ĐẠI HỌC QUỐC GIA
THÀNH PHỐ HỒ CHÍ MINH
TRƯỜNG ĐẠI HỌC QUỐC TẾ

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh phúc

CHƯƠNG TRÌNH ĐÀO TẠO KHÓA 2023 - NGÀNH KỸ THUẬT KHÔNG GIAN TRÌNH ĐỘ ĐẠI HỌC

(Kèm theo Quyết định số 1000/QĐ-ĐHQT ngày 30 tháng 8 năm 2023 của Hiệu trưởng trường Đại học Quốc tế)

1. Thông tin chung

- Tên ngành đào tạo:
  - + Tiếng Việt: Kỹ thuật Không gian
  - + Tiếng Anh: Space Engineering
- Mã ngành đào tạo: 7520121
- Trình độ đào tạo: Đại học
- Loại hình đào tạo: Chính quy
- Thời gian đào tạo: 4.5 năm
- Tên văn bằng sau khi tốt nghiệp:
  - + Tiếng Việt: Kỹ sư Kỹ thuật Không gian
  - + Tiếng Anh: Engineer in Space Engineering
- Nơi đào tạo: Trường Đại học Quốc tế, Đại học Quốc gia HCM

2. Thông tin tuyển sinh và kế hoạch đào tạo

a. Đối tượng tuyển sinh

Đối tượng tuyển sinh căn cứ theo quy chế tuyển sinh đại học của Bộ Giáo dục và Đào tạo và Đề án tuyển sinh hàng năm của Đại học Quốc gia TP.HCM và Đề án tuyển sinh của trường Đại học Quốc tế.

b. Hình thức tuyển sinh

Trường Đại học Quốc tế thực hiện tuyển sinh theo Quy chế tuyển sinh Đại học ban hành hàng năm bởi Bộ Giáo dục và Đào tạo, căn cứ theo Đề án tuyển sinh hàng năm của Đại học Quốc gia TP.HCM và Đề án tuyển sinh của trường Đại học Quốc tế.

c. Tổ hợp môn xét tuyển: A00, A01, A02, D01

d. Dự kiến chỉ tiêu tuyển sinh, quy mô đào tạo

Dự kiến 30 sinh viên/lớp nằm trong tổng chỉ tiêu tuyển sinh chung được ĐHQG giao hằng năm

Bảng 1. Dự kiến chỉ tiêu tuyển sinh, quy mô đào tạo qua các năm

Năm	2023	2024	2025	2026	2027	2028	Từ 2029 trở đi
Tuyển sinh mới	30	30	30	30	30	30	30
Quy mô đào tạo	70	100	130	160	160	160	160

3. Mục tiêu đào tạo

a. Mục tiêu chung:

Mục tiêu đào tạo của chương trình đào tạo ngành Kỹ thuật Không gian phù hợp với tầm nhìn, sứ mạng của nhà Trường, mục tiêu giáo dục của Luật Giáo dục và chiến lược quốc gia về phát triển khoa học và công nghệ vũ trụ.

Bảng 2. Sự phù hợp của mục tiêu đào tạo với Tầm nhìn, sứ mạng và mục tiêu giáo dục của Luật Giáo dục đại học

Mục tiêu đào tạo của CTĐT	**Tầm nhìn**	**Sứ mạng**	**Luật giáo dục**
(1) **Đào tạo nhân lực chất lượng cao**, bồi dưỡng nhân tài, **thúc đẩy nghiên cứu khoa học** và công nghệ để tạo ra tri thức mới, công nghệ mới nhằm **phục vụ yêu cầu phát triển kinh tế - xã hội, đảm bảo an ninh quốc phòng và hội nhập quốc tế**. (2) **Đào tạo người học có phẩm chất chính trị, đạo đức**; có kiến thức cơ sở và chuyên môn vững vàng, **có kỹ năng thực hành nghề nghiệp, có năng lực nghiên cứu, có khả năng sáng tạo**, biết vận dụng kiến thức và kỹ năng linh hoạt để giải quyết những vấn đề liên quan đến xây dựng và vận hành các sản phẩm, các hệ thống có sử dụng công nghệ vệ tinh trong đời sống, xã hội và an ninh quốc phòng, góp phần thực hiện chiến lược quốc gia về nghiên cứu và ứng dụng công nghệ vũ trụ.	Trường ĐHQT là trường **đại học nghiên cứu** thuộc tốp đầu tại châu Á; là cơ sở giáo dục quốc tế, **tự chủ, sáng tạo**; là nơi vun đắp và **phát triển nguồn nhân lực chất lượng cao** cho **thị trường lao động trong nước và quốc tế**	a) Là cơ sở giáo dục quốc tế, mang bản sắc văn hóa Việt Nam. b) Cơ sở giáo dục đại học đi tiên phong trong đổi mới cơ chế quản trị đại học theo mô hình tự chủ và tiên tiến. c) **Đào tạo chất lượng cao** đa ngành - đa lĩnh vực. Đạt chuẩn kiểm định chất lượng giáo dục theo tiêu chuẩn quốc tế/khu vực cho tất cả các chương trình đào tạo. d) Giảng dạy và nghiên cứu thực hiện bằng tiếng Anh là điểm khác biệt nâng tầm **quốc tế** của nhà trường. Người học được đào tạo và rèn luyện để trở thành **công dân toàn cầu** và **có trách nhiệm với xã hội**, dẫn dắt xã hội trong tương lai. đ) **Nghiên cứu cơ bản** với hàm lượng tri thức lớn song hành với nghiên cứu ứng dụng, đáp ứng yêu cầu **đổi mới sáng tạo** và phát triển bền vững của doanh nghiệp, địa phương và xã hội; quan tâm, thúc đẩy các **hoạt động kết nối và phục vụ cộng đồng**.	a) Đào tạo nhân lực, nâng cao dân trí, bồi dưỡng nhân tài; **nghiên cứu khoa học**, công nghệ tạo ra tri thức, sản phẩm mới, **phục vụ yêu cầu phát triển kinh tế - xã hội**, **bảo đảm quốc phòng, an ninh và hội nhập quốc tế**; b) **Đào tạo người học có phẩm chất chính trị, đạo đức;** có kiến thức, **kỹ năng thực hành nghề nghiệp**, **năng lực nghiên cứu** và phát triển ứng dụng khoa học và công nghệ tương xứng với trình độ đào tạo; có sức khỏe; **có khả năng sáng tạo** và trách nhiệm nghề nghiệp, thích nghi với môi trường làm việc; có ý thức phục vụ nhân dân.

b. Mục tiêu cụ thể (Program Objectives - POs)

Mục tiêu cụ thể của CTĐT được xác định từ mục tiêu chung, bao gồm 04 mục tiêu, trong đó có 02 mục tiêu về kiến thức, 01 mục tiêu về kỹ năng và 01 mục tiêu về tự chủ và trách nhiệm, được trình bày như sau:

PO1. Có kiến thức khoa học cơ bản về Toán học, Vật lý và Tin học, đáp ứng cho việc tiếp thu các kiến thức giáo dục chuyên nghiệp và khả năng học tập ở trình độ cao hơn.

PO2. Có kiến thức và kỹ năng chuyên ngành về khoa học không gian, liên lạc vệ tinh, xử lý ảnh số, xử lý dữ liệu lớn, viễn thám, GNSS và những dịch vụ định vị để phát triển những ứng dụng trong kỹ thuật không gian và các lĩnh vực liên quan.

PO3. Có kỹ năng nghiên cứu, phản biện, giao tiếp, lãnh đạo và làm việc nhóm đủ để làm việc trong môi trường làm việc liên ngành, đa văn hóa, đa quốc gia.

PO4. Có hiểu biết về kinh tế, chính trị; có các kiến thức cơ bản trong lĩnh vực khoa học xã hội và nhân văn phù hợp với chuyên chuyên ngành được đào tạo để đóng góp hữu hiệu và sự phát triển bền vững của xã hội, cộng đồng.

4. Chuẩn đầu ra của chương trình đào tạo (Intended Leaning Outcomes –ILOs)

Chương trình đào tạo ngành Kỹ thuật Không gian bao gồm 10 chuẩn đầu ra, được trình bày rõ ràng trong Bảng 3, đo được theo cấp độ tư duy và được sắp xếp theo các khối: kiến thức, kỹ năng, mức tự chủ và trách nhiệm theo Khung trình độ Quốc gia Việt Nam.

Bảng 3. Chuẩn đầu ra của chương trình đào tạo

Kiến thức	**ILO1**	Vận dụng kiến thức toán học, vật lý và tin học trong giải quyết các vấn đề liên quan đến kỹ thuật không gian
	ILO2	Vận dụng kiến thức vật lý và khoa học không gian để giải quyết các vấn đề trong ứng dụng công nghệ vệ tinh
	ILO3	Vận dụng kiến thức và kỹ năng về xử lý tín hiệu số trong phân tích tín hiệu liên lạc vệ tinh
	ILO4	Phát triển các ứng dụng dùng định vị vệ tinh và viễn thám trong bối cảnh khoa học kỹ thuật liên ngành phát triển mạnh mẽ.
Kỹ năng	**ILO5**	Thực nghiệm, phân tích, giải thích và đưa ra kết luận về các vấn đề kỹ thuật trong ứng dụng công nghệ vệ tinh
	ILO6	Hoạt động nhóm hiệu quả trong lĩnh vực kỹ thuật không gian và liên ngành
	ILO7	Giao tiếp hiệu quả trong công việc
Tự chủ và trách nhiệm	**ILO8**	Thể hiện sự hiểu biết về vai trò và trách nhiệm của người kỹ sư đối với xã hội
	ILO9	Thể hiện khả năng tự học và học tập suốt đời
	ILO10	Nhận biết tác động của các giải pháp kỹ thuật và công nghệ mới đối với các vấn đề môi trường và xã hội đương đại

5. Ma trận giữa mục tiêu đào tạo và chuẩn đầu ra

Bảng 4. Mối quan hệ giữa CĐR của CTĐT và mục tiêu đào tạo

	ILOs		**POs**		
		PO1	**PO2**	**PO3**	**PO4**
Kiến thức	**ILO1**	x			
	ILO2	x			
	ILO3		x		
	ILO4		x		
Kỹ năng	**ILO5**		x		
	ILO6			x	
	ILO7			x	
Tự chủ và trách nhiệm	**ILO8**				x
	ILO9			x	
	ILO10			x	

6. Quy trình đào tạo, điều kiện tốt nghiệp

Căn cứ Quyết định số 1342/QĐ-ĐHQG ngày 30 tháng 9 năm 2022 của Giám đốc Đại học Quốc gia Thành phố Hồ Chí Minh về việc ban hành Quy chế đào tạo trình độ đại học.

Căn cứ Quyết định số 719/QĐ-ĐHQT ngày 06 tháng 12 năm 2021 của Hiệu trưởng trường Đại học Quốc tế về việc ban hành Quy chế đào tạo trình độ đại học theo hệ thống tín chỉ tại trường Đại học Quốc tế.

7. Thang điểm (theo thang điểm chính thức của trường)

Trường quy định thang điểm đánh giá kết quả học tập của người học (Quy chế đào tạo trình độ đại học theo hệ thống tín chỉ tại trường Đại học Quốc tế).

Bảng 5. Thang điểm

Xếp loại	**Thang điểm 100**	**Thang điểm 10**	**Thang điểm 4**	**Thang điểm chữ**
Đạt				
Xuất sắc	90≤ ĐTBTL ≤ 100	9,0 ≤ ĐTBTL ≤ 10	4,0	A^+
Giỏi	80≤ ĐTBTL < 90	8,0 ≤ ĐTBTL < 9,0	3,5	A
Khá	70≤ ĐTBTL < 80	7,0≤ ĐTBTL < 8,0	3,0	B^+

Trung bình khá	60≤ ĐTBTL < 70	6,0≤ ĐTBTL < 7,0	2,5	B
Trung bình	50≤ ĐTBTL < 60	5,0≤ ĐTBTL < 6,0	2,0	C
Không đạt				
Yếu	40 ≤ ĐTBTL < 50	4,0≤ ĐTBTL < 5,0	1,5	D+
Kém	30 ≤ ĐTBTL < 40	3,0≤ ĐTBTL < 4,0	1,0	D
	ĐTBTL < 30	ĐTBTL < 3,0	0,0	F

8. Khối lượng kiến thức toàn khoá

Tổng số tín chỉ: 152 tín chỉ, trong đó phân bổ kiến thức như Bảng 6 (không bao gồm giáo dục thể chất và giáo dục quốc phòng):

Bảng 6. Cấu trúc chương trình đào tạo

TT	**Các khối kiến thức**	**Khối lượng**	
		Số tín chỉ	**%**
I	Khối kiến thức giáo dục đại cương	62	41%
II	Khối kiến thức cơ sở ngành	35	23%
III	Kiến thức chuyên ngành	37	24%
IV	Thực tập, khóa luận/luận văn tốt nghiệp	18	12%
	Tổng cộng	152	100%

9. Nội dung chương trình đào tạo

Chương trình đào tạo ngành Kỹ thuật Không gian được trình bày theo Bảng 7.

Bảng 7. Các môn học thuộc CTĐT

TT	**Mã môn học**	**Tên môn học**		**Loại MH (bắt buộc /tự chọn)**	**Tín chỉ**				**Phòng Thực hành**	**Ghi chú**
		Tiếng Việt	**Tiếng Anh**		**Tổng cộng**	**Lý thuyết**	**Thực hành**	**Đề án**		
I	**KIẾN THỨC GIÁO DỤC ĐẠI CƯƠNG**				**62**	**57**	**5**	**0**		
Lý luận chính trị					**11**	**11**	**0**	**0**		

1	PE015IU	Triết học Mác – Lênin	Marxist-Leninist philosophy	bắt buộc	3	3	0	0		
2	PE016IU	Kinh tế chính trị Mác - Lênin	Marxist - Leninist Political Economy	bắt buộc	2	2	0	0		
3	PE017IU	Chủ nghĩa XH KH	Scientific socialism	bắt buộc	2	2	0	0		
4	PE018IU	Lịch sử Đảng CSVN	History of Vietnamese Communist Party	bắt buộc	2	2	0	0		
5	PE019IU	Tư tưởng Hồ Chí Minh	Ho Chi Minh's Thought	bắt buộc	2	2	0	0		
Ngoại ngữ					**8**	**8**	**0**	**0**		
6	EN007IU	Tiếng Anh chuyên ngành 1: Viết	Academic English 1: Writing	bắt buộc	2	2	0	0		
7	EN008IU	Tiếng Anh chuyên ngành 1: Nghe	Academic English 1: Listening	bắt buộc	2	2	0	0		
8	EN011IU	Tiếng Anh chuyên ngành 2: Viết	Academic English 2: Writing	bắt buộc	2	2	0	0		
9	EN012IU	Tiếng Anh chuyên ngành 2: Nói	Academic English 2: Speaking	bắt buộc	2	2	0	0		
Toán - Tin học - Khoa học tự nhiên - Công nghệ - Môi trường					**34**	**29**	**5**	**0**		
10	MA001IU	Giải tích 1	Calculus 1	bắt buộc	4	4	0	0		
11	MA003IU	Giải tích 2	Calculus 2	bắt buộc	4	4	0	0		
12	EE057IU	Lập trình cho kỹ sư	Programming for engineers	bắt buộc	3	3	0	0		

13	EE058IU	Thực hành lập trình cho kỹ sư	Programming for engineers Laboratory	bắt buộc	1	0	1	0	PTN Công nghệ phần mềm	
14	PH019IU	Vật lý đại cương 1	General Physics 1	bắt buộc	4	4	0	0		
15	PH020IU	Thực hành Vật lý đại cương 1	General Physics 1 Laboratory	bắt buộc	2	0	2	0	PTN Cơ - Nhiệt	
16	PH021IU	Vật lý đại cương 2	General Physics 2	bắt buộc	3	3	0	0		
17	PH022IU	Thực hành Vật lý đại cương 2	General Physics 2 Laboratory	bắt buộc	1	0	1	0	PTN Điện - Từ	
18	PH023IU	Vật lý đại cương 3	General Physics 3	bắt buộc	2	2	0	0		
19	PH024IU	Thực hành Vật lý đại cương 3	General Physics 3 Laboratory	bắt buộc	1	0	1	0	PTN Quang học	
20	PH025IU	Toán cho kỹ sư	Mathematics for engineers	bắt buộc	4	4	0	0		
21	PH026IU	Phương trình vi phân	Differential equations	bắt buộc	2	2	0	0		
22	PH030IU	Xác suất và thống kê cho kỹ sư	Probability and statistics for engineers	bắt buộc	3	3	0	0		
Kinh tế - Quản lý					**9**	**9**	**0**	**0**		
23	PE008IU	Tư duy phân tích	Critical thinking	bắt buộc	3	3	0	0		
24	PH056IU	Quản lý dự án	Project Management	bắt buộc	3	3	0	0		
25	PE021IU	Pháp luật Đại cương	General Law	bắt buộc	3	3	0	0		
Giáo dục thể chất					**0**	**0**	**0**	**0**		
26	PT001IU	Giáo dục thể chất 1	Physical training 1	bắt buộc	0	0	0	0		

27	PT002IU	Giáo dục thể chất 2	Physical training 2	bắt buộc	0	0	0	0		
Giáo dục quốc phòng: 4 tuần				bắt buộc	0	0	0	0		
II	**KIẾN THỨC CƠ SỞ NGÀNH**				**35**	**31**	**4**	**0**		
28	PH018IU	Giới thiệu về kỹ thuật không gian	Introduction to Space Engineering	bắt buộc	2	2	0	0		
29	PH061IU	Quan sát Trái đất và môi trường	Earth observation and the environment	bắt buộc	2	2	0	0		
30	PH029IU	Giới thiệu về thuyết tương đối và vật lý hiện đại	Introduction to Relativity and Modern Physics	bắt buộc	3	3	0	0		
31	PH032IU	Giới thiệu về tín hiệu và hệ thống	Introduction to Signals and Systems	bắt buộc	3	3	0	0		
32	PH033IU	Thực hành tín hiệu và hệ thống	Signals and Systems Laboratory	bắt buộc	1	0	1	0	PTN viễn thông	
33	PH063IU	Giới thiệu về liên lạc không gian	Introduction to Space Communications	bắt buộc	2	2	0	0		
34	PH036IU	Viễn thám	Remote Sensing	bắt buộc	3	3	0	0		
35	PH037IU	Môi trường không gian	Space Environment	bắt buộc	3	3	0	0		
36	PH040IU	Công nghệ vệ tinh	Satellite Technology	bắt buộc	3	3	0	0		

37	PH062IU	Nền tảng lập trình trên hệ điều hành iOS	iOS programming fundamentals	bắt buộc	3	2	1	0	PTN xử lý tín hiệu và ảnh vệ tinh	
38	PH038IU	Giới thiệu về xử lý ảnh số	Introduction to Digital Image Processing	bắt buộc	2	2	0	0		
39	PH039IU	Thực hành xử lý ảnh số	Digital Image Processing Laboratory	bắt buộc	1	0	1	0	PTN công nghệ phần mềm	
40	IT079IU	Nguyên tắc quản lý cơ sở dữ liệu	Principles of Database Management	bắt buộc	4	3	1	0		
41	IT153IU	Toán rời rạc	Discrete Mathematics	bắt buộc	3	3	0	0		
III	**KIẾN THỨC CHUYÊN NGÀNH**				**37**	**29**	**8**	**0**		
42	PH060IU	Phân tích dữ liệu lớn cho viễn thám	Big data analytics for remote sensing	bắt buộc	4	4	0	0		
43	PH054IU	Thực hành phân tích dữ liệu lớn cho viễn thám	Big data analytics for remote sensing lab	bắt buộc	1	0	1	0	PTN xử lý tín hiệu và ảnh vệ tinh	
44	PH047IU	Hệ thống điều hướng	Navigation Systems	bắt buộc	3	3	0	0		
45	PH065IU	Phát triển ứng dụng định vị trên hệ điều hành iOS	Geolocation apps development for iOS	bắt buộc	3	2	1	0	PTN xử lý tín hiệu và ảnh vệ tinh	
46	EE092IU	Xử lý tín hiệu số	Digital Signal Processing	bắt buộc	3	3	0	0		

47	EE093IU	Thực hành xử lý tín hiệu số	Digital Signal Processing Laboratory	bắt buộc	1	0	1	0	PTN xử lý tín hiệu số	
48	PH041IU	Xử lý ảnh số	Digital Image Processing	bắt buộc	3	3	0	0		
49	PH043IU	Thực hành xử lý tín hiệu và ảnh vệ tinh	Satellite Signal and Image Processing Laboratory	bắt buộc	3	1	2	0	PTN xử lý tín hiệu và ảnh vệ tinh	
50	EE105IU	Kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering	bắt buộc	3	3	0	0		
51	EE124IU	Thực hành kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering Laboratory	bắt buộc	1	0	1	0	PTN Siêu cao tần	
Kiến thức tự chọn chuyên ngành (chọn 12 tín chỉ trong các môn sau)					**12**	**10**	**2**	**0**		
52	PH045IU	Trắc địa đại cương	Fundamental of Surveying	tự chọn	3	2	1	0		
53	PH046IU	Hệ thống thông tin địa lý và phân tích không gian	Geographic Information Systems (GIS) and Spatial Analysis	tự chọn	3	2	1	0		
54	EE133IU	Công nghệ kỹ thuật mới nổi	Emerging Engineering Technology	tự chọn	3	3	0	0		
55	PH048IU	Vật lý thiên văn vô tuyến	Radio Astrophysics	tự chọn	3	3	0	0		
56	PH049IU	Viễn thám nâng cao	Advanced Remote Sensing	tự chọn	3	3	0	0		
57	IT013IU	Cấu trúc dữ liệu và thuật toán	Data Structures and Algorithms	tự chọn	4	3	1	0		

58	IT142IU	Phân tích dữ liệu quan sát	Analytics for Observational Data	tự chọn	4	3	1	0		
59	IT160IU	Khai thác dữ liệu	Data mining	tự chọn	4	3	1	0		
60	PH058IU	Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data	tự chọn	3	3	0	0		
61	PH059IU	Thực hành Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data Laboratory	tự chọn	1	0	1	0		
IV	**THỰC TẬP, DỰ ÁN NGHIÊN CỨU, KHÓA LUẬN/LUẬN VĂN TỐT NGHIỆP**				**18**	**0**	**0**	**18**		
62	PH042IU	Dự án nghiên cứu	Research Project	bắt buộc	4	0	0	4		
63	PH064IU	Thực tập	Internship	bắt buộc	4	0	0	4		
64	PH050IU	Khóa luận tốt nghiệp	Thesis	bắt buộc	10	0	0	10		
	Tổng số (tín chỉ)				**152**	**117**	**17**	**18**		

10. Dự kiến kế hoạch giảng dạy *(phân bổ các môn học theo từng học kỳ)*

Tùy vào trình độ tiếng Anh của người học đạt trình độ AE1, IE2, IE1 và IE0, kế hoạch giảng dạy các môn học được cụ thể tương ứng được trình bày trong các Bảng 8, Bảng 9, Bảng 10 và Bảng 11.

10.1. Trình độ AE1

Bảng 8. Kế hoạch giảng dạy đối với người học đạt trình độ AE1

STT	Mã MH	Tên MH		Loại MH	Tín chỉ				ECTS	Môn học học trước (HT)	Môn học song hành (SH)
		Tiếng Việt	Tiếng Anh		Lý thuyết	Thực hành	Đề án	Tổng cộng			
Semester 1					**14**	**2**	**0**	**16**	**25.63**		
1	MA001IU	Giải tích 1	Calculus 1	BB	4	0		4	6.18		
2	PH019IU	Vật lý đại cương 1	General Physics 1	BB	4	0		4	6.18		
3	PH020IU	Thực hành Vật lý đại cương 1	General Physics 1 Laboratory	BB	0	2		2	4		
4	PH018IU	Giới thiệu về kỹ thuật không gian	Introduction to Space Engineering	BB	2	0		2	3.09		
5	EN007IU	Tiếng Anh chuyên ngành 1: Viết	Writing AE1	BB	2	0		2	3.09		
6	EN008IU	Tiếng Anh chuyên ngành 1: Nghe	Listening AE1	BB	2	0		2	3.09		
7	PT001IU	Giáo dục thể chất 1	Physical training 1	BB	0	0		0	0		
Semester 2					**16**	**1**	**0**	**17**	**26.73**		
8	MA003IU	Giải tích 2	Calculus 2	BB	4	0		4	6.18	Calculus 1 (MA001IU)	
9	PH021IU	Vật lý đại cương 2	General Physics 2	BB	3	0		3	4.64	General Physics 1 (PH019IU) (or Physics 1 (PH013IU) and Physics 2 (PH014IU))	
10	PH022IU	Thực hành Vật lý đại cương 2	General Physics 2 Laboratory	BB	0	1		1	2		General Physics 2 (PH021IU)

11	PH061IU	Quan sát Trái đất và môi trường	Earth observation and the environment	BB	2	0		2	3.09		
12	EN011IU	Tiếng Anh chuyên ngành 2: Viết	Writing AE 2	BB	2	0		2	3.09	Academic English 1 (EN008IU)	
13	EN012IU	Tiếng Anh chuyên ngành 2: Nói	Speaking AE2	BB	2	0		2	3.09	Academic English 1 (EN008IU)	
14	PE015IU	Triết học Mác – Lênin	Marxist-Leninist philosophy	BB	3	0		3	4.64		
15	PT002IU	Giáo dục thể chất 2	Physical training 2	BB	0	0		0	0		
Summer semester (Year 1)											
Semester 3					**15**	**2**	**0**	**17**	**27.19**		
16	PH023IU	Vật lý đại cương 3	General Physics 3	BB	2	0		2	3.09	General Physics 2 (PH021IU) (or Physics 3 (PH015IU))	
17	PH024IU	Thực hành Vật lý đại cương 3	General Physics 3 Laboratory	BB	0	1		1	2		General Physics 3 (PH023IU)
18	PH029IU	Giới thiệu về thuyết tương đối và vật lý hiện đại	Introduction to Relativity and Modern Physics	BB	3	0		3	4.64		
19	PH026IU	Phương trình vi phân	Differential equations	BB	2	0		2	3.09		
20	PH030IU	Xác suất và thống kê cho kỹ sư	Probability and statistics for engineers	BB	3	0		3	4.64	Calculus 2 (MA003IU)	
21	EE057IU	Lập trình cho kỹ sư	Programming for engineers	BB	3	0		3	4.64		
22	EE058IU	Thực hành lập trình cho kỹ sư	Programming for engineers Laboratory	BB	0	1		1	2		Programming for engineers (EE057IU)

23	PE016IU	Kinh tế chính trị Mác - Lênin	Marxist - Leninist Political Economy	BB	2	0		2	3.09		
Semester 4					**15**	**1**	**0**	**16**	**25.19**		
24	PH025IU	Toán cho kỹ sư	Mathematics for engineers	BB	4	0		4	6.18		
25	IT153IU	Toán rời rạc	Discrete Math	BB	3	0		3	4.64		
26	PH037IU	Môi trường không gian	Space Environment	BB	3	0		3	4.64		Physics 3 (PH015IU) or General Physics 2 (PH021IU)
27	PH032IU	Giới thiệu về tín hiệu và hệ thống	Introduction to Signals and Systems	BB	3	0		3	4.64		
28	PH033IU	Thực hành tín hiệu và hệ thống	Signals and Systems Laboratory	BB	0	1		1	2		Introduction to Signals and Systems (PH032IU)
29	PE017IU	Chủ nghĩa XH KH	Scientific socialism	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU)	
Summer semester (Year 2)											
30	MP001IU	Quân sự	Military training	BB	0	0		0	0		
Semester 5					**15**	**3**	**0**	**18**	**29.19**		
31	PH063IU	Giới thiệu về liên lạc không gian	Introduction to Space Communications	BB	2	0		2	3.09	General Physics 2 (PH021IU) (or Physics 3 (PH015IU))	

32	PH040IU	Công nghệ vệ tinh	Satellite Technology	BB	3	0		3	4.64		
33	EE092IU	Xử lý tín hiệu số	Digital Signal Processing	BB	3	0		3	4.64	Introduction to Signals and Systems (PH032IU) (Or Signals and Systems (EE088))	
34	EE093IU	Thực hành xử lý tín hiệu số	Digital Signal Processing Laboratory	BB	0	1		1	2		Digital Signal Processing (EE092IU)
35	IT079IU	Nguyên tắc quản lý cơ sở dữ liệu	Principles of Database Management	BB	3	1		4	6.64		
36	PH062IU	Nền tảng lập trình trên hệ điều hành iOS	iOS programming fundamentals	BB	2	1		3	5.09	Programming for Engineers (EE057IU)	
37	PE018IU	Lịch sử Đảng CSVN	History of Vietnamese Communist Party	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU), Scientific socialism (PH017IU)	
Semester 6					**11**	**5**	**0**	**16**	**27.01**		
38	PH047IU	Hệ thống điều hướng	Navigation Systems	BB	3	0		3	4.64		

39	PH065IU	Phát triển ứng dụng định vị trên hệ điều hành iOS	Geolocation App Development for iOS	BB	2	1		3	5.09	iOS programming fundamentals (PH062IU)	
40	PH038IU	Giới thiệu về xử lý ảnh số	Introduction to Digital Image Processing	BB	2	0		2	3.09		
41	PH039IU	Thực hành xử lý ảnh số	Digital Image Processing Laboratory	BB	0	1		1	2		Introduction to Digital Image Processing (PH038IU)
42	PH043IU	Thực hành xử lý tín hiệu và ảnh vệ tinh	Satellite Signal And Image Processing Laboratory	BB	1	2		3	5.55		Introduction to digital image processing (PH038IU), Digital signal processing (EE092)
43	EE105IU	Kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering	BB	3	0		3	4.64	General Physics 2 (PH021IU) (Or Physics 3 (PH015IU) or Electromagnetic Theory (EE010IU))	
44	EE124IU	Thực hành kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering Laboratory	BB	0	1		1	2		Antenna and Microwave Engineering (EE105)
Summer semester (Year 3)											
Semester 7					**16**	**1**	**0**	**17**	**26.74**		

45	PH041IU	Xử lý ảnh số	Digital Image Processing	BB	3	0		3	4.64	Introduction to digital image processing (PH038IU)	
46	PH036IU	Viễn thám	Remote Sensing	BB	3	0		3	4.64	General Physics 3 (PH023IU) or Analytical Physics IIB (IS014IU)	General Physics 3 Laboratory (PH024IU) or Analytical Physics IIB Lab (IS015IU)
47	PH060IU	Phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing	BB	4	0		4	6.18	Earth observation and the environment (PH061IU), Introduction to Digital Image Processing (PH038IU)	
48	PH054IU	Thực hành phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing Laboratory	BB	0	1		1	2		Big Data Analytics for Remote Sensing (PH060IU)
49	PH056IU	Quản lý dự án	Project Management	BB	3	0		3	4.64		
50	PE008IU	Tư duy phân tích	Critical thinking	BB	3	0		3	4.64		
Semester 8					**10**	**2**	**4**	**16**	**26**		
51	PH042IU	Dự án nghiên cứu	Research Project	BB	0	0	4	4	6.55		
Electives (choose 12 credits in 10 courses below)					10	2		12	19.45		
52	PH045IU	Trắc địa đại cương	Fundamental of Surveying	TC	2	1		3	5.09		

53	PH046IU	Hệ thống thông tin địa lý và phân tích không gian	Geographic Information Systems (GIS) and Spatial Analysis	TC	2	1		3	5.09		
54	PH048IU	Vật lý thiên văn vô tuyến	Radio Astrophysics	TC	3	0		3	4.64		
55	PH049IU	Viễn thám nâng cao	Advanced Remote Sensing	TC	3	0		3	4.64	Remote sensing (PH036IU), Introduction to Digital Image Processing (PH038IU)	
56	EE133IU	Công nghệ kỹ thuật mới nổi	Emerging Engineering Technologies	TC	3	0		3	4.64		
57	IT013IU	Cấu trúc dữ liệu và thuật toán	Data Structures and Algorithms	TC	3	1		4	6.64		
58	IT142IU	Phân tích dữ liệu quan sát	Analytics for Observational Data	TC	3	1		4	6.64		
59	IT160IU	Khai thác dữ liệu	Data mining	TC	3	1		4	6.64		
60	PH058IU	Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data	TC	3	0		3	4.64		
61	PH059IU	Thực hành Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data Laboratory	TC	0	1		1	2		Business analytics with Big data (PH058IU)
Summer semester (Year 4)					**0**	**0**	**4**	**4**	**6.55**		
62	PH064IU	Thực tập	Internship	BB	0	0	4	4	6.55	- To be yourth year students - No academic warning	
Semester 9					**5**	**0**	**10**	**15**	**24.09**		
63	PE021IU	Pháp luật Đại cương	General Law	BB	3	0		3	4.64		

64	PE019IU	Tư tưởng Hồ Chí Minh	Ho Chi Minh's Thought	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU), Scientific socialism (PH017IU)	
65	PH050IU	Khóa luận tốt nghiệp	Thesis	BB	0	0	10	10	16.36	- Successfully finish at least 90% over the total numbers of credits of the academic program - No academic warning	
Total					**117**	**17**	**18**	**152**	**244.32**		

10.2. Trình độ IE2

Bảng 9. Kế hoạch giảng dạy đối với người học đạt trình độ IE2

STT	Mã MH	Tên MH		Loại MH	Tín chỉ				ECTS	Môn học học trước (HT)	Môn học song hành (SH)
		Tiếng Việt	Tiếng Anh		Lý thuyết	Thực hành	Đề án	Tổng cộng			
Semester 1					**17**	**0**	**0**	**17**	**6.18**		
1	ENTP02IU	Tiếng Anh tăng cường 2	IE2	BB	13	0		13	0		
2	MA001IU	Giải tích 1	Calculus 1	BB	4	0		4	6.18		
3	PT001IU	Giáo dục thể chất 1	Physical training 1	BB	0	0		0	0		
Semester 2					**16**	**2**	**0**	**18**	**28.72**		
4	PH019IU	Vật lý đại cương 1	General Physics 1	BB	4	0		4	6.18		
5	PH020IU	Thực hành Vật lý đại cương 1	General Physics 1 Laboratory	BB	0	2		2	4		
6	PH018IU	Giới thiệu về kỹ thuật không gian	Introduction to Space Engineering	BB	2	0		2	3.09		
7	EN007IU	Tiếng Anh chuyên ngành 1: Viết	Writing AE1	BB	2	0		2	3.09		
8	EN008IU	Tiếng Anh chuyên ngành 1: Nghe	Listening AE1	BB	2	0		2	3.09		
9	MA003IU	Giải tích 2	Calculus 2	BB	4	0		4	6.18	Calculus 1 (MA001IU)	
10	PH061IU	Quan sát Trái đất và môi trường	Earth observation and the environment	BB	2	0		2	3.09		
11	PT002IU	Giáo dục thể chất 2	Physical training 2	BB	0	0		0	0		
Summer semester (Year 1)					**8**	**1**	**0**	**9**	**14.37**		
12	PE015IU	Triết học Mác – Lênin	Marxist-Leninist philosophy	BB	3	0		3	4.64		
13	PE016IU	Kinh tế chính trị Mác - Lênin	Marxist - Leninist Political Economy	BB	2	0		2	3.09		

14	PH021IU	Vật lý đại cương 2	General Physics 2	BB	3	0		3	4.64	General Physics 1 (PH019IU) (or Physics 1 (PH013IU) and Physics 2 (PH014IU))	
15	PH022IU	Thực hành Vật lý đại cương 2	General Physics 2 Laboratory	BB	0	1		1	2		General Physics 2 (PH021IU)
Semester 3					**15**	**2**	**0**	**17**	**27.19**		
16	PH023IU	Vật lý đại cương 3	General Physics 3	BB	2	0		2	3.09	General Physics 2 (PH021IU) (or Physics 3 (PH015IU))	
17	PH024IU	Thực hành Vật lý đại cương 3	General Physics 3 Laboratory	BB	0	1		1	2		General Physics 3 (PH023IU)
18	EN011IU	Tiếng Anh chuyên ngành 2: Viết	Writing AE 2	BB	2	0		2	3.09	Academic English 1 (EN008IU)	
19	EN012IU	Tiếng Anh chuyên ngành 2: Nói	Speaking AE2	BB	2	0		2	3.09	Academic English 1 (EN008IU)	
20	PH029IU	Giới thiệu về thuyết tương đối và vật lý hiện đại	Introduction to Relativity and Modern Physics	BB	3	0		3	4.64		
21	PH030IU	Xác suất và thống kê cho kỹ sư	Probability and statistics for engineers	BB	3	0		3	4.64	Calculus 2 (MA003IU)	
22	EE057IU	Lập trình cho kỹ sư	Programming for engineers	BB	3	0		3	4.64		
23	EE058IU	Thực hành lập trình cho kỹ sư	Programming for engineers Laboratory	BB	0	1		1	2		Programming for engineers (EE057IU)

Semester 4					**17**	**1**	**0**	**18**	**28.28**		
24	PH025IU	Toán cho kỹ sư	Mathematics for engineers	BB	4	0		4	6.18		
25	IT153IU	Toán rời rạc	Discrete Math	BB	3	0		3	4.64		
26	PH037IU	Môi trường không gian	Space Environment	BB	3	0		3	4.64		Physics 3 (PH015IU) or General Physics 2 (PH021IU)
27	PH032IU	Giới thiệu về tín hiệu và hệ thống	Introduction to Signals and Systems	BB	3	0		3	4.64		
28	PH033IU	Thực hành tín hiệu và hệ thống	Signals and Systems Laboratory	BB	0	1		1	2		Introduction to Signals and Systems (PH032IU)
29	PH026IU	Phương trình vi phân	Differential equations	BB	2	0		2	3.09		
30	PE017IU	Chủ nghĩa XH KH	Scientific socialism	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU)	
Summer semester (Year 2)											
31	MP001IU	Quân sự	Military training	BB	0	0		0	0		
Semester 5					**15**	**3**	**0**	**18**	**29.19**		
32	PH063IU	Giới thiệu về liên lạc không gian	Introduction to Space Communications	BB	2	0		2	3.09	General Physics 2 (PH021IU) (or Physics 3 (PH015IU))	

33	PH040IU	Công nghệ vệ tinh	Satellite Technology	BB	3	0		3	4.64		
34	EE092IU	Xử lý tín hiệu số	Digital Signal Processing	BB	3	0		3	4.64	Introduction to Signals and Systems (PH032IU) (Or Signals and Systems (EE088))	
35	EE093IU	Thực hành xử lý tín hiệu số	Digital Signal Processing Laboratory	BB	0	1		1	2		Digital Signal Processing (EE092IU)
36	IT079IU	Nguyên tắc quản lý cơ sở dữ liệu	Principles of Database Management	BB	3	1		4	6.64		
37	PH062IU	Nền tảng lập trình trên hệ điều hành iOS	iOS programming fundamentals	BB	2	1		3	5.09	Programming for Engineers (EE057IU)	
38	PE018IU	Lịch sử Đảng CSVN	History of Vietnamese Communist Party	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU), Scientific socialism (PH017IU)	
Semester 6					**11**	**5**	**0**	**16**	**27.01**		
39	PH047IU	Hệ thống điều hướng	Navigation Systems	BB	3	0		3	4.64		

40	PH065IU	Phát triển ứng dụng định vị trên hệ điều hành iOS	Geolocation App Development for iOS	BB	2	1		3	5.09	iOS programming fundamentals (PH062IU)	
41	PH038IU	Giới thiệu về xử lý ảnh số	Introduction to Digital Image Processing	BB	2	0		2	3.09		
42	PH039IU	Thực hành xử lý ảnh số	Digital Image Processing Laboratory	BB	0	1		1	2		Introduction to Digital Image Processing (PH038IU)
43	PH043IU	Thực hành xử lý tín hiệu và ảnh vệ tinh	Satellite Signal and Image Processing Laboratory	BB	1	2		3	5.55		Introduction to digital image processing (PH038IU), Digital signal processing (EE092)
44	EE105IU	Kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering	BB	3	0		3	4.64	General Physics 2 (PH021IU) (Or Physics 3 (PH015IU) or Electromagnetic Theory (EE010IU))	
45	EE124IU	Thực hành kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering Laboratory	BB	0	1		1	2		Antenna and Microwave Engineering (EE105)
Summer semester (Year 3)											
Semester 7					**16**	**1**	**0**	**17**	**26.74**		
46	PH041IU	Xử lý ảnh số	Digital Image Processing	BB	3	0		3	4.64	Introduction to digital image	

										processing (PH038IU)	
47	PH036IU	Viễn thám	Remote Sensing	BB	3	0		3	4.64	General Physics 3 (PH023IU) or Analytical Physics IIB (IS014IU)	General Physics 3 Laboratory (PH024IU) or Analytical Physics IIB Lab (IS015IU)
48	PH060IU	Phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing	BB	4	0		4	6.18	Earth observation and the environment (PH061IU), Introduction to Digital Image Processing (PH038IU)	
49	PH054IU	Thực hành phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing Laboratory	BB	0	1		1	2		Big Data Analytics for Remote Sensing (PH060IU)
50	PH056IU	Quản lý dự án	Project Management	BB	3	0		3	4.64		
51	PE008IU	Tư duy phân tích	Critical thinking	BB	3	0		3	4.64		
Semester 8					**10**	**2**	**4**	**16**	**26**		
52	PH042IU	Dự án nghiên cứu	Research Project	BB	0	0	4	4	6.55		
Electives (choose 12 credits in 10 courses below)					10	2		12	19.45		
53	PH045IU	Trắc địa đại cương	Fundamental of Surveying	TC	2	1		3	5.09		
54	PH046IU	Hệ thống thông tin địa lý và phân tích không gian	Geographic Information Systems	TC	2	1		3	5.09		

			(GIS) and Spatial Analysis								
55	PH048IU	Vật lý thiên văn vô tuyến	Radio Astrophysics	TC	3	0		3	4.64		
56	PH049IU	Viễn thám nâng cao	Advanced Remote Sensing	TC	3	0		3	4.64	Remote sensing (PH036IU), Introduction to Digital Image Processing (PH038IU)	
57	EE133IU	Công nghệ kỹ thuật mới nổi	Emerging Engineering Technologies	TC	3	0		3	4.64		
58	IT013IU	Cấu trúc dữ liệu và thuật toán	Data Structures and Algorithms	TC	3	1		4	6.64		
59	IT142IU	Phân tích dữ liệu quan sát	Analytics for Observational Data	TC	3	1		4	6.64		
60	IT160IU	Khai thác dữ liệu	Data mining	TC	3	1		4	6.64		
61	PH058IU	Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data	TC	3	0		3	4.64		
62	PH059IU	Thực hành Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data Laboratory	TC	0	1		1	2		Business analytics with Big data (PH058IU)
Summer semester (Year 4)					**0**	**0**	**4**	**4**	**6.55**		
63	PH064IU	Thực tập	Internship	BB	0	0	4	4	6.55	- To be yourth year students - No academic warning	
Semester 9					**5**	**0**	**10**	**15**	**24.09**		
64	PE021IU	Pháp luật Đại cương	General Law	BB	3	0		3	4.64		

65	PE019IU	Tư tưởng Hồ Chí Minh	Ho Chi Minh's Thought	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU), Scientific socialism (PH017IU)	
66	PH050IU	Khóa luận tốt nghiệp	Thesis	BB	0	0	10	10	16.36	- Successfully finish at least 90% over the total numbers of credits of the academic program - No academic warning	
Total					**130**	**17**	**18**	**165**	**244.32**		

10.3. Trình độ IE1

Bảng 10. Kế hoạch giảng dạy đối với người học đạt trình độ IE1

STT	Mã MH	Tên MH		Loại MH	Tín chỉ				ECTS	Môn học học trước (HT)	Môn học song hành (SH)
		Tiếng Việt	Tiếng Anh		Lý thuyết	Thực hành	Đề án	Tổng cộng			
Semester 1					**30**	**0**	**0**	**30**	**0**		
1	ENTP01IU	Tiếng Anh tăng cường 1	IE1	BB	17	0		17	0		
2	ENTP02IU	Tiếng Anh tăng cường 2	IE2	BB	13	0		13	0		
Semester 2					**16**	**2**	**0**	**18**	**28.72**		
3	MA001IU	Giải tích 1	Calculus 1	BB	4	0		4	6.18		
4	PH019IU	Vật lý đại cương 1	General Physics 1	BB	4	0		4	6.18		
5	PH020IU	Thực hành Vật lý đại cương 1	General Physics 1 Laboratory	BB	0	2		2	4		
6	PH018IU	Giới thiệu về kỹ thuật không gian	Introduction to Space Engineering	BB	2	0		2	3.09		
7	EN007IU	Tiếng Anh chuyên ngành 1: Viết	Writing AE1	BB	2	0		2	3.09		
8	EN008IU	Tiếng Anh chuyên ngành 1: Nghe	Listening AE1	BB	2	0		2	3.09		
9	PH061IU	Quan sát Trái đất và môi trường	Earth observation and the environment	BB	2	0		2	3.09		
10	PT001IU	Giáo dục thể chất 1	Physical training 1	BB	0	0		0	0		
Summer semester (Year 1)					**9**	**0**	**0**	**9**	**13.91**		
11	PE015IU	Triết học Mác – Lênin	Marxist-Leninist philosophy	BB	3	0		3	4.64		

12	PE016IU	Kinh tế chính trị Mác - Lênin	Marxist - Leninist Political Economy	BB	2	0		2	3.09		
13	MA003IU	Giải tích 2	Calculus 2	BB	4	0		4	6.18	Calculus 1 (MA001IU)	
Semester 3					**16**	**2**	**0**	**18**	**28.74**		
14	PH021IU	Vật lý đại cương 2	General Physics 2	BB	3	0		3	4.64	General Physics 1 (PH019IU) (or Physics 1 (PH013IU) and Physics 2 (PH014IU))	
15	PH022IU	Thực hành Vật lý đại cương 2	General Physics 2 Laboratory	BB	0	1		1	2		General Physics 2 (PH021IU)
16	EN011IU	Tiếng Anh chuyên ngành 2: Viết	Writing AE 2	BB	2	0		2	3.09	Academic English 1 (EN008IU)	
17	EN012IU	Tiếng Anh chuyên ngành 2: Nói	Speaking AE2	BB	2	0		2	3.09	Academic English 1 (EN008IU)	
18	PH029IU	Giới thiệu về thuyết tương đối và vật lý hiện đại	Introduction to Relativity and Modern Physics	BB	3	0		3	4.64		
19	PH030IU	Xác suất và thống kê cho kỹ sư	Probability and statistics for engineers	BB	3	0		3	4.64	Calculus 2 (MA003IU)	
20	EE057IU	Lập trình cho kỹ sư	Programming for engineers	BB	3	0		3	4.64		
21	EE058IU	Thực hành lập trình cho kỹ sư	Programming for engineers Laboratory	BB	0	1		1	2		Programming for engineers (EE057IU)
22	PT002IU	Giáo dục thể chất 2	Physical training 2	BB	0	0		0	0		
Semester 4					**15**	**2**	**0**	**17**	**27.19**		

23	PH025IU	Toán cho kỹ sư	Mathematics for engineers	BB	4	0		4	6.18		
25	PH023IU	Vật lý đại cương 3	General Physics 3	BB	2	0		2	3.09	General Physics 2 (PH021IU) (or Physics 3 (PH015IU))	
26	PH024IU	Thực hành Vật lý đại cương 3	General Physics 3 Laboratory	BB	0	1		1	2		General Physics 3 (PH023IU)
26	IT153IU	Toán rời rạc	Discrete Math	BB	3	0		3	4.64		
27	PH037IU	Môi trường không gian	Space Environment	BB	3	0		3	4.64		Physics 3 (PH015IU) or General Physics 2 (PH021IU)
28	PH032IU	Giới thiệu về tín hiệu và hệ thống	Introduction to Signals and Systems	BB	3	0		3	4.64		
29	PH033IU	Thực hành tín hiệu và hệ thống	Signals and Systems Laboratory	BB	0	1		1	2		Introduction to Signals and Systems (PH032IU)
Summer semester (Year 2)											
30	MP001IU	Quân sự	Military training	BB	0	0		0	0		
Semester 5					**15**	**3**	**0**	**18**	**29.19**		
31	PH063IU	Giới thiệu về liên lạc không gian	Introduction to Space Communications	BB	2	0		2	3.09	General Physics 2 (PH021IU) (or Physics 3 (PH015IU))	
32	PH040IU	Công nghệ vệ tinh	Satellite Technology	BB	3	0		3	4.64		
33	EE092IU	Xử lý tín hiệu số	Digital Signal Processing	BB	3	0		3	4.64	Introduction to Signals and Systems (PH032IU) (Or	

										Signals and Systems (EE088))	
34	EE093IU	Thực hành xử lý tín hiệu số	Digital Signal Processing Laboratory	BB	0	1		1	2		Digital Signal Processing (EE092IU)
35	IT079IU	Nguyên tắc quản lý cơ sở dữ liệu	Principles of Database Management	BB	3	1		4	6.64		
36	PH062IU	Nền tảng lập trình trên hệ điều hành iOS	iOS programming fundamentals	BB	2	1		3	5.09	Programming for Engineers (EE057IU)	
37	PH026IU	Phương trình vi phân	Differential equations	BB	2	0		2	3.09		
Semester 6					**11**	**5**	**0**	**16**	**27.01**		
38	PH047IU	Hệ thống điều hướng	Navigation Systems	BB	3	0		3	4.64		
39	PH065IU	Phát triển ứng dụng định vị trên hệ điều hành iOS	Geolocation App Development for iOS	BB	2	1		3	5.09	iOS programming fundamentals (PH062IU)	
40	PH038IU	Giới thiệu về xử lý ảnh số	Introduction to Digital Image Processing	BB	2	0		2	3.09		
41	PH039IU	Thực hành xử lý ảnh số	Digital Image Processing Laboratory	BB	0	1		1	2		Introduction to Digital Image Processing (PH038IU)

42	PH043IU	Thực hành xử lý tín hiệu và ảnh vệ tinh	Satellite Signal and Image Processing Laboratory	BB	1	2		3	5.55		Introduction to digital image processing (PH038IU), Digital signal processing (EE092)
43	EE105IU	Kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering	BB	3	0		3	4.64	General Physics 2 (PH021IU) (Or Physics 3 (PH015IU) or Electromagnetic Theory (EE010IU))	
44	EE124IU	Thực hành kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering Laboratory	BB	0	1		1	2		Antenna and Microwave Engineering (EE105)
Summer semester (Year 3)											
Semester 7					**18**	**1**	**0**	**19**	**29.83**		
45	PH041IU	Xử lý ảnh số	Digital Image Processing	BB	3	0		3	4.64	Introduction to digital image processing (PH038IU)	
46	PH036IU	Viễn thám	Remote Sensing	BB	3	0		3	4.64	General Physics 3 (PH023IU) or Analytical Physics IIB (IS014IU)	General Physics 3 Laboratory (PH024IU) or Analytical Physics IIB Lab (IS015IU)

47	PH060IU	Phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing	BB	4	0		4	6.18	Earth observation and the environment (PH061IU), Introduction to Digital Image Processing (PH038IU)	
48	PH054IU	Thực hành phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing Laboratory	BB	0	1		1	2		Big Data Analytics for Remote Sensing (PH060IU)
49	PE017IU	Chủ nghĩa XH KH	Scientific socialism	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU)	
50	PH056IU	Quản lý dự án	Project Management	BB	3	0		3	4.64		
51	PE008IU	Tư duy phân tích	Critical thinking	BB	3	0		3	4.64		
Semester 8					**12**	**2**	**4**	**18**	**29.09**		
52	PH042IU	Dự án nghiên cứu	Research Project	BB	0	0	4	4	6.55		
53	PE018IU	Lịch sử Đảng CSVN	History of Vietnamese Communist Party	BB	2	0	0	2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism	

										(PE016IU), Scientific socialism (PH017IU)	
Electives (choose 12 credits in 10 courses below)					10	2		12	19.45		
54	PH045IU	Trắc địa đại cương	Fundamental of Surveying	TC	2	1		3	5.09		
55	PH046IU	Hệ thống thông tin địa lý và phân tích không gian	Geographic Information Systems (GIS) and Spatial Analysis	TC	2	1		3	5.09		
56	PH048IU	Vật lý thiên văn vô tuyến	Radio Astrophysics	TC	3	0		3	4.64		
57	PH049IU	Viễn thám nâng cao	Advanced Remote Sensing	TC	3	0		3	4.64	Remote sensing (PH036IU), Introduction to Digital Image Processing (PH038IU)	
58	EE133IU	Công nghệ kỹ thuật mới nổi	Emerging Engineering Technologies	TC	3	0		3	4.64		
59	IT013IU	Cấu trúc dữ liệu và thuật toán	Data Structures and Algorithms	TC	3	1		4	6.64		
60	IT142IU	Phân tích dữ liệu quan sát	Analytics for Observational Data	TC	3	1		4	6.64		
61	IT160IU	Khai thác dữ liệu	Data mining	TC	3	1		4	6.64		
62	PH058IU	Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data	TC	3	0		3	4.64		

63	PH059IU	Thực hành Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data Laboratory	TC	0	1		1	2		Business analytics with Big data (PH058IU)
Summer semester (Year 4)					**0**	**0**	**4**	**4**	**6.55**		
64	PH064IU	Thực tập	Internship	BB	0	0	4	4	6.55	- To be yourth year students - No academic warning	
Semester 9					**5**	**0**	**10**	**15**	**24.09**		
65	PE021IU	Pháp luật Đại cương	General Law	BB	3	0		3	4.64		
66	PE019IU	Tư tưởng Hồ Chí Minh	Ho Chi Minh's Thought	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU), Scientific socialism (PH017IU)	
67	PH050IU	Khóa luận tốt nghiệp	Thesis	BB	0	0	10	10	16.36	- Successfully finish at least 90% over the total numbers of credits of the academic program - No academic warning	
Total					**147**	**17**	**18**	**182**	**244.32**		

10.4. Trình độ IE0

Bảng 11. Kế hoạch giảng dạy đối với người học đạt trình độ IE0

STT	Mã MH	Tên MH		Loại MH	Tín chỉ				ECTS	Môn học học trước (HT)	Môn học song hành (SH)
		Tiếng Việt	Tiếng Anh		Lý thuyết	Thực hành	Đề án	Tổng cộng			
Semester 1					**34**	**0**	**0**	**34**	**0**		
1	ENTP00IU	Tiếng Anh tăng cường 0	IE0	BB	17	0		17	0		
2	ENTP01IU	Tiếng Anh tăng cường 1	IE1	BB	17	0		17	0		
Semester 2					**13**	**0**	**0**	**13**	**0**		
3	ENTP02IU	Tiếng Anh tăng cường 2	IE2	BB	13	0		13	0		
4	PT001IU	Giáo dục thể chất 1	Physical training 1	BB	0	0		0	0		
Summer semester (Year 1)					**5**	**0**	**0**	**5**	**7.73**		
5	PE015IU	Triết học Mác – Lênin	Marxist-Leninist philosophy	BB	3	0		3	4.64		
6	PE016IU	Kinh tế chính trị Mác - Lênin	Marxist - Leninist Political Economy	BB	2	0		2	3.09		
Semester 3					**14**	**2**	**0**	**16**	**25.63**		
7	MA001IU	Giải tích 1	Calculus 1	BB	4	0		4	6.18		
8	PH019IU	Vật lý đại cương 1	General Physics 1	BB	4	0		4	6.18		
9	PH020IU	Thực hành Vật lý đại cương 1	General Physics 1 Laboratory	BB	0	2		2	4		
10	PH018IU	Giới thiệu về kỹ thuật không gian	Introduction to Space Engineering	BB	2	0		2	3.09		
11	EN007IU	Tiếng Anh chuyên ngành 1: Viết	Writing AE1	BB	2	0		2	3.09		

12	EN008IU	Tiếng Anh chuyên ngành 1: Nghe	Listening AE1	BB	2	0		2	3.09		
Semester 4					**13**	**1**	**0**	**14**	**22.09**		
13	MA003IU	Giải tích 2	Calculus 2	BB	4	0		4	6.18	Calculus 1 (MA001IU)	
14	PH021IU	Vật lý đại cương 2	General Physics 2	BB	3	0		3	4.64	General Physics 1 (PH019IU) (or Physics 1 (PH013IU) and Physics 2 (PH014IU))	
15	PH022IU	Thực hành Vật lý đại cương 2	General Physics 2 Laboratory	BB	0	1		1	2		General Physics 2 (PH021IU)
16	PH061IU	Quan sát Trái đất và môi trường	Earth observation and the environment	BB	2	0		2	3.09		
17	EN011IU	Tiếng Anh chuyên ngành 2: Viết	Writing AE 2	BB	2	0		2	3.09	Academic English 1 (EN008IU)	
18	EN012IU	Tiếng Anh chuyên ngành 2: Nói	Speaking AE2	BB	2	0		2	3.09	Academic English 1 (EN008IU)	
19	PT002IU	Giáo dục thể chất 2	Physical training 2	BB	0	0		0	0		
Summer semester (Year 2)											
20	MP001IU	Quân sự	Military training	BB	0	0		0	0		
Semester 5					**13**	**2**	**0**	**15**	**24.1**		
21	PH023IU	Vật lý đại cương 3	General Physics 3	BB	2	0		2	3.09	General Physics 2 (PH021IU) (or Physics 3 (PH015IU))	
22	PH024IU	Thực hành Vật lý đại cương 3	General Physics 3 Laboratory	BB	0	1		1	2		General Physics 3 (PH023IU)

23	PH029IU	Giới thiệu về thuyết tương đối và vật lý hiện đại	Introduction to Relativity and Modern Physics	BB	3	0		3	4.64		
24	PH026IU	Phương trình vi phân	Differential equations	BB	2	0		2	3.09		
25	PH030IU	Xác suất và thống kê cho kỹ sư	Probability and statistics for engineers	BB	3	0		3	4.64	Calculus 2 (MA003IU)	
26	EE057IU	Lập trình cho kỹ sư	Programming for engineers	BB	3	0		3	4.64		
27	EE058IU	Thực hành lập trình cho kỹ sư	Programming for engineers Laboratory	BB	0	1		1	2		Programming for engineers (EE057IU)
Semester 6					**15**	**1**	**0**	**16**	**25.19**		
28	PH025IU	Toán cho kỹ sư	Mathematics for engineers	BB	4	0		4	6.18		
29	IT153IU	Toán rời rạc	Discrete Math	BB	3	0		3	4.64		
30	PH037IU	Môi trường không gian	Space Environment	BB	3	0		3	4.64		Physics 3 (PH015IU) or General Physics 2 (PH021IU)
31	PH032IU	Giới thiệu về tín hiệu và hệ thống	Introduction to Signals and Systems	BB	3	0		3	4.64		
32	PH033IU	Thực hành tín hiệu và hệ thống	Signals and Systems Laboratory	BB	0	1		1	2		Introduction to Signals and Systems (PH032IU)

33	PE017IU	Chủ nghĩa XH KH	Scientific socialism	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU)	
Summer semester (Year 3)											
Semester 7					**15**	**3**	**0**	**18**	**29.19**		
34	PH063IU	Giới thiệu về liên lạc không gian	Introduction to Space Communications	BB	2	0		2	3.09	General Physics 2 (PH021IU) (or Physics 3 (PH015IU))	
35	PH040IU	Công nghệ vệ tinh	Satellite Technology	BB	3	0		3	4.64		
36	EE092IU	Xử lý tín hiệu số	Digital Signal Processing	BB	3	0		3	4.64	Introduction to Signals and Systems (PH032IU) (Or Signals and Systems (EE088))	
37	EE093IU	Thực hành xử lý tín hiệu số	Digital Signal Processing Laboratory	BB	0	1		1	2		Digital Signal Processing (EE092IU)
38	IT079IU	Nguyên tắc quản lý cơ sở dữ liệu	Principles of Database Management	BB	3	1		4	6.64		
39	PH062IU	Nền tảng lập trình trên hệ điều hành iOS	iOS programming fundamentals	BB	2	1		3	5.09	Programming for Engineers (EE057IU)	

40	PE018IU	Lịch sử Đảng CSVN	History of Vietnamese Communist Party	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU), Scientific socialism (PH017IU)	
Semester 8					**11**	**5**	**0**	**16**	**27.01**		
41	PH047IU	Hệ thống điều hướng	Navigation Systems	BB	3	0		3	4.64		
42	PH065IU	Phát triển ứng dụng định vị trên hệ điều hành iOS	Geolocation App Development for iOS	BB	2	1		3	5.09	iOS programming fundamentals (PH062IU)	
43	PH038IU	Giới thiệu về xử lý ảnh số	Introduction to Digital Image Processing	BB	2	0		2	3.09		
44	PH039IU	Thực hành xử lý ảnh số	Digital Image Processing Laboratory	BB	0	1		1	2		Introduction to Digital Image Processing (PH038IU)
45	PH043IU	Thực hành xử lý tín hiệu và ảnh vệ tinh	Satellite Signal and Image Processing Laboratory	BB	1	2		3	5.55		Introduction to digital image processing (PH038IU), Digital signal processing (EE092)

46	EE105IU	Kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering	BB	3	0		3	4.64	General Physics 2 (PH021IU) (Or Physics 3 (PH015IU) or Electromagnetic Theory (EE010IU))	
47	EE124IU	Thực hành kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering Laboratory	BB	0	1		1	2		Antenna and Microwave Engineering (EE105)
Summer semester (Year 4)											
Semester 9					**16**	**1**	**0**	**17**	**26.74**		
48	PH041IU	Xử lý ảnh số	Digital Image Processing	BB	3	0		3	4.64	Introduction to digital image processing (PH038IU)	
49	PH036IU	Viễn thám	Remote Sensing	BB	3	0		3	4.64	General Physics 3 (PH023IU) or Analytical Physics IIB (IS014IU)	General Physics 3 Laboratory (PH024IU) or Analytical Physics IIB Lab (IS015IU)
50	PH060IU	Phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing	BB	4	0		4	6.18	Earth observation and the environment (PH061IU), Introduction to Digital Image Processing (PH038IU)	

51	PH054IU	Thực hành phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing Laboratory	BB	0	1		1	2		Big Data Analytics for Remote Sensing (PH060IU)
52	PH056IU	Quản lý dự án	Project Management	BB	3	0		3	4.64		
53	PE008IU	Tư duy phân tích	Critical thinking	BB	3	0		3	4.64		
Semester 10					**10**	**2**	**4**	**16**	**26**		
54	PH042IU	Dự án nghiên cứu	Research Project	BB	0	0	4	4	6.55		
Electives (choose 12 credits in 10 courses below)					10	2		12	19.45		
55	PH045IU	Trắc địa đại cương	Fundamental of Surveying	TC	2	1		3	5.09		
56	PH046IU	Hệ thống thông tin địa lý và phân tích không gian	Geographic Information Systems (GIS) and Spatial Analysis	TC	2	1		3	5.09		
57	PH048IU	Vật lý thiên văn vô tuyến	Radio Astrophysics	TC	3	0		3	4.64		
58	PH049IU	Viễn thám nâng cao	Advanced Remote Sensing	TC	3	0		3	4.64	Remote sensing (PH036IU), Introduction to Digital Image Processing (PH038IU)	
59	EE133IU	Công nghệ kỹ thuật mới nổi	Emerging Engineering Technologies	TC	3	0		3	4.64		
60	IT013IU	Cấu trúc dữ liệu và thuật toán	Data Structures and Algorithms	TC	3	1		4	6.64		
61	IT142IU	Phân tích dữ liệu quan sát	Analytics for Observational Data	TC	3	1		4	6.64		
62	IT160IU	Khai thác dữ liệu	Data mining	TC	3	1		4	6.64		

63	PH058IU	Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data	TC	3	0		3	4.64		
64	PH059IU	Thực hành Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data Laboratory	TC	0	1		1	2		Business analytics with Big data (PH058IU)
Summer semester (Year 5)					**0**	**0**	**4**	**4**	**6.55**		
65	PH064IU	Thực tập	Internship	BB	0	0	4	4	6.55	- To be yourth year students - No academic warning	
Semester 11					**5**	**0**	**10**	**15**	**24.09**		
66	PE021IU	Pháp luật Đại cương	General Law	BB	3	0		3	4.64		
67	PE019IU	Tư tưởng Hồ Chí Minh	Ho Chi Minh's Thought	BB	2	0		2	3.09	Philosophy of Marxism and Leninism (PE015IU), Political economics of Marxism and Leninism (PE016IU), Scientific socialism (PH017IU)	
68	PH050IU	Khóa luận tốt nghiệp	Thesis	BB	0	0	10	10	16.36	- Successfully finish at least 90% over the total numbers of credits of the academic program	

										- No academic warning	
Total					**164**	**17**	**18**	**199**	**244.32**		

11 Ma trận các môn học và chuẩn đầu ra (kỹ năng)

Mức độ đóng góp của các môn học vào chuẩn đầu ra của CTĐT ngành Kỹ thuật Không gian được trình bày như Bảng 12. Thang đo năng lực hiện đang sử dụng với 03 mức L, M, H; trong đó L: đóng góp thấp, M: đóng góp ở mức medium; H: đóng góp mức cao.

Bảng 12. Đóng góp của các môn học vào CĐR của CTĐT

STT	**Tên môn học (4)**		**Chuẩn đầu ra của CTĐT (5)**									
			ILO1	**ILO2**	**ILO3**	**ILO4**	**ILO5**	**ILO6**	**ILO7**	**ILO8**	**ILO9**	**ILO10**
Semester 1												
1	Giải tích 1	Calculus 1	L									
2	Vật lý đại cương 1	General Physics 1	L									
3	Thực hành Vật lý đại cương 1	General Physics 1 Laboratory					L					
4	Giới thiệu về kỹ thuật không gian	Introduction to Space Engineering		L					L		L	
5	Tiếng Anh chuyên ngành 1: Viết	Writing AE1							L			
6	Tiếng Anh chuyên ngành 1: Nghe	Listening AE1							L			
7	Giáo dục thể chất 1	Physical training 1										
Semester 2												
8	Giải tích 2	Calculus 2	M									
9	Vật lý đại cương 2	General Physics 2	L									

10	Thực hành Vật lý đại cương 2	General Physics 2 Laboratory					L					
11	Quan sát Trái đất và môi trường	Earth observation and the environment		L			L					L
12	Tiếng Anh chuyên ngành 2: Viết	Writing AE 2							M			
13	Tiếng Anh chuyên ngành 2: Nói	Speaking AE2							M			
14	Triết học Mác – Lênin	Marxist-Leninist philosophy								L		
15	Giáo dục thể chất 2	Physical training 2										
Summer Semester Year 1												
Semester 3												
16	Vật lý đại cương 3	General Physics 3	L									
17	Thực hành Vật lý đại cương 3	General Physics 3 Laboratory					L					
18	Giới thiệu về thuyết tương đối và vật lý hiện đại	Introduction to Relativity and Modern Physics		M					L		L	
19	Phương trình vi phân	Differential equations	L									
20	Xác suất và thống kê cho kỹ sư	Probability and statistics for engineers	M									
21	Lập trình cho kỹ sư	Programming for engineers	L									
22	Thực hành lập trình cho kỹ sư	Programming for engineers Laboratory					L					
23	Kinh tế chính trị Mác - Lênin	Political economics of Marxism and Leninism						L		L		
Semester 4												

24	Toán cho kỹ sư	Mathematics for engineers	M									
25	Toán rời rạc	Discrete Math	M									
26	Môi trường không gian	Space Environment		M			L					L
27	Giới thiệu về tín hiệu và hệ thống	Introduction to Signals and Systems			L							
28	Thực hành tín hiệu và hệ thống	Signals and Systems Laboratory					L					
29	Chủ nghĩa XH KH	Scientific socialism						L		M		
Summer Semester Year 2												
Semester 5												
30	Giới thiệu về liên lạc không gian	Introduction to Space Communications	M		M				M	M		
31	Công nghệ vệ tinh	Satellite Technology			M			L				L
32	Xử lý tín hiệu số	Digital Signal Processing			M							
33	Thực hành xử lý tín hiệu số	Digital Signal Processing Laboratory					M					
34	Nguyên tắc quản lý cơ sở dữ liệu	Principles of Database Management				M						
35	Nền tảng lập trình trên hệ điều hành iOS	iOS programming fundamentals	M			M	M			L		
36	Lịch sử Đảng CSVN	History of Vietnamese Communist Party								M		
Semester 6												
37	Hệ thống điều hướng	Navigation Systems				M	M					M
38	Phát triển ứng dụng định vị trên hệ điều hành iOS	Geolocation App Development for iOS				H	H	M	M			

39	Giới thiệu về xử lý ảnh số	Introduction to Digital Image Processing				M	M			M		
40	Thực hành xử lý ảnh số	Digital Image Processing Laboratory				M	M			M		
41	Thực hành xử lý tín hiệu và ảnh vệ tinh	Satellite Signal And Image Processing Laboratory			H		H	M				M
42	Kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering			M							
43	Thực hành kỹ thuật vi sóng và ăng-ten	Antenna and Microwave Engineering Laboratory					M					
Summer Semester Year 3												
Semester 7												
44	Xử lý ảnh số	Digital Image Processing				H	H				M	
45	Viễn thám	Remote Sensing	M			H	H					M
46	Phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing				H	H				M	
47	Thực hành phân tích dữ liệu lớn cho viễn thám	Big Data Analytics for Remote Sensing Laboratory				H	H				M	
48	Quản lý dự án	Project Management						M		M		
49	Tư duy phân tích	Critical thinking					L			L		
Semester 8												
50	Dự án nghiên cứu	Research Project					H	M	H	M	M	M
51	Trắc địa đại cương	Fundamental of Surveying				M	M					M
52	Hệ thống thông tin địa lý và phân tích không gian	Geographic Information Systems (GIS) and Spatial Analysis				H	H			M	M	

53	Vật lý thiên văn vô tuyến	Radio Astrophysics		M			M				M	
54	Viễn thám nâng cao	Advanced Remote Sensing				H	H					M
55	Công nghệ kỹ thuật mới nổi	Emerging Engineering Technologies		M								M
56	Cấu trúc dữ liệu và thuật toán	Data Structures and Algorithms				M						
57	Phân tích dữ liệu quan sát	Analytics for Observational Data				M						
58	Khai thác dữ liệu	Data mining				M						
59	Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data				H	H				M	
60	Thực hành Phân tích kinh doanh với dữ liệu lớn	Business analytics with Big data Laboratory				H	H				M	
Summer Semester Year 4												
61	Thực tập	Internship					H	M	M	M	M	M
Semester 9												
62	Pháp luật Đại cương	General Law								M		
63	Tư tưởng Hồ Chí Minh	Ho Chi Minh’s Thought								M		
64	Khóa luận tốt nghiệp	Thesis					H		H	M	M	M

12 Mô tả vắn tắt nội dung và khối lượng các môn học

12.1. Triết học Mác-Lênin *(Marxist-Leninist philosophy)*

Số tín chỉ: 3

Điều kiện tiên quyết: không

Mô tả nội dung môn học: Môn học trang bị cho sinh viên những kiến thức cơ bản về triết học Mác-Lênin.

The course equips students with basic knowledge of Marxist-Leninist philosophy.

12.2. Kinh tế chính trị Mác-Lênin *(Marxist - Leninist Political Economy)*

Số tín chỉ: 2

Môn học trước: Marxist-Leninist philosophy

Mô tả môn học: Chương trình gồm 6 chương, trong đó Chương 1 trình bày về Đối tượng, phương pháp nghiên cứu và chức năng của kinh tế chính trị Mác - Lênin; các chương còn lại trình bày nội dung cốt lõi của môn Kinh tế chính trị Mác - Lênin theo mục tiêu của học phần. Cụ thể, nội dung gồm ngành hàng, thị trường và vai trò của các bên liên quan; sản xuất giá trị thặng dư; cạnh tranh và độc quyền; kinh tế thị trường định hướng xã hội chủ nghĩa và quan hệ lợi ích kinh tế ở Việt Nam; và công nghiệp hóa, hiện đại hóa và hội nhập kinh tế quốc tế ở Việt Nam.

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.

12.3. Chủ nghĩa xã hội khoa học *(Scientific socialism)*

Số tín chỉ: 2

Môn học trước: 1. Marxist-Leninist philosophy; 2. Marxist-Leninist political economy

Mô tả môn học: Môn học trang bị cho sinh viên những kiến thức cơ bản về chủ nghĩa xã hội khoa học.

The course equips students with basic knowledge of scientific socialism.

12.4. Lịch sử Đảng Cộng sản Việt Nam *(History of Vietnamese communist party)*

Số tín chỉ: 2

Môn học trước: 1. Marxist-Leninist philosophy; 2. Marxist-Leninist political economy; 3. Scientific socialism

Mô tả môn học: Môn học trang bị cho sinh viên những kiến thức cơ bản về chủ nghĩa xã hội khoa học.

The course equips students with basic knowledge about the History of the Communist Party of Vietnam.

12.5. Tư tưởng Hồ Chí Minh *(Ho Chi Minh's Thoughts)*

Số tín chỉ: 2

Môn học trước: 1. Marxist-Leninist philosophy; 2. Marxist-Leninist political economy; 3. Scientific socialism

Mô tả môn học: Môn học trang bị cho học viên những kiến thức cơ bản về đối tượng, phương pháp nghiên cứu và ý nghĩa tư tưởng Hồ Chí Minh; nguồn gốc tư tưởng Hồ Chí Minh; độc lập dân tộc và chủ

nghĩa xã hội; Đảng Cộng sản Việt Nam và Nhà nước Việt Nam; đại đoàn kết dân tộc và đoàn kết quốc tế; Văn hóa, đạo đức và con người.

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.

12.6. Tiếng Anh chuyên ngành 1: Viết *(Writing AE1)*

Số tín chỉ: 2

Môn học trước: 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 completed IE2 course

Mô tả môn học: Khóa học này cung cấp cho sinh viên các hướng dẫn và thực hành toàn diện về viết luận, bao gồm chuyển ý tưởng thành các chức năng khác nhau của văn bản như quy trình, nguyên nhân-kết quả, so sánh-tương phản và các bài luận tranh luận.

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.

12.7. Tiếng Anh chuyên ngành 1: Nghe *(Listening AE1)*

Số tín chỉ: 2

Môn học trước: 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 completed IE2 course

Mô tả môn học: Khóa học được thiết kế nhằm chuẩn bị cho sinh viên các kỹ năng nghe và ghi chú hiệu quả, để họ có thể theo đuổi các khóa học trong chuyên ngành của mình mà không gặp khó khăn đáng kể. Do đó, khóa học dựa trên bài giảng trong đó quy trình dạy và học được xây dựng dựa trên các bài giảng về nhiều chủ đề như kinh doanh, khoa học và nhân văn.

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.

12.8. Tiếng Anh chuyên ngành 2: Viết *(Writing AE2)*

Số tín chỉ: 2

Môn học trước: Students must complete Writing AE1 course.

Mô tả môn học: Khóa học này giới thiệu các khái niệm cơ bản trong viết bài nghiên cứu, đặc biệt là vai trò của khái quát hóa, định nghĩa, phân loại và cấu trúc của bài nghiên cứu cho sinh viên theo học các trường cao đẳng hoặc đại học có trình độ tiếng Anh trung bình. Nó cũng cung cấp cho họ các phương pháp phát triển và trình bày một lập luận, so sánh hoặc tương phản.

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.

12.9. Tiếng Anh chuyên ngành 2: Nói *(Speaking AE2)*

Số tín chỉ: 2

Môn học trước: Students must complete AE1 courses.

Mô tả môn học: Thuyết trình ngày nay trở thành một kỹ năng sống còn để sinh viên thành công không chỉ ở trường đại học mà còn trong công việc sau này. Vì vậy, Speaking AE2 cung cấp cho học viên kiến thức và kỹ năng cần thiết để thuyết trình hiệu quả (informative and thuyết phục).

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).

12.10. Giải tích 1 *(Calculus 1)*

Số tín chỉ: 4

Môn học trước: Không

Mô tả môn học: Khóa học này trang bị cho học sinh các khái niệm cơ bản về giải tích: giới hạn, liên tục, vi phân và tích phân. Các ứng dụng của các khái niệm này được thảo luận một cách rộng rãi.

This course equips students with basic concepts of calculus: limits, continuity, differentiation, and integration. Applications of these concepts are extensively discussed.

12.11. Giải tích 2 *(Calculus 2)*

Số tín chỉ: 4

Môn học trước: Calculus 1

Mô tả môn học: Khóa học này là phần tiếp theo của Giải tích 1. Mục đích của khóa học là trang bị cho sinh viên các khái niệm cơ bản về dãy, chuỗi, hàm vectơ, hàm nhiều biến, tích phân bội và ứng dụng của chúng.

This course is a continuation of Calculus 1. Its aim to equip student with basis concepts of sequence, series, vector functions, functions of several variables, multiple integrals and their applications.

12.12. Lập trình cho kỹ sư *(Programming for Engineers)*

Số tín chỉ: 3

Môn học trước: Không

Mô tả môn học: Khóa học này dành cho sinh viên không có hoặc có ít kinh nghiệm lập trình. Nói chung, nó cố gắng cung cấp cho sinh viên sự hiểu biết về vai trò của lập trình có thể đóng vai trò trong việc giải quyết vấn đề. Do đó, nội dung khóa học trang bị các thuật ngữ cơ bản về nguyên tắc lập trình và cấu trúc dữ liệu thông qua ngôn ngữ lập trình C.

Các nguyên tắc cơ bản bao gồm lịch sử lập trình, sàng lọc từng bước và lưu đồ, giới thiệu về phân tích thuật toán; các kiểu dữ liệu cơ bản, chuyển đổi kiểu, ra quyết định và lặp, phân nhánh, thao tác I/O; hàm, đệ quy; mảng và mảng nhiều chỉ số, thuật toán tìm kiếm và sắp xếp; con trỏ/con trỏ hàm; ký tự và chuỗi; cấu trúc, công đoàn, liệt kê, hoạt động trên bit; giới thiệu về các kiểu dữ liệu trừu tượng; cấp phát bộ nhớ động, xử lý tệp.

This course is aimed at students with no or little programming experiences. 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.

12.13. Thực hành lập trình cho kỹ sư *(Programming for Engineers Laboratory)*

Số tín chỉ: 1

Môn học song song: Programming for Engineers Laboratory EE057IU

Mô tả môn học: Khóa học này được liên kết với khóa học Lập trình cho Kỹ sư. Nó bao gồm mọi thứ mà sinh viên sẽ cần để hiểu các khái niệm cơ bản được đề cập trong khóa học lý thuyết, cũng như việc triển khai các chương trình C từ đơn giản đến phức tạp, đặc biệt là trong lĩnh vực kỹ thuật. Các chủ đề bao gồm kiểu dữ liệu, cấu trúc điều khiển, chức năng, mảng, tệp và cơ chế chạy, thử nghiệm và gỡ lỗi.

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.

12.14. Vật lý đại cương 1 *(General Physics 1)*

Số tín chỉ: 4

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Môn học này sẽ giới thiệu về cơ học bao gồm các khái niệm và nguyên tắc về động học, động lực học, năng lượng chuyển động của hạt và vật rắn và cung cấp kiến thức cơ bản về cơ học chất lỏng; mô tả vĩ mô của khí; nhiệt và định luật thứ nhất của nhiệt động lực học; động cơ nhiệt và định luật thứ hai của nhiệt động lực học; mô tả kính hiển vi của chất khí và lý thuyết động học của chất khí.

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 gasses; heat and the first law of thermodynamics; heat engines and the second law of thermodynamics; microscopic description of gasses and the kinetic theory of gasses.

12.15. Thực hành Vật lý đại cương 1 *(General Physics 1 Laboratory)*

Số tín chỉ: 2

Môn học song song: Vật lý đại cương 1 (PH019IU)

Mô tả nội dung môn học: Môn học trang bị cho sinh viên những kỹ năng cần thiết cho việc làm thí nghiệm trong cơ học, nhiệt học và cơ học chất lưu.

General Physics 1 Laboratory is an experimental course that provides students with necessary skills to do experiments of mechanics, thermodynamics and fluid mechanics.

12.16. Vật lý đại cương 2 *(General Physics 2)*

Số tín chỉ: 3

Môn học trước: Physics 1

Mô tả nội dung môn học: Môn học này sẽ cung cấp kiến thức cơ bản về điện và từ.

This subject will provide a basic knowledge of electricity and magnetism.

12.17. Thực hành Vật lý đại cương 2 *(General Physics 2 Lab)*

Số tín chỉ: 1

Môn học song song: General Physics 2

Mô tả nội dung môn học: Môn học này cung cấp cho sinh viên những kiến thức cơ bản về điện và từ trong phòng thí nghiệm, bao gồm: định luật Ôm, mạch LRC, mạch RC, mạch LR, từ trường của cuộn dây…..

This course provides students with basic knowledge of electricity and magnetism in the laboratory, consisting of: Ohm's law, LRC circuit, RC circuit, LR circuit, magnetic fields of coils….

12.18. Vật lý đại cương 3 *(General Physics 3)*

Số tín chỉ: 2

Môn học trước: Physics 1

Mô tả nội dung môn học: Môn học này sẽ cung cấp những kiến thức cơ bản về Sóng và Vật lý hiện đại.

This subject will provide a basic knowledge of Wave and Modern Physics.

12.19. Thực hành Vật lý đại cương 3 *(General Physics 3 Lab)*

Số tín chỉ: 1

Môn học song song: General Physics 3

Mô tả nội dung môn học: Môn học này cung cấp cho sinh viên những kiến thức cơ bản về quang học trong phòng thí nghiệm, bao gồm: nhiễu xạ, giao thoa, kính thiên văn, định luật Brewster, hiệu ứng quang điện….

This course provides students with basic knowledge of optics in laboratory, consists of: diffraction, interferences, telescope, brewster's law, photoelectric effect….

12.20. Toán cho kỹ sư *(Mathematics for Engineers)*

Số tín chỉ: 4

Môn học trước: Không

Mô tả nội dung môn học: Khóa học này phát triển một cái nhìn tổng hợp về kiến thức toán học và kỹ năng phân tích và lập mô hình Tín hiệu và Hệ thống. Bao gồm việc xem xét phân tích sóng hài cơ bản, với các ứng dụng trong Điện tử, Điều khiển, Truyền thông và Xử lý tín hiệu.

This course develops a synthetic view of mathematical knowledge and skills in analyzing and modeling Signals and Systems. Covers review of fundamental harmonic analysis, with applications in Electronics, Control, Communications and Signal processing.

12.21. Phương trình vi phân (Differential Equations*)*

Số tín chỉ: 2

Môn học trước: Không

Mô tả nội dung môn học: Khóa học này giới thiệu các phương pháp toán học cơ bản và phân tích trong phương trình vi phân thường và ứng dụng của chúng và giới thiệu ngắn về phương trình đạo hàm riêng.

This course introduces fundamental mathematical methods and analysis in ordinary differential equations and their applications and a short introduction to partial differential equations.

12.22. Xác suất và thống kê cho kỹ sư (*Probability and statistics for engineers)*

Số tín chỉ: 3

Môn học trước: Calculus 2 (MA003IU)

Mô tả nội dung môn học: Khóa học này phát triển quan điểm của một kỹ sư về xác suất, bắt đầu từ khái niệm cơ hội, tần suất tương đối và sau đó là xác suất. Nó bao gồm tất cả các khái niệm cơ bản về xác suất, biến ngẫu nhiên và thống kê sẽ phục vụ hàng ngày cho một kỹ sư làm việc trong các lĩnh vực thực tế như kiểm soát chất lượng, xử lý tín hiệu, kỹ thuật y sinh, điều khiển tự động, truyền thông, v.v….

This course develops an engineer's view of probability, started 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….

12.23. Tư duy phân tích *(Critical thinking)*

Số tín chỉ: 3

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Khóa học này cung cấp bản chất và kỹ thuật tư duy làm cơ sở cho những tuyên bố, niềm tin và thái độ của chúng ta về thế giới. Khóa học cũng khám phá quá trình mọi người phát triển các tuyên bố và hỗ trợ niềm tin của họ.

Cụ thể, khóa học bao gồm lý thuyết và thực hành trình bày lập luận dưới dạng nói và viết, lập luận suy diễn và quy nạp, đánh giá tính hợp lệ hoặc sức mạnh của lập luận, phát hiện các ngụy biện trong lập luận và bác bỏ các lập luận sai.

Nguồn lực cho quá trình lập luận bao gồm các tình huống giả định và thực tế trong các lĩnh vực khoa học tự nhiên, khoa học xã hội và nhân văn.

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.

12.24. Quản lý dự án *(Project Management)*

Số tín chỉ: 3

Môn học trước: Không

Mô tả nội dung môn học: Khóa học này được phát triển để cung cấp khái niệm chính về quản lý dự án, được đặc trưng bởi phần hướng dẫn kiến thức về quản lý dự án (Hướng dẫn PMBOK). Hướng dẫn này nhấn mạnh năm nhóm quy trình dự án gồm khởi tạo, lập kế hoạch, thực hiện, kiểm soát và kết thúc, và

chín lĩnh vực kiến thức về tích hợp dự án, phạm vi, thời gian, chi phí, chất lượng, nguồn nhân lực, truyền thông, rủi ro và quản lý mua sắm. Học sinh cũng sẽ áp dụng tất cả các kiến thức quản lý dự án trong một dự án phát triển vệ tinh cụ thể để hiểu thêm về vòng đời của vệ tinh thông qua một dự án nhỏ và báo cáo tổng kết. Ngoài ra, khóa học này cũng cung cấp hỗ trợ máy tính để quản lý dự án bằng cách giới thiệu ứng dụng của Microsoft Project và lập kế hoạch dự án.

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.

12.25. Pháp luật Đại cương *(General Law)*

Số tín chỉ: 3

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Khóa học sẽ giới thiệu cho sinh viên hệ thống pháp luật Việt Nam. Đặc biệt, sinh viên sẽ hiểu được quyền và nghĩa vụ của mình trong Hiến pháp, luật Hình sự, luật hành chính, luật dân sự, luật lao động và luật doanh nghiệp của Việt Nam. Từ đó, sinh viên sẽ nâng cao nhận thức về trách nhiệm đảm bảo công lý, trong đó có việc chấm dứt tham nhũng trong xã hội.

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.

12.26. Giáo dục thể chất 1 *(Physical Training 1)*

Số tín chỉ: 0

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Giáo dục thể chất là môn học giúp sinh viên phát triển các kỹ năng vận động.

This course provides students with physical training, improving physical skills.

12.27. Giáo dục thể chất 2 *(Physical Training 2)*

Số tín chỉ: 0

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Giáo dục thể chất là môn học giúp sinh viên phát triển các kỹ năng vận động.

This course provides students with physical training, improving physical skills.

12.28. Giới thiệu về kỹ thuật không gian *(Introduction to Space Engineering)*

Số tín chỉ: 2

Điều kiện tiên quyết: Không.

Mô tả nội dung môn học: Khóa học này sẽ mang lại cái nhìn tổng quan về Khoa học và Kỹ thuật Không gian cho sinh viên, bao gồm nền tảng của vật lý không gian và mặt trời cũng như lịch sử phát triển của

Kỹ thuật Không gian trong suốt thế kỷ XX. Vì khóa học được thiết kế theo quan điểm của các kỹ sư, các sinh viên tương lai có hứng thú mạnh mẽ với Khoa học và Kỹ thuật Không gian sẽ được cung cấp nền tảng vững chắc về lĩnh vực này, cũng như những động lực tốt nhất cho nhu cầu của Việt Nam về khoa học không gian, công nghệ không gian và ứng dụng trong thế kỷ XXI.

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.

12.29. Quan sát Trái đất và môi trường *(Earth observation and the environment)*

Số tín chỉ: 2

Môn học trước: Không

Mô tả nội dung môn học: Khóa học này cung cấp cho sinh viên sự hiểu biết về hệ thống khí hậu của Trái đất, đánh giá cao các vấn đề môi trường (ô nhiễm nước, ô nhiễm không khí, ô nhiễm đất, v.v.), đồng thời làm sáng tỏ vai trò của hệ thống khí hậu Trái đất, có thể ảnh hưởng đến các hệ thống không gian. đặc biệt là những tác động tiêu cực. Một số phương pháp kỹ thuật được đề xuất để ngăn chặn những tác động tiêu cực này trong việc duy trì tuổi thọ của các hệ thống vũ trụ trong các dịch vụ của chúng.

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.

12.30. Giới thiệu về thuyết tương đối và vật lý hiện đại ***(****Introduction to Relativity and Modern Physics****)***

Số tín chỉ: 3

Môn học trước: Không

Mô tả nội dung môn học: Khóa học này giới thiệu tất cả các khía cạnh cơ bản về mặt lý thuyết của Thuyết tương đối đặc biệt và Thuyết lượng tử sơ khai. Trong phần đầu tiên của khóa học, học sinh được làm quen với một số thí nghiệm dẫn đến khái niệm thuyết tương đối hẹp về các vật thể chuyển động với tốc độ gần bằng tốc độ ánh sáng. Từ đó, họ có thể phát triển hình thức của thuyết tương đối hẹp trong cả động học và động lực học thông qua thảo luận về các hệ quy chiếu chuyển động, các phép biến đổi Galilean và Lorentz, và thuyết điện từ. Phần thứ hai của khóa học cũng sẽ giới thiệu trụ cột khác của vật lý hiện đại, lý thuyết lượng tử, trong giai đoạn đầu của nó. Một lần nữa, học sinh sẽ làm quen với một số thí nghiệm dẫn đến tư tưởng lượng tử hóa, tính chất lưỡng tính sóng hạt của bức xạ, nguyên lý bất định; và sau đó áp dụng những nền tảng vật lý nền tảng này cho thuyết lượng tử nguyên tử..

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.

12.31. Giới thiệu về tín hiệu và hệ thống *(Introduction to Signals and Systems)*

Số tín chỉ: 3

Môn học trước: Không

Mô tả nội dung môn học: Giới thiệu về các tín hiệu và hệ thống thời gian liên tục và rời rạc, biểu diễn hàm cơ sở của tín hiệu, tích chập, Chuỗi Fourier, Fourier, Laplace, lý thuyết biến đổi Z, phân tích biến không gian trạng thái của hệ thống tuyến tính, các khái niệm phản hồi cơ bản.

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.

12.32. Thực hành tín hiệu và hệ thống *(Signals and Systems Laboratory)*

Số tín chỉ: 1

Môn học song song: Introduction to Signals and Systems (PH032IU)

Mô tả nội dung môn học: Khóa học này bao gồm các chủ đề sau: Bài tập thực nghiệm thông qua mô phỏng bằng MATLAB để hiểu về phân tích miền tần số và thời gian của hệ động lực tuyến tính và tín hiệu tương ứng. Tìm đáp ứng của hệ thống tuyến tính thời gian liên tục và thời gian rời rạc thông qua mô phỏng.

This course covers the following topics: Experimental exercises via simulation using MATLAB to get an understanding of frequency and time domain analysis of linear dynamic systems and corresponding signals. Finding the response of continuous-time and discrete-time linear systems via simulation.

12.33. Giới thiệu về liên lạc không gian *(Introduction to Space Communications)*

Số tín chỉ: 2

Môn học trước: General Physics 2 (PH021IU) (or Physics 3 (PH015IU))

Mô tả nội dung môn học: Khóa học này giới thiệu tất cả các khía cạnh cơ bản của Truyền thông không gian giữa tàu vũ trụ (hoặc vệ tinh) và các trạm mặt đất. Phạm vi của khóa học bao gồm nhiều cuộc thảo luận từ các thiết kế công nghệ và giải pháp kỹ thuật của vệ tinh cho đến việc liên lạc của nó với các trạm mặt đất được kiểm soát. Trong phần đầu tiên của khóa học, sinh viên sẽ nghiên cứu các đặc điểm và thành phần cơ bản của vệ tinh, các phương pháp phóng vệ tinh, quỹ đạo vệ tinh (tập trung chủ yếu ở các vệ tinh địa tĩnh) và các nhiễu loạn quỹ đạo của vệ tinh; tuy nhiên, trong phần thứ hai, nội dung học tập sẽ tập trung vào tín hiệu tương tự và kỹ thuật số, truyền, nhận, phương trình liên kết và dịch vụ vệ tinh.

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.

12.34. Viễn thám *(Remote Sensing)*

Số tín chỉ: 3

Môn học trước: General Physics 3 (PH023IU) or Analytical Physics IIB (IS014IU)

Môn học song song: General Physics 3 Laboratory (PH024IU) or Analytical Physics IIB Lab (IS015IU)

Mô tả nội dung môn học: Trong khóa học này, sinh viên sẽ có thể trích xuất thông tin vật lý của bề mặt Trái đất bằng viễn thám, ứng dụng cho lâm nghiệp, nông nghiệp, tài nguyên nước và môi trường. Các dải bước sóng được sử dụng trong khóa học này là tia cực tím, khả kiến, hồng ngoại bước sóng ngắn, hồng ngoại nhiệt và vi sóng.

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..

12.35. Môi trường không gian *(Space Environment)*

Số tín chỉ: 3

Môn học song song: Physics 3 (PH015IU) or General Physics 2 (PH021IU)

Mô tả nội dung môn học: Đây là khóa học giới thiệu về tính chất vật lý của plasma; bầu khí quyển mặt trời; máy phát điện mặt trời; từ trường và tầng điện ly của Trái đất; sự tương tác giữa gió Mặt trời và từ trường Trái đất; tác động của tầng điện ly đối với thông tin vệ tinh.

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.

12.36. Công nghệ vệ tinh *(Satellite Technology)*

Số tín chỉ: 3

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Khóa học này giới thiệu kiến thức chung về vệ tinh, bao gồm hai phần riêng biệt về công nghệ và ứng dụng vệ tinh. Phần đầu tiên của khóa học sẽ giới thiệu cho sinh viên các chủ đề cơ bản về công nghệ vệ tinh, quỹ đạo vệ tinh và phóng vệ tinh. Phần thứ hai của khóa học chủ yếu tập trung vào các ứng dụng vệ tinh, bao gồm kỹ thuật liên lạc, viễn thám, điều hướng, vệ tinh thời tiết và vệ tinh quân sự.

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.

12.37. Nền tảng lập trình trên hệ điều hành iOS *(iOS programming fundamentals)*

Số tín chỉ: 3 (2 theory and 1 practice)

Môn học trước: Programming for Engineers (EE057IU)

Mô tả nội dung môn học: Khóa học này cung cấp cho sinh viên phần giới thiệu về lập trình trên nền tảng iOS với ngôn ngữ Lập trình Swift cho các ứng dụng dịch vụ dựa trên vị trí, bao gồm dịch vụ Vị trí cốt lõi, Bản đồ, Giám sát khu vực, iBeacon, Tiêu đề la bàn, Mã hóa địa lý, Xử lý lỗi và Firebase. Ngoài ra, khóa học này cung cấp cho sinh viên các kỹ năng thiết kế, triển khai và gỡ lỗi chương trình cho nền tảng iOS.

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.

12.38. Giới thiệu về xử lý ảnh số *(Introduction to Digital Image Processing)*

Số tín chỉ: 2

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Khóa học này sẽ giới thiệu cho sinh viên những kiến thức cơ bản cần thiết về tạo, hiển thị và xử lý hình ảnh kỹ thuật số bằng máy tính. Các chủ đề sẽ bao gồm biểu diễn dữ liệu hai chiều (2D), biểu diễn miền thời gian và tần số, lọc và nâng cao, biến đổi Fourier, tích chập, nội suy, hình ảnh màu và kiến thức sơ bộ về nhận dạng và mô tả đối tượng.

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.

12.39. Thực hành xử lý ảnh số *(Digital Image Processing Laboratory)*

Số tín chỉ: 1

Môn học song song: Introduction to Digital Image Processing (PH038IU)

Mô tả nội dung môn học: Khóa học này cung cấp cho sinh viên các bài tập trong phòng thí nghiệm dựa trên máy tính được thiết kế để giới thiệu các phương pháp thao tác dữ liệu trong thế giới thực. Các bài tập trong phòng thí nghiệm sẽ giới thiệu các chủ đề xử lý hình ảnh khác nhau, có thể được hoàn thành bằng nhiều ngôn ngữ lập trình được sử dụng rộng rãi như Matlab, C hoặc Python.

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.

12.40. Nguyên tắc quản lý cơ sở dữ liệu *(Principles of Database Management)*

Số tín chỉ: 4 (3 theory + 1 practice)

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Giới thiệu cho sinh viên các khái niệm cơ bản về thiết kế và triển khai cơ sở dữ liệu. Các kỹ thuật thiết kế cơ sở dữ liệu, bao gồm thiết kế quan hệ và phân tích E-R, được trình bày. Các truy vấn cơ sở dữ liệu sử dụng SQL được trình bày trong các bài giảng và được hỗ trợ bởi các bài tập thực hành.

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.

12.41. Toán rời rạc *(Discrete Mathematics)*

Số tín chỉ: 3

Điều kiện tiên quyết: Không.

Mô tả nội dung môn học: Môn học rèn luyện cho học sinh khả năng suy luận và tư duy toán học, logic; và áp dụng khả năng này để phân tích và giải quyết các vấn đề thực tế rời rạc trong Khoa học Máy tính và CNTT.

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.

12.42. Phân tích dữ liệu lớn cho viễn thám *(Big data analytics for remote sensing)*

Số tín chỉ: 4

Môn học trước: Earth observation and the environment (PH061IU), Introduction to Digital Image Processing (PH038IU)

Mô tả nội dung môn học: Mục đích của khóa học là giúp sinh viên làm quen với các khía cạnh tính toán hiệu suất cao của viễn thám. Học sinh sẽ học cách khám phá kiến thức từ dữ liệu viễn thám bằng các phương pháp tính toán hiệu suất cao và các công cụ phân tích trực quan dữ liệu (Apache Hadoop, Python song song, R, Google Earth Engine).

The aim of the course is to get students familiar with high-performance computing aspects of remote sensing. Students will learn how to discover knowledge from remote sensing data with high-performance computing approaches and data visual analytics tools (Apache Hadoop, parallel Python, R, Google Earth Engine).

12.43. Thực hành phân tích dữ liệu lớn cho viễn thám *(Big Data Analytics for Remote Sensing Laboratory)*

Số tín chỉ: 1

Môn học song song: Big Data Analytics for Remote Sensing (PH060IU)

Mô tả nội dung môn học: Khóa học này cung cấp cho sinh viên kinh nghiệm thực hành về xử lý dữ liệu lớn cho viễn thám. Sinh viên sẽ làm việc với các công cụ và nền tảng phát triển mới nhất như Apache Hadoop, Python song song, R, Google Earth Engine.

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.

12.44. Hệ thống điều hướng *(Navigation Systems)*

Số tín chỉ: 3

Môn học trước: Không

Mô tả nội dung môn học: Khóa học này giới thiệu các nguyên tắc của hệ thống định vị không gian dựa trên cảm biến quán tính và định vị vệ tinh. Học sinh sẽ bắt đầu với lịch sử phát triển của nhiều hệ thống vệ tinh định vị toàn cầu (GNSS) như GPS, GLONASS, EGNOS, Galileo, v.v. và sau đó sẽ xây dựng dựa trên các hệ thống định vị hiện đại, GPS, với Khung tọa độ, Tham chiếu thời gian và Quỹ đạo để ước tính vị trí, vận tốc và thời gian, cũng như sai số của chúng. Bên cạnh đó, môn học còn cung cấp cho học viên kiến thức cơ bản về tín hiệu GPS, điều hòa và thu nhận tín hiệu GPS sử dụng phép biến đổi và tích chập Fourier.

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.

12.45. Phát triển ứng dụng định vị trên hệ điều hành iOS *(Geolocation App Development for iOS)*

Số tín chỉ: 3 (2 theory + 1 practice)

Môn học trước: iOS programming fundamentals (PH062IU)

Mô tả nội dung môn học: Khóa học này cung cấp cho sinh viên phần giới thiệu về lập trình trên nền tảng iOS với ngôn ngữ Lập trình Swift cho các ứng dụng dịch vụ dựa trên vị trí, bao gồm dịch vụ Vị trí cốt lõi, Bản đồ, Giám sát khu vực, iBeacon, Tiêu đề la bàn, Mã hóa địa lý, Xử lý lỗi và Firebase. Ngoài ra, khóa học này cung cấp cho sinh viên các kỹ năng thiết kế, triển khai và gỡ lỗi chương trình cho nền tảng iOS.

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.

12.46. Xử lý tín hiệu số *(Digital Signal Processing)*

Số tín chỉ: 3

Môn học trước: Introduction to Signals and Systems (PH032IU) (Or Signals and Systems (EE088))

Mô tả nội dung môn học: Khóa học này giới thiệu về các nguyên tắc, phương pháp và ứng dụng cơ bản của xử lý tín hiệu số, nhấn mạnh các khía cạnh thuật toán, tính toán và lập trình của nó. Đặc biệt, sinh viên sẽ học chuyển đổi từ tương tự sang kỹ thuật số, các khái niệm về hệ thống tuyến tính thời gian rời rạc, lọc, phân tích quang phổ của tín hiệu thời gian rời rạc và thiết kế bộ lọc.

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.

12.47. Thực hành xử lý tín hiệu số *(Digital Signal Processing Laboratory)*

Số tín chỉ: 1

Môn học song song: Digital Signal Processing (EE092IU)

Mô tả nội dung môn học: Khóa học này giới thiệu về các nguyên tắc, phương pháp và ứng dụng cơ bản của xử lý tín hiệu số, nhấn mạnh các khía cạnh thuật toán, tính toán và lập trình của nó.

This course is an introduction to the basic principles, methods, and applications of digital signal processing, emphasizing its algorithmic, computational, and programming aspects.

12.48. Xử lý ảnh số *(Digital Image Processing)*

Số tín chỉ: 3

Môn học trước: Introduction to digital image processing (PH038IU)

Mô tả nội dung môn học: Khóa học này cung cấp các chủ đề nâng cao trong xử lý hình ảnh kỹ thuật số. Sinh viên trong lớp sẽ được cung cấp kiến thức lý thuyết chuyên sâu về các chủ đề chuyên môn, bao gồm phân đoạn, xử lý hình thái hình thái, lọc ảnh tuyến tính, tương quan ảnh, biến đổi ảnh, ảnh bản địa, xử lý ảnh đa phân giải, giảm nhiễu và phục hồi, trích xuất đặc trưng và các tác vụ nhận dạng.

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, imaging transforms, eigenimage, multiresolution image processing, noise reduction and restoration, feature extraction, and recognition tasks.

12.49. Thực hành xử lý tín hiệu và ảnh vệ tinh *(Satellite Signal and Image Processing Laboratory)*

Số tín chỉ: 3 (1 theory + 2 laboratory)

Môn học song song: Introduction to digital image processing (PH038IU), Digital signal processing (EE092)

Mô tả nội dung môn học: Môn học này cung cấp cho sinh viên các thí nghiệm truyền dữ liệu thu thập được từ vệ tinh đến các trạm trên mặt đất, sau đó thực hiện hậu xử lý dữ liệu trên mặt đất. Các sinh viên tham gia sẽ có cơ hội học cách vận hành và điều khiển các vệ tinh cũng như trang bị cho họ các kỹ năng quản lý dự án.

This course provides students with 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.

12.50. Kỹ thuật vi sóng và ăng-ten *(Antenna and Microwave Engineering)*

Số tín chỉ: 3

Môn học trước: General Physics 2 (PH021IU) (Or Physics 3 (PH015IU) or Electromagnetic Theory (EE010IU))

Mô tả nội dung môn học: Khóa học cung cấp cho sinh viên sự hiểu biết về các nguyên tắc cơ bản về bức xạ, ăng ten tuyến tính, mảng nguồn điểm, ăng ten khẩu độ, trở kháng ăng ten và hệ thống ăng ten. Các khái niệm cơ bản về kỹ thuật vi ba như đường truyền, sơ đồ Smith, mạch vi ba, kỹ thuật phân tích, thiết kế và ứng dụng.

The course provides students the understanding of radiation fundamentals, linear antennas, point source arrays, aperture antennas, antenna impedance, and antenna systems. Basic concepts of microwave engineering such as transmission lines, Smith plot, microwave circuits, analysis techniques, design and applications.

12.51. Thực hành kỹ thuật vi sóng và ăng-ten *(Antenna and Microwave Engineering Laboratory)*

Số tín chỉ: 1

Môn học song song: Antenna and Microwave Engineering (EE105)

Mô tả nội dung môn học: Ăng-ten & Sách bài tập thực hành kỹ thuật vi sóng bao gồm nhiều thí nghiệm được thiết kế để hỗ trợ sinh viên trong nghề nghiệp và lý thuyết của họ. Chúng bao gồm nhiều chủ đề khác nhau bao gồm ăng-ten, đường truyền và ống dẫn sóng vi ba. Việc tiếp xúc thực tế với các thiết bị như vậy là cần thiết vì nó được xây dựng dựa trên lý thuyết được dạy cho sinh viên.

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.

12.52. Trắc địa đại cương *(Fundamental of Surveying)*

Số tín chỉ: 3 (2 theory + 1 practice)

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Chủ đề này liên quan đến một số định nghĩa về hình dạng và hệ tọa độ của Trái đất và cũng liên quan đến giới thiệu về thiết bị đo lường, chẳng hạn như máy kinh vĩ, máy đo mức, v.v. kết quả. Ngoài ra, giáo trình trình bày các thủ tục tạo tọa độ và mặt cắt ngang trong thành lập bản đồ địa hình.

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.

12.53. Hệ thống thông tin địa lý và phân tích không gian *(Geographic Information Systems (GIS) and Spatial Analysis)*

Số tín chỉ: 3 (2 theory + 1 practice)

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Khóa học này sẽ tập trung vào các khái niệm và kỹ thuật của GIS. Học sinh sẽ làm quen với các mô hình và cấu trúc dữ liệu, quản lý cơ sở dữ liệu và phân tích và mô hình hóa không gian.

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.

12.54. Công nghệ kỹ thuật mới nổi *(Emerging Engineering Technology)*

Số tín chỉ: 3

Môn học trước: Không

Mô tả nội dung môn học: Khóa học này sẽ khám phá các công nghệ đột phá hiện tại và những đổi mới đột phá mới xuất hiện trong vài năm qua. Một cuộc kiểm tra chặt chẽ về công nghệ sẽ được tiến hành để hiểu ứng dụng sử dụng các công nghệ mới. Lớp học là một loạt các hội thảo về từng công nghệ mới nổi.

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.

12.55. Vật lý thiên văn vô tuyến (*Radio Astrophysics)*

Số tín chỉ: 3

Môn học trước: Không

Mô tả nội dung môn học: Mục đích của khóa học này là mở rộng kiến thức của sinh viên về khoa học vũ trụ, hiểu rõ cách sử dụng ăng-ten trong nghiên cứu Vật lý thiên văn.

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.

12.56. Viễn thám nâng cao *(Advanced Remote Sensing)*

Số tín chỉ: 3

Môn học trước: Remote sensing (PH036IU), Introduction to Digital Image Processing (PH038IU)

Mô tả nội dung môn học: Khóa học này cung cấp kiến thức và kỹ năng xử lý hình ảnh kỹ thuật số để trích xuất thông tin môi trường từ các hệ thống hình ảnh vệ tinh và trên không. Các ứng dụng của quy trình xử lý hình ảnh tiền xử lý, tăng cường, phân loại và lập mô hình là để giám sát, lập mô hình và quản lý môi trường, đồng thời áp dụng cho khoa học sinh học, trên mặt đất, khí quyển và đại dương.

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.

12.57. Cấu trúc dữ liệu và thuật toán *(Data Structures and Algorithms)*

Số tín chỉ: 4

Điều kiện tiên quyết: Java

Mô tả nội dung môn học: Cung cấp phần giới thiệu về cấu trúc dữ liệu và thuật toán, bao gồm thiết kế, phân tích và triển khai của chúng.

Provide an introduction to data structures and algorithms, including their design, analysis, and implementation.

12.58. Phân tích dữ liệu quan sát *(Analytics for Observational Data)*

Số tín chỉ: 4 (3 lý thuyết + 1 thực hành)

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Môn học này giải thích các nguyên tắc và thực hành lập mô hình và phân tích dữ liệu quan sát, nhấn mạnh vào ứng dụng thực tế. Các khái niệm cốt lõi là mô hình xác suất và dự đoán. Các mô hình xác suất cho các loại dữ liệu khác nhau được giới thiệu, bao gồm các mô hình cho số lượng sự kiện, giá trị phân loại. Trọng tâm chính là dữ liệu lớn, chẳng hạn như cơ sở dữ liệu đồ thị hoặc luồng dữ liệu.

This subject explains the principles and practice of modelling and analysing observational data, with an emphasis on practical application. The core concepts are probability modelling and prediction. Probability models for various kinds of data are introduced, including models for counts of events, categorical values. The main focus is on massive data such as, graph database or data stream.

12.59. Khai thác dữ liệu *(Data mining)*

Số tín chỉ: 4 (3 lý thuyết + 1 thực hành)

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Môn học này giới thiệu cho sinh viên các nguyên lý, thuật toán khai phá dữ liệu, yêu cầu của một quá trình khai phá dữ liệu. Học sinh sẽ nghiên cứu các khái niệm và thuật toán khai thác dữ liệu để giải quyết các vấn đề khám phá tri thức. Học sinh có thể phát triển các kỹ năng sử dụng phần mềm khai thác dữ liệu gần đây để giải quyết các vấn đề thực tế và tích lũy kinh nghiệm thực hiện nghiên cứu và học tập độc lập.

This subject introduces the students to principles and algorithms of data mining, and requirements of a data mining process. 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.

12.60. Phân tích kinh doanh với dữ liệu lớn *(Business analytics with Big data)*

Số tín chỉ: 3

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Khóa học này giới thiệu về phân tích kinh doanh với nhiều loại phân tích kinh doanh, loại dữ liệu, nguồn dữ liệu, hiểu biết về dữ liệu lớn và phân tích dữ liệu lớn và phương tiện truyền thông xã hội cũng như phân tích phương tiện truyền thông xã hội.

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.

12.61. Thực hành Phân tích kinh doanh với dữ liệu lớn *(Business analytics with Big data Laboratory)*

Số tín chỉ: 1

Môn học song song: Business analytics with Big data

Mô tả nội dung môn học: Khóa học này cung cấp cho sinh viên các nghiên cứu điển hình liên quan đến phân tích kinh doanh với nhiều loại phân tích kinh doanh, loại dữ liệu, nguồn dữ liệu, hiểu biết về dữ liệu lớn và phân tích dữ liệu lớn và phương tiện truyền thông xã hội cũng như phân tích phương tiện truyền thông xã hội.

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.

12.62. Dự án nghiên cứu *(Research Project)*

Số tín chỉ: 4

Điều kiện tiên quyết: Không

Mô tả nội dung môn học: Môn học này cung cấp dự án nghiên cứu cho sinh viên nhằm nâng cao kỹ năng nghiên cứu và có những trải nghiệm trong các dự án thực tiễn.

This course provides the research project for students, which improves their skills in doing research and has experience in a practical project.

12.63. Thực tập *(Internship)*

Số tín chỉ: 3

Điều kiện tiên quyết: Là sinh viên năm thứ 3, không vi phạm các cảnh báo học vụ

Mô tả nội dung môn học: Sinh viên sẽ được thực tập tại trung tâm vũ trụ, trung tâm vệ tinh quốc gia về các lĩnh vực liên quan đến khoa học vệ tinh và kỹ thuật vệ tinh.

Students will start their internship at space center, satellite center and company relating to satellite science and satellite engineering.

12.64. Khóa luận tốt nghiệp *(Thesis)*

Số tín chỉ: 10

Điều kiện tiên quyết: Hoàn thành 90% trên tổng số tín chủ của chương trình học, không vi phạm các cảnh báo học vụ.

Mô tả nội dung môn học: Nội dung của khóa luận tốt nghiệp tập trung về kỹ thuật không gian, đặc biệt là công nghệ vệ tinh và các ứng dụng. Sinh viên sẽ am hiểu sâu sắc về lý thuyết và ứng dụng. Sinh viên cũng sẽ được làm quen với nhiều đề tài nghiên cứu, cách lập luận và đưa ra quan điểm trong quá trình nghiên cứu, những điều này sẽ giúp sinh viên phát triển các quan điểm học thuật.

The topics of the thesis focus on space engineering, especially satellite technology and satellite application. Students have deeply understanding about the 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.

TRƯỞNG BỘ MÔN VẬT LÝ

Phan Bảo Ngọc

KT. HIỆU TRƯỞNG
PHÓ HIỆU TRƯỞNG

ĐẠI HỌC QUỐC GIA THÀNH PHỐ HỒ CHÍ MINH
TRƯỜNG ĐẠI HỌC QUỐC TẾ

Đinh Đức Anh Vũ

ĐẠI HỌC QUỐC GIA
THÀNH PHỐ HỒ CHÍ MINH
TRƯỜNG ĐẠI HỌC QUỐC TẾ

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh phúc

Phụ lục 1
NỘI DUNG ĐIỀU CHỈNH CHƯƠNG TRÌNH ĐÀO TẠO
NGÀNH KỸ THUẬT KHÔNG GIAN KHÓA 2023 SO VỚI KHÓA 2022

(Kèm theo Quyết định số 1000/QĐ-ĐHQT ngày 30 tháng 8 năm 2023 của Hiệu trưởng trường Đại học Quốc tế)

1. Các môn học loại bỏ khỏi chương trình đào tạo

- Bỏ 3 môn bắt buộc sau:

STT	Mã môn học	Tên môn học	Số tín chỉ	Loại MH
1	EE050IU	Introduction to computer for engineers	3	Bắt buộc
2	PH031IU	Optics and Photonics	2	Bắt buộc
3	PE020IU	Engineering Ethics and Professional skills	3	Bắt buộc

2. Các môn học bổ sung vào chương trình đào tạo

- Thêm 3 môn bắt buộc.
- Thêm 5 môn tự chọn.

STT	Mã môn học	Tên môn học	Số tín chỉ	Loại MH
1	IT153IU	Discrete Mathematics	3 (3LT+0TH)	Bắt buộc
2	IT079IU	Principles of database management	4 (3LT+1TH)	Bắt buộc
3	PE021IU	General law	3 (3LT+0TH)	Bắt buộc
4	IT013IU	Data structures and Algorithms	4 (3LT+1TH)	Tự chọn
5	IT142IU	Analytics for observational data	4 (3LT+1TH)	Tự chọn
6	IT160IU	Data mining	4 (3LT+1TH)	Tự chọn
7	PH058IU	Business analytics with Big data	3 (3LT+0TH)	Tự chọn
8	PH059IU	Business analytics with Big data laboratory	1 (0LT+1TH)	Tự chọn

3. Các điều chỉnh khác

Điều chỉnh số tín chỉ môn học

STT	Tên môn học	CTĐT hiện hành		CTĐT điều chỉnh		Loại MH
		Mã MH cũ	**Số tín chỉ cũ**	**Mã MH mới**	**Số tín chỉ mới**	
1	Big data analytics for Remote sensing	PH053IU	3 TC (3LT+0TH)	PH060IU	4 TC (4LT+0TH)	Bắt buộc
2	Earth observation and the Environment	PH027IU	3TC (3LT+0TH)	PH061IU	2 TC (2LT+0TH)	Bắt buộc
3	iOS programming fundamentals	PH055IU	4 TC (3LT+1TH)	PH062IU	3TC (2LT+ 1TH)	Bắt buộc
4	Introduction to Space communications	PH035IU	3 TC (3LT+0TH)	PH063IU	2 TC (2LT+0TH)	Bắt buộc
5	Internship	PH044IU	3TC	PH064IU	4TC	Bắt buộc
6	Geolocation App development for iOS	PH057IU	4 TC (3LT+1TH)	PH065IU	3 TC (2LT + 1TH)	Bắt buộc

4. Hướng xử lý cho các sinh viên khóa cũ khi chưa học các môn học bị loại bỏ khỏi chương trình đào tạo

Trường hợp		Điều kiện	Giải pháp	Ghi chú
1	K2022, K2021 theo đúng trình độ tiếng Anh	Đủ số lượng mở lớp	Học theo đúng kế hoạch hiện hành theo lộ trình CTĐT cũ	
2	SV đã học đủ môn nhưng còn thiếu TC do giảm *học trễ/rớt môn/cải thiện/không đủ số lượng mở lớp*	Thiếu 1-2TC	Học môn Project 1 (PH066IU - 1TC) hoặc Project 2 (PH067IU - 2TC)	
			Đủ số lượng: Mở lớp với số tín chỉ cũ	
			Không đủ số lượng: Gom chung với khóa mới để học môn với số TC cũ	SV khóa mới chỉ nộp học phí theo đúng số TC mới

		Thiếu 3-4TC	SV học thêm 1 môn thay thế: Discrete Math (3TC) hoặc Principles of Database Management (4TC)	Tính thay thế 3-4TC từ Intro to SC, Earth obs, Geolocation và iOS funda bằng Discrete Math (3TC) hoặc Principles of Database Management (4TC)
3	SV nợ môn đã hủy (Optics and photonics (2TC)) *học trễ/rớt môn/cải thiện/không đủ số lượng mở lớp*	Thiếu 2TC	SV học thêm 1 môn thay thế: Discrete Math (3TC) hoặc Principles of Database Management (4TC)	Tính thay thế môn Optics and photonics bằng Discrete Math (3TC) hoặc Principles of Database Management (4TC)

ĐẠI HỌC QUỐC GIA
THÀNH PHỐ HỒ CHÍ MINH
TRƯỜNG ĐẠI HỌC QUỐC TẾ

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh phúc

Phụ lục 2
ĐỀ CƯƠNG CHI TIẾT CÁC MÔN HỌC
(Kèm theo Quyết định số 1000/QĐ-ĐHQT ngày 30 tháng 8 năm 2023 của Hiệu trưởng trường Đại học Quốc tế)

1. 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/ 4.62 ECTS
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.

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

	have all test scores, lively discussions, constructive and serious statements in class.
Materials	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.

2. 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/ 3.08 ECTS
Required and recommended prerequisites	Marxist-Leninist philosophy

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

	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.

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<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>
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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.

3. 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/ 3.08 ECTS
Required and recommended prerequisites	l. Marxist-Leninist political economy 2. Marxist-Leninist philosophy
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 the 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

<table>
<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><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction</td><td>1</td><td>I, T</td></tr>
<tr><td>Introduction to Scientific Socialism</td><td>4</td><td>I, T</td></tr>
<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></td></tr>
<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.
- 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%). 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>
<tr><td>Materials</td><td>1. Ministry of Education and Training. (2019). Giáo trình Chủ nghĩa xã hội khoa học, 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.</td></tr>
</table>

	3. Governing Body. (2008). *Giáo trình Chủ nghĩa xã hội khoa học,* National Political Publishing House, Hanoi.

4. 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/ 3.08 ECTS
Required and recommended prerequisites	1. Marxist-Leninist philosophy 2. Marxist-Leninist political economy 3. Scientific socialism
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

<table>
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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, T</td></tr>
<tr><td>Objects, functions, tasks, contents and methods of research and study History of the Communist Party of Vietnam</td><td>4</td><td>I, T</td></tr>
<tr><td>The Communist Party of Vietnam was born and led the struggle for power (1930-1945)</td><td>5</td><td>T</td></tr>
<tr><td>The Party led two resistance wars, completed the national liberation and reunification (1945-1975)</td><td>5</td><td>I, T</td></tr>
<tr><td>The Party led the country in the transition to socialism and carried out the Doi moi (1975-2018)</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; 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.
- 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). 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</td></tr>
</table>

	Lịch sử Đảng Cộng sản Việt Nam (revised and supplemented edition). National Political Publishing House, Hanoi.

5. 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/ 3.08 ECTS
Required and recommended prerequisites	1. Marxist-Leninist philosophy 2. Marxist-Leninist political economy 3. Scientific socialism
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 *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

<table>
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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, 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>
<tr><td>Ho Chi Minh ideology on culture, morality and human</td><td>3</td><td>I, T</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Class discussion; Group presentations and reports; Mid-term exam: Multiple choice (closed-book) or essay (opened-book); Final exam: Essay (opened-book)</td></tr>
<tr><td>Study and examination regulations</td><td>- 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.</td></tr>
<tr><td>Materials</td><td>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.</td></tr>
</table>

	4. *Biography of Ho Chi Minh* (2016). National Political Publishing House, Hanoi.

6. 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 Department of English
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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	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 hours)
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</td></tr>
</table>

	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. *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 ● - 115

6	*In-class Assignment:* 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 academic task (register for classes, apply for a scholarship, pass an exam, etc.)	1-5	As Mid	Lecture Discussion	[1] pp. 101 ● - 115
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 children ● The causes of stress in college students The effects of regular reading on students' lives	1-5			
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	1-5	As Fin	Lecture Discussion	[1] pp. 133

	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.				
10	Comparison/ Contrast Essays (Cont'd) Review/ Correction: Lecturer gives feedback to one or two students' writings in class. *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	1-5	As Fin	Lecture Discussion	[1] pp. 133-151
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 statements. ● 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 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?	1-5	As Fin	Lecture Discussion	

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 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?	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

7. 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 Department of English
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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	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

<table>
<tr><td>Course objectives</td><td>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.</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. Remember different strategies and techniques in listening to academic lectures and taking notes.
CLO2. Improve their specialized knowledge of academic lectures</td></tr>
<tr><td>Skill</td><td>CLO3. Respond to academic lectures with appropriate strategies
CLO4. Communicate effectively with their classmates and professors.</td></tr>
<tr><td>Attitude</td><td>CLO5. Respond to academic lectures with confidence</td></tr>
</table></td></tr>
</table>

<table>
<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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><th>Topic</th><th>Weight</th><th>Level</th></tr>
<tr><td>Orientation & Introduction of strategies and techniques in note-taking</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 1: New Trends in Marketing Research</td><td>3</td><td>T, U</td></tr>
<tr><td>Chapter 2: Business Ethics</td><td>3</td><td>T, U</td></tr>
<tr><td>Chapter 3: Trends in Children’s Media Use</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 4: The Changing Music Industry</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 5: The Placebo Effect</td><td>2</td><td>T, U</td></tr>
<tr><td>Midterm Sample Test & Review</td><td>2</td><td>T, U</td></tr>
<tr><td>Chapter 6: Intelligent Machines</td><td>3</td><td>T, U</td></tr>
<tr><td>Chapter 7: Sibling Relationships</td><td>3</td><td>T, U</td></tr>
<tr><td>Chapter 8: Multiple Intelligences</td><td>3</td><td>T, U</td></tr>
<tr><td>Chapter 9: The Art of Graffiti</td><td>3</td><td>T, U</td></tr>
<tr><td>Final Sample Test & Review</td><td>2</td><td>T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Paper and pen tests: Correct the mistakes, Fill in the blanks, Write short answers, Write a summary paragraph.</td></tr>
<tr><td>Study and examination requirements</td><td>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</td></tr>
<tr><td>Reading list</td><td>[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.</td></tr>
</table>

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	1-5	As Mid	Lecture discussion & inclass-tasks	Chapter 4 The Changing Music Industry

	by using a split-page format				
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 discussio n & 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	CLO 4	CLO 5
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

8. 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 Department of English
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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	Students must complete Writing AE1 course
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.

<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 the structure of a research paper and emILOy appropriate academic language in writing a research paper</td></tr>
<tr><td>Skill</td><td>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.</td></tr>
<tr><td>Attitude</td><td>CLO4. Reason around ethical issues in writing research paper 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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Unit 1: The Academic Writing Process Introduction</td><td>4</td><td>I, T, U</td></tr>
<tr><td>Unit 2: Researching and Writing</td><td>2</td><td>T, U</td></tr>
<tr><td>Unit 3: Fundamentals & Feedback</td><td>2</td><td>T, U</td></tr>
<tr><td>Unit 4: Definitions, Vocabulary & Clarity</td><td>2</td><td>T, U</td></tr>
<tr><td>Unit 5: Generalizations, Facts and Honesty</td><td>4</td><td>T, U</td></tr>
<tr><td>Unit 6: Seeing Ideas and Sharing Texts</td><td>2</td><td>T, U</td></tr>
<tr><td>Unit 7: Description, Methods & Reality</td><td>2</td><td>T, U</td></tr>
<tr><td>Unit 8: Results, Discussion & Relevance</td><td>2</td><td>T, U</td></tr>
<tr><td>Unit 9: The Whole Academic Text</td><td>2</td><td>T, U</td></tr>
<tr><td>Unit 10: Creating the Whole Text</td><td>4</td><td>T, U</td></tr>
<tr><td>Course Review</td><td>2</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Essay writing</td></tr>
</table>

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 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

<table>
<tr><td></td><td>The rater will review the paper to check if citations or references are provided properly. Penalties due to improper citations or references include:
<table>
<tr><td>Degree of magnitude</td><td>Description</td></tr>
<tr><td>Below 15%</td><td>Marked as it is.</td></tr>
<tr><td>15% - 25%</td><td>The score is deducted by 25%.</td></tr>
<tr><td>25% - 40%</td><td>The score is deducted by 50%</td></tr>
<tr><td>Over 40%</td><td>The score is 0.</td></tr>
</table>
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.</td></tr>
<tr><td>Reading list</td><td>[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</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										
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 Unit 1: The Academic Writing Process Introduction	1-4		Lecture discussion and writing practice
2	Unit 1: 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	Unit 2: 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 ExILOring 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 discussion 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 Teacher evaluation	1-4	HW: Task 9	Lecture discussion and writing practice
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 a. avoid the place where they have been shut for long b. go for the place where they were released from quickly.	7.5	CLO 1,2
	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

9. SPEAKING AE2 (EFFECTIVE PRESENTATIONS)

Course Code: **EN012IU**

1. General information

Course title	SPEAKING AE2 (*Effective Presentations*)
Course designation	*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).*
Semester(s) in which the course is taught	1, 2, 3
Person responsible for the course	Lecturers of Department of English
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, lesson, mini presentations
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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	Students must complete AE1 courses
Course objectives	Speaking AE2 aims at introducing an 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.

<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 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>
<tr><td>Skill</td><td>CLO2. Prepare and deliver effective, formal, structured presentations that are appropriate to the specific environment and audience.</td></tr>
<tr><td>Attitude</td><td>CLO3. Deliver both informative and persuasive speech with confidence</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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Orientation & Introduction
Needs analysis</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Building up confidence</td><td>2</td><td>T, U</td></tr>
<tr><td>The first few minutes</td><td>2</td><td>T, U</td></tr>
<tr><td>Organizing what you want to say</td><td>2</td><td>T, U</td></tr>
<tr><td>Summarizing and concluding</td><td>2</td><td>T, U</td></tr>
<tr><td>Using equipment</td><td>2</td><td>T, U</td></tr>
<tr><td>Delivery techniques: Putting it all together</td><td>2</td><td>T, U</td></tr>
<tr><td>Group presentations for the instructor’s evaluation and advice</td><td>2</td><td>U</td></tr>
<tr><td>Introduction to persuasive speeches</td><td>2</td><td>T, U</td></tr>
<tr><td>Methods of persuasion</td><td>2</td><td>T, U</td></tr>
<tr><td>Maintaining interest</td><td>2</td><td>T, U</td></tr>
<tr><td>Dealing with problems and questions</td><td>2</td><td>T, U</td></tr>
<tr><td>Body language</td><td>2</td><td>T, U</td></tr>
<tr><td>Individual presentations for the instructor’s evaluation and advice</td><td>4</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Oral Presentations</td></tr>
</table>

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, Presentation practice	● *Presenting*, pp. 8-13 *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

5.1.Midterm exam rubrics and mark sheets

	Very Poor	Poor	Average	Good	Excellent
Pronunciation, Voice Techniques (Pauses, Volume, Speed Change, Stress, Tone, Etc)	- Mumbles, often mispronounces, very difficult to understand. - Dead person talking, voice to text software does better	- Slurred speech, mispronounces some words. Difficult to understand. - Quiet, monotone, sing/song, little or no expression, boring.	- Clear voice, few pronunciation errors. Some slurring Most can understand the presentation - Some use of voice to show interest	- Crisp, clear voice, correct, precise pronunciation, all can understand. - proper volume; steady rate; enthusiasm; confidence	- Native like
Grammar& Vocabulary (Usage And Appropriateness For Audience)	- Frequent grammar or spelling errors - Inappropriate level. for the audience, Misuse vocabulary	- Noticeable Errors - Often too simple or sophisticated, inconsistent. Some vocabulary incorrectly used	- Minor errors - Generally appropriate, little variation or creativity	- No errors, but simple language - Always appropriate for the audience. Excellent use of vocabulary	- No errors. Excellent use of grammar to support ideas - Creative use of language
Body Language, Gestures, Eye Contact (Turns back to audience and reads screen – 0)	- Dead person on stage - Almost no eye contact, reads notes/screen	- Excessive movement or many distracting gestures - Occasionally eye contact, mostly reads notes/screen	- Some distracting gestures, and some movement and useful gestures - Generally maintains eye contact frequently reads notes/screen	- No distracting gestures. Body language supports speech - Excellent eye contact, seldom uses notes	- Excellent use of body language - Constant eye contact, no use of notes
Organization: Intro, Main, Ending, Coherence (see RATING CHECKLIST)	- Difficult to follow as disorganized	- Generally follows outline, poor introduction or conclusion.	- Follows outline, material generally well organized. Some use of transitions and linkage of ideas. Conclusion acceptable	- Follows outline, material well organized. - Ideas clearly linked. Some use of transitions	- Excellent, clear linkage of ideas. - Good transitions Arouses interest in Introduction, and summarizes clearly main points in conclusion
Content: Relevant/ Interesting/ Accurate	- Several errors or lacks critical information	- Some errors and has irrelevant information	- Information is generally accurate, minor errors, generally meets needs of the audience	- Accurate information, related to needs of audience	- No errors, answers all needs of the audience
Visual Aids: Appropriate, Clear (Movies, sound – 0)	- Slides consist of full paragraphs of text, no or superfluous graphics - Tiny font	- Slides have full sentences and occasional superfluous graphics, Difficult to read	- Slides have short phrases, Graphics relate to text and presentation. Easily read	- Attractive, informative graphics, only key words, easily understood, Good use of masking	- Professional quality, Excellent use of visual, no unrelated graphics, easily read, supports presentation
Overall effectiveness	- Ineffective, alienated audience	- Little positive effect or exchange of info.. Audience bored	- Audience learned something, no change in attitude	- Audience generally positive and learned from presentation	- Audience was kept interested and would remember key points

INTERNATIONAL UNIVERSITY
DEPARTMENT OF ENGLISH

SPEAKING AE2 - **MIDTERM** EXAMINATION
RATING CHECKLIST

ACADEMIC YEAR 2021 - 2022
DATE: _____

Student name : _____ Student ID : _____
Topic : _____

Wtg.	*Criteria*	*Very poor*	*Poor*	*Average*	*Good*	*Excellent*	*Comments*
15	**Pronunciation & Voice Techniques (Pause, Volume, Speed Change, Stress, Tone, etc.)**	*(1-3)*	*(4-6)*	*(7-9)*	*(10-12)*	*(13-15)*	
15	**Language use: Grammar & Vocabulary (usage and appropriateness for audience)**	*(1-3)*	*(4-6)*	*(7-9)*	*(10-12)*	*(13-15)*	
10	**Body Language: Gestures, Eye contact, Facial expressions** (turns back to the audience and reads from screen: 0 pt)	*(1-2)*	*(3-4)*	*(5-6)*	*(7-8)*	*(9-10)*	
20	**Organization: Intro, Body, Ending, Coherence** (see below)	*(1-4)*	*(5-8)*	*(9-12)*	*(13-16)*	*(17-20)*	
20	**Content: Relevance, Accuracy**	*(1-4)*	*(5-8)*	*(9-12)*	*(13-16)*	*(17-20)*	
10	**Visual aids: Appropriateness, Clarity** (Movies, sound: 0 pt)	*(1-2)*	*(3-4)*	*(5-6)*	*(7-8)*	*(9-10)*	
10	**Overall effectiveness**	*(1-2)*	*(3-4)*	*(5-6)*	*(7-8)*	*(9-10)*	
	FINAL SCORE: /100						

Negative points: ✧ Timing: <3m: *-15pts* 3m - 3m29: *-10pts* 3m30 - 3m59: *-5pts* 4m - 6m: OK >6m: *-5pts*

Organization:		*Yes*	*No*
A.	Introduction		
a.	Greeting, name, position *(Good morning ladies and gentlemen. My name is___. I'm a___)*	☐	☐
b.	Purpose/ Objective *(The purpose of this talk is to ____)*	☐	☐
c.	Connect with the audience *(I can see that all of you love to___)*	☐	☐
d.	Outline/ Main part *(I've divided my presentation into __ parts)*	☐	☐
e.	Questions *(Should you have any questions, please save them until the end of my presentation)*	☐	☐
B.	Body *(Transitions: Let's start with___/ That brings me to___/ Firstly, Secondly, Next, Lastly)*	☐	☐
C.	Ending		
a.	Signaling the end *(That brings me to the end of my presentation)*	☐	☐
b.	Summary *(Let me just run over the key points again)*	☐	☐
c.	Closing *(Thank you very much for your attention)*	☐	☐
d.	Inviting questions *(I'd be glad to answer any questions you might have)*	☐	☐

Examiner : .....

Final exam rubrics and mark sheets

	Very Poor	Poor	Average	Good	Excellent
Pronunciation, Voice Techniques (Pauses, Volume, Speed Change, Stress, Tone, etc.)	– Mumbles, often mispronounces, very difficult to understand. – Dead person talking, voice to text software does better	– Slurred speech mispronounces some words. Difficult to understand. – Quiet, monotone, sing/song, little or no expression, boring.	– Clear voice, few pronunciation errors. Some slurring Most can understand the presentation – Some use of voice to show interest	– Crisp, clear voice, correct, precise pronunciation, all can understand. – Proper volume, steady rate, enthusiasm, confidence	– Native like
Grammar & Vocabulary (Usage and Appropriateness for Audience)	– Frequent grammar or spelling errors – Inappropriate level. for the audience, Misuse vocabulary	– Noticeable Errors – Often too simple or sophisticated, inconsistent. Some vocabulary incorrectly used	– Minor errors – Generally appropriate, little variation or creativity	– No errors, but simple language – Always appropriate for the audience. Excellent use of vocabulary	– No errors. Excellent use of grammar to support ideas – Creative use of language
Body Language: Posture, Gestures, Eye contact, Facial expression (Turns back to audience and reads screen – 0)	– Dead person on stage – Almost no eye contact, reads notes/screen	– Excessive movement or many distracting gestures – Occasionally eye contact, mostly reads notes/screen	– Some distracting gestures, and some movement and useful gestures – Generally maintains eye contact frequently reads notes/screen	– No distracting gestures. Body language supports speech – Excellent eye contact, seldom uses notes	– Excellent use of body language – Constant eye contact, no use of notes
Organization: Intro, Main, Ending, Coherence (see RATING CHECKLIST)	– Difficult to follow as disorganized	– Generally follows outline, poor introduction or conclusion.	– Follows outline, material generally well organized. Some use of transitions and linkage of ideas. – Conclusion acceptable	– Follows outline, material well organized. – Ideas clearly linked. Some use of transitions	– Excellent, clear linkage of ideas. – Good transitions Arouses interest in Introduction, and summarizes clearly main points in conclusion
Content: Relevant/Accurate, Informative and Persuasive	– Several errors or lacks critical information	– Some errors and has irrelevant information – Just focus on giving information	– Information is generally accurate, minor errors – Give reasons with little or no emphasis on persuasion	– Accurate information, related to needs of audience – Give frequent emphasis on persuasion	– No errors, answers all needs of the audience – Persuade the audience well
Visual Aids: Appropriateness, Clarity *(Use of video clip exceeding 20 seconds – 0)*	– Slides consist of full paragraphs of text, no or superfluous graphics – Tiny font	– Slides have full sentences and occasional superfluous graphics, – Difficult to read	– Slides have short phrases, Graphics relate to text and presentation. Easily read	– Attractive, informative graphics, only key words, easily understood, good use of masking	– Professional quality, Excellent use of visual, no unrelated graphics, easily read, supports presentation
Question response	– Welcomes the question	– Listens carefully, doesn't interrupt	– Thinks before answering – Clarifies, rephrases as needed	– Answers correctly and briefly	– Checks to see if questioner is satisfied

INTERNATIONAL UNIVERSITY
DEPARTMENT OF ENGLISH

SPEAKING AE2 - **FINAL EXAMINATION**
RATING CHECKLIST

ACADEMIC YEAR 2021 – 2022
DATE: _____

Student name : ..... Student ID : .....
Topic : .....

Wtg.	*Criteria*	*Very poor*	*Poor*	*Average*	*Good*	*Excellent*	*Comments*
15	**Pronunciation & Voice Techniques (Pause, Volume, Speed Change, Stress, Tone, etc.)**	*(1-3)*	*(4-6)*	*(7-9)*	*(10-12)*	*(13-15)*	
10	**Language use: Grammar & Vocabulary (usage and appropriateness for audience)**	*(1-2)*	*(3-4)*	*(5-6)*	*(7-8)*	*(9-10)*	
15	**Body Language: Posture, Gestures, Eye contact, Facial expression** (turns back to the audience and reads from screen: 0 pt)	*(1-3)*	*(4-6)*	*(7-9)*	*(10-12)*	*(13-15)*	
15	**Organization: Intro, Body, Ending, Coherence** (see below)	*(1-3)*	*(4-6)*	*(7-9)*	*(10-12)*	*(13-15)*	
20	**Content: Relevant, Accurate, Informative and Persuasive**	*(1-4)*	*(5-8)*	*(9-12)*	*(13-16)*	*(17-20)*	
15	**Visual aids: Appropriateness, Clarity** (Movies, sound: 0 pt)	*(1-3)*	*(4-6)*	*(7-9)*	*(10-12)*	*(13-15)*	
10	**Question response**	*(1-2)*	*(3-4)*	*(5-6)*	*(7-8)*	*(9-10)*	
	SCORE (max. 100): _____		*BONUS (max.10):* _____			**TOTAL SCORE (max.100):** _____	

Deduction points: ✧ No references: -10 ✧ Timing: < 5m: *-15pts* 5m - 5m29: *-10pts* 5m30 - 5m59: *-5pts* > 8m *-5pts*

Bonus points: *Up to **10pts for creativity**, which involves PowerPoint design, Organization of information, Presentation style ...*

Organization:	*Yes*	*No*
A. Introduction		
a. Greeting, name, position *(Good morning, ladies and gentlemen. My name is___. I'm a___)*	☐	☐
b. Connect with the audience *(I can see that all of you love to___)*	☐	☐
c. Purpose/ Objective *(The purpose of this talk is to ____)*	☐	☐
d. Time length *(My presentation should last for ___)*	☐	☐
e. Outline/ Main part *(I've divided my presentation into ___ parts)*	☐	☐
f. Questions *(Should you have any questions, please save them until the end of my presentation)*	☐	☐
B. Body *(Transitions: Let's start with____/ That brings me to____/ Firstly, Secondly, Next, Lastly)*	☐	☐
C. Ending		
a. Signaling the end *(That brings me to the end of my presentation)*	☐	☐
b. Summary *(Let me just run over the key points again)*	☐	☐
c. Closing *(Thank you very much for your attention)*	☐	☐
d. Inviting questions *(I'd be glad to answer any questions you might have)*	☐	☐

Examiner : _____

10. 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	
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
Required and recommended prerequisites for joining the course	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

<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. Have basic knowledge of limits and derivatives (Program outcomes: a)
CLO2. Have basic knowledge of definite/indefinite integrals (Program outcomes: a)</td></tr>
<tr><td>Skill</td><td>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)</td></tr>
<tr><td>Attitude</td><td>CLO5. Confident when dealing with derivatives and integrals. Comfortable with using derivatives and integrals in practical situations. (Program outcome: j, k)</td></tr>
</table></td></tr>
</table>

<table>
<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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><th>Topic</th><th>Weight</th><th>Level</th></tr>
<tr><td>Functions and Graphs, Inverse Functions, Exponential Logarithmic Functions</td><td>1</td><td>I, T</td></tr>
<tr><td>Parametric Curves, Limit. One-sided Limits, Laws of Limits.</td><td>1</td><td>I, T</td></tr>
<tr><td>Evaluating Limits. The Squeeze Theorem. Continuity. The Intermediate Value Theorem</td><td>1</td><td>T, U</td></tr>
<tr><td>Tangent Lines and Velocity Problems. Rates of Change, Derivative.</td><td>1</td><td>T, U</td></tr>
<tr><td>Higher-Order Derivatives, Rules of Differentiation. Rates of Change in the Natural and Social Sciences</td><td>1</td><td>T, U</td></tr>
<tr><td>Implicit Differentiation, Differentiation of Inverse Functions,</td><td>1</td><td>T, U</td></tr>
<tr><td>Logarithmic Differentiation, Linear Approximations. Differentials.</td><td>1</td><td>T, U</td></tr>
<tr><td>Related Rates, Maxima and Minima. Critical Point, The Mean Value Theorem.</td><td>1</td><td>T, U</td></tr>
<tr><td>The First and Second Derivative Test, Concavity. Shapes of Curves, Curve Sketching</td><td>1</td><td>T, U</td></tr>
<tr><td>Indeterminate Forms and l’Hôpital’s Rules, Maxima and Minima Problems, Newton’s Method</td><td>1</td><td>T, U</td></tr>
<tr><td>Anti-derivatives and Indefinite Integrals, The Definite Integral</td><td>1</td><td>I, T</td></tr>
<tr><td>Properties of the Definite Integral. The Fundamental Theorem of Calculus, Integration by Substitution</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Integration by Parts, Partial Fractions, Numerical Integration,</td><td>1</td><td>T, U</td></tr>
<tr><td>Improper Integrals, Areas between Curves Areas Enclosed by Parametric Curves</td><td>1</td><td>T, U</td></tr>
<tr><td>Volumes, Arc Length, Applications to Engineering, Economics and Science</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>
</table>

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**

11. 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 basis 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	Assoc. Prof.Mai Duc Thanh, Assoc. Prof. Tran Vu Khanh, Dr. Nguyen Minh Quan, Dr. Nguyen Anh Tu, Dr. Ta Quoc Bao.
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
Required and recommended prerequisites for joining the course	Calculus 1
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

<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. Have basic knowledge of series, functions of several variables, multiple integrals (Program outcomes: a)
CLO2. Have basic knowledge of vector calculus (Program outcomes: a)</td></tr>
<tr><td>Skill</td><td>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)</td></tr>
<tr><td>Attitude</td><td>CLO5. Confident when dealing with partial derivatives, multiple integrals. Comfortable with using partial derivatives and multiple integrals in practical situations. (Program outcome: j, k)</td></tr>
</table></td></tr>
</table>

<table>
<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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><th>Topic</th><th>Weight</th><th>Level</th></tr>
<tr><td>Sequences and Convergence</td><td>1</td><td>I, T</td></tr>
<tr><td>Series</td><td>1</td><td>I, T</td></tr>
<tr><td>Tests for Convergence</td><td>1</td><td>T, U</td></tr>
<tr><td>Power series</td><td>1</td><td>T, U</td></tr>
<tr><td>Representations of Functions as Power series</td><td>1</td><td>T, U</td></tr>
<tr><td>Taylor and Maclaurin series</td><td>1</td><td>T, U</td></tr>
<tr><td>Vector Functions and Space Curves, Limit and continuity of vector functions</td><td>1</td><td>I, T</td></tr>
<tr><td>Derivatives and Integrals of vector functions, Length of space curves</td><td>1</td><td>T, U</td></tr>
<tr><td>Functions of Several Variables, Limits and Continuity</td><td>1</td><td>I, T</td></tr>
<tr><td>Partial Derivatives, Tangent Plane and Linear Approximations</td><td>1</td><td>T, U</td></tr>
<tr><td>Chain Rules, Directional Derivatives and Gradient</td><td>1</td><td>T, U</td></tr>
<tr><td>Maximum and Minimum Values of Functions of two variables</td><td>1</td><td>T, U</td></tr>
<tr><td>Lagrange Multipliers and Applications</td><td>1</td><td>T, U</td></tr>
<tr><td>Double Integrals in Rectangles, Iterated Integrals</td><td>1</td><td>I, T</td></tr>
<tr><td>Double, Triple Integrals in General regions and Applications</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>
<tr><td>Reading list</td><td>J. Stewart, Calculus, Thomson Learning, 7th edition, 2012.</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										

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, Derivaties and Integrals of Vector Functions, Arc Length, Parametric Surfaces	4, 5	HW	Lectures and Quiz
6	Functions of Several Variables, Limit and Continuty,	2, 4, 5	Quiz	Lectures and Quiz
7	Partial Derivatives, Tangent Plances and Linear Approximations,	3, 5	HW	Lectures and Quiz
8	Chain Rule, Directional Derivaties and Gradient Vectors,	3, 5	HW	Lectures and Quiz
MIDTERM				
9	Maximun and Minimun Values, Larange Multipliers	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 Spherial 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,	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

12. 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 experiences. Generally, it endeavors to provide students 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. Nguyen Ngoc Truong 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/ 4.62 ECTS
Required and recommended prerequisites for joining the course	Parallel course: Programming for Engineers Laboratory EE058IU

<table>
<tr><td>Course objectives</td><td>The course is designed to provide students complete knowledge of C language. Students will be able to develop logics 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.</td></tr>
<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 hours)
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>
</table>

Reading list	[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

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	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

13. 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	Trang Kien, M. Eng
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
Required and recommended prerequisites for joining the course	Parallel course: Programming for Engineers Laboratory 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

<table>
<tr><td>Course learning outcomes</td><td>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 the professional and ethical responsibility.
CLO3: Understand the impact of electrical engineering solutions in a global, economic, environmental and social context.
<table>
<tr><td>Competency level</td><td>Course learning outcome (CLO)</td></tr>
<tr><td>Knowledge</td><td>CLO1, CLO2, CLO3</td></tr>
<tr><td>Skill</td><td>CLO1, CLO2, CLO3</td></tr>
<tr><td>Attitude</td><td>CLO2, CLO3</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 hours)
Teaching levels: I (Introduction); T (Teaching); U (Utilization)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Variables, Data Types, Making Decisions, Branching and Looping</td><td>1</td><td>I, T, U</td></tr>
<tr><td>I/O operations</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Functions/Recursion</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Arrays</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Pointers/Function Pointers</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Structures/Unions/Enumerates</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Characters and Strings, Operations on Bits</td><td>1</td><td>I, T, U</td></tr>
</table>
</td></tr>
<tr><td>Examination forms</td><td>short-answer questions</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] Laboratory Manual supplied by the instructor</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										

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

14. 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	Assoc. Prof. Phan Bảo Ngọc Dr. Đỗ Xuân Hội Dr. Phan Hiền Vũ Dr. Trần Nguyên Lân 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/ 6.16 ECTS
Required and recommended prerequisites for joining the course	None

<table>
<tr><td>Course objectives</td><td>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.</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 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 hours)
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>2</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>2</td><td>I, T,U</td></tr>
<tr><td>Chapter 6: Equilibrium and Elasticity</td><td>2</td><td>I</td></tr>
<tr><td>Chapter 7: Universal Gravitation</td><td>2</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>Exam</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	[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) (1-5) 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	1,3	Assignment/Quiz, Midterm	Lecture, Discussion, In class-Quiz	[1] 1 [2] 1, 2, 3, 4

	with Constant Acceleration. Projectile Motion - Circular Motion. Tangential and Radial Acceleration - Relative Velocity and Relative Acceleration				
4-7	Chapter 2: Laws of Motion - Newton's First Law and Inertial Frames - Newton's Second Law - Newton's Third Law 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	1,3	Assignment/Quiz Midterm	Lecture, Discussion, In class-Quiz	[1] 2 [2] 5, 6
8	Chapter 3: Work and Mechanical Energy - Work Done by Force. Power - Kinetic Energy and Work. Kinetic Energy Theorem	1,3	Assignment/Quiz Final	Lecture, Discussion, In class-Quiz	[1] 3 [2] 7, 8
	MIDTERM				
9	- 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		Lecture, Discussion, In class-Quiz	
10-11	Chapter 4: Linear Momentum and Collisions - Linear Momentum and Its	4,5	Assignment/Quiz Final	Lecture, Discussion,	[1] 4 [2] 9

	Conservation - Impulse and Momentum - Collisions in One Dimension and Two Dimensions			In class-Quiz	
12-14	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 Object - Angular Momentum of a Rotating Rigid Object - Conservation of Angular Momentum	4,5	Assignment/Quiz Final	Lecture, Discussion, In class-Quiz	[1] 5 [2] 10, 11
15	Chapter 6: Equilibrium and Elasticity The Conditions for Equilibrium The Center of Gravity 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	4,5	Assignment/Quiz Final	Lecture, Discussion, In class-Quiz	[1] 6, 7 [2] 12. 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	2,3	Assignment/Quiz Midterm	Lecture, Discussion, In class-Quiz	[1] 1 [2] 14
3-8	Chapter 2: Temperature, Heat, and First Law of Thermodynamics	2,3	Assignment/Quiz Midterm	Lecture, Discussion,	[1] 2 [2] 18

	- 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			In class-Quiz	
	MIDTERM				
9-12	Chapter 3: Kinetic Theory of Gases - Ideal Gases: Experimental Laws, Equation of State - Molecular Model of an Ideal Gas. Mean Free Path - 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	4,5	Assignment/Quiz Final	Lecture, Discussion, In class-Quiz	[1] 2 [2] 19
13-15	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	4,5	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

Phan Bảo Ngọc

15. 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	MSc. 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
Required and recommended prerequisites for joining the course	General Physics 1
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.

<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 law of conservations and dynamics of rigid body and of the kinetic energy of ideal gas and the second law of thermodynamics.</td></tr>
<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 hours)
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>
</table>

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										
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	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	Lecture Discussion	[1]

			Lab report Final exam	Experiment Presentation	
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 Final exam	Lecture Discussion Experiment Presentation	[1]
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

Phan Bảo Ngọc

16. GENERAL PHYSICS 2

Course Code: **PH021IU**

1. General information

Course title	General Physics 2 (Electricity and Magnetism) *(Vật lý đại cương 2)*
Course designation	*This subject will provide a basic knowledge of electricity and magnetism.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Assoc. Prof. Phan Bảo Ngọc Dr. Phan Hiền Vũ Dr. Trần Nguyên Lân Dr. Nguyễn Quang
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/ 4.62 ECTS
Required and recommended prerequisites for joining the course	Physics 1
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 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 electricity and magnetism.
CLO2. Apply knowledge of physics to solving problems in science and engineering.</td></tr>
<tr><td>Skill</td><td>CLO3. Apply skills to analyzing and solving problems in science and engineering.</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: lecture session (3 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Electric Fields</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Chapter 2: Electric Potential and Capacitance</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 3: Current and Resistance. Direct Current Circuits</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Chapter 4: Magnetism</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 5: Electromagnetic Induction</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 6: Electromagnetic Oscillations and Alternating Current</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Chapter 7: Maxwell’s Equation and Electromagnetic Waves</td><td>1</td><td>I, T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam</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] 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.</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										
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, 2, 3, 4	Quiz 1/ Assignment Midterm exam	Lecture, Discussion	[1].0. [2].1.
4-5	Chapter 2: Electric Potential and Capacitance	1, 2, 3, 4	Quiz 2/ Assignment Midterm exam	Lecture, Discussion	[1].9.
6-7	Chapter 3: Current and Resistance. Direct Current Circuits	1, 2, 3, 4	Assignment Midterm exam	Lecture, Discussion	[2].2.
8	Chapter 4: Magnetism (Part 1)	1, 2, 3, 4	Assignment Final exam	Lecture, Discussion	[2]. 4. [1]. 18.
	MIDTERM				
9-10	Chapter 4: Magnetism (Part 2)	1, 2, 3, 4	Quiz 3/ Assignment Final exam	Lecture, Discussion	[2]. 4. [1]. 18.
11-12	Chapter 5: Electromagnetic Induction	1, 2, 3, 4	Quiz 4/ Assignment Final exam	Lecture, Discussion	[3]. 10
13-14	Chapter 6: Electromagnetic Oscillations and Alternating Current	1, 2, 3, 4	Assignment Final exam	Lecture, Discussion	[2]. 4. [1]. 18.
15	Chapter 7: Maxwell's Equation and Electromagnetic Waves	1, 2, 3, 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

Phan Bảo Ngọc

17. 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	MSc. 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
Required and recommended prerequisites for joining the course	General Physics 2
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.

<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 electricity and magnetism.</td></tr>
<tr><td>Skill</td><td>CLO2. Approach and solve problems in electricity and magnetism 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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Ohm’s law</td><td>1</td><td>T,U</td></tr>
<tr><td>Resistances in Circuits</td><td>1</td><td>T,U</td></tr>
<tr><td>LRC Circuits</td><td>1</td><td>T,U</td></tr>
<tr><td>Kirchhoff’s laws</td><td>1</td><td>T,U</td></tr>
<tr><td>RC circuit</td><td>1</td><td>T,U</td></tr>
<tr><td>LR circuit</td><td>1</td><td>T,U</td></tr>
<tr><td>Magnetic fields of coils</td><td>1</td><td>T,U</td></tr>
<tr><td>The e/m experiment</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					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

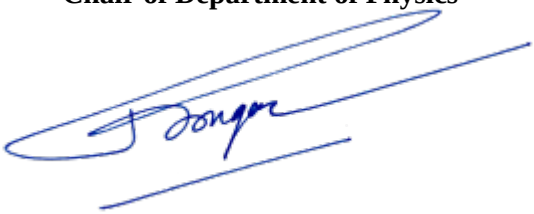
Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (20%)				
Prelab (20%)	x	x	x	x
Report (30%)	x	x	x	x
Final exam (30%)	x	x	x	x

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



Phan Bảo Ngọc

18. 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 Dr. Trần Nguyên Lân
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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	Physics 1
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.

<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 waves, quantum physics, special relativity, and nuclear physics
CLO2. Apply knowledge of physics to solving problems in science and engineering</td></tr>
<tr><td>Skill</td><td>CLO3. Apply skills to analyzing and solving problems in science and engineering</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: lecture session (2 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Chapter 1: Vibration and Mechanical Wave</td><td>3</td><td>I, T,U</td></tr>
<tr><td>Chapter 2: Properties of Light</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Chapter 3: Introduction to Quantum Physics</td><td>3</td><td>I, T,U</td></tr>
<tr><td>Chapter 4: Atomic Physics</td><td>4</td><td>I, T,U</td></tr>
<tr><td>Chapter 5: Relativity and Nuclear Physics</td><td>3</td><td>I, T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam</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.
[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	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 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	1, 2	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz	[1] 1 [2] 15, 16
4-8	Chapter 2: Properties of Light - Interference of Light Waves - Diffraction Patterns and Polarization - Reflection and Refraction. Mirrors and Thin Lenses	1, 2	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz	[1] 1 [2] 34, 35. 36
9-10	MIDTERM				
11-12	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	3, 4	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz	[1] 3
12-13	Chapter 4: Atomic Physics - Atomic spectra - The Bohr Theory of the Hydrogen Atom - The Quantum Mechanical Picture	3, 4	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz	[1] 4

	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 Semiconductivity				
14-16	Chapter 5: Relativity and Nuclear Physics - Special Theory of Relativity: 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	3, 4	Assignment /Quiz Final	Lecture, Discussion, Inclass-Quiz	[1] 5 [2] 37
17	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

Phan Bảo Ngọc

19. 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	MSc. 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
Co-requisites for joining the course	General Physics 3
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.

<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 concepts in Optics and Atomic Physics.</td></tr>
<tr><td>Skill</td><td>CLO2. Approach and solve problems in Optics and Atomic Physics 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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Intensity versus Distance</td><td>1</td><td>T,U</td></tr>
<tr><td>Diffraction and Interference of light</td><td>1</td><td>T,U</td></tr>
<tr><td>Polarization of light</td><td>1</td><td>T,U</td></tr>
<tr><td>Telescope</td><td>1</td><td>T,U</td></tr>
<tr><td>Brewster’s Angle</td><td>1</td><td>T,U</td></tr>
<tr><td>Photoelectric effect 1</td><td>1</td><td>T,U</td></tr>
<tr><td>Photoelectric effect 2</td><td>1</td><td>T,U</td></tr>
<tr><td>Atomic Spectra</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					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	Lecture Discussion	[1]

			Final exam	Experiment Presentation	

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

Phan Bảo Ngọc

20. MATHEMATICS FOR ENGINEERS

Course Code: **PH025IU**

1. General information

Course title	MATHEMATICS FOR ENGINEERS *(Toán cho kỹ sư)*
Course designation	*This course develops a synthetic view of mathematical knowledge and skills in analyzing and modeling Signals and Systems. Covers review of fundamental harmonic analysis, with applications in Electronics, Control, Communications and Signal processing*
Semester(s) in which the course is taught	1,2
Person responsible for the course	Dr. Trần Nguyên Lân
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/ 6.16 ECTS
Required and recommended prerequisites for joining the course	None
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.

<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 complex analysis, determinants, and matrices.</td></tr>
<tr><td>Skill</td><td>CLO2. Apply skills to solve problems in science and engineering.</td></tr>
<tr><td>Attitude</td><td>CLO3. Recognize the need for further self-learning in mathematics.</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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Part I Complex analysis
Functions of a complex variable: limits and continuity</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Singular points, Poles. Laurent series. Line integrals. Cauchy’s integral theorem.</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Residues. Residue theorem. Evaluation of definite integrals</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Application of the residue theorem to compute the Fourier and Laplace transform</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Part II Determinants and matrices
Introduction to determinants</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Matrices: definition; special type of matrices; addition, multiplication; transposition, inversion</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Systems of linear equations; existence of solution; unicity condition; Gauss-Jordan elimination; homogeneous linear systems</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Eigenvalues and eigenvectors of a matrix</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Applications of Eigen technique to solve linear problems.</td><td>1</td><td>I, T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam</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] K.T. Tang, Mathematical Methods for Engineers and Scientists 1”, Springer Verlag, 2007.</td></tr>
</table>

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	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
1-2	Part I Complex analysis Functions of a complex variable: limits and continuity; Derivatives, Analyticity; Cauchy-Riemann condition.	1, 2	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
3-4	Singular points, Poles. Laurent series. Line integrals. Cauchy's integral theorem.	1, 2	Assignment/ Quiz Midterm	Lecture, Discussion, Inclass-Quiz
5	Residues. Residue theorem. Evaluation of definite integrals	1, 2	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
6-7	Application of the residue theorem to compute the Fourier and Laplace transform	1, 2	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
	MIDTERM EXAM	1, 2		
8	Part II Determinants and matrices Introduction to determinants: definition; computation techniques; geometrical interpretation	1, 2	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
9-10	Matrices: definition; special type of matrices; addition, multiplication; transposition, inversion	1, 2	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, 2	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
13-14	Eigenvalues and eigenvectors of a matrix: definition, characteristic polynomial; similarity transformation; diagonalization.	1, 2	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz

15	Applications of Eigen technique to solve linear problems.	1, 2	Assignment/ Quiz Final	Lecture, Discussion, Inclass-Quiz
	FINAL EXAM	1, 2		

4. Assessment plan

Assessment Type	CLO1	CLO2
Attendance + Homework + in-class discussion (30%)	HW1, HW2, HW3 50%Pass	HW4, HW5 50%Pass
Midterm exam or Course Project (30%)	Q1, Q2, Q3 50%Pass	Q4, Q5 50%Pass
Final exam (40%)	Q1, Q2, Q3 50%Pass	Q4, 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

Phan Bảo Ngọc

21. DIFFERENTIAL EQUATIONS

Course Code: **PH026IU**

1. General information

Course title	DIFFERENTIAL EQUATIONS *(Phương trình vi phân)*
Course designation	*This course provides an introduction to ordinary differential equations. Topic includes first order, second order, numerical methods, series solutions, Laplace transforms and Fourier series.*
Semester(s) in which the course is taught	1
Person responsible for the course	
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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	None
Course objectives	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.

<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. Solve mathematical problems by using first order, second order, numerical methods, series solutions, Laplace transforms and Fourier series.</td></tr>
<tr><td>Skill</td><td>CLO2. Apply the techniques, skills, and modern engineering tools to engineering practice</td></tr>
<tr><td>Attitude</td><td>CLO3. Confidence when applying differential equations to practical situations.</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 hours)
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</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Chapter 2: First Order Differential Equations</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Chapter 3: Second Order Linear Equations</td><td>4</td><td>I, T,U</td></tr>
<tr><td>Chapter 4: The Laplace Transform</td><td>3</td><td>I, T,U</td></tr>
<tr><td>Chapter 5: Numerical Methods</td><td>3</td><td>I, T,U</td></tr>
<tr><td>Chapter 6: Partial Differential Equations and Fourier Series</td><td>2</td><td>I, T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam</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] W.E. Boyce, R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 8th ed., John Wiley & Sons, 2004</td></tr>
</table>

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	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
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 Between Linear and Nonlinear Equations Autonomous Equations and Population Dynamics Exact Equations and Integrating Factors	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	1, 2, 3		
8-10	Chapter 4: The Laplace Transform	1, 2, 3		
11-13	Chapter 5: Numerical Methods	1, 2, 3	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
14-15	Chapter 6: Partial Differential Equations and Fourier Series Separation of variables Heat conduction in a bar Wave equation, Laplace equation	1, 2, 3	Assignment/Quiz Final	Lecture, Discussion, Inclass-Quiz
	FINAL EXAM	1, 2, 3		

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

Phan Bảo Ngọc

22. 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, started 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	2
Person responsible for the course	Department of Mathematics
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/ 4.62 ECTS
Previous course	Calculus 2
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.

<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. 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 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 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>
</table>

Reading list	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; [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; Chebychev theorem; Characteristic Function of a Random Vector	3	HW2	Lecture, Discussion, HW	[2].4
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	3	Quiz5	Lecture, Discussion, HW	[1]. 10 [3]. 8

	the variance; Two samples: Estimating the ratio of two variances				
	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

Phan Bảo Ngọc

23. 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 exILOres 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	Trần Thanh Tú (Ph.D); Nguyễn Thị Thủy (Ph.D); Phạm Ngọc (Ph.D) Nguyễn Văn Tiếp (Ph.D); Vũ Tiến Thịnh (MA); Đỗ Thị Diệu Ngọc (MA)
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/ 4.62 ECTS
Required and recommended prerequisites for joining the course	None

<table>
<tr><td>Course objectives</td><td>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</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. 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>
</table>

<table>
<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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><th>Topic</th><th>Weight</th><th>Level</th></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>
<tr><td>Reading list</td><td>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 (11th ed.), Wadsworth, Cengage Learning
+ Relevant web resources</td></tr>
</table>

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	CLO 1	CLO 2	CLO 3	CLO 4	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

24. 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
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/ 4.62 ECTS
Required and recommended prerequisites for joining the course	None

<table>
<tr><td>Course objectives</td><td>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.
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 hours)
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>
</table>

	- Schedule management. + Constructing the network: AON & AOA + Gannt chart + Solving the network	1	T, U
	- Project cost management Project budgeting & Cost estimation + Top-Down budgeting + Bottom-Up budgeting + Improving the process of cost estimation	1	T, U
	- 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)	1	T, U

	- Review
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] [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				
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 + Perform quality control	3	Fin	Lecture, Group work	
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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

25. 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. Vo Tuong Huan LLM. Bui Doan Danh Thao
Language	English
Relation to curriculum	Compulsory
Teaching methods	Student-centred 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
Required and recommended prerequisites for joining the course	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.

<table>
<tr><td>Course learning outcomes</td><td>Upon the successful completion of this course, students will be able to:
<table>
<tr><th>Competency level</th><th>Course learning outcome (CLO)</th></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.
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></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 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 Lecturer can be replaced with relevant Assignment. **Meeting up with the lecturers after classes** Students must make an appointment via emails 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* attendance in 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 in 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 • Breach of law and liabilities for breach of law • Introduction to structure of Vietnamese legal system	1-5	Tests Peer evaluations Class performance evaluations	Discussions Case studies	PPT - Introduction to Vietnamese legal system available on Blackboard
3	Constitutional Law	1-5	Tests	Discussions Case studies	PPTs – Constitutional

	• 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		Peer evaluations Class performance evaluations		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 performance evaluations	Discussions Case studies, especially cases related to corruption	PPT– Criminal law available on Blackboard Criminal code 2015 available on Blackboard
8	Revision for mid-term exam		Quizzes Projects		
	MIDTERM				
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		
	FINAL PROJECT				

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	Generally organised logically, with evidence of progression Occasionally, there may be a	Clear organization and progression. Responds appropriately and relevantly, although some ideas are	Response is focused, detailed and nontangential. Shows a high degree of attention to logic and reasoning of points. Clearly leads

				consistenc e	lack of focus or ideas may be tangential	underdevelo pe d	the reader to the conclusion and stirs thought rega
2		Originalit y and usefulnes s of the analysis	Shows no ability to identify legal issues or a clear inability to gather the facts	Demonstra tes an incomplete grasp of the task. There is no overall sense of creative coherence. Arguments are addressed incomplete ly.	Shows ability to identify legal issues, gather the facts and develop claims. Argument are addressed well but no links with evidence	Shows strong ability to identify legal issues, gather the fact 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/infor mation	Shows no effort to incorporate information from primary and secondary sources	Shows little informatio n from sources. Poor handling of sources	Shows moderate amount of source informatio n incorporat ed. Some key points supported by sources. Quotation s may be poorly integrated into paragraph s. Some possible problems with	Draws upon sources to support most points. Some evidence may not support arguments or may appear where inappropriat e. 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

					source citations		
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 where 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	Shows no effort to construct	Shows little attempt to	Shows argument of poor	Shows clear, relevant and	Shows identifiable, reasonable

		arguments	logical arguments. Fails to support analysis	offer support for key claims or to relate evidence to analysis. Reasons offered are irrelevant.	quality. Weak, undeveloped reasons are offered to support key claims	logical arguments.	and sound arguments. Clear reasons are offered to support key claims.

6. Date revised: May 2023

26. 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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	None

<table>
<tr><td>Course objectives</td><td>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 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 hours)
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>Exam</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] *Tools of Radio Astronomy,* T. L. Wilson, K. Rohlfs, S. Huttemeister, 5th Edition, Springer [2] Anil K. Maini & VarshaAgrawal (2011). *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 [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	1, 3			

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	1-3			

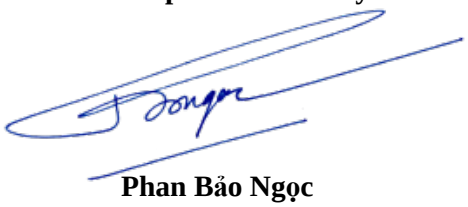
4. Assessment plan

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, Q2 60%Pass				Mid. Q3 60%Pass	
Final exam (40%)	Fin. Q1, Q2 60%Pass				Fin. Q3 60%Pass	

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

5. Date revised: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics



Phan Bảo Ngọc

27. 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
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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	None
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 hours)
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>Exam</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] *Satellite Technology, Principles and Technology,* Anil K. Maini & Varsha A., Wiley, 2011. [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	Resources
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	1, 3	As Mid	Lecture, Discussion	

	Identification of the key environment system components and their characteristics and interactions				
6-8	Chapter 3: Key environmental issues relevant to Earth observation Local (pollution), regional (acid rain), and global (ozone depletion, climate change)	1-3	As Mid Fin	Lecture, Discussion	
	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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

28. 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	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/ 4.62 ECTS
Previous course	None

<table>
<tr><td>Course objectives</td><td>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 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 hours)
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>Exam</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] *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).

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	1, 3			
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 Compton Effect Pair Production Photons	1-3	As Fin	Lecture Discussion	Chapter 5, [1]
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	1-3			

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

29. 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/ 4.62 ECTS
Previous course	General Physics 2 (PH021IU) (or Physics 3 (PH015IU), Differential Equations (PH026IU or MA024IU)
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.

<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 the fundamentals of signals and systems in both discrete time and continuous time domains and 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>
</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 hours)
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>Exam</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] 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

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			
8-10	Fourier Series and Fourier Transforms	1, 2, 3	Assignment/Quiz Final	

11-12	Laplace Transform	1, 2, 3	Assignment/Quiz 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	1, 2, 3		

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

Phan Bảo Ngọc

30. 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. Huynh Vo Trung Dung
Language	English
Relation to curriculum	Compulsory
Teaching methods	Lecture, Exercises
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
Parallel course	Introduction to Signals and Systems (PH032IU)
Course objectives	This course will provide students with: **1.** Design and conduct experiments, analyze results. **2.** Skills to use MATLAB software to write programs about some signals and systems topics and know how to write lab report. **3.** Understand the basic knowledge about the main parts of a typical communication system. **4.** Have an opportunity to exam case studies to understand the professional and ethical responsibility as an engineer

<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. Review the fundamentals of signals and systems.</td></tr>
<tr><td>Skill</td><td>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</td></tr>
<tr><td>Attitude</td><td>CLO4. Understand the professional and ethical responsibility as an engineer</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 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 MATLAB</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Elementary Signals</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Mathematical Description of Signals</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Systems</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Fourier Series</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Time-Domain System Analysis and Laplace Transform</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Fourier Transform and Fourier Analysis Discrete-Time Signals</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Review and Final Examination</td><td>1</td><td>I, T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam</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] Laboratory Manual supplied by the instructor.
Reference:
[2] Z. Gajic, Linear Dynamic Systems and Signals, Prentice-Hall, 2003</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					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

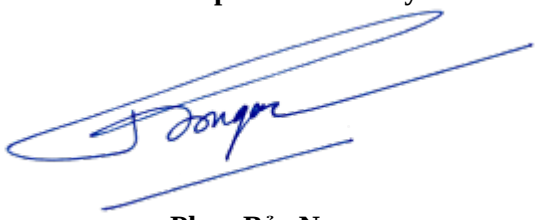
4. Assessment plan

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



Phan Bảo Ngọc

31. 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
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/ 3.08 ECTS
Previous course	Physics 3 (PH015IU)
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.

<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 the knowledge of mathematics and physics to solve engineering problems.
CLO2. ~~D~~emonstrate the understanding of the fundamental principles of satellite communications, satellite orbits, and satellite designs.</td></tr>
<tr><td>Skill</td><td>CLO3. Show abilities of expressing ideas using graphical communications or oral presentations</td></tr>
<tr><td>Attitude</td><td>CLO4. Show the role and responsibility of an engineer in society</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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Overview of Satellite Systems</td><td>1</td><td>I</td></tr>
<tr><td>Orbital and Launching Methods</td><td>1</td><td>I, T</td></tr>
<tr><td>The Geostationary Orbit</td><td>1</td><td>I, T</td></tr>
<tr><td>Polarization</td><td>1</td><td>I, T</td></tr>
<tr><td>Introduction to Antennas</td><td>1</td><td>I, T</td></tr>
<tr><td>Antenna Fundamental Parameters</td><td>1</td><td>I, T</td></tr>
<tr><td>The Space and Earth Segment</td><td>1</td><td>I, T</td></tr>
<tr><td>Analog Signals</td><td>1</td><td>I, T</td></tr>
<tr><td>Digital Signals</td><td>1</td><td>I, T</td></tr>
<tr><td>Error Correcting Codes</td><td>2</td><td>I, T</td></tr>
<tr><td>Interference
Satellite Network</td><td>1</td><td>I, T</td></tr>
<tr><td>Direct Broadcast Satellite (DBS) Television
Satellite mobile and Specialized Services</td><td>2</td><td>I, T</td></tr>
<tr><td>Group Presentation
Review 2</td><td>1</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam</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] D. Roddy, *Satellite Communications,* 4th edition, McGraw–Hill, 2006 [2] Lecture notes [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 Fin	Lecture Class discussion	Chapter 9, [1]
	MIDTERM	1-4			
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	1-4			

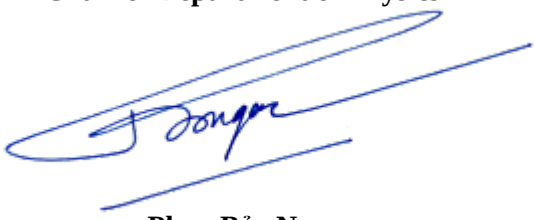
4. Assessment plan

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics



Phan Bảo Ngọc

32. 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
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/ 4.62 ECTS
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 hours)
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>Short-answer questions</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 o Units of Measure o Electromagnetic Energy o Electromagnetic Spectrum o Image Characteristics o Remote Sensing Systems o Spectral Reflectance Curves o Multispectral Imaging Systems o Hyperspectral Scanning Systems o 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 o Interactions between Light and Matter o Film Technology and Photomosaic o Low-Sun-Angle Photographs o Black-and-White Photographs o Normal Color Photographs o IR Color Photographs o Image digital from Satellites o Multispectral scanning o Digital image description and	1-4	As Mid	- Lecture - Class discussion	Chapter 2 [1]

	interpretation				
7-8	Chapter 3: Earth Resource and Environmental Satellites o Geostationary Environmental Satellites o Environmental and Earth Resources Images Compared o Future Satellite System	1-4	As Mid	- Lecture - Class discussion	Chapter 3 [1]
9-10	MIDTERM				
11	Chapter 4: Thermal Infrared Images o Thermal Processes and Properties o TIR Detection and Imaging Technology o Characteristics of TIR Images o Conducting Airborne TIR Surveys o Satellite Thermal IR Images o Thermal IR Spectra o Thermal IR Multispectral Scanner	1-4	As Fin	- Lecture - Class discussion , quiz	Chapter 10, [1]
12	Chapter 5: Radar Technology and Terrain Interactions o Radar Systems o Characteristics of Radar Images o Radar Return and Image Signatures o Polarization o Interferometry	1-4	Fin	- Lecture - Class discussion	Chapter 11, [1]
13-14-15	Chapter 6: Digital image processing o Image correction: radiometric, atmospheric , and geometric o Image conversion: enhancing, filtering o 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 o Land Use and Land Cover, Forestry, Agriculture o Water Resources, Ocean Productivity o 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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

33. 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/ 4.62 ECTS
Parallel Course	General Physics 2 (PH014IU) (or Physics 3 (PH015IU))
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.

<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: 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 hours)
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>1</td><td>I, T</td></tr>
<tr><td>Chapter 2: Solar physics</td><td>1</td><td>I, T</td></tr>
<tr><td>Chapter 3: Solar Wind</td><td>1</td><td>I, T</td></tr>
<tr><td>Chapter 4: Geomagnetism</td><td>1</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>Exam</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] 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)

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	1-3	Mid	Lecture Discussion	Chapter 11, [1]

	The solar eruption				
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	1-3			
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 Magnetospheric current systems Magnetic storms	1-3	Final	Lecture Discussion	Chapter 14, [1]
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	1-3			

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

34. 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	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/ 4.62 ECTS
Previous course	None
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 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 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>
</table>

Reading list	Textbooks: [1] Anil K. Maini & Varsha Agrawal (2011). *Satellite Technology: Princ and Applications*, A John Wiley and Sons, Ltd., Publication) References: [2] James R. Wertz, Wiley J. Larson, *Space Mission Analysis and Desig* Third Edition [3] Miguel A. Aguirre, *Introduction to Space Systems: Design and Synth* 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	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.

ILO7. Communicate effectively in career.

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	1-4			
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	1-4			

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 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.

5. Date revised: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

35. 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 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	2
Person responsible for the course	MS. 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)/5.08 ECTS
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

<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 the knowledge of informatics to solve engineering problems.
CLO2. Apply the Swift Language to develop iOS applications.</td></tr>
<tr><td>Skill</td><td>CLO3. Implement programs on iOS using the Swift language and app development tools.</td></tr>
<tr><td>Attitude</td><td>CLO4. Recognize the legality, professional ethics and responsibilities, and norms of developing and using the software.</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 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 Swift Language
Architecture of Swift
Functions
Variable and Simple Types
Object Type
Flow Control and More</td><td>3</td><td>I, T</td></tr>
<tr><td>OOP Concepts & Practices
Objects, Properties, Classes, methods.
Constructor.
Inheritance
Polymorphism
Abstraction
Encapsulation.</td><td>3</td><td>T</td></tr>
<tr><td>Xcode Project
Anotomy of an Xcode Project
Nib Management
Documentation
Life Cycle of a Project
MVC Concepts</td><td>2</td><td>T, U</td></tr>
<tr><td>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</td><td>2</td><td>T, U</td></tr>
</table></td></tr>
</table>

	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 o Architecture of Swift o Functions o Variable and Simple Types o Object Type o Flow Control and More	1-4	Lecture Discussion	Chapter 2, [1]	I, T
4+5+6	OOP Concepts & Practices o Objects, Properties, Classes, methods. o Constructor. o Inheritance o Polymorphism o Abstraction o Encapsulation.	1-4	Lecture Practice using learnt theories	Chapter 3, [1]	I, T
7+8	Xcode Project o Anotomy of an Xcode Project o Nib Management o Documentation o Life Cycle of a Project o MVC Concepts	1-4	Lecture Practice using learnt theories	Chapter 1, [2]	T, U
	MIDTERM				
9+10	Build the UI o UIKit and Interface Builder o Build a basic UI o Connect the UI to code. o Working with View Controllers. o Implement custom controls. o 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. o TableView	1-4	Lecture Practice using	Chapter 8, [1]	T, U

	○ Navigation Controller.		learnt theories		
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 ○ Networking services ○ GET request ○ REST & CRUD ○ Decoding, Async, and POST Request Test and publish apps on App Store	1-4	Lecture Practice using learnt theories	Chapter 9, [2]	T, U
	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	1-4	Project Discussion	Chapter 6, [1]	T, U

	○ Connect the UI to code. ○ Working with View Controllers. ○ Implement custom controls. ○ Define your data model.				
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				

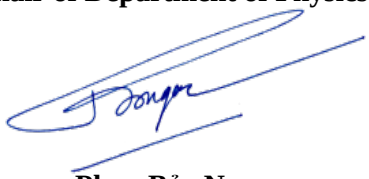
Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Attendance (10%)				
Assignment (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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics



Phan Bảo Ngọc

36. 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
Person responsible for the course	Dr. Hồ Đình Duẩn
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/ 3.08 ECTS
Required and recommended prerequisites for joining the course	None

<table>
<tr><td>Course objectives</td><td>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.</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: 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>
</table>

<table>
<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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><th>Topic</th><th>Weight</th><th>Level</th></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 ILOts</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>Exam</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] Handouts [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	1-3	HW1 Mid	Lecture Discussion	Chapter 8, [4]

	transformation; image registration and interpolation				
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	1-3			
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				

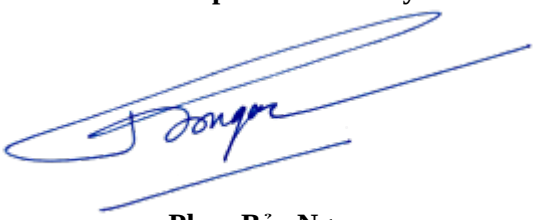
4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3
Attendance (10%)			
Assignment/Homework (20%)	HW1-5. Q1 60%Pass	HW1-5. Q2 60%Pass	HW1-5. Q3 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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics



Phan Bảo Ngọc

37. DIGITAL IMAGE PROCESSING LABORATORY

Course Code: **PH039IU**

1. General information

Course Title	DIGITAL IMAGE PROCESSING LABORATORY *(Thực hành xử lý ảnh số)*
Course Code	PH039IU
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
Person responsible for the course	Dr. Hồ Đình Duẩn
Language	English
Relation to curriculum	Compulsory
Teaching methods	Laboratory, 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
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.

<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 the basic knowledge of digital imaging processing and manipulating on computers in designing, manipulating, and creating 2D digital images.</td></tr>
<tr><td>Skill</td><td>CLO2. Use many widely used programming languages such as Matlab, C/C++, or Python at advanced levels.</td></tr>
<tr><td>Attitude</td><td>CLO3. Show the legal issues and responsibilities in engineering practice.</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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Viewing digital images, bits and bytes, raster scan format, quantization</td><td>1</td><td>T, U</td></tr>
<tr><td>Scaling, translation and rotation, sums and differences</td><td>1</td><td>T, U</td></tr>
<tr><td>Histograms and stretches, convolutional filters</td><td>1</td><td>T, U</td></tr>
<tr><td>Fourier transforms and the frequency domain, filters</td><td>1</td><td>T, U</td></tr>
<tr><td>FFTs, Image filtering: smoothing and sharpening</td><td>1</td><td>T, U</td></tr>
<tr><td>2D convolution and correlation</td><td>1</td><td>T, U</td></tr>
<tr><td>Color and color tables</td><td>1</td><td>T, U</td></tr>
<tr><td>Creating multiple image sequences for the project</td><td>1</td><td>T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam</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] 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</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.

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 60%Pass	Report 1-8. Q2 60%Pass	Report 1-8. Q3 60%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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

38. 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. Nguyen, Thi Thanh Sang*
Language	English
Relation to curriculum	Compulsory
Teaching methods	
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)/6.62 ECTS
Required and recommended prerequisites for joining the course	IT069IU - Object-oriented Programming
Course objectives	● Produce an (Extended) Entity-Relationship (E-R) model from specifications. ● Apply data normalization principles to transforming an ER model into a database schema. ● Construct efficient SQL queries to retrieve and manipulate data as required.

<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 mathematics, science, and engineering</td></tr>
<tr><td>Skill</td><td>CLO2. Design and conduct experiments, as well as to analyze and interpret data</td></tr>
<tr><td>Attitude</td><td>CLO3. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability</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 Database Systems</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Relational Model</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Structured Query Language</td><td>3</td><td>I, T, U</td></tr>
<tr><td>(Extended) Entity Relationship Model</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Relational Database Design</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Application Design and Development</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Advanced SQL</td><td>2</td><td>I, T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam</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	[1] Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 6th edition, McGraw-Hill, 2011 Other supplemental materials: [2] Jeffrey A. Hoffer, Ramesh Venkataraman, Heikki Topi, Modern Database Management, 12th Edition, Prentice Hall, 2016 [3] Ramez Elmasri, Shamkant Navathe, Fundamentals of Database Systems, 6th Edition, Addison Wesley, 2011

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, 2, 3	Assignment Midterm	Lecture Practice	[1]
2-3	Relational Model	1, 2, 3	Assignment Midterm	Lecture Practice	[1]
4-6	Structured Query Language	1, 2, 3	Assignment Midterm	Lecture Practice	[1]
7-9	(Extended) Entity Relationship Model	1, 2, 3	Assignment Midterm	Lecture Practice	[1]
	MIDTERM EXAM				
10-11	Relational Database Design	1, 2, 3	Assignment Final	Lecture Practice	[1]
12-13	Application Design and Development	1, 2, 3	Assignment Final	Lecture Practice	[1]
14-15	Advanced SQL	1, 2, 3	Assignment Final	Lecture Practice	[1]

	FINAL EXAM				

4. **Assessment plan**

Assessment Type	**CLO1**	**CLO2**	**CLO3**
In-class exercises/ assignment	As. P1, As. P2 60%Pass	As. P2 60%Pass	As. P3, As. P4 60%Pass
Midterm exam	Mid. Q1 60%Pass		Mid. Q2 60%Pass
Final exam		Fin. Q2 60%Pass	Fin. Q1, Fin. Q3 60%Pass

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

5. **Date revised: February 15, 2022**

39. DISCRETE MATH

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. Nguyen Van 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/ 4.62 ECTS
Required and recommended prerequisites for joining the course	C/C++ Programming Calculus 1, 2
Course objectives	This course provides students the 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 in 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.

<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 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</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 teaching hours)
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>3</td><td>I,T</td></tr>
<tr><td>Week 2: Logic and propositions (continue)</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 3: Propositional Equivalences; predicates and quantifiers</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 4: Nested Quantifiers and Methods of Proof</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 5: Induction and recursion</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 6&7: Number of theory</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 8: Counting: part 1, 2; midterm review</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 9: Counting: part 3</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 10: Advanced counting</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 11: Boolean algebras</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 12: Graph theory</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 13: Optimal problem solving on graphs</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 14: Introduction and application of tree</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 15: Search on tree; review for final exam</td><td>3</td><td>I,T,U</td></tr>
<tr><td>Week 1: Course syllabus and introduction; Logic and propositions</td><td>3</td><td>I,T</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Multiple-choice questions, short-answer questions</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	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 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	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 examination				
9	Counting: part 3	2,3,4	Quiz, Homework, Final exam	Lecture, Discussion, In-class exercises	[1, 2]
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 examination				

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

40. BIG DATA ANALYTICS FOR REMOTE SENSING

Course Code: **PH060IU**

1. General information

Course title	BIG DATA ANALYTICS FOR REMOTE SENSING (*Phân tích dữ liệu lớn cho Viễn thám*)
Course designation	*The aim of the course is to get students familiar with high-performance computing aspects of remote sensing. Students will learn how to discover knowledge from remote sensing data with high-performance computing approaches and data visual analytics tools (Apache Hadoop, parallel Python, R, and Google Earth Engine).*
Semester(s) in which the course is taught	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/ 6.16 ECTS
Previous Course	Programming for engineers (EE057IU), Earth Observation and Environment (PH061IU), 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.

<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 algorithms of analyzing big data in remote sensing using high-performance computing approaches and data visual analytics tools.</td></tr>
<tr><td>Skill</td><td>CLO2. Analyze data to make conclusions to engineering problems in big data and remote sensing.</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 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 remote sensing big data</td><td>1</td><td>I, T</td></tr>
<tr><td>Infrastructure and high-performance computing for remote sensing data</td><td>2</td><td>I, T</td></tr>
<tr><td>Hadoop and Map Reduce</td><td>2</td><td>I, T</td></tr>
<tr><td>Distributed database</td><td>1</td><td>T, U</td></tr>
<tr><td>The computing platforms: parallel computing (CPUs and GPUs), Cloud computing</td><td>1</td><td>T, U</td></tr>
<tr><td>Python for Big Data</td><td>2</td><td>T, U</td></tr>
<tr><td>R - advanced spatial statistics for remote sensing big data</td><td>1</td><td>T, U</td></tr>
<tr><td>Remote sensing image handling: Image Enhancement, Data Mining</td><td>2</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>Short answer question, 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>
</table>

Reading list	**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 [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 Software:

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 to remote sensing big data	1-3	Lecture Discussion	Chapter 1, [2]	I, T
2+3	Infrastructure and high-performance computing for remote sensing data	1-3	Lecture Discussion	Chapter 2, [2]	I, T
4+5	Hadoop and Map Reduce	1-3	Lecture Discussion	Chapter 1, Chapter 2, [3]	I, T
6	Distributed database	1-3	Lecture	Chapter 3, [3]	T, U

			Discussion		
7	The computing platforms: parallel computing (CPUs and GPUs), Cloud computing	1-3	Lecture Discussion	Chapter 3, [1]	T, U
8	Python for Big Data	1-3	Lecture Discussion	[5]	T, U
	MIDTERM				
9	R - advanced spatial statistics for remote sensing big data	1-3	Lecture Discussion	[4]	T, U
10 + 11	Remote sensing image handling: Image Enhancement, Data Mining	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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

41. BIG DATA ANALYTICS FOR REMOTE SENSING LABORATORY

Course Code: **PH054IU**

1. General information

Course title	BIG DATA ANALYTICS FOR REMOTE SENSING LABORATORY (*Thực hành Phân tích dữ liệu lớn cho Viễn thám*)
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	2
Person responsible for the course	Dr. Lê Thanh Vân
Language	English
Relation to curriculum	Compulsory
Teaching methods	Practice.
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
Previous Course	Big Data Analytics for Remote Sensing (PH060IU)
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.

<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 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.</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 hours)
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 the computing resources.
o Parallel computing: CPUs and GPUs
o Cloud computing</td><td>1</td><td>T, U</td></tr>
<tr><td>Python programming for big data</td><td>1</td><td>T, U</td></tr>
<tr><td>R - advanced spatial statistics for remote sensing big data</td><td>2</td><td>T, U</td></tr>
<tr><td>Remote sensing image handling: Image Enhancement, Data Mining</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>Take experiment and 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>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
Software:</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	Getting started with the computing resources. Parallel computing: CPUs and GPUs Cloud computing	1-3	Lecture Practice	[2]	T, U
6	Python programming for big data	1-3	Lecture Practice	[2]	T, U
7 + 8	R - advanced spatial statistics for remote sensing big data	1-3	Lecture Practice	[2]	T, U
9 + 10	Remote sensing image handling: Image Enhancement, Data Mining	1-3	Lecture Practice	[2]	T, U
11 + 12	Remote sensing thematic mapping on Google Earth Engine platform	1-3	Lecture Practice	[2]	T, U
13	FINAL EXAM				

4. 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.

5. Date revised: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

42. 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
Person responsible for the course	Dr. Nguyễn Chánh Nghiệm
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/ 4.62 ECTS
Previous Course	

<table>
<tr><td>Course objectives</td><td>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.
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>
</table>

Content

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

Weight: lecture session (3 hours)

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

Topic	Weight	Level
Part 1: Fundamentals Chapter 1: Introduction Overview of navigation principles Typical applications Axis systems and projections	1	I, T
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	T
Chapter 3: GPS: An overview Objectives, Policies, and Status System Architecture Signals Receivers, Measurements, and Performance Applications	1	T
Chapter 4: GNSS Development history: GNSS, GPS, GLONASS, EGNOS, Galileo GPS system architecture (ground, space, user segment) Code (CDMA) and carrier techniques	2	T, U
Chapter 5: GPS Coordinate Frames, Time Reference, and Orbits Global Coordinate Systems Time References and GPS Time GPS Orbits and Satellite Position Determination	2	T, U
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	U
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	1	T, U

	Fourier Series Fourier Transform Random Signals Laplace Transform		
	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	1-3	As2 Mid	Lecture, Discussion	Chapter 4, [1]

	Time References and GPS Time 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]
9	MIDTERM EXAM	1-3			
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	1-3	Fin	Lecture, Discussion Practice	Chapter 11, [1]

	Statistical Analysis of Signal Acquisition				
	FINAL PROJECT/EXAM	1-3			

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

43. 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
Person responsible for the course	MS. Truong Thi Ngoc Phuong
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)/5.08 ECTS
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.

<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. 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 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 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.	1-4	As Fin	Lecture, Group work	

	Turning an iOS device into an iBeacon device.				
	MIDTERM EXAM	1, 2			
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	1-4			

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 Anotomy 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]
9	Break				
10	GPS Programming Core Location Map Kit Digital Compass	1-4	As Fin	Lecture Group work	Chapter 2, [2]
11	GPS Programming Geocoding	1-4	As Fin	Lecture Group work	Chapter 5, 6, 7 [2]

	Drawing Heat Maps Further Information and Third-Party SDKs				
12	Case study	1-4	As Fin	Group work	
13	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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

44. 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. Huynh Vo Trung Dung
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/ 4.62 ECTS
Required and recommended prerequisites for joining the course	EE088IU – Signals and Systems
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.

<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 mathematics, science and engineering to solve digital signal processing problem.</td></tr>
<tr><td>Skill</td><td>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</td></tr>
<tr><td>Attitude</td><td>CLO4. Confidence and fluency in discussing digital signal processing in English</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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Introduction. Sampling and reconstruction</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Quantization</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Discrete-time systems</td><td>1</td><td>I, T,U</td></tr>
<tr><td>FIR filtering and convolution</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Z- transforms</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Transfer function</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Digital filter realization</td><td>2</td><td>I, T,U</td></tr>
<tr><td>DFT/FFT algorithms</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Signal processing applications. Class project</td><td>2</td><td>I, T,U</td></tr>
<tr><td>Filter design techniques (FIR, IIR)</td><td>2</td><td>I, T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written Exam</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] 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</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										
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	1-4		

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

45. 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. Huynh Vo Trung Dung
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
Co-requisite	EE092IU – Digital Signal Processing
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

<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. Design and implement digital signal processing algorithms in MATLAB software.</td></tr>
<tr><td>Skill</td><td>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</td></tr>
<tr><td>Attitude</td><td>CLO5. Confidence and fluency in discussing digital signal processing in English</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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Sampling and reconstruction of analog signals.</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Sampling, Quantizing and Coding</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Z transform</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Z transform and Transfer Function</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Fourier Analysis of Discrete-Time Signals</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Frequency Response</td><td>1</td><td>I, T,U</td></tr>
<tr><td>Review and Final Exam</td><td>2</td><td>I, T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written Exam</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] 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</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					

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	Lecture Do exercise

			Lab test Final examination	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

46. 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	2
Person responsible for the course	Dr. Hồ Đình Duẩn
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/ 4.62 ECTS
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.

<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 algorithms for digital image analysis and interpretation in engineering areas.</td></tr>
<tr><td>Skill</td><td>CLO2. Analyze digital images using various platforms and programming languages.</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 (3 hours)
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>Point Operations, local and global operations for image segmentation.</td><td>1</td><td>I, T</td></tr>
<tr><td>Differential operators for segmentation: Gradient and Laplacian.</td><td>1</td><td>I, T</td></tr>
<tr><td>Histograms revisited and Statistics-based segmentation.</td><td>1</td><td>I, T</td></tr>
<tr><td>Color Science.</td><td>1</td><td>I, T</td></tr>
<tr><td>Feature representation.</td><td>1</td><td>I, T</td></tr>
<tr><td>Morphological Image Processing.</td><td>1</td><td>I, T</td></tr>
<tr><td>Linear Image Processing and Filtering.</td><td>1</td><td>I, T</td></tr>
<tr><td>Template Matching.</td><td>1</td><td>I, T</td></tr>
<tr><td>Eigen images.</td><td>1</td><td>I, T</td></tr>
<tr><td>Feature descriptors.</td><td>1</td><td>I, T</td></tr>
<tr><td>Fourier and Morphology-based descriptors.</td><td>1</td><td>I, T</td></tr>
<tr><td>Scale-Space Image Processing.</td><td>1</td><td>I, T</td></tr>
<tr><td>Feature-based Methods for Image Matching.</td><td>1</td><td>I, T</td></tr>
<tr><td>Image classification and simple recognition.</td><td>1</td><td>U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Project /Exam.</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] 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	1, 3			
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	1-3			

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

47. 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 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	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 (lecture 1 + laboratory 2)/5.54 ECTS
Parallel Course	Digital signal processing (EE092), Introduction to digital image processing (PH038IU)
Course objectives	This course will provide students with: ● 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. ● 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.

<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. Analyze processes of operating a satellite system, and collecting, transmitting and post-processing its data.</td></tr>
<tr><td>Skill</td><td>CLO2. Experiment controlling 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 hours)
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 signal and image processing course</td><td>1</td><td>I, T</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 Functions Test Process</td><td>1</td><td>I, T</td></tr>
<tr><td>Function Test in practice: Electrical Power Unit, On-board computer, signal transmission</td><td>1</td><td>I, T</td></tr>
<tr><td>An introduction to 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>An introduction for system test process</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.</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 equivalence 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 engineering: 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 signal and image processing course	CLO1 CLO2	Lecture Discussion	[1]	I, T
2	An introduction of satellite system design,	CLO1	Lecture Discussion	[1]	I, T

	verification and validation process	CLO2			
3	An introduction Functions Test Process	CLO1 CLO2 CLO3 CLO4	Lecture Discussion	[1]	I, T
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 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	Bus System Integration: ADCS components	CLO1 CLO2	Group work Discussion	[1]	T, U

		CLO3 CLO4			
	Break				
9	Bus System Integration: ADCS components (cont)	CLO1 CLO2 CLO3 CLO4	Group work Discussion	[1]	T, U
10	Payload System Integration	CLO1 CLO2 CLO3 CLO4	Group work Discussion	[1]	T, U
11	An introduction for system test process	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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

48. 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 ILOt, microwave circuits, analysis techniques, design and applications.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Tran Van Su
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/ 4.62 ECTS
Required and recommended prerequisites for joining the course	EE010IU – Electromagnetic Theory
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 hours)
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 beam-width, 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></td></tr>
<tr><td>Review</td><td>1</td><td></td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Written Exam</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	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 beam-width, 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	1-3		
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	1-3		

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

49. 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	Tran Van Su
Language	English
Relation to curriculum	Compulsory
Teaching methods	Laboratory, 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
Co-requisite	EE105IU - Antenna and Microwave Engineering
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 hours)
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>Exam</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 [2] Laboratory Manual supplied by the instructor. Reference: [3] Antenna Fundamentals – Lab-Volt's Document. [4] Microwave Fundamentals – Lab-Volt's Document.

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

50. 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
Person responsible for the course	Dr. Nguyễn Đình Hùng
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)/5.08 ECTS
Previous Course	None
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>
</table>

<table>
<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 (4 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><th>Topic</th><th>Weight</th><th>Level</th></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>
<tr><td>Examination forms</td><td>Exam</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] Tom Mastin Barry Kavanagh. (2014). *Surveying: Principles and Applications*, 9th Edition, Pearson India. **References:** [2] Barry Kavanagh, Diane Slattery. (). *Surveying with Construction Applications*, 8th Edition, Pearson India. [3] Wesley G. Crawford. (). *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	1-3	Mid	Lecture, Practice Discussion	Chapter 2, 3 [1]

	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				
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				
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
5	Part B: Practical section Introduction to theodolite and level and how to use this equipment	1-3	Report	Lecture, Group work	Chapter 5 [1]
6	Measuring differential leveling	1-3	Report	Lecture, Group work	Chapter 3 [1]
7	Checking accuracy of theodolite	1-3	Report	Lecture, Group work	Chapter 5 [1]
8	Benchmarks and turning points	1-3	Report	Lecture, Group work	Chapter 3 [1]
	Break				
9	Distance measurement	1-3	Report	Lecture, Group work	Chapter 2 [1]
10	Angle measurement Area measurement	1-3	Report	Lecture, Group work	Chapter 2 [1]

11	Trigonometric leveling	1-3	Report	Lecture, Group work	Chapter 3 [1]
12	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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

51. 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
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)/5.08 ECTS
Required and recommended prerequisites for joining the course	None
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.

<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. 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 hours
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 Sys (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>Exam, 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>
</table>

Reading list	**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, *ExILOring Spatial analysis in Geographic Information Systems*, On Word Press, 1997. [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	1-3			
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	1-3			

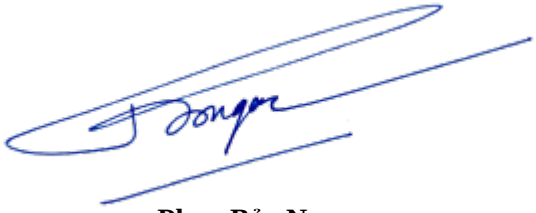
4. Assessment plan

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics



Phan Bảo Ngọc

52. 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	Nguyen Dinh Uyen, Ph.D.
Language	English
Relation to curriculum	Specialization
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/ 4.62 ECTS
Required and recommended prerequisites for joining the course	None
Course objectives	This course will provide students with: ● the depth of students' knowledge in a 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 hours
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>Life Long 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 exam</td></tr>
</table>

Study and examination requirements	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
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				Written 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	Life Long 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				Written 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

53. RADIO ASTROPHYSICS

Course Code: **PH048IU**

1. General information

<table>
<tr><td>Course title</td><td>RADIO ASTROPHYSICS (Vật lý thiên văn vô tuyến)</td></tr>
<tr><td>Course designation</td><td>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.</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>Assoc. Prof. Phan Bảo Ngọc</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, assignment, homework</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/ 4.62 ECTS</td></tr>
<tr><td>Parallel Course</td><td>Antenna and microwave engineering (EE105IU), Antenna and microwave engineering laboratory (EE124IU)</td></tr>
<tr><td>Course objectives</td><td>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</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. Apply knowledge of antenna theory in designing radio antennas for science purposes</td></tr>
<tr><td>Skill</td><td>CLO2. Analyze signals and images of objects in space based on hands-on skills</td></tr>
<tr><td>Attitude</td><td>CLO3. Show abilities of further self-learning and longlife learning.</td></tr>
</table>
</td></tr>
</table>

<table>
<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 hours)
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></td></tr>
<tr><td>Examination forms</td><td>Exam</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] Tools of Radio Astronomy, T. L. Wilson, K. Rohlfs, S. Huttemeister, 5th Edition, Springer</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.

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	Chapter 1 An introduction to radio astrophysics	1, 2, 3	Lecture Discussion		I, T
2-3	Chapter 2 Basic radiative transfer	1, 2, 3	Lecture Discussion		I, T
4-5	Chapter 3 Blackbody radiation and radiation from an accelerated charge	1, 2, 3	Lecture Discussion		T, U
6-7	Chapter 4 Radio telescopes, receivers, and interferometers	1, 2, 3	Lecture Discussion		T, U
	MIDTERM	1, 2, 3			
8-9	Chapter 5 Thermal continuum sources	1, 2, 3	Lecture Discussion		T, U
10-11	Chapter 6 Nonthermal continuum sources	1, 2, 3	Lecture Discussion		T, U
12-13	Chapter 7 Pulsars	1, 2, 3	Lecture Discussion		T, U
14-15	Chapter 8 Spectral-line sources	1, 2, 3	Lecture Discussion		T, U
	FINAL	1, 2, 3			

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

54. 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
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/ 4.62 ECTS
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 hours)
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>Short-answer questions</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] 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	
2	Chapter 2 Remote sensing data collection	1, 2, 3	P Mid	Lecture, Discussion	
3	Chapter 3 Digital image processing hardware and software	1, 2, 3	P Mid	Lecture, Discussion	

4	Chapter 4 Image Quality Assessment and Statistical Evaluation	1, 2, 3	P Mid	Lecture, Discussion	
5	Chapter 5 Display Alternatives and Scientific Visualization	1, 2, 3	HW 1 P Mid	Lecture, Discussion	
6	Chapter 6 Electromagnetic Radiation Principles and Radiometric Correction	1, 2, 3	P Mid	Lecture, Discussion	
7-8	Chapter 7 Geometric Correction	1, 2, 3	HW 2 P Mid	Lecture, Discussion Project presentation	
9	**MIDTERM**				
10	Chapter 8 Image Enhancement	1, 2, 3	HW 3 P Fin	Lecture, Discussion	
11	Chapter 9 Thematic Information Extraction: Pattern Recognition	1, 2, 3	Fin	Lecture, Discussion	
12	Chapter 10 Information Extraction Using Artificial Intelligence	1, 2, 3	Fin	Lecture, Discussion	
13-14	Chapter 11 Change Detection	1, 2, 3	HW 4 P Fin	Lecture, Discussion	
15-16	Chapter 12 Remote Sensing–Derived Thematic Map Accuracy	1, 2, 3	Fin	Lecture, Discussion Project presentation	
17	**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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

55. DATA STRUCTURES AND ALGORITHMS

Course Code: **IT013IU**

1. General information

Course name	Data Structures and Algorithms/ Cấu trúc dữ liệu và thuật toán
Course designation	*Provide an introduction to data structures and algorithms, including their design, analysis, and implementation.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	Dr. Duong Trong Hai
Language	English
Relation to curriculum	Required
Teaching methods	Lecture, practice
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)/6.62 ECTS
Prerequisites	Java
Course objectives	The student will be able to explain the significance of current research about a particular topic

<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 data structures and algorithms in Java.</td></tr><tr><td>Skill</td><td>CLO2. Provide exposure to a broad range of data structures and algorithms including Arrays, Linked Lists, and Recursion, Analysis Tools, Stacks and Queues, Lists and Iterators, Trees, Priority Queues, Maps and Dictionaries, Search Trees, Sorting, Sets, and Selection, Text Processing, Graphs</td></tr><tr><td>Attitude</td><td>CLO3. Provide team programming experience.</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>Arrays, Linked Lists, and Recursion</td><td>1</td><td>I, T, U</td></tr><tr><td>Analysis Tools</td><td>2</td><td>I, T, U</td></tr><tr><td>Stacks and Queues</td><td>2</td><td>I, T, U</td></tr><tr><td>Lists and Iterators</td><td>1</td><td>I, T, U</td></tr><tr><td>Trees</td><td>1</td><td>I, T, U</td></tr><tr><td>Priority Queues</td><td>1</td><td>I, T, U</td></tr><tr><td>Maps and Dictionaries</td><td>1</td><td>I, T, U</td></tr><tr><td>Search Trees</td><td>1</td><td>I, T, U</td></tr><tr><td>Sorting, Sets, and Selection</td><td>1</td><td>I, T, U</td></tr><tr><td>Text Processing</td><td>2</td><td>I, T, U</td></tr><tr><td>Graphs</td><td>2</td><td>I, T, U</td></tr></table></td></tr>
<tr><td>Examination forms</td><td>Exam/project</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	[1] Data Structures and Algorithms in Java (4th edition), Michael T. Goodric and Roberto Tamassia. ISBN: 0-471-73884-0.

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	Arrays, Linked Lists, and Recursion	1, 2, 3	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]
2-3	Analysis Tools	1, 2, 3	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]
4-5	Stacks and Queues	1, 2, 3	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]
6	Lists and Iterators	1, 2, 3	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]
7	Trees	1, 2, 3	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]
8	Priority Queues	1, 2, 3	Labs As, Qz P	Lecture, Practice, Discussion,	[1]

			Mid	Project	
	MIDTERM EXAM				
9	Maps and Dictionaries	1, 2, 3	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
10	Search Trees	1, 2, 3	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
11	Sorting, Sets, and Selection	1, 2, 3	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
12-13	Text Processing	1, 2, 3	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
14-15	Graphs	1, 2, 3	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	**CLO1**	**CLO2**	**CLO3**
Labs (20%)		x	x
Midterm (30%)	x	x	
Final (35%)	x	x	
Project (10%)			x
Assignment, quiz (5%)			x

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

5. Date revised: 15/02/2022

56. ANALYTICS FOR OBSERVATIONAL DATA

Course Code: **IT142IU**

1. General information

Course name	Analytics for Observational Data/ Phân tích dữ liệu quan sát
Course designation	*This subject explains the principles and practice of modelling and analysing observational data, with an emphasis on practical application. The core concepts are probability modelling and prediction. Probability models for various kinds of data are introduced, including models for counts of events, categorical values. The main focus is on massive data such as, graph database or data stream.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	*Nguyen Thi Thanh Sang, Dr.*
Language	English
Relation to curriculum	Required
Teaching methods	Lecture, Practice
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)/6.62 ECTS
Prerequisites	Fundamentals of Programming
Course objectives	This course will provide students with: -

<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. 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.
CLO3. Use Monte-Carlo integration in observational data analysis.</td></tr>
<tr><td>Attitude</td><td>CLO4. Analyze graph data or data stream in experiments.</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 observational data analysis</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Probability distributions</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Generating functions, moments, and central moments</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Covariance and correlation matrices</td><td>3</td><td>I, T, U</td></tr>
<tr><td>Bootstrap and Jackknife methods</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Bayesian statistics</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Monte-Carlo methods</td><td>3</td><td>I, T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam/Project</td></tr>
<tr><td>Study and examination requirements</td><td>Student responsibility: Students are expected to spend at least 8 hours per week for 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>[1] Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman. Mining of Mas Datasets 3rd Edition, Cambridge University Press, 2020.</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:

	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]
2-3	Probability distributions	1, 2, 3, 4	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]
4-5	Generating functions, moments, and central moments	1, 2, 3, 4	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]
6-8	Covariance and correlation matrices	1, 2, 3, 4	Labs As, Qz P Mid	Lecture, Practice, Discussion, Project	[1]
	MIDTERM EXAM				
9-10	Bootstrap and Jackknife methods	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
11-12	Bayesian statistics	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
13-15	Monte-Carlo methods	1, 2, 3, 4	Labs As, Qz P Fin	Lecture, Practice, Discussion, Project	[1]
	FINAL EXAM				

4. Assessment plan

Assessment Type	CLO1	CLO2	CLO3	CLO4
Midterm examination (30%)	x	x	x	
Projects/Lab (20%)	x	x	x	x
Final examination (40%)	x	x	x	
Exercises/ Quiz (10%)	x	x	x	

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

5. Date revised: 15/02/2022

57. DATA MINING
Course Code: **IT132IU**

1. General information

Course name	Data Mining/ Nhập môn khai thác dữ liệu
Course designation	*This subject introduces the students to principles and algorithms of data mining, and requirements of a data mining process. 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.*
Semester(s) in which the course is taught	1, 2
Person responsible for the course	*Dr. Nguyen Thi Thanh Sang*
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture, Practice
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)/6.62 ECTS
Prerequisites	IT069IU - Object-Oriented Programming
Course objectives	This course will provide students with: -

<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 contents of data warehousing and data mining.
CLO2. Explain modern algorithms in the area of data mining and knowledge discovery.</td></tr>
<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, T, U</td></tr>
<tr><td>Know your data</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Data preprocessing</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Data mining knowledge representation</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Data mining algorithms: Classification</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Mining Frequent Patterns, Association and Correlations: Basic Concept and Methods</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Data mining algorithms: Clustering</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Classification: Advanced Methods</td><td>1</td><td>I, T, U</td></tr>
<tr><td>Evaluating what’s been learned</td><td>2</td><td>I, T, U</td></tr>
<tr><td>Recommender systems</td><td>1</td><td>I, T, U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam/Project</td></tr>
</table>

Study and examination requirements	Student responsibility: Students are expected to spend at least 8 hours per week for 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	***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] David Nettleton, *Commercial Data Mining: Processing, Analysis and Modeling for Predictive Analytics Projects*, Elsevier Inc., 2014.

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, 2, 3, 4	Ex Pro Mid	Lecture, Practice, Discussion	[1]
2-3	Know your data	1, 2, 3, 4	Ex Pro Mid	Lecture, Practice, Discussion	[1]
4-5	Data preprocessing	1, 2, 3, 4	Ex Pro Mid	Lecture, Practice, Discussion	[1]

6	Data mining knowledge representation	1, 2, 3, 4	Ex Pro Mid	Lecture, Practice, Discussion	[1]
7-8	Data mining algorithms: Classification	1, 2, 3, 4	Ex Pro Mid	Lecture, Practice, Discussion	[1]
	MIDTERM EXAM				
9-10	Mining Frequent Patterns, Association and Correlations: Basic Concept and Methods	1, 2, 3, 4	Ex Pro Fin	Lecture, Practice, Discussion	[1]
11	Data mining algorithms: Clustering	1, 2, 3, 4	Ex Pro Mid	Lecture, Practice, Discussion	[1]
12	Classification: Advanced Methods	1, 2, 3, 4	Ex Pro Mid	Lecture, Practice, Discussion	[1]
13-14	Evaluating what's been learned	1, 2, 3, 4	Ex Pro Fin	Lecture, Practice, Discussion	[1]
15	Recommender systems	1, 2, 3, 4	Ex Pro Fin	Lecture, Practice, Discussion	[1]
	FINAL EXAM				

4. Assessment plan

Assessment item	**CLO1**	**CLO2**	**CLO3**	**CLO4**
Exercises in Tutorial sessions (10%)	x			
Programming (20%)			x	x
Midterm exam (30%)	x	x		
Final exam (40%)		x	x	

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

5. Date revised: 15/02/2022

58. BUSINESS ANALYTICS WITH BIG DATA

Course Code: **PH058IU**

1. General information

Course name	Business Analytics with Big Data / Phân tích kinh doanh với dữ liệu lớn
Course designation	*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.*
Semester(s) in which the course is taught	1
Person responsible for the course	Dr. Lê Thanh Vân
Language	English
Relation to curriculum	Elective
Teaching methods	Lecture.
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/ 4.62 ECTS
Prerequisites	None
Course objectives	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..

<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 big data concepts and big data tools</td></tr>
<tr><td>Skill</td><td>CLO2. Understand insights of social media analytics in business success.</td></tr>
<tr><td>Attitude</td><td>CLO3. Understand the importance of business analytics to business.</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 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 Business Analytics</td><td>3</td><td>I, T,U</td></tr>
<tr><td>Principles of Big data and Big data tools</td><td>3</td><td>I, T,U</td></tr>
<tr><td>Data warehousing for business decision making</td><td>3</td><td>I, T,U</td></tr>
<tr><td>Data mining and business applications</td><td>3</td><td>I, T,U</td></tr>
<tr><td>Social media analytic – Text analysis and sentiment analysis</td><td>3</td><td>I, T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Exam/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 and Business Analytics, Edited by Jay Liebowitz, CPC Pres 2013.
References:
[2] Social Media Analytics: Effective Tools for Building, Interpreting, an Using Metrics, Marshall Sponder, Mc Graw Hill, 2012.</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

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: 2022

Ho Chi Minh City, 31/12/2022
Chair of Department of Physics

Phan Bảo Ngọc

59. 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. Lê Thanh Vân
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
Co-requisites	Business Analytics with Big Data (PH058IU)
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.

<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 big data concepts and big data tools into business</td></tr>
<tr><td>Skill</td><td>CLO2. Understand insights of social media analytics in business success.</td></tr>
<tr><td>Attitude</td><td>CLO3. Understand the importance of business analytics to business.</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 hours)
Teaching levels: I (Introduce); T (Teach); U (Utilize)
<table>
<tr><td>Topic</td><td>Weight</td><td>Level</td></tr>
<tr><td>Big data analytics in business use-cases</td><td>8</td><td>I, T,U</td></tr>
</table></td></tr>
<tr><td>Examination forms</td><td>Report and Presentation</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 and Business Analytics, Edited by Jay Liebowitz, CPC Press, 20
References:
[2] Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, Marshall Sponder, Mc Graw Hill, 2012.</td></tr>
</table>

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: 2022

Ho Chi Minh City, 31/12/2022
Chair of Department of Physics

Phan Bảo Ngọc

60. RESEARCH PROJECT

Course Code: **PH042IU**

1. General information

Course title	RESEARCH PROJECT (*Dự án nghiên cứu*)
Course designation	*This course provides the research project for students, which improves their skills in doing research and has experience in a practical project.*
Semester(s) in which the course is taught	1
Person responsible for the course	Assoc. 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 (180 hours)
Credit points/ECTS	4 credits/ 6.56 ECTS
Previous Course	None
Course objectives	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.

<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>Skill</td><td>CLO1. Perform experiments, analyze data, and interpret results to get practical experience in working.
CLO2. Cooperate effectively in a team.
CLO3. Show abilities of effective written and oral communication.</td></tr>
<tr><td>Attitude</td><td>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</td></tr>
</table></td></tr>
<tr><td>Content</td><td>A group of students choose one of the research projects assigned by professors. The topic is in two fields:
● Space Science
● Space Engineering</td></tr>
<tr><td>Examination forms</td><td>Report and presentation</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>No textbook required</td></tr>
</table>

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

61. 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	Assoc. 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/ 6.56 ECTS
Previous Course	none
Course objectives	This course will provide students with: - Experience in the application of theory - Communication and teamwork skills. - Opportunity to work in 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.

<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>Skill</td><td>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.</td></tr>
<tr><td>Attitude</td><td>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.</td></tr>
</table></td></tr>
<tr><td>Content</td><td>Students will follow the guidance of the instructors from the space center/satellite center/company.</td></tr>
<tr><td>Examination forms</td><td>Report and presentation</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>Documents, notes from space center/ satellite center</td></tr>
</table>

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	CLO 1	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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics

Phan Bảo Ngọc

62. 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	Assoc. 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
Previous Course	● 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.

<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>Skill</td><td>CLO1. Perform experiments, analyze data, interpret results, and make conclusions for a practical problem.
CLO2. Show abilities of effective written and oral communication</td></tr><tr><td>Attitude</td><td>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.</td></tr></table></td></tr>
<tr><td>Content</td><td>The topic is in two fields:
Space Science
Space Engineering</td></tr>
<tr><td>Examination forms</td><td>Thesis report and presentation</td></tr>
<tr><td>Study and examination requirements</td><td>Following the Thesis Guideline of Department of Physics</td></tr>
<tr><td>Reading list</td><td>Depending on the topic</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		

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

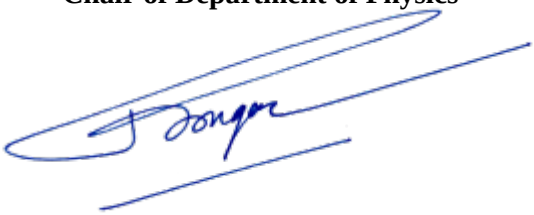
4. Assessment plan

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: 2022

Ho Chi Minh City, 21/01/2022
Chair of Department of Physics



Phan Bảo Ngọc

ĐẠI HỌC QUỐC GIA
THÀNH PHỐ HỒ CHÍ MINH
TRƯỜNG ĐẠI HỌC QUỐC TẾ

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh phúc

Phụ lục 3

BẢNG MÔ TẢ SỐ TÍN CHỈ THỰC TẬP CỦA CTĐT ĐƯỢC THỂ HIỆN CỤ THỂ THEO MÔN HỌC ĐỂ ĐẢM BẢO 8 TÍN CHỈ THỰC TẬP THEO QUY ĐỊNH TẠI THÔNG TƯ 17/2021/TT-BGDĐT

(Kèm theo Quyết định số 1000/QĐ-ĐHQT ngày 30 tháng 8 năm 2023 của Hiệu trưởng trường Đại học Quốc tế)

TT	Mã môn học	Tên môn học		Loại MH (bắt buộc /tự chọn)	Tín chỉ				Ghi chú
		Tiếng Việt	Tiếng Anh		Tổng cộng	Lý thuyết	Thực hành	Đề án	
	THỰC TẬP, DỰ ÁN NGHIÊN CỨU								
1	PH042IU	Dự án nghiên cứu	Research Project	bắt buộc	4	0	0	4	
2	PH064IU	Thực tập	Internship	bắt buộc	4	0	0	4	
	Tổng số (tín chỉ)				**8**	**0**	**0**	**8**	