyze signals and images of objects in space based on hands-on skills
Attitude	CLO3. Show abilities of further self-learning and long-life learning.

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (3 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize) <table><tr><td>Topic</td><td>Weight</td><td>Level</td></tr><tr><td>Chapter 1 An introduction to radio astrophysics</td><td>1</td><td>I, T</td></tr><tr><td>Chapter 2 Basic radiative transfer</td><td>2</td><td>T</td></tr><tr><td>Chapter 3 Blackbody radiation and radiation from an accelerated charge</td><td>2</td><td>T, U</td></tr><tr><td>Chapter 4 Radio telescopes, receivers, and interferometers</td><td>2</td><td>T, U</td></tr><tr><td>Chapter 5 Thermal continuum sources</td><td>2</td><td>T, U</td></tr><tr><td>Chapter 6 Non-thermal continuum sources</td><td>2</td><td>T, U</td></tr><tr><td>Chapter 7 Pulsars</td><td>2</td><td>T, U</td></tr><tr><td>Chapter 8 Spectral-line sources</td><td>2</td><td>T, U</td></tr></table>
Examination forms	Written Examination
Study and examination requirements	*Attendance:* A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. *Assignments/Examination:* Students must have more than 50/100 points overall to pass this course.
Reading list	[1] *Tools of Radio Astronomy*, T. L. Wilson, K. Rohlfs, S. Huttemeister, 5th Edition, Springer

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1		x								
2					x					
3									x	

ILO2. Apply knowledge of physics and space science for solving problems in satellite technology applications

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.

ILO9. Show abilities of further self-learning and lifelong learning

3. Planned learning activities and teaching methods

I: Introduce; T: Teach; U: Utilize

Week	**Topic**	**CLO**	**Learning activities**	**Teaching level (I, T, U)**	**Resources**
1	Chapter 1 An introduction to radio astrophysics	1, 2, 3	Lecture Discussion	I, T	[1]
2-3	Chapter 2 Basic radiative transfer	1, 2, 3	Lecture Discussion	I, T	[1]

4-5	Chapter 3 Blackbody radiation and radiation from an accelerated charge	1, 2, 3	Lecture Discussion	T, U	[1]
6-7	Chapter 4 Radio telescopes, receivers, and interferometers	1, 2, 3	Lecture Discussion	T, U	[1]
	MIDTERM EXAM				
8-9	Chapter 5 Thermal continuum sources	1, 2, 3	Lecture Discussion	T, U	[1]
10-11	Chapter 6 Nonthermal continuum sources	1, 2, 3	Lecture Discussion	T, U	[1]
12-13	Chapter 7 Pulsars	1, 2, 3	Lecture Discussion	T, U	[1]
14-15	Chapter 8 Spectral-line sources	1, 2, 3	Lecture Discussion	T, U	[1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (10%)			
Assignment (20%)	As. Q1 60%Pass	As. Q2 60%Pass	As. Q3 60%Pass
Midterm exam (30%)	Q1 60%Pass	Q2 60%Pass	Q3 60%Pass
Final project (40%)	Part I 60%Pass	Part II. 1 60%Pass	Part II.2 60%Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

ADVANCED REMOTE SENSING

Course Code: **PH049IU**

1. General information

Course title	ADVANCED REMOTE SENSING (*Viễn thám nâng cao*)
Course designation	*This course provides knowledge and skills of digital image processing for extracting environmental information from satellite and airborne imaging systems. Applications of pre-processing, enhancement, classification, and modeling image processing routines are for environmental monitoring, modeling, and management, and applicable for biological, terrestrial, atmospheric, and oceanic sciences.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Phan Hiền Vũ
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, lesson, project.
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 127.5 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5 Private study including examination preparation, specified in hours: 90
Credit points/ECTS	3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Previous course: Remote sensing (PH036IU), Introduction to Digital Image Processing (PH038IU)
Course objectives	This course will provide students with: ● Advanced theories of remote sensed image processing with radiometric calibration, atmospheric correction, construction, conversion, and classification. ● A variety of hands-on techniques and practical skills to complete the imaging data acquisition and process such as importing, displaying, and analyzing multi/hyper-spectral and synthetic-aperture-radar (SAR) images. ● An awareness of the impact of emerging remote sensing techniques in contemporary society and environmental issues.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Develop applications of remote sensing in natural disasters and environmental pollution.</td></tr>
<tr><td>Skill</td><td>CLO2. Experiment remotely sensed data for monitoring natural hazards and environment, such as drought, flooding, sea level rise, air pollution, urban expansion, etc.</td></tr>
<tr><td>Attitude</td><td>CLO3. Show the impact of remote sensing techniques for disaster risk and environmental management, and sustainable development.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture session (3 periods)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1 Remote sensing and digital image processing</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 2 Remote sensing data collection</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 3 Digital image processing hardware and software</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 4 Image Quality Assessment and Statistical Evaluation</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 5 Display Alternatives and Scientific Visualization</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 6 Electromagnetic Radiation Principles and Radiometric Correction</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 7 Geometric Correction</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 8 Image Enhancement</td><td>1</td><td>T, U</td></tr>
<tr><td>Chapter 9 Thematic Information Extraction: Pattern Recognition</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 10 Information Extraction Using Artificial Intelligence</td><td>1</td><td>T</td></tr>
<tr><td>Chapter 11 Change Detection</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 12 Remote Sensing–Derived Thematic Map Accuracy</td><td>2</td><td>T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written examination</td></tr>
<tr><td>Study and examination requirements</td><td>Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged.
Assignments/Examination: Students must have more than 50/100 points overall to pass this course.</td></tr>
</table>

Reading list	Textbooks: [1] Jensen, J.R, *Introductory digital image processing: a remote sensing perspective*, 4th edition, Pearson, 2015. References: [2] Q. Weng, *Advances in environmental remote sensing: sensors, algorithms, and applications*, CRC Press (2011). [3] W.G. Rees, *Physical principles of remote sensing*, Cambridge University Press (2012).

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3										x

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology
ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications
ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society

3. Planned learning activities and teaching methods

Note:
As: Assignment; Midterm: Mid; Final: Fin; Homework: HW; Project: P

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Chapter 1 Remote sensing and digital image processing	1, 2, 3	P Mid	Lecture, Discussion Project introduction	Chapter 1, [1]
2	Chapter 2 Remote sensing data collection	1, 2, 3	P Mid	Lecture, Discussion	Chapter 2, [1]
3	Chapter 3 Digital image processing hardware and software	1, 2, 3	P Mid	Lecture, Discussion	Chapter 3, [1]
4	Chapter 4 Image Quality Assessment and Statistical Evaluation	1, 2, 3	P Mid	Lecture, Discussion	Chapter 4, [1]
5	Chapter 5 Display Alternatives and Scientific Visualization	1, 2, 3	HW 1 P Mid	Lecture, Discussion	Chapter 5, [1]

6	Chapter 6 Electromagnetic Radiation Principles and Radiometric Correction	1, 2, 3	P Mid	Lecture, Discussion	Chapter 6, [1]
7-8	Chapter 7 Geometric Correction	1, 2, 3	HW 2 P Mid	Lecture, Discussion Project presentation	Chapter 7, [1]
	MIDTERM EXAM				
9	Chapter 8 Image Enhancement	1, 2, 3	HW 3 P Fin	Lecture, Discussion	Chapter 8, [1]
10	Chapter 9 Thematic Information Extraction: Pattern Recognition	1, 2, 3	Fin	Lecture, Discussion	Chapter 9, [1]
11	Chapter 10 Information Extraction Using Artificial Intelligence	1, 2, 3	Fin	Lecture, Discussion	Chapter 10, [1]
12-13	Chapter 11 Change Detection	1, 2, 3	HW 4 P Fin	Lecture, Discussion	Chapter 11, [1]
14-15	Chapter 12 Remote Sensing–Derived Thematic Map Accuracy	1, 2, 3	Fin	Lecture, Discussion Project presentation	Chapter 12, [1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Homework (15%)	HW1, HW2, HW3, HW4 70% Pass	HW1, HW2, HW3, HW4 70% Pass	
Project (25%)	As. Q1 70% Pass	As. Q2 70% Pass	As. Q3 70% Pass
Midterm exam (30%)	Mid.Q1 %Pass 70%	Mid.Q2 %Pass 70%	Mid.Q3 %Pass 70%
Final exam (30%)	Fin.Q1 70% Pass	Fin.Q2 70% Pass	Fin.Q3 70% Pass

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022

CHAIR OF DEPARTMENT OF PHYSICS

(**Signed**)

Phan Bảo Ngọc

DATA STRUCTURES AND ALGORITHMS

Course Code: **IT013IU**

1. General information

<table>
<tr><td>Course name</td><td>DATA STRUCTURES AND ALGORITHMS (Cấu trúc dữ liệu và thuật toán)</td></tr>
<tr><td>Course designation</td><td>This subject introduces students to basic data structures and algorithms</td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1, 2</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Dương Trọng Hải, Dr. Trần Thanh Tùng</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Elective</td></tr>
<tr><td>Teaching methods</td><td>Lecture, lesson, project, seminar.</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td>(Estimated) Total workload: 182.5
Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5, laboratory: 25
Private study including examination preparation, specified in hours: 120</td></tr>
<tr><td>Credit points/ECTS</td><td>4 credits (3 theory and 1 practice)/6.64 ECTS (1 ECTS is equivalent to 27.5 hours)</td></tr>
<tr><td>Required and recommended prerequisites</td><td>Previous course: Object-Oriented Programming (IT069IU) or Programming for Engineers (EE057IU) & object-oriented programming with C++/Java</td></tr>
<tr><td>Course objectives</td><td>Introduction to data structures and algorithms, including their design, analysis, and implementation.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Understand basic data structures and algorithms</td></tr>
<tr><td>Skill</td><td>CLO2. Analyze and evaluate data structures and algorithms.
CLO3. Design algorithms and select data structures for real world applications.</td></tr>
<tr><td>Attitude</td><td>CLO3. Design algorithms and select data structures for real world applications.</td></tr>
</table></td></tr>
</table>

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture and laboratory sessions (3 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Review OOP & Java	1	I
Arrays	1	T
Complexity	1	T
Sorting	1	T, U
Queue, Stack	1	T
List	2	T
Recursion	1	T, U
Advanced Sorting	2	T
Binary Tree	1	T
Hash Table	1	T
Graphs	1	T
Algorithms on graphs	1	T, U
Review	1	I, T, U

Examination forms	Written Examination
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	[1]. Michael T. Goodrich and Roberto Tamassia, Data Structures and Algorithms in Java 6th, 2014 [2]. Cormen, Thomas H., et al. Introduction to algorithms. MIT press, 2009. [3]. Lafore, Robert. Data structures and algorithms in Java. Sams publishing, 2017.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2				x						
3										

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.

3. Planned learning activities and teaching methods

Note: As: Assignment; Qz: Quiz; Midterm: Mid; Final: Fin; Project: P; Labs: Laboratory

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Review OOP & Java	1	Quiz	Lecture	

2	Arrays	1	Lab, Quiz, Midterm	Lecture, Discussion, In class exercises	[1,3]
3	Complexity	2	Quiz	Lecture, Discussion	[2]
4	Sorting	1, 2	Lab, Quiz, Midterm	Lecture, Discussion, In class exercises	[1,3]
5	Queue, Stack	2, 3	Lab, Quiz, Midterm	Lecture, Discussion, In class exercises	[1,3]
6	List part 1	1, 2	Lab, Quiz, Midterm	Lecture, Discussion, In class exercises	[1,3]
7	List part 2	2, 3	Lab, Quiz, Midterm	Lecture, Discussion	
8	Recursion	2, 3	Lab, Quiz, Midterm	Lecture, Discussion, In class exercises	[1,3]
	MIDTERM EXAM				
9	Advanced Sorting part 1	1, 2	Lab, Quiz, Final	Lecture, Discussion, In class exercises	[1,3]
10	Advanced Sorting part 2	2, 3	Lab, Quiz, Final	Lecture, Discussion	[1,2,3]
11	Binary Tree	1, 2	Lab, Quiz, Final	Lecture, Discussion, In class exercises	[1,3]
12	Hash Table	1, 2	Lab, Quiz, Final	Lecture, Discussion, In class exercises	[1,3]
13	Graphs	1, 2	Lab, Quiz, Final	Lecture, Discussion, In class exercises	[2,3]
14	Algorithms on graphs	2, 3	Lab, Quiz, Final	Lecture, Discussion	[2,3]
15	Review				
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Quiz (5%)	20%	5%	
Labs (10%)	10%		
Midterm examination (30%)	40%	30%	30%
Projects/Presentations/Report (15%)	15%	40%	
Final examination (40%)	40%	40%	30%

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Date revised: 15/02/2022

ANALYTICS FOR OBSERVATIONAL DATA

Course Code: **IT142IU**

1. General information

<table>
<tr><td>Course name</td><td>ANALYTICS FOR OBSERVATIONAL DATA (Phân tích dữ liệu quan sát)</td></tr>
<tr><td>Course designation</td><td>This subject explains the principles and practice of modelling and analysing observational data, with an emphasis on practical applications.</td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1, 2</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Nguyễn Thị Thanh Sang</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Elective</td></tr>
<tr><td>Teaching methods</td><td>Lecture, lesson, lab, seminar.</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td>(Estimated) Total workload: 182.5
Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5, laboratory: 25
Private study including examination preparation, specified in hours: 120</td></tr>
<tr><td>Credit points/ECTS</td><td>4 credits (3 theory and 1 practice)/6.64 ECTS (1 ECTS is equivalent to 27.5 hours)</td></tr>
<tr><td>Required and recommended prerequisites</td><td>Previous course: Fundamentals of Programming (IT149IU) or Programming for Engineers (EE057IU)</td></tr>
<tr><td>Course objectives</td><td>Students will be provided with the core concepts of probability modelling and prediction. Probability models for various kinds of data are introduced, including models for counts of events, categorical values and waiting times. The main focus is on analysing several or many variables, including techniques, such as, correlation, discrimination, principal components, model selection, and classification methods.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Calculate probability distributions and fitting to experimental data including noise and systematics.</td></tr>
<tr><td>Skill</td><td>CLO2. Apply Bayesian analysis in observational data.</td></tr>
</table></td></tr>
</table>

		CLO3. Analyze dynamical multi-scale time series in experiments.
	Attitude	CLO4. Aware of Monte-Carlo integration in observational data analysis.

Content

The description of the contents should clearly indicate the weighting of the content and the level.

Weight: lecture sessions (3 periods)

Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Introduction to observational data analysis	1	I, T, U
Probability distributions	2	I, T, U
Generating functions, moments, and central moments	2	I, T, U
Covariance and correlation matrices	3	I, T, U
Fitting and hypothesis testing	2	T, U
Bootstrap and Jackknife methods	2	I, T, U
Bayesian statistics	2	I, T, U
Monte-Carlo methods	3	I, T, U
Dealing with statistical and systematic uncertainties	1	I
Advanced and numerical methods	1	I, T

Examination forms	Written Examination
Study and examination requirements	Student responsibility: Students are expected to spend at least 8 hours per week self – studying. This time should be made up of reading, working on exercises and problems and group assignment. Attendance: Regular on-time attendance in this course is expected. It is compulsory that students attend at least 80% of the course to be eligible for the final examination. Missed tests: Students are not allowed to miss any of the tests (both on-going assessment and final test). There are very few exceptions. (Only with extremely reasonable excuses, e.g. certified paper from doctors, students may re-take the tests.)
Reading list	[1] Rosenbaum, Paul R., (2002) Observational Studies, Springer Series in Statistics, Springer-Verlag New York. [2] National Research Council. (2004). Measuring Racial Discrimination. Panel on Methods for Assessing Discrimination. Rebecca M. Blank, Marilyn Dabady, and Constance F. Citro, Editors. Committee on National Statistics, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press. [3] Vijay Gupta, Themistocles M. Rassias, P.N. Agrawal, Ana Maria Acu, (2018) Recent Advances in Constructive Approximation Theory, Springer Optimization and Its Applications, Springer International Publishing, ISBN 978-3-319-92165-5, DOI 10.1007/978-3-319-92165-5. [4] Massimiliano Bonamente, (2017) Statistics and Analysis of Scientific Data, Springer, New York, NY, https://doi.org/10.1007/978-1-4939-6572-4.

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	1	2	3	4	5	6	7	8	9	10
1				x						
2										
3										
4										

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.

3. Planned learning activities and teaching methods

Note: As: Assignment; Qz: Quiz; Midterm: Mid; Final: Fin; Project: P; Labs: Laboratory

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Introduction to observational data analysis	1, 2, 3, 4	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]. 7, [2]. 3
2	Probability distributions	1, 2, 3, 4	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[4]. 2, 7, 10. [5]. J
3-4	Generating functions, moments, and central moments	1, 2, 3, 4	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[3]. 1. [6]. C.3
5-6	Covariance and correlation matrices	1, 2, 3, 4	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[5]. C.3.3 [6]. C-3
7-8	Fitting and hypothesis testing	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[2]. 2 [4]. 7 [8]. 10
	MIDTERM EXAM				
9	Bootstrap and Jackknife methods	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[4]. C.14
10-11	Bayesian statistics	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[4]. 1.7

12	Monte-Carlo methods	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
13	Dealing with statistical and systematic uncertainties	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	
14	Advanced and numerical methods	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[6], [4]
15	Revision			Review-Test	
	FINAL EXAM				

Laboratory

Week	Lab
5-6	Lab1-2. Probability distributions
7-8	Lab3-4. Covariance and correlation
9	Lab5. Sampling and hypothesis testing
10	Lab6. Bootstrap and Jackknife methods
11	Lab7. Bayesian statistics
12	Lab8. Group presentation

Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Exercises/Quiz (10%)	70%	10%	10%	10%
Labs (20%)	50%	50%		
Midterm examination (30%)	100%			
Final examination (40%)	20%	60%	10%	10%

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

4. Date revised: 15/02/2022

DATA MINING

Course Code: **IT160IU**

1. General information

<table>
<tr><td>Course name</td><td>DATA MINING (Khai thác dữ liệu)</td></tr>
<tr><td>Course designation</td><td>This subject introduces the students to principles and algorithms of data mining, and requirements of a data mining process.</td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1, 2</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Nguyễn Thị Thanh Sang</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Elective</td></tr>
<tr><td>Teaching methods</td><td>Lecture, lesson, project, laboratory.</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td>(Estimated) Total workload: 182.5
Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5, laboratory: 25
Private study including examination preparation, specified in hours: 120</td></tr>
<tr><td>Credit points/ECTS</td><td>4 credits (3 theory and 1 practice)/6.64 ECTS (1 ECTS is equivalent to 27.5 hours)</td></tr>
<tr><td>Required and recommended prerequisites</td><td>Previous course: Object-Oriented Programming (IT069IU) or Programming for Engineers (EE057IU)</td></tr>
<tr><td>Course objectives</td><td>Students will study data mining concepts and algorithms to solve problems of knowledge discovery. Students can develop skills of using recent data mining software for solving practical problems, and gain experience of doing independent study and research.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1. Understand basic contents of data warehousing and data mining.
CLO2. Explain modern algorithms in the area of data mining and knowledge discovery.</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td><table><tr><td>Skill</td><td>CLO3. Apply data mining techniques to some case studies using existing datasets.</td></tr><tr><td>Attitude</td><td>CLO4. Work in a team to build a data mining process</td></tr></table></td></tr>
<tr><td>Content</td><td>The description of the contents should clearly indicate the weighting of the content and the level.
Weight: lecture and laboratory sessions (5 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction to Data Mining</td><td>1</td><td>I</td></tr>
<tr><td>Know your data</td><td>1</td><td>T, U</td></tr>
<tr><td>Data preprocessing</td><td>1</td><td>T, U</td></tr>
<tr><td>Data mining knowledge representation</td><td>1</td><td>T, U</td></tr>
<tr><td>Evaluating what's been learned</td><td>1</td><td>T</td></tr>
<tr><td>Data mining algorithms: Classification</td><td>2</td><td>T, U</td></tr>
<tr><td>Data mining to code</td><td>1</td><td>T, U</td></tr>
<tr><td>Mining Frequent Patterns, Association and Correlations: Basic Concept and Methods</td><td>2</td><td>T</td></tr>
<tr><td>Data mining algorithms: Clustering</td><td>2</td><td>T</td></tr>
<tr><td>Classification: Advanced Methods</td><td>1</td><td>I, T</td></tr>
<tr><td>Semantic data mining</td><td>1</td><td>I</td></tr>
<tr><td>Revision</td><td>1</td><td>I, T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written Examination</td></tr>
<tr><td>Study and examination requirements</td><td>Student responsibility: Students are expected to spend at least 8 hours per week self – studying. This time should be made up of reading, working on exercises and problems and group assignment.
Attendance: Regular on-time attendance in this course is expected. It is compulsory that students attend at least 80% of the course to be eligible for the final examination.
Missed tests: Students are not allowed to miss any of the tests (both on-going assessment and final test). There are very few exceptions. (Only with extremely reasonable excuses, e.g. certified paper from doctors, students may re-take the tests.)</td></tr>
<tr><td>Reading list</td><td>Textbook:
[1] Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufmann, 2011.
[2] Ian H. Witten, Eibe Frank and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Third Edition), Morgan Kaufmann, 2011.
Other supplemental materials
[3] A. Lawrynowicz, Semantic Data Mining: An Ontology-based Approach (Studies on the Semantic Web), IOS Press (April 15, 2017), ISBN-10 1614997454.</td></tr>
</table>

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-4) and Program/Student Learning Outcomes (PLO) (1-10) is shown in the following table:

	1	2	3	4	5	6	7	8	9	10
1				x						
2				x						
3										
4										

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.

3. Planned learning activities and teaching methods

Note: Ex: Exercise; Pro: Programming; Midterm: Mid; Final: Fin

Week	Topic	CLO	Assessments	Learning activities	Resources
1	Introduction to Data Mining	1		Lecture, Discussion	[1, 2]. Chapter 1
2	Know your data	1	Quiz.s2	Lecture, In-class quiz	[1]. Chapter 2
3	Data preprocessing	1, 4		Lecture, Discussion	[1]. Chapter 3
4	Data mining knowledge representation	1	Quiz.s4	Lecture, In-class quiz	[2]. Chapter 3; Reading [1]. Chapter 4 – Data Warehousing
5	Evaluating what's been learned	1	Quiz.s5	Lecture, In-class quiz	[2]. Chapter 5
6-7	Data mining algorithms: Classification	2, 3	Quiz.s6-7	Lecture, In-class quiz	[1]. Chapter 8; [2]. Chapter 4.3
8	Data mining to code	3		Lecture, Discussion	
	MIDTERM EXAM				
9-10	Mining Frequent Patterns, Association and Correlations: Basic Concept and Methods	2, 3, 4	Quiz.s10-11	Lecture, In-class quiz	[1]. Chapter 6; [2]. Chapter 4.5
11-12	Data mining algorithms: Clustering	2, 3, 4	Quiz.s12-13	Lecture, In-class quiz	[1]. Chapter 10; [2]. Chapter 4.8
13	Classification: Advanced Methods	2	Quiz.s14	Lecture, In-class quiz	[1]. Chapter 9
14	Semantic data mining	2		Lecture, Discussion	[3]

15	Revision			Review-test	
	FINAL EXAM				

4. Assessment plan

Assessment item	CLO1	CLO2	CLO3	CLO4
Labs (10%)			100%	10%
Programming (20%)			70%	30%
Midterm examination (30%)	50%	50%		
Final examination (40%)		40%	60%	

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Date revised: 15/02/2022

BUSINESS ANALYTICS WITH BIG DATA

Course Code: **PH068IU**

1. General information

<table>
<tr><td>Course name</td><td>BUSINESS ANALYTICS WITH BIG DATA (Phân tích kinh doanh với dữ liệu lớn)</td></tr>
<tr><td>Course designation</td><td>This course is an introduction to business analytics with various types of business analytics, types of data, data sources, understanding of big data and big data analytics and social media as well as social media analytics.</td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1</td></tr>
<tr><td>Person responsible for the course</td><td>Dr. Nguyễn Quang</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Elective</td></tr>
<tr><td>Teaching methods</td><td>Lecture.</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td>(Estimated) Total workload: 127.5
Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5
Private study including examination preparation, specified in hours: 90</td></tr>
<tr><td>Credit points/ECTS</td><td>3 credits/ 4.64 ECTS (1 ECTS is equivalent to 27.5 hours)</td></tr>
<tr><td>Required and recommended prerequisites</td><td>Previous course: Remote Sensing Utilizing Big Data Analytics (PH070IU)</td></tr>
<tr><td>Course objectives</td><td>This course will provide students with:
Big data concepts and big data tools
Insights of social media analytics in business success.
An awareness of the importance of business analytics to business.</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:<table><tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr><tr><td>Knowledge</td><td>CLO1. Describe big data concepts and big data tools</td></tr><tr><td>Skill</td><td>CLO2. Analyze social media data using big data tools and generate insights for business success.</td></tr></table></td></tr>
</table>

	Attitude	CLO3. Generalize the importance of business analytics to business.

Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: lecture session (3 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize)

Topic	Weight	Level
Introduction to Business Analytics	3	I, T, U
Principles of Big data and Big data tools	3	I, T, U
Data warehousing for business decision making	3	I, T, U
Data mining and business applications	3	I, T, U
Social media analytic – Text analysis and sentiment analysis	3	I, T, U

Examination forms	Written Examination/Project
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.
Reading list	Textbooks: [1] *Big Data and Business Analytics*, Edited by Jay Liebowitz, CPC Press, 201 References: [2] *Social Media Analytics: Effective Tools for Building, Interpreting, and Usi Metrics*, Marshall Sponder, Mc Graw Hill, 2012. [3] *Hadoop: The Definitive Guide*, 2nd edition, Tom White, 2011, O'Reilly. [4] *Big Data Analysis with Python: Combine Spark and Python to unlock the powers of parallel computing and machine learning*, Ivan Marin, Ankit Shukla, Sarang VK, 2019

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3									x	

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.

ILO9. Show abilities of further self-learning and lifelong learning

3. Planned learning activities and teaching methods

Week	Topic	CLO	Learning activities	Resources	Assessments
1 -3	Introduction to Business Analytics	CLO1 CLO2 CLO3	Lecture Discussion	[1]	Exercise/Quiz Midterm
4-6	Principles of Big data and Big data tools Big data elements Machine-learning techniques Introduction to sales data and provide insight into customer buying trends and preferences	CLO1 CLO2 CLO3	Lecture Discussion	[1]	Exercise/Quiz Midterm
7-9	Data warehousing for business decision making Introduction to Data Warehousing Introduction to ETL components and Scripting	CLO1 CLO2 CLO3	Lecture Discussion	[1]	Exercise/Quiz Midterm
10-12	Data mining and business applications	CLO1 CLO2 CLO3	Lecture Discussion	[1]	Exercise/Quiz Final exam
13-15	Social media analytic – Text analysis and sentiment analysis	CLO1 CLO2 CLO3	Lecture Discussion	[1]	Exercise/Quiz Final exam

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (10%)			
In – class exercises (20%)	Qz1-5 60%Pass	Qz1-5 60%Pass	Qz1-5 60%Pass
Midterm (30%)	Q1 60%Pass	Q2 60%Pass	Q3 60%Pass
Final exam (40%)	Part I 60%Pass	Part II. 1 60%Pass	Part II.2 60%Pass

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Date revised: July 15, 2023

Ho Chi Minh City, 31/07/2023

CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

BUSINESS ANALYTICS WITH BIG DATA LABORATORY

Course Code: **PH059IU**

1. General information

Course name	BUSINESS ANALYTICS WITH BIG DATA LABORATORY *(Thực hành phân tích kinh doanh với dữ liệu lớn)*
Course designation	*This course provides students with case studies related to business analytics with various types of business analytics, types of data, data sources, understanding of big data and big data analytics and social media as well as social media analytics.*
Semester(s) in which the course is taught	1
Person responsible for the course	Dr. Nguyễn Quang
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, practice, presentation
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 55 Contact hours (please specify whether lecture, exercise, laboratory session, etc.): laboratory project: 25 Private study including examination preparation, specified in hours: 30
Credit points/ECTS	1 credit/ 2 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	Parallel course: Business Analytics with Big Data (PH068IU)
Course objectives	This course will provide students with: • Case studies about big data analytics and its applications. • Insights of social media analytics in business success. • An awareness of the importance of business analytics to business.
Course learning outcomes	Upon the successful completion of this course students will be able to:

Competency level	Course learning outcome (CLO)
Knowledge	CLO1. Apply big data concepts and big data tools into business

	Skill	CLO2. Analyze social media data using big data tools and generate insights for business success.
	Attitude	CLO3. Generalize the importance of business analytics to business.
Content	*The description of the contents should clearly indicate the weighting of the content and the level.* Weight: laboratory session (4 periods) Teaching levels: I (Introduce); T (Teach); U (Utilize) Topic | Weight | Level Big data analytics in business use-cases | 8 | I, T, U	
Examination forms	Report and Presentation	
Study and examination requirements	Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. Assignments/Examination: Students must have more than 50/100 points overall to pass this course.	
Reading list	Textbooks: [1] *Big Data and Business Analytics*, Edited by Jay Liebowitz, CPC Press, 2013. References: [2] *Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics*, Marshall Sponder, Mc Graw Hill, 2012. [3] *Hadoop: The Definitive Guide*, 2nd edition, Tom White, 2011, O'Reilly. [4] *Big Data Analysis with Python: Combine Spark and Python to unlock the powers of parallel computing and machine learning*, Ivan Marin, Ankit Shukla, Sarang VK, 2019	

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-3) and Program/Student Learning Outcomes (PLO) (1-10) is shown in the following table:

	PLO									
CLO	1	2	3	4	5	6	7	8	9	10
1				x						
2					x					
3									x	

ILO4. Develop applications using satellite-based positioning and remote sensing in the era of interdisciplinary science and technology.

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.

ILO9. Show abilities of further self-learning and lifelong learning

3. Planned learning activities and teaching methods

Students choose a topic related to big data for business.

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (10%)			
In – class discussion (20%)	Qz1-5 60%Pass	Qz1-5 60%Pass	Qz1-5 60%Pass
Report and Presentation (70%)	Part I 60%Pass	Part II. 1 60%Pass	Part II.2 60%Pass

Note: %Pass: Target that % of students having scores greater than 50 out of 100.

5. Date revised: July 15, 2023

Ho Chi Minh City, 31/07/2023
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

RESEARCH PROJECT

Course Code: **PH042IU**

1. General information

<table>
<tr><td>Course title</td><td>RESEARCH PROJECT (Dự án nghiên cứu)</td></tr>
<tr><td>Course designation</td><td>This course provides the research project for students, which improves their skills in doing research and has experience in a practical project.</td></tr>
<tr><td>Semester(s) in which the course is taught</td><td>1, 2</td></tr>
<tr><td>Person responsible for the course</td><td>Assos. Prof. Phan Bảo Ngọc; Dr. Phan Hiền Vũ; MSc. Lê Thị Quế</td></tr>
<tr><td>Language</td><td>English</td></tr>
<tr><td>Relation to curriculum</td><td>Compulsory</td></tr>
<tr><td>Teaching methods</td><td>Project</td></tr>
<tr><td>Workload (incl. contact hours, self-study hours)</td><td>12 weeks (180 hours)</td></tr>
<tr><td>Credit points/ECTS</td><td>4 credits/ 6.55 ECTS (1 ECTS is equivalent to 27.5 hours)</td></tr>
<tr><td>Required and recommended prerequisites</td><td>Students must have enough knowledge about projects</td></tr>
<tr><td>Course objectives</td><td>This course will provide students with:

experience in doing research skills
experience in group working
identical topics in Space Science and Space Engineering.
An awareness of the legal issues and responsibilities, the commitment to professional ethics and responsibilities, and the norms of developing and using software.
</td></tr>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course students will be able to:
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Skill</td><td>CLO1. Perform experiments, analyze data, and interpret results to get practical experience in working.
CLO2. Cooperate effectively in a team.</td></tr>
</table></td></tr>
</table>

		CLO3. Show abilities of effective written and oral communication.
	Attitude	CLO4. Show the understanding of the role and responsibility of an engineer in society. CLO5. Show abilities of further self-learning and lifelong learning. CLO6. Show the awareness of the legal issues and responsibilities, the commitment to professional ethics and responsibilities, and the norms of developing and using software
Content	A group of students choose one of the research projects assigned by professors. The topic is in two fields: ● Space Science ● Space Engineering	
Examination forms	Report and presentation	
Study and examination requirements	*Attendance:* A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. *Assignments/Examination:* Students must have more than 50/100 points overall to pass this course.	
Reading list	*No textbook required*	

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1					x					
2						x				
3							x			
4										x
5									x	
6								x		

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO6. Work effectively in a team in space engineering and interdisciplinary areas.
ILO7. Communicate effectively in career.
ILO8. Show an understanding of the role and responsibility of an engineer in society.
ILO9. Show abilities of further self-learning and lifelong learning
ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society.

3. Planned learning activities and teaching methods

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6
Advisor assessment (50%)	x	x	x	x	x	x
Committee assessment (50%)	x	x	x	x	x	x

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022

CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

INTERNSHIP

Course Code: **PH064IU**

1. General information

Course title	INTERNSHIP (*Thực tập*)
Course designation	*Students will start their internship at space center, satellite center and company relating to satellite science and satellite engineering.*
Semester(s) in which the course is taught	Summer of third year
Person responsible for the course	Assos. Prof. Phan Bảo Ngọc; Dr. Phan Hiền Vũ; MSc. Lê Thị Quế
Language	English
Relation to curriculum	Compulsory
Teaching methods	Project, practice
Workload (incl. contact hours, self-study hours)	(Estimated) Total workload: 180 hours
Credit points/ECTS	4 credits/ 6.55 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	• Successfully finish at least 70% over the total numbers of credits of the academic program. • Do not be under any academic warning • Chair of Department of Physics will decide for other special cases.
Course objectives	This course will provide students with: • Experience in the application of theory • Communication and teamwork skills. • Opportunity to work in an academic environment. • An awareness of the legal issues and responsibilities, the commitment to professional ethics and responsibilities, and the norms of developing and using software.
Course learning outcomes	Upon the successful completion of this course students will be able to: Competency level | Course learning outcome (CLO)

	Skill	CLO1. Perform experiments, analyze data, and interpret results to get practical experience in working. CLO2. Cooperate effectively in a team. CLO3. Communicate effectively in the working environment.
	Attitude	CLO4. Show the understanding of the role and responsibility of an engineer in society. CLO5. Show abilities of further self-learning and lifelong learning. CLO6. Show awareness of legal issues and responsibilities, the commitment to professional ethics and responsibilities, and norms of developing and using software.
Content	Students will follow the guidance of the instructors from the space center/satellite center/company.	
Examination forms	Report and presentation	
Study and examination requirements	*Attendance:* A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. *Assignments/Examination:* Students must have more than 50/100 points overall to pass this course.	
Reading list	Documents, notes from space center/ satellite center	

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-6) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1					x					
2						x				
3							x			
4										x
5									x	
6								x		

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications.
ILO6. Work effectively in a team in space engineering and interdisciplinary areas.
ILO7. Communicate effectively in career.
ILO8. Show an understanding of the role and responsibility of an engineer in society.
ILO9. Show abilities of further self-learning and lifelong learning
ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society.

3. Planned learning activities and teaching methods

Students will follow the guidance of the instructors from the space center/satellite center/company.

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5	CLO6
Advisor's assessment (50%)	x	x	x	x	x	x
Committee's assessment (50%)	x	x	x	x	x	x

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 10, 2023

Ho Chi Minh City, 30/12/2023
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc

THESIS

Course Code: **PH050IU**

1. General information

Course title	THESIS *(Khóa luận tốt nghiệp)*
Course designation	*The topics of the thesis focus on space engineering, especially satellite technology and satellite application. Students have a deep understanding about theoretical knowledge and application. Students will also become familiar with research topics, ways of argument and making points according to the research process, which will help them develop a more academic perspective*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Assos. Prof. Phan Bảo Ngọc; Dr. Phan Hiền Vũ; MSc. Lê Thị Quế
Language	English
Relation to curriculum	Compulsory
Teaching methods	Project
Workload (incl. contact hours, self-study hours)	12 weeks (450 hours)
Credit points/ECTS	10 credits/16.4 ECTS (1 ECTS is equivalent to 27.5 hours)
Required and recommended prerequisites	• Successfully finish at least 90% over the total numbers of credits of the academic program. • Do not be under any academic warning
Course objectives	This course will provide students with: • strong understanding of interesting topics relating to space science and engineering • independent research skills. • academic writing skill in thesis • An awareness of the legal issues and responsibilities, the commitment to professional ethics and responsibilities, and the norms of developing and using software.

Course learning outcomes	Upon the successful completion of this course students will be able to: **Competency level** — **Course learning outcome (CLO)** Skill — CLO1. Perform experiments, analyze data, interpret results, and make conclusions for a practical problem. CLO2. Show abilities of effective written and oral communication Attitude — CLO3. Show an understanding of the role and responsibility of an engineer in society. CLO4. Show abilities of further self-learning and lifelong learning. CLO5. Show an awareness of the legal issues and responsibilities, the commitment to professional ethics and responsibilities, and the norms of developing and using software.
Content	The topic is in two fields: ● Space Science ● Space Engineering
Examination forms	Thesis report and presentation
Study and examination requirements	Following the Thesis Guideline of Department of Physics
Reading list	*Depending on the topic*

2. Learning Outcomes Matrix (optional)

The relationship between Course Learning Outcomes (CLO) (1-5) and Program/Intended Learning Outcomes (ILO) (1-10) is shown in the following table:

	ILO									
CLO	1	2	3	4	5	6	7	8	9	10
1					x					
2							x			
3										x
4									x	
5								x		

ILO5. Perform experiments, analyze data, interpret results, and make conclusions regarding to technical problems in satellite technology applications
ILO7. Communicate effectively in career
ILO8. Show an understanding of the role and responsibility of an engineer in society
ILO9. Show abilities of further self-learning and lifelong learning
ILO10. Recognize the impact of technical solutions and modern technology on the environmental issues and contemporary society

3. Planned learning activities and teaching methods

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4	CLO5
Advisor assessment	x	x	x	x	x
Reviewer assessment	x	x	x	x	x
Committee assessment	x	x	x	x	x

Note: %Pass: Target that % of students having scores greater than 70 out of 100.

5. Date revised: January 12, 2022

Ho Chi Minh City, 21/01/2022
CHAIR OF DEPARTMENT OF PHYSICS

(Signed)

Phan Bảo Ngọc