HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Chemistry 2B
Course code: CHE 2B
Number of credits: 5
Number of hours: 225
Theory: 46; Homeworks + Midterm + Final exam: 29; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 150

2. Course management unit
2.1. Instructor (s): **Instructor's code**

1. PhD. Vu Kim Thu, 0103-16
email: vukimthu@humg.edu.vn; phone number: 0983327276
2. PhD. Cong Tien Dung 0103-03
email: congtiendung@humg.edu.vn; phone number: 0926988868

2.2. Department: Chemistry

2.3. Faculty: Basic Sciences

3. Prerequisites (course code): CHE 2A

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge
4.1.1. Bonding: General Concepts
4.1.2. Covalent Bonding: Orbitals
4.1.3. Liquids and Solids
4.1.4. Properties of Solutions
4.1.5. Chemical Kinetics
4.1.6. Chemical Equilibrium

4.2. Skills
4.2.1. Understand the concepts of chemistry so that you can better appreciate the world around you and can be more effective in whatever career you choose. Integrate concepts/equations and apply them to chemical problems associated with the topics covered

4.2.2. Understand the concepts of bonding as type of bond, Electronegativity; can explain formation of polar bonds and polar molecules; Write Electron Configurations fluently; understand and explain sizes of atoms and their ions in the period (also in the column); specify Binary Ionic and Covalent Compounds; Understanding the rule how to write Lewis Structures; Understand and apply The VSEPR Model to explain the structure of Covalent Compounds.

4.2.3. Understand the theory of Hybridization and the Localized Electron Model and apply to describe the structure of Covalent Compounds. Distinguish Two types of bonds (sigma and pi bonds); Understand and apply The Molecular Orbital Model to explain paramagnetism and diamagnetism property of substance.

4.2.4. Understand the property of matter: liquids and solids; determine three kind of Intermolecular Forces (dipole–dipole attraction, hydrogen bonding, and London dispersion forces) and apply in explaining the property of substances; Understand and Distinguish Structures and Types of Solids; Understand the concept of Vapor Pressure and Changes of State then apply in using Phase Diagrams to know the condition (pressure, temperature) to convert the phase of matter.

4.2.5. Understand and determine all kind of solution composition, the energies of solution formation; Understand factors affecting solubility and use the principal "Like dissolves like" as useful generalization; Understand Vapor pressure of solutions and apply to calculate the boiling-point elevation, freezing-point depression, and osmotic pressure.

4.2.6. Understand collision theory as a controlling factor in reaction rates. Explain the factors that affect the rate of reaction. Understand rate law, rate constant, order, (differential) rate law, integrated rate law, half-life of a reactant and apply the equations to determine all factors. Understand the role of Catalysis in chemical reaction and its mechanism and apply in the fact. Explain how temperature and activation energy affect the rate of a chemical reaction.

4.2.7. Understand the factors that affect chemical equilibrium, the way to use equilibrium constant K_{eq}, apply Le Châtelier's principle to get the aim of reaction (high or low capacity).

5. Course description:

CHEM 2B is the second course of a three-quarter general chemistry sequence for science and engineering majors, as well as pre-professionals in health-related studies. The course is designed to provide students with basic knowledge of general chemistry: Bonding: General Concepts; Covalent Bonding: Orbitals; Liquids and Solids; Properties of Solutions; Chemical Kinetics; and Chemical Equilibrium.

The main goal of this part is to help you understand the concepts of chemistry so that you can better appreciate the world around you and can be more effective in whatever career you choose.

Notes Homework

• Homework assignments will be collected and graded. Students will be required to demonstrate assigned exercises or problems in front of the class by writing on the board and describing their work step by step, as noted in the first session. The number of homework demonstrations will be communicated the first day of class.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

Content	*Topics/ Activities*	*Hours*	*Objectives*

Chapter 8	**Bonding: General Concepts**	**11**	
8.1	Types of Chemical Bonds	7	4.1.1 4.2.1 4.2.2
8.2	Electronegativity		
8.3	Bond Polarity and Dipole Moments		
8.4	Ions: Electron Configurations and Sizes		
8.5	Energy Effects in Binary Ionic Compounds		
8.6	Partial Ionic Character of Covalent Bonds		
8.7	The Covalent Chemical Bond: A Model		
8.8	Covalent Bond Energies and Chemical Reactions		
8.9	The Localized Electron Bonding Model		
8.10	Lewis Structures		
8.11	Exceptions to the Octet Rule		
8.12	Resonance		
8.13	Molecular Structure: The VSEPR Model		
	For Review • Key Terms • Questions and Exercises	4	
Chapter 9	**Covalent Bonding: Orbitals**	**10**	
9.1	Hybridization and the Localized Electron Model	7	4.1.2 4.2.1 4.2.3
9.2	The Molecular Orbital Model		
9.3	Bonding in Homonuclear Diatomic Molecules		
9.4	Bonding in Heteronuclear Diatomic Molecules		
9.5	Combining the Localized Electron and Molecular Orbital Models		
	For Review • Key Terms • Questions and Exercises	3	
Chapter 10	**Liquids and Solids**	**11**	
10.1	Intermolecular Forces	7	4.1.3 4.2.1 4.2.4
10.2	The Liquid State		
10.3	An Introduction to Structures and Types of Solids		
10.4	Structure and Bonding in Metals		
10.5	Carbon and Silicon: Network Atomic Solids		
10.6	Molecular Solids		
10.7	Ionic Solids		
10.8	Vapor Pressure and Changes of State		
10.9	Phase Diagrams		
	For Review • Key Terms • Questions and Exercises	4	
Midterm 1	Include chapters 8, 9 & 10	**1**	
Chapter 11	**Properties of Solutions**	**11**	
11.1	Solution Composition	7	4.1.4 4.2.1 4.2.5
11.2	The Energies of Solution Formation		
11.3	Factors Affecting Solubility		
11.4	The Vapor Pressures of Solutions		
11.5	Boiling-Point Elevation and Freezing-Point Depression		
11.6	Osmotic Pressure		

11.7	Colligative Properties of Electrolyte Solutions		
11.8	Colloids		
	For Review • Key Terms • Questions and Exercises	4	
Chapter 12	**Chemical Kinetics**	**11**	
12.1	Reaction Rates	7	4.1.5 4.2.1 4.2.6
12.2	Rate Laws: An Introduction		
12.3	Determining the Form of the Rate Law		
12.4	The Integrated Rate Law		
12.5	Rate Laws: A Summary		
12.6	Reaction Mechanisms		
12.7	A Model for Chemical Kinetics		
12.8	Catalysis		
	For Review • Key Terms • Questions and Exercises	4	
Chapter 13	**Chemical Equilibrium**	11	4.1.6 4.2.1 4.2.7
13.1	The Equilibrium Condition	7	
13.2	The Equilibrium Constant		
13.3	Equilibrium Expressions Involving Pressures		
13.4	Heterogeneous Equilibria		
13.5	Applications of the Equilibrium Constant		
13.6	Solving Equilibrium Problems		
13.7	Le Châtelier's Principle		
	For Review • Key Terms • Questions and Exercises	4	
Midterm 2	Include chapters 11, 12 & 13	**1**	
*	**Oral Test**	5	
*	**Final Exam**	3	
SUM		**75**	

Course topics to be corved - tentative schedule (Brief form)

No.	Title	Official (hours)	Self-study (hours)
1	Bonding: General Concepts	12	24
2	Covalent Bonding: Orbitals	11	22
3	Liquids and Solids	12	24
4	*Midterm 1*	1	2
5	Properties of Solutions	12	24
6	Chemical Kinetics	12	24
7	Chemical Equilibrium	11	22
8	*Midterm 2*	1	2
10	Final Exam	3	6
	Sum	**75**	**150**

7. Method of instruction:

The students will be guided to prepare for the topics before coming to the class. The theoretical part will be introduced and incorporated with solving exercises and problems in the class. Students can be asked for studying in groups under guidance of the lecturers.

8. Requirements for student:

- Attendance, respectful classroom participation: ≥ 80% (C points)
- A student must complete at least 80% homework exercises (B1 points)
- Midterm 1 and 2 (B2 points)
- Oral Test: compulsory participation (B3 points)
- Final exam: compulsory participation (A points)
- Integrity: Dishonesty can lead to a falling grade
- Prepare for the contents in Table 3

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance (C)	Hours/ Total lecturing hours ≥ 80%	10 %
2	Homeworks (B1)	Homework numbers/ Total homework numbers ≥ 80%	30 %
3	Midterms (B2)	Writing (50 minutes)	
4	Oral Test (B3)	Answer for prepared questions	
5	Final exam (A)	Writing (120 minutes)	60 %

Midterm 1: 50 minutes
Midterm 2: 50 minutes
Course project: To be arranged (if any)
Final Exam: 120 minutes
Average point = 0.6*A + 0.3*(B1+B2+B3)/3+0.1*C

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1]. Steven S. Zumdahl, Sunsan A. Zumdahl. *Chemistry*, Seventh edition, Houghton Mifflin Company, Boston, New York, 2007.

[2]. Martin S. Silberberg. *Principles of general chemistry*, Mc Graw Hill Company, New York, 2007.

[3]. Ralph H. Petrucci …. *General chemistry: Principles and modern applications*, tenth edition, Pearson Canada, Toronto, 2011.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Home works (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student

1	**Chapter 8: Bonding: General Concepts** 8.1 Types of Chemical Bonds 8.2 Electronegativity 8.3 Bond Polarity and Dipole Moments 8.4 Ions: Electron Configurations and Sizes 8.5 Energy Effects in Binary Ionic Compounds 8.6 Partial Ionic Character of Covalent Bonds 8.7 The Covalent Chemical Bond: A Model 8.8 Covalent Bond Energies and Chemical Reactions 8.9 The Localized Electron Bonding Model 8.10 Lewis Structures 8.11 Exceptions to the Octet Rule 8.12 Resonance 8.13 Molecular Structure: The VSEPR Model For Review • Key Terms • Questions and Exercises	8	4	0	24	Study chapter 8 of book **[1]**, chapter 9 of book **[2]** and chapter 10, 11 of book **[3]**
2	**Chapter 9: Covalent Bonding: Orbitals** 9.1 Hybridization and the Localized Electron Model 9.2 The Molecular Orbital Model 9.3 Bonding in Homonuclear Diatomic Molecules 9.4 Bonding in Heteronuclear Diatomic Molecules 9.5 Combining the Localized Electron and Molecular Orbital Models For Review • Key Terms • Questions and Exercises	7	4	0	22	Study chapter 9 of book **[1]**, chapter 9, 10, 11 of book **[2]** and chapter 10, 11 of book **[3]**
3	**Chapter 10: Liquids and Solids** 10.1 Intermolecular Forces 10.2 The Liquid State 10.3 An Introduction to Structures and Types of Solids 10.4 Structure and Bonding in Metals 10.5 Carbon and Silicon: Network Atomic Solids	8	4	0	24	Study chapter 10 of book **[1]**, chapter 12 of books **[2]** and **[3]**

	10.6 Molecular Solids 10.7 Ionic Solids 10.8 Vapor Pressure and Changes of State 10.9 Phase Diagrams For Review • Key Terms • Questions and Exercises					
*	**Midterm 1**	1	0	0	2	
4	**Chapter 11: Properties of Solutions** 11.1 Solution Composition 11.2 The Energies of Solution Formation 11.3 Factors Affecting Solubility 11.4 The Vapor Pressures of Solutions 11.5 Boiling-Point Elevation and Freezing-Point Depression 11.6 Osmotic Pressure 11.7 Colligative Properties of Electrolyte Solutions 11.8 Colloids For Review • Key Terms • Questions and Exercises	8	4	0	24	Study chapter 11 of book **[1]**, and chapter 13 of books **[2]** **[3]**
5	**Chapter 12: Chemical Kinetics** 12.1 Reaction Rates 12.2 Rate Laws: An Introduction 12.3 Determining the Form of the Rate Law 12.4 The Integrated Rate Law 12.5 Rate Laws: A Summary 12.6 Reaction Mechanisms 12.7 A Model for Chemical Kinetics 12.8 Catalysis For Review • Key Terms • Questions and Exercises	8	4	0	24	Study chapter 12 of book **[1]**, chapter 16 of book **[2]** and chapter 14 of book **[3]**
6	**Chapter 13: Chemical Equilibrium** 13.1 The Equilibrium Condition 13.2 The Equilibrium Constant 13.3 Equilibrium Expressions Involving Pressures 13.4 Heterogeneous Equilibria 13.5 Applications of the Equilibrium Constant 13.6 Solving Equilibrium Problems 13.7Le Châtelier's Principle For Review • Key Terms • Questions	7	4	0	22	Study chapter 13 of book **[1]**, chapter 17 of book **[2]** and chapter 15 of book **[3]**

	and Exercises					
*	**Midterm 2**	1	0	0	2	
*	**Final Test**	3	0	0	6	
SUM					**150**	

Hanoi, 30th May 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

Công Tiến Dũng

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Phương trình vi phân - *Differential Equations*
Course code: MAT22B
Number of credits: 3
Total number of hours: 135
Theory: 45; Homeworks/Problems/Discussion: 0; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 90;

2. Course management unit
2.1. Instructor (s):

	Instructor's code
1. Dr. NguyenTruong Thanh	1010-11
2. Ms.Nguyen Thi Lan Huong	1010-12

2.2. Department: Mathematics
2.3. Faculty: Basic of Science

3. Prerequisites (course code): MAT21C, MAT22A

4. Course objectives/goals/expectations (Relationship to learning outcomes):
4.1. Knowledge
4.1.1. To introduce students to, to provide students with basic knowledge of first order differential equation.
4.1.2. To introduce students to and to provide students with basic knowledge of second order differential equation.
4.1.3. To introduce students to and to provide students with basic knowledge of Laplace transformation and how to apply to solve basic differential equations.

4.2. Skills
4.2.1. Recognizing, distinguishing, solving first order differential equations.
4.2.2. Recognizing, distinguishing, solving second order differential equations.
4.2.3. Recognizing, distinguishing, solving differential equations based on Laplace transformation.

5. Course description:
The course is designed to provide students with basic knowledge of elementary differential equations and technologies in finding solutions of basic differential equations.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	First order differential equation	10	4.1.1/4.2.1
Chapter 2	Second order differential equation	10	4.1.2/4.2.2

	Midterm 1	1	
Chapter 3	Laplace transformation and its Applications to Differential equations	20	4.1.3/4.2.3
	Midterm 2	2	
	Final Exam	2	

General Overview/Syllabus, The scope of Calculus 1-MAT 22B

Chapter 1. First order differential equation (10 hours)
1.1 Solutions, Slope Fields, and Euler's Method
1.2 Types of first order differential equation
1.3 Applications of first-order differential equations
Chapter 2. Second order differential equation (10 hours)
2.1 Homogeneous linear equations
2.2 Non-homogeneous linear Equations
2.3 Applications of second-order differential equations
2.4 Euler Equations
2.5 Power-Series Solutions
Midterm 1 (1 hour)
Chapter 3. Laplace transformation (20 hours)
3.1 Laplace transformation
3.2 Applications of Laplace transformation to Differential equations
Midterm 2 (2 hour)
Final Exam (2 hour)

7. Methods of instruction:
- Lectures and discussions.
- Cooperative learning groups and independent study.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the midterms and final exam.
- Homework, laboratory,…and exams: Students are expected to complete all assignments and homework. Students must take part in the final exam.
- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.
- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.
- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. Open books. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted

1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
6	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 60 minutes
Midterm 2: 120 minutes
Course presentations: TBA
Final Exam: 120 minutes
Midterms count as much as 20 % (midterms 10 % each)

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] Maurice D. Weir, Joel Hass, George B. Thomas, Thomas' Calculus Early Transcendentals, Twelfth Edition, *Pearson Education, Boston, New York*, 2009.

[2] Nguyễn Thế Hoàn, Phạm Phu, Cơ sở phương trình vi phân và lý thuyết ổn định. *Nhà xuất bản Giáo dục*, 2000.

[3] Nguyễn Thế Hoàn, Trần Văn Nhung, Bài tập phương trình vi phân. *Nhà xuất bản Giáo dục*, 2005.

[4] S. J. Desjardins and R. Vaillancourt, Ordinary differential equations Laplace transforms and numerical methods for engineers, Notes for the course MAT 2384 3X Spring 2011.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1.** First order differential equation (10 hours) 1.1 Solutions, Slope Fields, and Euler's Method 1.2 Types of first order differential equation 1.3 Applications of first-order differential equations **Midterm 1** (1 hour)	11			22	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
3	**Chapter 2.** Second order differential equation (10 hours) 2.1 Homogeneous linear equations 2.2 Non-homogeneous linear equations	10			20	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**

	2.3 Applications of second-order differential equations 2.4 Euler Equations 2.5 Power-Series Solutions					
7	**Chapter 3. Laplace transformation** (20 hours) 3.1 Laplace transformation 3.2 Applications of Laplace transformation to Differential equations **Midterm 2** (2 hour) **Final Exam** (2 hour)	**24**			48	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**

Hanoi, 30th May 2018

ADVANCE PROGRAM

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Dr. Nguyen Truong Thanh

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

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COURSE SYLLABUS

1. Course title: Đại số tuyến tính - Linear Algebra
Course code: MAT22A
Number of credits: 3
Total number of hours: 135
Theory: 45; Homeworks/Problems/Discussion:0; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 90;

2. Course management unit

2.1. Instructor (s):

	Instructor's code
1. Dr. Nguyen Truong Thanh	0101-11
2. Ms.Nguyen Thi Lan Huong	0101-12

2.2. Department: Mathematics
2.3. Faculty: Basic Science

3. Prerequisites (course code):

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. To introduce students to and to provide students with basic knowledge of Matrices, Determinants, linear systems.
4.1.2. To introduce students to and to provide students with basic knowledge of vector spaces.
4.1.3. To introduce students to and to provide students with basic knowledge of linear transformations, eigenvalues, eigenvectors, diagonalization, factorization.

4.2. Skills

4.2.1. Recognizing, distinguishing, evaluating the Matrices, Determinants, linear systems.
4.2.2. Recognizing, distinguishing vector spaces.
4.2.3. Recognizing, distinguishing, evaluating linear transformations, eigenvalues, eigenvectors, diagonalization, factorization.

5. Course description:

The course is designed to provide students with basic knowledge of Matrices and linear transformations, determinants, eigenvalues, eigenvectors, diagonalization, factorization.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	Matrices, Determinants, Linear systems	**10**	4.1.1/4.2.1
	Midterm 1	**1**	
Chapter 2	Vector space	**10**	4.1.2/4.2.2
	Midterm 2	**1**	
Chapter 3	Linear transformations, eigenvalues, eigenvectors, diagonalization, factorization	**20**	4.1.3/4.2.3
	Midterm 3	**1**	
	Final Exam	**2**	

General Overview/Syllabus, The scope of Linear Algebra **-MAT 22A**

Chapter 1. Matrices, Determinants, Linear systems (10 hours)

1.1. Matrices

1.2. Determinants

1.3. Linear systems

Chapter 2. Vector space (10 hours)

Chapter 3. Linear transformations, eigenvalues, eigenvectors, diagonalization, factorization (20 hours)

3.1 Linear transformations

3.2 Eigenvalues, eigenvectors

3.3 Diagonalization, factorization

Midterm 1 (1 hours)

Midterm 2 (1 hours)

Midterm 3 (1 hours)

Final Exam (2 hours)

7. Methods of instruction:

- Lectures and discussions.
- Cooperative learning groups and independent study.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the midterms and final exam.
- Homework, laboratory,...and exams: Students are expected to complete all assignments and homework. Students must take part in the final exam.
- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.
- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.
- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
6	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 60 minutes

Midterm 2: 60 minutes

Midterm 3: 60 minutes

Course presentations: TBA

Final Exam: 120 minutes

Midterms count as much as 20 % (midterms 10 % each)

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] David Cherney, Tom Denton and Andrew Waldron. Linear Algebra, *First Edition. California*, 2013.

[2] Nguyễn Đình Trí (chủ biên), Toán học cao cấp, tập 1. *NXB GD*, 2005.

[3] Nguyễn Đình Trí (chủ biên), Bài tập toán học cao cấp, tập 1. *NXB GD*, 2005.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1.** Matrices, Determinants, Linear systems (10 hours) 1.1 Matrices 1.2 Determinants 1.3 Linear systems	10			20	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3]**
	Midterm 1	1			2	
2	**Chapter 2.** Vector space (10 hours)	10			20	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3]**
	Midterm 2	1			2	
3	**Chapter 3.** Linear transformations, eigenvalues, eigenvectors, diagonalization, factorization (20 hours) **3.1** Linear transformations **3.2** Eigenvalues, eigenvectors **3.3** Diagonalization, factorization	20			40	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3]**
	Midterm 3	**1**			2	
	Final Exam	**2**			4	

Hanoi, 30th May 2018

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MINISTRY OF EDUCATION AND TRAINING
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COURSE SYLLABUS

1. Course title: *Topics on Refining Project Technology*

Course code: ADECH02A1

Number of credits: 2

Total number of hours: 90

Theory: 0;	Homeworks/Problems/Discussion: 30;	Practice/Laboratory: 0;
Internship: 0;	Topics: 60;	Self-study: 90;

2. Course management unit

2.1. Instructor (s):	**Instructor's code**
1. Dr. Cong Ngoc Thang	0603-11
2. Dr. Vu Van Toan	0603-13

2.2. Department: Oil Refining and Petrochemistry

2.3. Faculty: Oil and Gas

3. Prerequisites (course code):

ADECH02 (Oil refining).

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. Fundametal knowledge of petroleum chemistry;

4.1.2. Fundametal knowledge of organic transformation, petroleum processes in the refinery and chemical plants;

4.2. Skills

4.2.1. Providing/ training the student to be fimilar with the calculation and designing skills, as well as consolidating students' basic knowledge about the processes in petroleum processing technology.

4.2.2. Reinforcing students to master the basic knowledge of oil refining processes, confidently proactively complete graduation thesis in the field of process/ equipment design, confidently work in an oil refinery or petrochemical plant.

4.2.3. After this course/ module, students can fulfill the graduation thesis confidently and proactively in the fields of calculation, design and simulation; confidently working in positions

such as: "design engineers", "operation engineers", "QA engineers" ... in oil refineries or chemical plants after graduation.

5. Course description:

" *Oil Refining Project Assignment* " is a practical component applying the basic knowledge of reaction techniques, thermodynamics of chemical engineering, technology of chemical processes to calculate to design processes in oil refining technology. For each project, students will be assigned to calculate and design 2 parts:

- Part 1: Calculation and design of crude oil distillation process
- Part 2: Calculation and design of one of the following basic chemical processing processes: hydrotreating, catalytic cracking, catalytic reforming, hydrocracking, alkylation, isomerization, coking, or base oils for production of lubricating oils)

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
1	Part 1: Calculation and design of a crude oil distillation tower (basic knowledge and tools for calculating and designing a crude oil distillation tower; studying an example of a sample calculation, and be assigned tasks to evaluate or calculate)	2	4.1.1/4.1.3/4.2.1/4.2.3
2	Part 2: Calculation and design of chemical processing process (to systematize the knowledge and basic tools for calculation and design of chemical processing processes: hydrotreating, catalytic cracking, catalytic reforming, hydrocracking, alkylation, isomerization, coking or production of base oils for lubricating oils; studying an example of a sample calculation, and be assigned tasks to evaluate or calculate)	4	4.1.2/4.1.4/4.2.2/4.2.3

6.2	Presentation of assignment	8	4.1.2/4.1.4/4.2.2/4.2.3
6.3	Writing assignment report	16	4.1.2/4.1.4/4.2.2/4.2.3

7. Methods of instruction:

- Lectures and discussions.
- Cooperative learning groups and independent study.
- Debates and problem solving.

8. Requirements for student:

- Attendance: at least 80 % of lectures.
- Assignments, homeworks, reports: 100%.
- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.
- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
...	...	...	...
...	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books:

[1] Phan Tử Bằng, "Giáo trình công nghệ lọc dầu", Nhà xuất bản xây dựng, Hà nội, (2002).

[2] Phan Tử Bằng, "Hóa học dầu ,mỏ, khí tự nhiên", Nhà xuất bản giao thông vận tải, Hà nội (1999).

[3] Mohamed A. Fahim, Taher A. Alsahhaf, and Amal Elkilani, "Fundamentals of petroleum refining", Elsevier (2010).

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	Part 1: Calculation and design of a crude oil distillation tower				30	+ Document [1, 2]: Content of each item in the chapter. + Exercises related to heat transfer [3].
2	Part 2: Calculation and design of chemical processing				30	+ Document [1, 2]: Content of each item in the chapter. + Exercises related to mass transfer [4].

Hanoi, 30th May 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

TS. Công Ngọc Thắng

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
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COURSE SYLLABUS

1. Course title:

Organic chemistry, part 2
Course code: CHE128B
Number of credits: 3
Number of hours: 45
Theory: 35; Homeworks: 10; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study:90;

2. Course management unit

2.1. Instructor (s): **Instructor's code**
1. Assoc. Prof. Bùi Thị Lệ Thủy 0603-12
2.2. Department: Oil and Petrochemistry Department
2.3. Faculty: Oil and Gas Faculty

3. Prerequisites (course code): CHE2A, CHE2B

4. Course objectives/goals/expectations (Relationship to learning outcomes):
Students should gain the basic knowledge of organic chemistry such as the structure, nomenclature, physical and chemical properties, origins, synthesis methods, practical applications of aromatic hydrocarbons and hydrocarbon derivatives (hydroxyl compounds, carbonnyl compounds, carboxylic acids, and derivatives of carboxylic acids).

4.1. Knowledge

4.1.1 Structure, name, physical and chemical properties, origin, synthesis, practical application of aromatic hydrocarbons

4.1.2 Structure, name, physical and chemical properties, origin, synthesized methods, practical applicability of organometallic compounds.

4.1.3 Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of hydroxyl compounds.

4.1.4 Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of carbonnyl compounds.

4.1.5 Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of carboxylic acids.

4.1.6 Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of derivatives of carboxylic acids.

4.2. Skills

4.2.1 Do the exercises in all chapters

4.2.2. Do the exercises about determination the composition of a substance, the predictive properties of a substance, the preparation of a chemical from a given substances

4.2.3. Exercises about completion of the transformation of substances.

5. Course description:

Knowledge of the structure, name, physical and chemical properties, origin, synthesis methods, practical application of aromatic hydrocarbons and hydrocarbon derivatives (hydroxyl compounds, carbonnyl compounds, carboxylic acids, and derivatives of carboxylic acids).

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Objectives	***Objectives***	***Objectives***	***Content***
Chapter 9	**Mononuclear arenes. Polynuclear arenes**	**8**	**4.1.1, 4.2.1, 4.2.2, 4.2.3**
9.1	The structure of benzene ring	**1**	4.1.1, 4.2.1, 4.2.2, 4.2.3
9.2	The methods of extraction of arenes	**1**	4.1.1, 4.2.1, 4.2.2, 4.2.3
9.3	Physical properties of arenes	**0,5**	4.1.1, 4.2.1, 4.2.2, 4.2.3
9.4	Chemical properties of arenes	3	4.1.1, 4.2.1, 4.2.2, 4.2.3
9.5	The orientation in benzoic ring	1	4.1.1, 4.2.1, 4.2.2, 4.2.3
9.6	Polycyclic arenes	1	4.1.1, 4.2.1, 4.2.2, 4.2.3
9.7	Unbenzenoid aromatic systems	0,5	4.1.1, 4.2.1, 4.2.2, 4.2.3
Chapter 10	**Organometallic Compounds**	**7**	**4.1.2, 4.2.1, 4.2.2, 4.2.3**
10.1	Organmagnesium compounds - Synthesis - Properties - Use	3	4.1.2, 4.2.1, 4.2.2, 4.2.3
10.2	Organzinc compounds - Synthesis - Properties	3	4.1.2, 4.2.1, 4.2.2, 4.2.3

	- Use		
10.3	Organphosphonium compounds - *Organphosphonium compounds P–C* - *Organphosphonium compounds P-O-C*	1	4.1.2, 4.2.1, 4.2.2, 4.2.3
Chapter 11	**Hydroxyl compounds (alcohol phenol ether)**	**9**	**4.1.3, 4.2.1, 4.2.2, 4.2.3**
11.1	Isomers and nomenclature	1	4.1.3, 4.2.1, 4.2.2, 4.2.3
11.2	Physical properties	0,5	4.1.3, 4.2.1, 4.2.2, 4.2.3
11.3	Chemical properties	3	4.1.3, 4.2.1, 4.2.2, 4.2.3
11.4	Synthesis of alcohols and phenol	1,5	4.1.3, 4.2.1, 4.2.2, 4.2.3
11.5	Unsaturated Alcohol	0,5	4.1.3, 4.2.1, 4.2.2, 4.2.3
11.6	Thiol (thioalcohol, mercaptane): RSH	0,5	4.1.3, 4.2.1, 4.2.2, 4.2.3
11.7	Polyol	1	4.1.3, 4.2.1, 4.2.2, 4.2.3
11.8	Typical compounds	0,5	4.1.3, 4.2.1, 4.2.2, 4.2.3
11.9	Ether	1	4.1.3, 4.2.1, 4.2.2, 4.2.3
Chapter 12	**Carbonyl compounds**	**8**	**4.1.4, 4.2.1, 4.2.2, 4.2.3**
12.1	Nomenclature	1	4.1.4, 4.2.1, 4.2.2, 4.2.3
12.2	Physical properties	1	4.1.4, 4.2.1, 4.2.2, 4.2.3
12.3	Chemical properties	5	4.1.4, 4.2.1, 4.2.2, 4.2.3
12.4	Synthesis of carbonyl compounds	2	4.1.4, 4.2.1, 4.2.2, 4.2.3
Chapter 13	**Carboxylic Acids**	5	4.1.5, 4.2.1, 4.2.2, 4.2.3
13.1	Nomenclatures	1	4.1.5, 4.2.1, 4.2.2, 4.2.3
13.2	Preparation of Carboxylic Acids	1	4.1.5, 4.2.1, 4.2.2, 4.2.3
13.3	Physical Properties of Carboxylic Acids	1	4.1.5, 4.2.1, 4.2.2, 4.2.3

13.4	Chemical Properties of Carboxylic Acids	**3**	4.1.5, 4.2.1, 4.2.2, 4.2.3
Chapter 14	**Carboxylic Acid Derivatives**	**8**	**4.1.6, 4.2.1, 4.2.2, 4.2.3**
14.1	Structure and nomenclature	2	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2	Properties	6	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.1	Acidity of amides imides and sulfonamides Acidity of N-H bonds	0,5	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.2	Characteristic Reactions	0,5	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.3	Reaction with H_2O	1	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.4	Reaction with Alcohols	1	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.5	Reaction with Ammonia, etc.	1	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.6	Acid Chlorides with Salts	1	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.7	Interconversions of Acid Derivatives	0,5	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.8	React with organomatellic reagents	1	4.1.6, 4.2.1, 4.2.2, 4.2.3
14.2.9	Reduction	0,5	4.1.6, 4.2.1, 4.2.2, 4.2.3

7. Method of instruction:

- Introduction to the theory knowledge **and guild how to do the exercises**

- Discussion

8. Duties of students:

- Attendance, respectful classroom participation: 80 %
- Homework: 100%
- Special needs: 0

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %

3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing: 60 minutes)	
6	Final exam	Writing: 90 minutes	60 %

Midterm 1: 60 minutes
Midterm 2: 60 minutes
Final Exam: 90 minutes

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] William H. Brown, Christopher S. Foote, Brent L. Iverson, Eric V. Anslyn, Bruce M. Novak, 6th Edition, Organic chemistry, Cengage Learning, 2012

[2] Francis A. Carey, Organic Chemistry, 4th Edition, McGraw-Hill, 2000

[3] James F. Norris, The principles of organic chemistry, 2nd Edition, McGraw-Hill, 2000

10. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 9** Mononuclear arenes. Polynuclear arenes 9.1The structure of benzene ring 9.2The methods of extraction of arenes 9.3Physical properties of arenes 9.4Chemical properties of	8	6		16	+ Book **[1], [2], [3]**: Corresponding chapters + Reading assignments + Summary ....

	arenes 9.5The orientation in benzoic ring 9.6Polycyclic arenes 9.7Unbenzenoid aromatic systems					
2	**Chapter 10** Organometallic Compounds 10.1 Organmagnesium compounds 10.2 Organzinc compounds 10.3 Organphosphonium compounds - *Organphosphonium compounds P–C* - *Organphosphonium compounds P-O-C*	7	7	0	14	+ Book **[1], [2], [3]**: Corresponding chapters + Reading assignments + Summary ....
3	Chapter 11 Hydroxyl compounds (alcohol phenol ether) 11.1Isomers and nomenclature 11.2Physical properties 11.3Chemical properties 11.4Synthesis of alcohols and phenol	9	9		18	+ Book **[1], [2]**: Corresponding chapters + Reading assignments + Summary ....

	11.5 Unsaturated Alcohol 11.6Thiol (thioalcohol, mercaptane): RSH **11.7**Polyol 11.8Typical compounds 11.9Ether					
	Chapter 12Carbonyl compounds 12.1Nomenclature **12.2**Physical properties 12.3Chemical properties 12.4Synthesis of carbonyl compounds	8	8		16	+ Book **[1], [2]**: Corresponding chapters + Reading assignments + Summary ....
	Chapter 13Carboxylic Acids 13.1 Nomenclatures 13.2 Preparation of Carboxylic Acids 13.3 Physical Properties of Carboxylic Acids 13.4 Chemical Properties of Carboxylic Acids	5	5		10	+ Book **[1], [2]**: Corresponding chapters + Reading assignments + Summary ....
	Chapter 14 Carboxylic Acid Derivatives 14.1 Structure and nomenclature 14.2 Properties	8	8		16	+ Book **[1], [2]**: Corresponding chapters + Reading assignments

						+ Summary ....

Hanoi, 30th May... 2018

ADVANCE PROGRAM

TS. Công Ngọc Chăng

CHAIR OF DEPARTMENT

TS. Công Ngọc Chăng

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
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COURSE SYLLABUS

1. Course title: Organic chemistry laboratory

Course code: CHE129A

Number of credits: 02

Number of hours:

Theory: 10 hours	Homework: hours	Practice/Laboratory: 20
Internship: 0	Topics: 0	Self-study: 90 hours

2. Course management unit

2.1. Instructor **Instructor's code**

2.2. Department of Oil Refining and Petrochemistry.

2.3. Faculty of Oil and Gas

3. Prerequisites (course code)

CHE 128B: Organic chemistry 2B

4. Course objectives/goals/expectations (Relationship to learning outcomes

Students should gain the basic knowledge of organic chemistry such as the structure, nomenclature, physical and chemical properties, origins, synthesis methods, practical applications of hydrocarbons (saturated, unsaturated and aromatic) as well as alkyl halides.

4.1. Knowlegde

4.1.1 Basic knowledge of organic chemistry: classification, naming, structure, homogeneity, isomerism, covalent bonding, concepts of acid and base in organic chemistry, effect of electron transfer in organic molecules, classification and organic reaction mechanism; Structure, name, physical and chemical properties, origin, synthesis, practical application of saturated hydrocarbons and of unsaturated hydrocarbons. Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of alkyl halide. Structure, name, physical and chemical properties, origin, synthesis, practical application of aromatic hydrocarbons

4.1.2 Structure, name, physical and chemical properties, origin, synthesized methods, practical applicability of organometallic compounds; Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of hydroxyl compounds; Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of carbonnyl compounds; Structure, name, physical and

chemical properties, origin, synthesis methods, practical applicability of carboxylic acids; Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of derivatives of carboxylic acids.

4.1.3. Students will have the basic knowledge of Laboratory Safety, Organic laboratory equipment and Synthesis compound organics.

4.2. Skill

4.2.1 Do all experiments of the course.
4.2.2. Do the exercises about determination the composition of a substance, the predictive properties of a substance, the preparation of a chemical from a given substances
4.2.3. Exercises about completion of the transformation of substances.
4.2.4 Providing students with opportunities to develop basic skills in respect to group-working neatly and accurately and solving problems in accordance with applying appropriate operations.; Laboratory Safety, Organic laboratory equipment and Synthesis compound organics.

5. Course description

Introduction to the basic knowledge of organic chemistry: classification, naming, structure, homogeneity, isomerism, covalent bonding, conceps of acid and base in organic chemistry, effect of electron transfer in organic molecules, classification and organic reaction mechanism, classification and organic compound mechanisms; Stereoisomer, substitution and elimination.
Knowledge of the structure, name, physical and chemical properties, origin, synthesis methods, practical application of hydrocarbons (saturated, unsaturated) and alkyl halide.
Knowledge of the structure, name, physical and chemical properties, origin, synthesis methods, practical application of aromatic hydrocarbons and hydrocarbon derivatives (hydroxyl compounds, carbonnyl compounds, carboxylic acids, and derivatives of carboxylic acids).

6. Organization/ Structure of the course

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	**Topics/ Activities**	**Hours**	**Objectives**
1	Introduction	**2**	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
2	Safety rules	**2**	4.1.1, 4.1.2,

			4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
3	Organic Laboratory Equipment and Procedures	6	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
6.2. Practice/Laboratory: Experiments LAB			
1	Experiment 1 Simple distillation	2.0	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
2	Experiment 2: Fractional distillation	2.0	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
3	Experiment 3a: Steam distillation	2.5	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
4	Experiment 3b: Extraction	2.5	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
5	Recrystallization	2.0	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
6	Synthesis of benzoic acid	4	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
7	Synthesis of nitrobenzene	2.5	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4
8	Synthesis of ethyl acetate (esterification of ethyl alcohol with acetic acid)	2.5	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.2.3, 4.2.4

7. Method of instruction:

Practice, experiment in laboratory

8. Requirements for student:

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Proportion of Total Assessment
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework or activities.	30 %
3	Group collaboration	Reports/ Presentations	
4	Midterms	Writing/ Viva(60 minutes)	
5	Final exam	Writing/Multiple-choice/Viva	60 %
	Total		**100 %**

9.2.Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books

Textbook

[1] Experiment organic chemistry 2.

Reference Book

[2] William H. Brown, Christopher S. Foote, Brent L. Iverson, Eric V. Anslyn, Bruce M. Novak, 6th Edition, Organic chemistry, Cengage Learning, 2012

[3] Jone C Gilbert, Stephent F.Martin. Experimental organic chemistry 5th Edition

[4] James F. Norris, Experimental Organic Chemistry 2th Edition

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	Introduction	1	0	0	1	[3] Chapter 1
2	Labortory safety	1	0	0	1	[3] Chapter 1

3	The use equiment of experiment organic	1	0	0	1	[3] Chapter 2
4	Laboratory Menthods	1	0	0	1	[4] Chapter 1
5	Distillation					[3] Chapter 4, 5 - Reading experimental method - The students writed report at home
5.1	Simple distillation	0.5	0	2	2.5	
5.2	Fractional distillation	0.5	0	2	2.5	
5.3	Steam distillation	0.5	0	2	2.5	
5.4	Extraction	0.5	0	2	2.5	
6	Synthesis organic					
	Synthesis of benzoic acid and recrystallization	1		3	4	[1],[4] - Reading experimental method - The students writed report at home
	Synthesis of nitrobenzene	0.5		2	2.5	
	Synthesis of ethyl acetate (esterification of ethyl alcohol with acetic acid)	0.5		2	2.5	

Hà nội, 30th May 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

TS. Công Ngọc Thắng

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
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COURSE SYLLABUS

1. Course title: *Mathematical Methods in Biochemical and Chemical Engineering*
Course code: ECH 140
Number of credits: 4
Total number of hours: 180

Theory: 60;	Homeworks/Problems/Discussion: 0;	Practice/Laboratory: 0;
Internship: 0;	Topics: 0;	Self-study: 120;

2. Course management unit

2.1. Instructor (s):	**Instructor's code**
1. Dr. Nguyen Truong Thanh	0101-11
2. Ms. Nguyen Thi Lan Huong	0101-12

2.2. Department: Mathematics
2.3. Faculty: Basic of Science

3. Prerequisites (course code): MAT21B

4. Course objectives/goals/expectations (Relationship to learning outcomes):
4.1. Knowledge
4.2.1. To introduce students to, to provide students with basic knowledge of derivation, ordinary differential equation.
4.1.2. To introduce students to and to provide students with basic knowledge of heat conduction problems, transient heat conduction, Bessel functions.
4.1.3. To introduce students to and to provide students with basic knowledge of Laplace transform, process dynamics, numerical methods.
4.2. Skills
4.2.1. Recognizing, distinguishing, evaluating derivations, ordinary differential equations.
4.2.2. Recognizing, distinguishing, evaluating heat conduction problems, transient heat conduction, Bessel functions.
4.2.3. Recognizing, distinguishing, evaluating Laplace transform, process dynamics, numerical methods.

5. Course description:
The course is designed to provide students with knowledge of problems in Chemical Engineering as heat conduction problems, transient heat conduction, process dynamics and technologies in solving them by Laplace transform, Bessel functions, and numerical methods.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	Derivation	5	4.1.1/4.2.1
Chapter 2	Ordinary differential equations	5	4.1.1/4.2.1
	Midterm 1	2	
Chapter 3	Heat Conduction Problems	5	4.1.2/4.2.2
Chapter 4	Transient Heat Conduction	5	4.1.2/4.2.2
Chapter 5	Bessel Functions	5	4.1.2/4.2.2
	Midterm 2	2	
Chapter 6	Laplace Transform	10	4.1.3/4.2.3
Chapter 7	Process Dynamics	10	4.1.3/4.2.3
	Midterm 3	2	
Chapter 8	Numerical methods	5	4.1.3/4.2.3
	Final practice exam	2	
	Student Presentations/ Final Review Session (Optional)		
	Final Exam	2	

General Overview/Syllabus, The scope of Chemical Engineering Analysis–ECH 140

Chapter 1. Derivation (5 hours)
1.1 Overview
1.2 Derivation of Heat Conduction Equation
1.3 Derivation of 1-D Heat Conduction Equation with Variable Cross-Section
1.4 Cooling of a Sphere

Chapter 2. Ordinary differential equations (5 hours)
2.1 Method of Separation of Variables
2.2 Linear Operators
Midterm 1 (2 hour)

Chapter 3. Heat Conduction Problems (5 hours)
3.1 Step by Step Solution of Transient Heat Conduction Problem
3.2 Transient Heat Conduction: Flux Boundary Conditions
3.3 Steady State Conduction in a Sphere with Source
3.4 Fourier Series

Chapter 4. Transient Heat Conduction (5 hours)
4.1 Transient Heat Conduction in a Finite Cylinder
4.2 Transient Heat Conduction in a Sphere
4.3 Transient Heat Conduction in a Cylindrical Annulus

Chapter 5. Bessel Functions (5 hours)
5.1 Introduction to Bessel Functions
5.2 Sturm-Liouville Eigenvalue Problem
5.3 Boundary Conditions of Third Kind: Newton's Law of Cooling

5.4 Start-up Flow in a Pipe
Midterm 2 (2 hour)

Chapter 6. Laplace Transform (10 hours)
6.1 Primer on the Laplace Transform
6.2 Overview of Process Dynamics the Case for Laplace Transforms
6.3 Introduction to Partial Fractions
6.4 Introduction to Laplace Transforms
6.5 Laplace Transforms: Unit Step
6.6 Problems involving Laplace Transforms
6.7 Solution of ODEs using Laplace Transforms and Table of Laplace Transforms

Chapter 7. Process Dynamics (10 hours)
7.1 Introduction to Process Dynamics
7.2 Laplace Transforms: Differential Equations
7.3 Laplace Transforms: Process Dynamics 2
7.4 Process Dynamics: Multiple Storage Tanks
Midterm 3 (2 hour)

Chapter 8. Numerical methods (5 hours)
8.1 Finite difference methods
8.2 Computaitional Methods
8.3 Finite difference methods: boundary value problems
8.4 Rectilinear flow in duct: solution of Poisson's equation
8.5 Start-up Flow in a Pipe
Final practice exam (2 hour)
Final Exam (2 hour)

7. Methods of instruction:
- Lectures and discussions.
- Cooperative learning groups and independent study.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the midterms and final exam.

- Homework, laboratory,…and exams: Students are expected to complete all assignments and homework. Students must take part in the final exam.

- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.

- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.

- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. Open books. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
...	...	...	...
...	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 120 minutes
Midterm 2: 120 minutes
Course presentations: TBA
Final Exam: 120 minutes
Midterms count as much as 20 % (midterms 10 % each)

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] Richard Haberman, Elementary Applied Partial Differential Equations by Richard Haberman, *Second Edition,* Prentice Hall, Englewood Cliffs, New Jersey, 1983.
[2] Phan Huy Thiện. *Phương trình toán lý*. NXB GD, 2010.
[3] Phan Huy Thiện. *Tuyển tập bài tập phương trình toán lý*. NXB GD, 2010.
[4] Nguyễn Đình Trí (chủ biên). *Toán học cao cấp*, tập 2,3. NXB GD, 2005.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1. Derivation** (5 hours) 1.1 Overview 1.2 Derivation of Heat Conduction Equation 1.3 Derivation of 1-D Heat Conduction Equation with Variable Cross-Section 1.4 Cooling of a Sphere	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]** + Summary ....
2	**Chapter 2. Ordinary differential equations** (5 hours) 2.1 Method of Separation	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading

	of Variables 2.2 Linear Operators **Midterm 1** (2 hour)	2			4	assignments**[1,2,3,4]** + Summary .....
3	**Chapter 3. Heat Conduction Problems** (5 hours) 3.1 Step by Step Solution of Transient Heat Conduction Problem 3.2 Transient Heat Conduction: Flux Boundary Conditions 3.3 Steady State Conduction in a Sphere with Source 3.4 Fourier Series	5			10	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]** + Summary .....
4	**Chapter 4. Transient Heat Conduction** (5 hours) 4.1 Transient Heat Conduction in a Finite Cylinder 4.2 Transient Heat Conduction in a Sphere 4.3 Transient Heat Conduction in a Cylindrical Annulus	5			10	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]** + Summary .....
5	**Chapter 5. Bessel Functions** (5 hours) 5.1 Introduction to Bessel Functions 5.2 Sturm-Liouville Eigenvalue Problem 5.3 Boundary Conditions of Third Kind: Newton's Law of Cooling 5.4 Start-up Flow in a Pipe **Midterm 2** (2 hour)	5 2			10 4	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]** + Summary .....
6	**Chapter 6. Laplace Transform** (10 hours) 6.1 Primer on the Laplace Transform 6.2 Overview of Process Dynamics The Case for Laplace Transforms 6.3 Introduction to Partial Fractions 6.4 Introduction to Laplace Transforms 6.5 Laplace Transforms: Unit Step	5			10	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]** + Summary .....
7	6.6 Problems involving Laplace Transforms 6.7 Solution of ODEs using Laplace Transforms	**5**			10	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**

	and Table of Laplace Transforms					+ Summary .....
8	**Chapter 7. Process Dynamics** (10 hours) 7.1 Introduction to Process Dynamics 7.2 Laplace Transforms: Differential Equations	5			10	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]** + Summary .....
9	7.3 Laplace Transforms: Process Dynamics 2 7.4 Process Dynamics: Multiple Storage Tanks **Midterm 3** (2 hour)	5 2			10 4	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]** + Summary .....
10	**Chapter 8. Numerical methods** (5 hours) 8.1 Finite difference methods 8.2 Computaitional Methods 8.3 Finite difference methods: boundary value problems 8.4 Rectilinear flow in duct: solution of Poisson's equation 8.5 Start-up Flow in a Pipe **Final practice exam** (2 hour) **Final Exam** (2 hour)	5 2 2			10 4 4	Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]** + Summary .....

Hanoi, .30th May. 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

Ng Th Thar

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Computers for Chemical and Materials Engineers
Course code: ECM6
Number of credits: 4
Total number of hours: 180
Theory: 60; Homeworks/Problems/Discussion:0; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 120;

2. Course management unit
2.1. Instructor (s): **Instructor's code**
1. Msc. Nguyen Thi Lan Huong 0101-12
2. Dr. Nguyen Truong Thanh 0101-11

2.2. Department: Mathematics
2.3. Faculty: Basic Science

3. Prerequisites (course code):
Mat 21A-B-C-D, Mat22A

4. Course objectives/goals/expectations (Relationship to learning outcomes):
4.1. Knowledge
4.1.1. To introduce students to and to provide students with basic knowledge of Accuracy and Errors, Solutions of nonlinear equations, Systems of equations.
4.1.2. To introduce students to and to provide students with basic knowledge of Interpolation of data, Applications of Interpolation.
4.1.3. To introduce students to and to provide students with basic knowledge of Mathematica Software.

4.2. Skills
4.2.1. Recognizing, distinguishing, evaluating a nonlinear equations, Systems of equations .
4.2.2. Recognizing, distinguishing, evaluating the Interpolation of data and Applications of Interpolation
4.2.3. Using Mathematica Software.

5. Course description:
The course is designed to provide students with basic knowledge of Accuracy and Errors, Solutions of nonlinear equations, Systems of equations; Interpolation of data, Applications of Interpolation; Mathematica Software.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***

Chapter 1	Accuracy and Errors	5	4.1.1/4.2.1
Chapter 2	Solutions of nonlinear equations	10	4.1.1/4.2.1
Chapter 3	Systems of equations	10	4.1.1/4.2.1
	Midterm 1	2	4.1.1/4.2.1
Chapter 4	Interpolation of data	10	4.1.2/4.2.2
Chapter 5	Applications of Interpolation	10	4.1.2/4.2.2
	Midterm 2	2	4.1.2/4.2.2
Chapter 6	Mathematica Software	6	4.1.3/4.2.3
	Student Presentations/ Final Review Session (Optional)	3	4.1.1/4.2.1 4.1.2/4.2.2 4.1.3/4.2.3
	Final Exam	2	4.1.1/4.2.1 4.1.2/4.2.2 4.1.3/4.2.3

General Overview/Syllabus, The Differential Equations

Chapter 1. Accuracy and Errors (5 hours)

1.1. Accuracy
1.2. Rounding
1.3. Errors

Chapter 2. Solutions of nonlinear equations (10 hours)

2.1 The problem
2.2 Methods

Chapter 3. Systems of equations (10 hours)

3.1 Solution by optimisation
3.2 Systems of linear equations
3.3 Nonlinear equations

Midterm 1 (2 hours)

Chapter 4. Interpolation of data (10 hours)

4.1 The nature of the problem
4.2 Scaling of the dependent variable

Chapter 5. Applications of Interpolation (10 hours)

5.1 Differentiation
5.2 Integration
5.3 Numerical solution of ordinary differential equations

Midterm 2 (2 hours)

Chapter 6. Mathematica Software (6 hours)

Student Presentations/ Final Review Session (Optional) (3 hours)
Final Exam (2 hours)

7. Methods of instruction:
- Lectures and discussions.
- Cooperative learning groups and independent study.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the midterms and final exam.
- Homework, laboratory,...and exams: Students are expected to complete all assignments and homework. Students must take part in the final exam.
- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.
- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.
- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
...	...	...	...
...	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 60 minutes
Midterm 2: 60 minutes
Course presentations: TBA
Final Exam: 60 minutes
Midterms count as much as 20 % (midterms 10 % each)

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] John D. Fenton, *Numerical Methods,* Institude of Hydraulic and Water Resources Engineering, Austria, 2010.

[2] Anthony O'Hare, *Numerical Methods for Physicists,* 2005.

[3] Tô Văn Đinh, Nguyễn Thị Lan Hương, Đào Xuân Hưng, Nguyễn Trường Thanh, *Phương Pháp Tính,* NXB GD, 2016.

[4] Stephen Wolfram , *The Mathematica book* , 5th Edition, 2003.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	Chapter 1. Accuracy and Errors (5 hours) 1.1 Accuracy 1.2 Rounding 1.3 Errors	5			10	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1,2, 3, 4]** + Summary ....
2	Chapter 2. Solutions of nonlinear equations (10 hours) 2.1 The problem 2.2 Methods	10			20	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1,2, 3, 4]** + Summary ....
3	Chapter 3. Systems of equations (10 hours) 3.1 Solution by optimisation 3.2 Systems of linear equations 3.3 Nonlinear equations	10			20	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1,2, 3, 4]** + Summary ....
4	**Midterm 1**	**2**			4	
5	Chapter 4. Interpolation of data (10 hours) 4.1 The nature of the problem 4.2 Scaling of the dependent variable	10			20	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1,2, 3, 4]** + Summary ....
6	Chapter 5. Applications of Interpolation (10 hours) 5.1 Differentiation 5.2 Integration 5.3 Numerical solution of ordinary differential equations	10			0	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1,2, 3, 4]** + Summary ..
7	**Midterm 2**	**2**			4	
8	Chapter 6. Mathematica	**6**			12	+ Book **[1, 2, 3, 4]**:

	Software (6 hours)					Appropriate contents and chapters + Reading assignments**[1,2, 3, 4]** + Summary ....
9	Student Presentations/ Final Review Session (Optional)	3			6	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1,2, 3, 4]** + Summary ....
10	Final Exam	**2**			4	

TOPICS TO BE COVERED

No	Topic/Activity	Hours (Attendence)	Hours (Self-Study)
1	Accuracy and Errors	5	10
2	Solutions of nonlinear equations	10	20
3	Systems of equations	10	20
4	*Midterm 1*	2	4
5	Interpolation of data	10	20
6	Applications of Interpolation	10	20
7	*Midterm 2*	2	4
8	Mathematica Software	6	12
9	Review	3	6
10	Final exam	2	4

Hanoi, 30th May. 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Phép tính 1 - Calculus
Course code: MAT21A
Number of credits: 3
Total number of hours: 135
Theory: 45; Homeworks/Problems/Discussion: 0; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 90;

2. Course management unit

2.1. Instructor (s):	**Instructor's code**
1. Dr. NguyenTruong Thanh	0101-11
2. Ms.Nguyen Thi Lan Huong	0101-12

2.2. Department: Mathematics
2.3. Faculty: Basic of Science

3. Prerequisites (course code): None
4. Course objectives/goals/expectations (Relationship to learning outcomes):
4.1. Knowledge
4.1.1. To introduce students to provide students with basic knowledge of functions, limits, continuity, and guide them to do some basic examples.
4.1.2. To introduce students to and to provide students with basic knowledge of slope of curves and derivatives, differentiation of algebraic and transcendental functions.
4.1.3. To introduce students to how to model something mathematically as motion, natural growth, graphing, extrema of functions.
4.1.4. To introduce students with technologies in finding limits and differentials as L'Hospital's rule and so on.
4.2. Skills
4.2.1. Recognizing, distinguishing, evaluating functions, limits, continuity, and solving some basic examples.
4.2.2. Recognizing, distinguishing, evaluating slope of curves and derivatives, differentiation of algebraic and transcendental functions.
4.2.3. Knowing how to model something mathematically and applying to graphing and finding extrema of functions.
4.2.4. Knowing how to find limits of functions by L'Hospital's rule and so on.

5. Course description:
The course is designed to provide students with first knowledge of calculus 1: Functions, limits, continuity; Slope and derivative; Differentiation of algebraic and transcendental functions; Applications to motion, natural growth, graphing, extrema of a function; Differentials; L'Hospital's rule.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	Functions	10	4.1.1/4.2.1
Chapter 2	Limits and continuity	10	4.1.1/4.2.1
	Midterm 1	1	
Chapter 3	Differentiation	10	4.1.2/4.2.2 4.1.3/4.2.3
Chapter 4	Applications of Derivatives	10	4.1.3/4.2.3 4.1.4/4.2.4
	Midterm 2	2	
	Final Exam	2	

General Overview/Syllabus, The scope of Calculus 1-MAT 21A

Chapter 1. Functions (10 hours)
1.1 Functions and their graphs
1.2 Some of basic functions
1.3 Combining Functions
1.4 Inverse Functions
Chapter 2. Limits and continuity (10 hours)
2.1 Functions and their graphs
2.2 Some of basic functions
2.3 Combining Functions
2.4 Inverse Functions
Midterm 1 (1 hour)
Chapter 3. Differentiation (10 hours)
3.1 Derivatives
3.2 Differentiation Rules
3.3 Second- and Higher-Order Derivatives
3.4 Implicit Differentiation
Chapter 4. Applications of Derivatives (10 hours)
4.1 Extreme Values of Functions
4.2 The Mean Value Theorem
4.3 Indeterminate Forms and L'Hospitals Rule
Midterm 2 (2 hour)
Final Exam (2 hour)

7. Methods of instruction:
- Lectures and discussions.
- Cooperative learning groups and independent study.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills, and understanding needed to successfully pass the midterms and final exam.

- Homework, laboratory,...and exams: Students are expected to complete all assignments and homework. Students must take part in the final exam.

- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.

- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.

- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. Open books. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
6	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 60 minutes
Midterm 2: 120 minutes
Course presentations: TBA
Final Exam: 120 minutes
Midterms count as much as 20 % (midterms 10 % each)

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] Maurice D. Weir, Joel Hass, George B. Thomas, Thomas' Calculus Early Transcendentals, Twelfth Edition, *Pearson Education, Boston, New York*, 2009.

[2] Nguyễn Đình Trí, Toán cao cấp - tập 2, *NXB GD*, 2005.

[3] Nguyễn Đình Trí, Bài tập toán cao cấp - tập 2, *NXB GD*, 2005.

[4] Jean Marie Monier, Giải tích 1- tập 1, *NXB GD*, 2009.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory	Homeworks/	Laboratory	Total	Requirements for student

		(hours)	Problems/ Discussion (hours)	(hours)	self-study (hours)	
1	**Chapter 1.** Functions 1.1 Functions and their graphs 1.2 Some of basic functions	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
2	1.3 Combining Functions 1.4 Inverse Functions	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
3	**Chapter 2.** Limits and continuity 2.1 Functions and their graphs 2,2 Some of basic functions	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
4	2.3 Combining Functions 2.4 Inverse Functions	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
5	**Midterm 1** **Chapter 3.** Differentiation 3.1 Derivatives 3.2 Differentiation Rules	6			12	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
6	3.3 Second- and Higher-Order Derivatives 3.4 Implicit Differentiation	**5**			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
7	**Chapter 4.** Applications of Derivertives 4.1 Extreme Values of Functions	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
8	4.2 The Mean Value Theorem 4.3 Indeterminate Forms and L'Hopitals Rule **Midterm 2** (2 hour) **Final Exam** (2 hour)	9			18	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**

Hanoi, 30th May 2018

ADVANCE PROGRAM

Công Ngọc Thắng

CHAIR OF DEPARTMENT

Dr. Nguyen Truong Thanh

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Phép tính 2 - Calculus
Course code: MAT21B
Number of credits: 3
Total number of hours: 135
Theory: 45; Homeworks/Problems/Discussion: 0; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 90;

2. Course management unit
2.1. Instructor (s): **Instructor's code**
1. Dr. NguyenTruong Thanh 0101-11
2. Ms.Nguyen Thi Lan Huong 0101-12
2.2. Department: Mathematics
2.3. Faculty: Basic of Science

3. Prerequisites (course code): MAT21A

4. Course objectives/goals/expectations (Relationship to learning outcomes):
4.1. Knowledge
4.1.1. To introduce and provide students with basic knowledge of definition of integral and to guide them to do some basic examples.
4.1.2. To introduce and provide students with basic knowledge of applications of integral to area, volume, arc length, average of a function, improper integral, surface of revolution.
4.1.3. To introduce students fundamental theorem of calculus with techniques of integration.
4.2. Skills
4.2.1. Recognizing, distinguishing, evaluating integral.
4.2.2. Knowing how to model something mathematically and applying to calculating area, volume, arc length, average of a function, surface of revolution.
4.2.3. Recognizing, distinguishing, evaluating integrals based on techniques of integration and testing convergence of improper integrals.

5. Course description:
The course is designed to provide students with knowledge of calculus I: Continuation of course 21A. Definition of integral, fundamental theorem of calculus, techniques of integration. Application to area, volume, arc length, average of a function, improper integral, surface of revolution.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	Integration	10	4.1.1/4.2.1
Chapter 2	Application of Integrals	10	4.1.2/4.2.2

	Midterm 1	1	
Chapter 3	Techniques of integration	20	4.1.3/4.2.3
	Midterm 2	2	
	Final Exam	2	

General Overview/Syllabus, The scope of Calculus 1-MAT 21B

Chapter 1. Integration (10 hours)
1.1 Anti-derivatives
1.2 Sigma Notation
1.3 The Definite Integral
Chapter 2. Application of Integrals (10 hours)
2.1 Method of slicing to evaluate a volume
2.2 Length of a Curve
2.3 Work
2.4 Moments and Center of Mass
Midterm 1 (1 hour)
Chapter 3. Techniques of integration (20 hours)
3.1 Basic integration formulas
3.2 Integration by Parts
3.3 Other methods
3.4 Improper Integrals
Midterm 2 (2 hour)
Final Exam (2 hour)

7. Methods of instruction:
- Lectures and discussions.
- Cooperative learning groups and independent study.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the midterms and final exam.
- Homework, laboratory,…and exams: Students are expected to complete all assignments and homework. Students must take part in the final exam.
- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.
- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.
- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. Open books. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
6	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 60 minutes
Midterm 2: 120 minutes
Course presentations: TBA
Final Exam: 120 minutes
Midterms count as much as 20 % (midterms 10 % each)

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] Maurice D. Weir, Joel Hass, George B. Thomas, Thomas' Calculus Early Transcendentals, Twelfth Edition, *Pearson Education, Boston, New York*, 2009.

[2] Nguyễn Đình Trí, Toán cao cấp - tập 2, *NXB GD*, 2005.

[3] Nguyễn Đình Trí, Bài tập toán cao cấp - tập 2, *NXB GD*, 2005.

[4] Jean Marie Monier, Giải tích 1- tập 1, *NXB GD*, 2009.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1. Integration** 1.1 Anti-derivatives	5			10	+ Book [1,2,3,4]: Appropriate contents and chapters + Reading assignments[1,2,3,4]
2	1.2 Sigma Notation 1.3 The Definite Integral	5			10	+ Book [1,2,3,4]: Appropriate contents and chapters + Reading assignments[1,2,3,4]
3	**Chapter 2. Application of Integrals** 2.1 Method of slicing to evaluate a volume 2.2 Length of a Curve	5			10	+ Book [1,2,3,4]: Appropriate contents and chapters + Reading assignments[1,2,3,4]
4	2.3 Work 2.4 Moments and Centers	5			10	+ Book [1,2,3,4]: Appropriate contents and

	of Mass **Midterm 1**	1			2	chapters + Reading assignments**[1,2,3,4]**
5	**Chapter 3. Techniques of integration** 3.1 Basic integration formulas	**5**			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
6	3.2 Integration by Parts	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
7	3.3 Other methods	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
8	3.4 Improper Integrals **Midterm 2** **Final Exam**	5 2 2			10 4 4	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**

Hanoi, 30th May 2018

ADVANCE PROGRAM

TS. Công Ngọc Chăng

CHAIR OF DEPARTMENT

Dr. Nguyen Truong Thanh

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Phép tính 3 - Calculus
Course code: MAT21C
Number of credits: 3
Total number of hours: 135
Theory: 45; Homeworks/Problems/Discussion: 0; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 90;

2. Course management unit

2.1. Instructor (s):	**Instructor's code**
1. Dr. NguyenTruong Thanh	0101-11
2. Ms. Nguyen Thi Lan Huong	0101-12

2.2. Department: Mathematics
2.3. Faculty: Basic of Science

3. Prerequisites (course code): MAT21B

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. To introduce and provide students with basic knowledge of infinite sequences and series.
4.1.2. To introduce and provide students with basic knowledge of vectors and the geometry of space.
4.1.3. To introduce students to and to provide students with basic knowledge of vetor valued functions and motion in space.
4.1.4. To introduce students to and to provide students with basic knowledge of partial derivatives and how to apply to solve some exercises.

4.2. Skills

4.2.1. Recognizing, distinguishing, evaluating infinite sequences and series.
4.2.2. Recognizing, distinguishing, evaluating vectors, the geometry of space, vetor valued functions, and motion in space.
4.2.3. Recognizing, distinguishing, evaluating partial derivatives.

5. Course description:

The course is designed to provide students with knowledge of calculus I: Continuation of course 21B. Sequences, series, tests for convergence, Taylor expansions. Vector algebra, vector calculus, scalar and vector fields. Partial derivitives, total differentials. Applications to maximum and minimum problems in two or more variables. Applications to physical systems

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	Infinite sequences and series	10	4.1.1/4.2.1
	Midterm 1	1	
Chapter 2	Vectors and the geometry of space	10	4.1.2/4.2.2
Chapter 3	Vetor valued functions and motion in space	10	4.1.3/4.2.2
Chapter 4	Partial derivatives	10	4.1.4/4.2.3
	Midterm 2	2	
	Final Exam	2	

General Overview/Syllabus, The scope of Calculus 1-MAT 21C

Chapter 1. Infinite sequences and series (10 hours)
1.1 Sequences
1.2 Infinite Series
1.3 Power Series
1.4 Taylor and Maclaurin Series
Midterm 1 (1 hour)
Chapter 2. Vectors and the geometry of space (10 hours)
2.1 Parametric equations
2.2 Three-Dimensional Coordinate Systems
2.3 Vectors
Chapter 3. Vetor valued functions and motion in space (10 hours)
3.1 Vetor valued functions and motion in space
Chapter 4. Partial derivatives (10 hours)
4.1 Functions of Several Variables
4.2 Limits and Continuity in Higher Dimensions
4.3 Partial derivatives
4.4 The Chain Rule
4.5 Directional Derivatives, Gradient Vectors, and Total Differential
4.6 Taylors Formula for Two Variables
4.7 Extreme Values and Saddle Points

Midterm 2 (2 hour)
Final Exam (2 hour)

7. Methods of instruction:
- Lectures and discussions.
- Cooperative learning groups and independent study.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the midterms and final exam.

- Homework, laboratory,...and exams: Students are expected to complete all assignments and homework. Students must take part in the final exam.

- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.

- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.

- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. Open books. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
6	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 60 minutes
Midterm 2: 120 minutes
Course presentations: TBA
Final Exam: 120 minutes
Midterms count as much as 20 % (midterms 10 % each)

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] Maurice D. Weir, Joel Hass, George B. Thomas, Thomas' Calculus Early Transcendentals, Twelfth Edition, *Pearson Education, Boston, New York*, 2009.

[2] Nguyễn Đình Trí, Toán cao cấp - tập 2, *NXB GD*, 2005.

[3] Nguyễn Đình Trí, Bài tập toán cao cấp - tập 2, *NXB GD*, 2005.

[4] Jean Marie Monier, Giải tích 1- tập 1, *NXB GD*, 2009.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1. Infinite sequences and series** 1.1 Sequences 1.2 Infinite Series	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
2	1.3 Power Series	6			12	+ Book **[1,2,3,4]**:

	1.4 Taylor and Maclaurin Series **Midterm 1**					Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
3	**Chapter 2. Vectors and the geometry of space** 2.1 Parametric equations 2.2 Three Dimensional Coordinate Systems	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
4	2.3 Vectors	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
5	**Chapter 3. Vetor valued functions and motion in space** 3.1 Vetor valued functions and motion in space	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
6	3.1 Vetor valued functions and motion in space	**5**			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
7	**Chapter 4. Partial derivatives** 4.1 Functions of Several Variables 4.2 Limits and Continuity in Higher Dimensions 4.3 Partial derivatives 4.4 The Chain Rule 4.5 Directional Derivatives, Gradient Vectors, and Total Differential	5			10	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**
8	4.6 Taylors Formula for Two Variables 4.7 Extreme Values and Saddle Points **Midterm 2** (2 hour) **Final Exam** (2 hour)	9			18	+ Book **[1,2,3,4]**: Appropriate contents and chapters + Reading assignments**[1,2,3,4]**

Hanoi, 30th May 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

Dr. Nguyen Truong Thanh

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Phân tích Véctơ - *Vector Analysis*
Course code: MAT21D
Number of credits: 3
Total number of hours: 135
Theory: 45; Homeworks/Problems/Discussion:0; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 90;

2. Course management unit

2.1. Instructor (s): **Instructor's code**
1. Dr. Nguyen Truong Thanh 0101-11
2. Ms.Nguyen Thi Lan Huong 0101-12

2.2. Department: Mathematics
2.3. Faculty: Basic of Science

3. Prerequisites (course code): Mat 21C

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge
4.1.1. To introduce and provide students with basic knowledge of multiple integral.
4.1.2. To introduce students to and to provide students with the theory of integration to lines and surfaces in space.

4.2. Skills
4.2.1. Recognizing, distinguishing, evaluating the multiple integral.
4.2.2. Recognizing, distinguishing, evaluating the line and surface integral.

5. Course description:
The course is designed to provide students with basic knowledge of definite integrals over plane and solid regions in various coordinate Line and surface integrals. Green's theorem, Stoke's theorem, divergence theorem.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	**Multiple Integrals**	**20**	4.1.1/4.2.1
	Midterm 1	**1**	
Chapter 2	**Integration In Vector Fields**	**20**	4.1.2/4.2.2
	Midterm 2	**2**	
	Final Exam	**2**	

General Overview/Syllabus, The scope of Calculus - MAT 21D

Chapter 1. Multiple Integrals (20 hours)
1.1. Double and Iterated Integrals over Rectangles
1.2. Double Integrals over General Regions
1.3. Area by Double Integration

1.4. Double Integrals in Polar Form
1.5. Triple Integrals in Rectangular Coordinates
1.6. Moments and Centers of Mass
1.7. Triple Integrals in Cylindrical and Spherical Coordinates
1.8. Substitions in Multiple Integrals
Midterm 1 (1 hours)
Chapter 2. Integration in Vector Fields (20 hours)
2.1 Line Integrals
2.2 Vector Fields and Line Integrals: Work, Circulation, and Flux
2.3 Path Independence, Conservative Fields, and Potential Functions
2.4 Green's Theorem in the Plane
2.5 Surfaces and Area
2.6 Surface Integrals
2.7 Stokes's Theorem
2.8 The Divergence Theorem and a Unified Theory
Midterm 2 (2 hours)
Final Exam (2 hours)

7. Methods of instruction:
- Lectures and discussions.
- Cooperative learning groups and independent study.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the midterms and final exam.
- Homework, laboratory,...and exams: Students are expected to complete all assignments and homework. Students must take part in the final exam.
- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.
- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.
- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
6	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 60 minutes
Midterm 2: 120 minutes
Course presentations: TBA
Final Exam: 120 minutes
Midterms count as much as 20 % (midterms 10 % each)

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] Maurice D. Weir, Joel Hass, George B. Thomas, Thomas' Calculus Early Transcendentals, Twelfth Edition, *Pearson Education, Boston, New York*, 2009.

[2] Nguyễn Đình Trí, Toán cao cấp - tập 2, *NXB GD*, 2005.

[3] Nguyễn Đình Trí, Bài tập toán cao cấp - tập 2, *NXB GD*, 2005.

[4] Jean Marie Monier, Giải tích 1- tập 1, *NXB GD*, 2009.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1. Multiple Integrals** 1.1 Double and Iterated Integrals over Rectangles 1.2 Double Integrals over General Regions	5			10	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3, 4]**
2	1.3 Area by Double Integration 1.4 Double Integrals in Polar Form	**5**			10	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3, 4]**
3	1.5 Triple Integrals in Rectangular Coordinates 1.6 Moments and Centers of Mass	**5**			10	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3, 4]**
4	1.7 Triple Integrals in Cylindrical and Spherical Coordinates 1.8 Substitions in Multiple Integrals **Midterm 1**	**6**			12	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3, 4]**
3	**Chapter 2. Integration in Vector Fields** 2.1 Line Integrals 2.2 Vector Fields and Line Integrals: Work,	5			10	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3, 4]**

	Circulation, and Flux					
	2.3 Path Independence, Conservative Fields, and Potential Functions **2.4** Green's Theorem in the Plane	**5**			10	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3, 4]**
	2.5 Surfaces and Area **2.6** Surface Integrals	**5**			10	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3, 4]**
	2.7 Stokes's Theorem 2.8 The Divergence Theorem and a Unified Theory **Midterm 2** **Final Exam**	**9**			18	+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Reading assignments**[1, 2, 3, 4]**

TOPICS TO BE COVERED

No	Topic/Activity	Hours (Attendence)	Hours (Self-Study)
1	**Multiple Integrals**	**20**	**40**
2	*Midterm 1*	**1**	**2**
3	**Integration in Vector Fields**	**20**	**40**
4	*Midterm 2*	**2**	**4**
5	**Final exam**	**2**	**4**

Hanoi, 30th May 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

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HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Chemistry of Petroleum
Course code: ADECH 01
Number of credits: 4
Number of hours: 60

2. Course management unit

2.1. Instructor (s):	**Instructor's code**
1. Assoc Prof. Bui Thi Le Thuy	0406-12
2. TS. Ngô Thanh Hải	0406-09

2.2. Department: Oil Refining and Petrochemistry
2.3. Faculty: Oil and Gas

3. Prerequisites (course code):

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge
4.1.1 Origin of Petroleum; Petroleum Assay;
4.1.2. Composition of Petroleum
4.1.3. Some important properties of petroleum
4.1.4. Chemistry of petrochemical processes
4.1.5. Petroleum Products (energy and non-energy products)
4.2. Skills
4.2.1. Reading Technical Articles; Technical Writing
4.2.2. Data collection and analysis

5. Course description:
Introduction about terminology and origins of petroleum; petroleum characterizations and assay; petroleum refining and chemical conversion of petroleum products.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	**Origin and classification of petroleum**	4	4.1.1
1.1	Origin of petroleum		4.1.1
	Inorganic Origin		4.1.1
	Orgamic Origin		4.1.1
1.2	Classification of petroleum		4.1.1
Chapter 2	**Chemical composition of petroleum**	4	4.1.2
2.1	Hydrocarbons		4.1.2
2.2	Non-hydrocarbon		4.1.2

Chapter 3	**Important properties of petroleum**	6	4.1.3
3.1	Vapor pressure		4.1.3
3.2	Distillation curves		4.1.3
3.3	Critical parameters		4.1.3
3.4	Flash and Ignition Points		4.1.3
3.5	Specific gravity , density		4.1.3
3.6	Specific heat , Enthalpy, Heat evaporation		4.1.3
3.7	Viscosity, viscosity index		4.1.3
3.8	Heat of combustion		4.1.3
Chapter 4	**Introduction to Refining Processes**	**12**	4.1.4
4.1	Thermal processes	**2**	4.1.4
4.2	Catalytic processes	**10**	4.1.4
4.2.1	Catalytic cracking	2	4.1.4
4.2.2	Reforming	2	4.1.4
4.2.3	Hydroprocesses	3	4.1.4
4.2.4	Isomerization	1	4.1.4
4.2.5	Alkylation Processes	1	4.1.4
4.2.6	Oligomerization	1	4.1.4
Chapter 5	**Products of petroleum**	**4**	4.1.5
5.1	Energy products	3	4.1.5
5.2	Non-energy products	1	4.1.5

7. Method of instruction:

Conventional methods with TA.

Group discussion required.

8. Requirements for student:

- Attendance, respectful classroom participation: 80 %.
- Homework,

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.... minutes)	
...	...	...	...
...	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm: Writing

Final Exam: Writing

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1].James G. Speight, The Chemistry and Technology of Petroleum, 4th Edition, CRC Press, Taylor & Francis Group, 2014.

[2].James H. Gary, Glenn E. Handwerk, Petroleum Refining: Technology and Economics, 4th Edition, CRC Press, Taylor and Francis Group, 2001.

[3].James G. Speight, Heavy and Extra-heavy Oil Upgrading Technologies, Gulf Professional Publishing, 2013.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1 Origin and classification of petroleum**	4	0	0	4	+Book[1]: Content, chapter,... +Reading assignments + Summary ....
2	**Chapter 2 Chemical composition of petroleum** 2.1Hydrocarbons 2.2Non-Hydrocarbons	6	0	0	6	
3	**Chapter 3 Important properties of petroleum** 3.1 Vapor pressure 3.2 Distillation curves 3.3 Critical parameters 3.4 Flash and Ignition Points 3.5 Specific gravity , densit 36. Specific gravity , densit 3.7 Viscosity, viscosity index 3.8 Heat of combustion	6	16	0	24	
4	**Chapter 4 Introduction to Refining Processes** 6.1 Thermal processes 6.2 Catalytic processes 6.2.1 Reforming 6.2.2 Catalytic cracking 6.2.3 Hydroprocesses 6.2.4 Isomerization 6.2.5 Alkylation 6.2.6 Oligomerization	16	16	0	32	

5	**Chapter 5 Products of petroleum** 5.1 Energy products 5.2 Non-energy products	4	4	0	8	

Hanoi, .30th..May.. 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

TS. Công Ngọc Thắng

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title:

Classical Physics 9B
Course code: PHY 9B
Number of credits: 4(3-2-7)
Number of hours:
Theory: 35; Homework: 15; Practice/Laboratory: 20; Self-study: 105

2. Course management unit

2.1. Instructor (s):

	Instructor's code
1. Assoc. Prof. Dr. Du Thi Xuan Thao	0102-10
2. Dr. Le Dac Tuyen	0102-13
3. Dr. Nguyen Manh Hung	0102-07
4. Dr. Dao Viet Thang	0102-16
5. M.S. Do Thi Hong Hai	0102-06
6. M.S. Nguyen Thi Dieu Thu	0102-11
7. Dr. Nguyen Xuan Chung	0102-03

2.2. Department: Physics
2.3. Faculty: Basic Sciences

3. Prerequisites (course code): Physics 9A, Mathematic 21C, 21D

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. Introduction to general principles and analytical methods used in physics for physical science and engineering majors. Basic knowledge of Fluid Mechanics, Thermodynamics, and Wave phenomena and Optics.

4.1.2. Practice to investigate some of the phenomena and laws of physics.

4.2. Skills

4.2.1. Understand the concepts of physical quantities, laws and physical phenomena.

4.2.2. Understand and apply knowledge to solve exercises, explain some phenomena.

4.2.3. Know some methods of measuring and using basic measuring tools, know how to perform measurements, evaluate the accuracy of measurement results and write reports.

5. Course description:

- Concepts, characteristics of physical quantities of fluid, waves, thermodynamics, and optics.
- Use knowledge to solve exercises and explain physical phenomena.
- Practice tests that help students understand the physical phenomena, know how to use the instrument, calculate and evaluate the measurement error.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 14	FLUID MECHANICS	3+2	
14.1	Density		4.1.1 4.2.1 4.2.2
14.2	Pressure in a Fluid		
14.3	Buoyancy		
14.4	Fluid Flow		
14.5	Bernoulli's Equation		
14.6	Viscosity and Turbulence		
Chapter 15	MECHANICAL WAVES	3+2	
15.1	Types of Mechanical Waves		4.1.1 4.2.1 4.2.2
15.2	Periodic Waves		
15.3	Mathematical Description of a Wave		
15.4	Speed of a Transverse Wave		
15.5	Energy in Wave Motion		
15.6	Wave Interference, Boundary Conditions, and Superposition		
15.7	Standing Waves on a String		
15.8	Normal Modes of a String		
Chapter 16	SOUND AND HEARING	3+2	
16.1	Sound Waves		4.1.1 4.2.1 4.2.2
16.2	Speed of Sound Waves		
16.3	Sound Intensity		
16.4	Standing Sound Waves and Normal Modes		
16.5	Resonance and Sound		
16.6	Interference of Waves		
16.7	Beats		
16.8	The Doppler Effect		
16.9	Shock Waves		
Chapter 17	TEMPERATURE AND HEAT	3+2	
17.1	Temperature and Thermal Equilibrium		4.1.1 4.2.1 4.2.2
17.2	Thermometers and Temperature Scales		
17.3	Gas Thermometers and the Kelvin Scale		
17.4	Thermal Expansion		
17.5	Quantity of Heat		
17.6	Calorimetry and Phase Changes		
17.7	Mechanisms of Heat Transfer		
Chapter 18	THERMAL PROPERTIES OF MATTER	3	
18.1	Equations of State		4.1.1 4.2.1 4.2.2
18.2	Molecular Properties of Matter		
18.3	Kinetic-Molecular Model of an Ideal Gas		
18.4	Heat Capacities		
18.5	Molecular Speeds		
18.6	Phases of Matter		
Chapter 19	THE FIRST LAW OF THERMODYNAMICS	3+1	

19.1	Thermodynamic Systems		4.1.1 4.2.1 4.2.2
19.2	Work Done During Volume Changes		
19.3	Paths Between Thermodynamic States		
19.4	Internal Energy and the First Law of Thermodynamics		
19.5	Kinds of Thermodynamic Processes		
19.6	Internal Energy of an Ideal Gas		
19.7	Heat Capacities of an Ideal Gas		
19.8	Adiabatic Processes for an Ideal Gas		
Chapter 20	THE SECOND LAW OF THERMODYNAMICS	4+2	
20.1	Directions of Thermodynamic Processes		4.1.1 4.2.1 4.2.2
20.2	Heat Engines		
20.3	Internal-Combustion Engines		
20.4	Refrigerators		
20.5	The Second Law of Thermodynamics		
20.6	The Carnot Cycle		
20.7	Entropy		
20.8	Microscopic Interpretation of Entropy		
Chapter 33	THE NATURE AND PROPAGATION OF LIGHT	2	
33.1	The Nature of Light		4.1.1 4.2.1 4.2.2
33.2	Reflection and Refraction		
33.3	Total Internal Reflection		
33.4	Dispersion		
33.5	Polarization		
33.6	Scattering of Light		
33.7	Huygens's Principle		
Chapter 34	GEOMETRIC OPTICS	3	
34.1	Reflection and Refraction at a Plane Surface		4.1.1 4.2.1 4.2.2
34.2	Reflection at a Spherical Surface		
34.3	Refraction at a Spherical Surface		
34.4	Thin Lenses		
34.5	Cameras		
34.6	The Eye		
34.7	The Magnifier		
34.8	Microscopes and Telescopes		
Chapter 35	INTERFERENCE	4+2	
35.1	Interference and Coherent Sources		4.1.1 4.2.1 4.2.2
35.2	Two-Source Interference of Light		
35.3	Intensity in Interference Patterns		
35.4	Interference in Thin Films		
35.5	The Michelson Interferometer		
Chapter 36	DIFFRACTION	4+2	
36.1	Fresnel and Fraunhofer Diffraction		4.1.1 4.2.1 4.2.2
36.2	Diffraction from a Single Slit		
36.3	Intensity in the Single-Slit Pattern		
36.4	Multiple Slits		
36.5	The Diffraction Grating		
36.6	X-Ray Diffraction		
36.7	Circular Apertures and Resolving Power		

36.8	Holography		
6.2. Practice/Laboratory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 18-19	Ratio of Heat Capacities (C_p/C_v)	5	4.1.2 4.2.3
Chapter 33	Polarization of light	5	4.1.2 4.2.3
Chapter 34	Interference	5	4.1.2 4.2.3
Chapter 35	Diffraction	5	4.1.2 4.2.3

7. Method of instruction:

Teaching theory combined with homework and practice

8. Requirements for student:

- Attend theory class, respectful classroom participation: 80 %
- Complete homework and practice
- Attend the midterm and final exams

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Practice	Skills/ Reports	
4	Midterms	Writing/ no documents/ 60 minutes	
5	Final exam	Writing/ / no documents/ 75 minutes	60 %

Midterm 1: 60 minutes
Final Exam: 75 minutes

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books:

[1] Sears' and Zemansky's University Physics, by Young and Freedman, 12th edition, Addison Wesley, 2008

[2] Physics for Scientists and Engineers, by Raymond A. Serway, John W. Jewett, 9th Edition, Cengage Learning, 2013

[3] Fundamentals of Physics, by David Halliday, Robert Resnick, Jearl Walker, 8th Edition, Wiley, 2007.

[4] Practical book, Department of Physics, Hanoi University of Mining and Geology, HUMG 2017

10. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 14:** FLUID MECHANICS 14.1 Density 14.2 Pressure in a Fluid 14.3 Buoyancy 14.4 Fluid Flow 14.5 Bernoulli's Equation 14.6 Viscosity and Turbulence	3	5		8	-Book [1]: chapter 14 -Group discussion of part 14.5 -Reading assignments
2	**Chapter 15:** MECHANICAL WAVES 15.1 Types of Mechanical Waves 15.2 Periodic Waves 15.3 Mathematical Description of a Wave 15.4 Speed of a Transverse Wave 15.5 Energy in Wave Motion 15.6 Wave Interference, Boundary Conditions, and Superposition 15.7 Standing Waves on a String 15.8 Normal Modes of a String	3	5		8	-Book [1]: chapter 15 -Group discussion of part 15.6 -Reading assignments
3	**Chapter 16:** SOUND AND HEARING 16.1 Sound Waves 16.2 Speed of Sound Waves 16.3 Sound Intensity 16.4 Standing Sound Waves and Normal Modes 16.5 Resonance and Sound 16.6 Interference of Waves 16.7 Beats 16.8 The Doppler Effect 16.9 Shock Waves	3	5		8	-Book [1]: chapter 16 -Group discussion of part 16.6 -Reading assignments
4	**Chapter 17:** TEMPERATURE AND HEAT 17.1 Temperature and Thermal Equilibrium 17.2 Thermometers and Temperature Scales 17.3 Gas Thermometers	3	5		8	-Book [1]: chapter 17 -Group discussion of part 17.7 -Reading assignments -Book [4]: Prepare practice unit 5, writing report.

	and the Kelvin Scale 17.4 Thermal Expansion 17.5 Quantity of Heat 17.6 Calorimetry and Phase Changes 17.7 Mechanisms of Heat Transfer					
5	**Chapter 18:** THERMAL PROPERTIES OF MATTER 18.1 Equations of State 18.2 Molecular Properties of Matter 18.3 Kinetic-Molecular Model of an Ideal Gas 18.4 Heat Capacities 18.5 Molecular Speeds 18.6 Phases of Matter	3	3	5	11	-Book [1]: chapter 18 -Group discussion of part 18.2 -Reading assignments -Book [4]: Prepare practice unit 5, writing report.
6	**Chapter 19:** THE FIRST LAW OF THERMODYNAMICS 19.1 Thermodynamic Systems 19.2 Work Done During Volume Changes 19.3 Paths Between Thermodynamic States 19.4 Internal Energy and the First Law of Thermodynamics 19.5 Kinds of Thermodynamic Processes 19.6 Internal Energy of an Ideal Gas 19.7 Heat Capacities of an Ideal Gas 19.8 Adiabatic Processes for an Ideal Gas	3	4		7	-Book [1]: chapter 19 -Group discussion of part 19.6 -Reading assignments
7	**Chapter 20:** THE SECOND LAW OF THERMODYNAMICS 20.1 Directions of Thermodynamic Processes 20.2 Heat Engines 20.3 Internal-Combustion Engines 20.4 Refrigerators 20.5 The Second Law of Thermodynamics 20.6 The Carnot Cycle 20.7 Entropy 20.8 Microscopic Interpretation of Entropy	4	6		10	-Book [1]: chapter 20 -Group discussion of part 20.8 -Reading assignments
8	**Chapter 33:** THE NATURE AND PROPAGATION OF LIGHT	2	2	5	9	-Book [1]: chapter 33 -Group discussion of part 33.7 -Reading assignments

	33.1 The Nature of Light 33.2 Reflection and Refraction 33.3 Total Internal Reflection 33.4 Dispersion 33.5 Polarization 33.6 Scattering of Light 33.7 Huygens's Principle					-Book [4]: Prepare practice unit 6, writing report.
9	**Chapter 34:** GEOMETRIC OPTICS 34.1 Reflection and Refraction at a Plane Surface 34.2 Reflection at a Spherical Surface 34.3 Refraction at a Spherical Surface 34.4 Thin Lenses 34.5 Cameras 34.6 The Eye 34.7 The Magnifier 34.8 Microscopes and Telescopes	3	3		6	-Book [1]: chapter 34 -Group discussion of part 34.8 -Reading assignments
10	**Chapter 35:** INTERFERENCE 35.1 Interference and Coherent Sources 35.2 Two-Source Interference of Light 35.3 Intensity in Interference Patterns 35.4 Interference in Thin Films 35.5 The Michelson Interferometer	4	6	5	15	-Book [1]: chapter 35 -Group discussion of part 35.2 -Reading assignments -Book [4]: Prepare practice unit 7, writing report.
11	**Chapter 36:** DIFFRACTION 36.1 Fresnel and Fraunhofer Diffraction 36.2 Diffraction from a Single Slit 36.3 Intensity in the Single-Slit Pattern 36.4 Multiple Slits 36.5 The Diffraction Grating 36.6 X-Ray Diffraction 36.7 Circular Apertures and Resolving Power 36.8 Holography	4	6	5	15	-Book [1]: chapter 36 -Group discussion of part 36.2 -Reading assignments -Book [4]: Prepare practice unit 8, writing report.

Hanoi, Date

ADVANCE PROGRAM

TS. Công Ngọc Thắng

HEAD OF DEPARTMENT

Lê Đức Tuyên

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title:

Classical Physics 9A
Course code: PHY 9A
Number of credits: 4(3-2-7)
Number of hours:
Theory: 35; Homework: 15; Practice/Laboratory: 20; Self-study: 105

2. Course management unit

2.1. Instructor (s):	**Instructor's code**
1. Assoc. Prof. Dr. Du Thi Xuan Thao	0102-10
2. Dr. Le Dac Tuyen	0102-13
3. Dr. Nguyen Manh Hung	0102-07
4. Dr. Dao Viet Thang	0102-16
5. M.S. Do Thi Hong Hai	0102-06
6. M.S. Nguyen Thi Dieu Thu	0102-11
7. Dr. Nguyen Xuan Chung	0102-03

2.2. Department: Physics
2.3. Faculty: Basic Sciences

3. Prerequisites (course code): Mathematic 21B

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. Introduction to general principles and analytical methods used in physics for physical science and engineering majors. Basic knowledge of classical mechanics.

4.1.2. Practice to investigate some of the phenomena and laws of physics.

4.2. Skills

4.2.1. Understand the concepts of physical quantities, laws and physical phenomena.

4.2.2. Understand and apply knowledge to solve exercises, explain some phenomena.

4.2.3. Know some methods of measuring and using basic measuring tools, know how to perform measurements, evaluate the accuracy of measurement results and write reports.

5. Course description:

- Concepts, characteristics of physical quantities of motion, work, energy, rotational motion and gravitation.
- Use knowledge to solve exercises and explain physical phenomena.
- Practice tests that help students understand the physical phenomena, know how to use the instrument, calculate and evaluate the measurement error.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***

Chapter 1	UNITS, PHYSICAL QUANTITIES, AND VECTORS	3	
1.1	The Nature of Physics		4.1.1 4.2.1 4.2.2
1.2	Solving Physics Problems		
1.3	Standards and Units		
1.4	Unit Consistency and Conversions		
1.5	Uncertainty and Significant Figures		
1.6	Estimates and Orders of Magnitude		
1.7	Vectors and Vector Addition		
1.8	Components of Vectors		
1.9	Unit Vectors		
1.10	Products of Vectors		
Chapter 2	MOTION ALONG A STRAIGHT LINE	3	
2.1	Displacement, Time, and Average Velocity		4.1.1 4.2.1 4.2.2
2.2	Instantaneous Velocity		
2.3	Average and Instantaneous Acceleration		
2.4	Motion with Constant Acceleration		
2.5	Freely Falling Bodies		
2.6	Velocity and Position by Integration		
Chapter 3	MOTION IN TWO OR THREE DIMENSIONS	3+2	
3.1	Position and Velocity Vectors		4.1.1 4.2.1 4.2.2
3.2	The Acceleration Vector		
3.3	Projectile Motion		
3.4	Motion in a Circle		
3.5	Relative Velocity		
Chapter 4	NEWTON'S LAWS OF MOTION	3+2	
4.1	Force and Interactions		4.1.1 4.2.1 4.2.2
4.2	Newton's First Law		
4.3	Newton's Second Law		
4.4	Mass and Weight		
4.5	Newton's Third Law		
4.6	Free-Body Diagrams		
Chapter 5	APPLYING NEWTON'S LAWS	4+3	
5.1	Using Newton's First Law: Particles in Equilibrium		4.1.1 4.2.1 4.2.2
5.2	Using Newton's Second Law: Dynamics of Particles		
5.3	Frictional Forces		
5.4	Dynamics of Circular Motion		
5.5	The Fundamental Forces of Nature		
Chapter 6	WORK AND KINETIC ENERGY	2	
6.1	Work		4.1.1 4.2.1 4.2.2
6.2	Kinetic Energy and the Work–Energy Theorem		
6.3	Work and Energy with Varying Forces		
6.4	Power		
Chapter 7	POTENTIAL ENERGY AND ENERGY CONSERVATION	2+2	
7.1	Gravitational Potential Energy		4.1.1 4.2.1 4.2.2
7.2	Elastic Potential Energy		
7.3	Conservative and Nonconservative Forces		
7.4	Force and Potential Energy		
7.5	Energy Diagrams		
Chapter 8	MOMENTUM, IMPULSE, AND COLLISIONS	2+1	
8.1	Momentum and Impulse		4.1.1

8.2	Conservation of Momentum		4.2.1 4.2.2
8.3	Momentum Conservation and Collisions		
8.4	Elastic Collisions		
8.5	Center of Mass		
8.6	Rocket Propulsion		
Chapter 9	ROTATION OF RIGID BODIES	3+2	
9.1	Angular Velocity and Acceleration		4.1.1 4.2.1 4.2.2
9.2	Rotation with Constant Angular Acceleration		
9.3	Relating Linear and Angular Kinematics		
9.4	Energy in Rotational Motion		
9.5	Parallel-Axis Theorem		
9.6	Moment-of-Inertia Calculations		
Chapter 10	DYNAMICS OF ROTATIONAL MOTION	4+3	
10.1	Torque		4.1.1 4.2.1 4.2.2
10.2	Torque and Angular Acceleration for a Rigid Body		
10.3	Rigid-Body Rotation About a Moving Axis		
10.4	Work and Power in Rotational Motion		
10.5	Angular Momentum		
10.6	Conservation of Angular Momentum		
10.7	Gyroscopes and Precession		
Chapter 11	EQUILIBRIUM AND ELASTICITY	2	
11.1	Conditions for Equilibrium		4.1.1 4.2.1 4.2.2
11.2	Center of Gravity		
11.3	Solving Rigid-Body Equilibrium Problems		
11.4	Stress, Strain, and Elastic Moduli		
11.5	Elasticity and Plasticity		
Chapter 12	GRAVITATION	2	
12.1	Newton's Law of Gravitation		4.1.1 4.2.1 4.2.2
12.2	Weight		
12.3	Gravitational Potential Energy		
12.4	The Motion of Satellites		
12.5	Kepler's Laws and the Motion of Planets		
12.6	Spherical Mass Distributions		
12.7	Apparent Weight and the Earth's Rotation		
12.8	Black Holes		
Chapter 13	PERIODIC MOTION	2	
13.1	Describing Oscillation		4.1.1 4.2.1 4.2.2
13.2	Simple Harmonic Motion		
13.3	Energy in Simple Harmonic Motion		
13.4	Applications of Simple Harmonic Motion		
13.5	The Simple Pendulum		
13.6	The Physical Pendulum		
13.7	Damped Oscillations		
13.8	Forced Oscillations and Resonance		

6.2. Practice/Laboratory

Content	*Topics/ Activities*	*Hours*	*Objectives*
Chapter 1	Measurement of length and mass	5	4.1.2 4.2.3
Chapter 1-2	Standing waves on air, measurement of velocity of sound	5	4.1.2 4.2.3
Chapter 4-5	Atwood Machine, Newton's laws of motion	5	4.1.2 4.2.3

Chapter 12-13	Physical Pendulum, measurement of gravity	5	4.1.2 4.2.3

7. Method of instruction:

Teaching theory combined with homework and practice

8. Requirements for student:

- Attend theory class, respectful classroom participation: 80 %
- Complete homework and practice
- Attend the midterm and final exams

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Practice	Skills/ Reports	
4	Midterms	Writing/ no documents/ 60 minutes	
5	Final exam	Writing/ / no documents/ 75 minutes	60 %

Midterm 1: 60 minutes
Final Exam: 75 minutes

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books:

[1] Sears' and Zemansky's University Physics, by Young and Freedman, 12th edition, Addison Wesley, 2008

[2] Physics for Scientists and Engineers, by Raymond A. Serway, John W. Jewett, 9th Edition, Cengage Learning, 2013

[3] Fundamentals of Physics, by David Halliday, Robert Resnick, Jearl Walker, 8th Edition, Wiley, 2007.

[4] Practical book, Department of Physics, Hanoi University of Mining and Geology, HUMG 2017

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1:** UNITS, PHYSICAL QUANTITIES, AND VECTORS 1.1 The Nature of Physics 1.2 Solving Physics Problems 1.3 Standards and Units	3	3	5	11	-Book [1]: chapter 1 -Group discussion of part 1.4 -Reading assignments -Book [4]: Prepare practice unit 1, writing report.

	1.4 Unit Consistency and Conversions					
2	**Chapter 2:** MOTION ALONG A STRAIGHT LINE 2.1 Displacement, Time, and Average Velocity 2.2 Instantaneous Velocity 2.3 Average and Instantaneous Acceleration 2.4 Motion with Constant Acceleration 2.5 Freely Falling Bodies 2.6 Velocity and Position by Integration	3	3	5	11	-Book [1]: chapter 2 -Group discussion of part 2.4 -Reading assignments -Book [4]: Prepare practice unit 2, writing report.
3	**Chapter 3:** MOTION IN TWO OR THREE DIMENSIONS 3.1 Position and Velocity Vectors 3.2 The Acceleration Vector 3.3 Projectile Motion 3.4 Motion in a Circle 3.5 Relative Velocity	3	5		8	-Book [1]: chapter 3 -Group discussion of part 3.1 -Reading assignments
4	**Chapter 4:** NEWTON'S LAWS OF MOTION 4.1 Force and Interactions 4.2 Newton's First Law 4.3 Newton's Second Law 4.4 Mass and Weight 4.5 Newton's Third Law 4.6 Free-Body Diagrams	3	5		8	-Book [1]: chapter 4 -Group discussion of part 4.6 -Reading assignments -Book [4]: Prepare practice unit 3, writing report.
5	**Chapter 5:** APPLYING NEWTON'S LAWS 5.1 Using Newton's First Law: Particles in Equilibrium 5.2 Using Newton's Second Law: Dynamics of Particles 5.3 Frictional Forces 5.4 Dynamics of Circular Motion 5.5 The Fundamental Forces of Nature	4	7	5	16	-Book [1]: chapter 5 -Group discussion of part 5.2 -Reading assignments -Book [4]: Prepare practice unit 3, writing report.
6	**Chapter 6:** WORK AND KINETIC ENERGY 6.1 Work 6.2 Kinetic Energy and the Work–Energy Theorem 6.3 Work and Energy with Varying Forces 6.4 Power	2	2		4	-Book [1]: chapter 6 -Group discussion of part 6.3 -Reading assignments

	11.1 Conditions for Equilibrium 11.2 Center of Gravity 11.3 Solving Rigid-Body Equilibrium Problems 11.4 Stress, Strain, and Elastic Moduli 11.5 Elasticity and Plasticity					-Reading assignments
12	**Chapter 12:** GRAVITATION 12.1 Newton's Law of Gravitation 12.2 Weight 12.3 Gravitational Potential Energy 12.4 The Motion of Satellites 12.5 Kepler's Laws and the Motion of Planets 12.6 Spherical Mass Distributions 12.7 Apparent Weight and the Earth's Rotation 12.8 Black Holes	2	2	5	9	-Book [1]: chapter 12 -Group discussion of part 12.8 -Reading assignments
13	**Chapter 13:** PERIODIC MOTION 13.1 Describing Oscillation 13.2 Simple Harmonic Motion 13.3 Energy in Simple Harmonic Motion 13.4 Applications of Simple Harmonic Motion 13.5 The Simple Pendulum 13.6 The Physical Pendulum 13.7 Damped Oscillations 13.8 Forced Oscillations and Resonance	2	2		4	-Book [1]: chapter 13 -Group discussion of part 13.8 -Reading assignments -Book [4]: Prepare practice unit 4, writing report.

ADVANCE PROGRAM

TS. Công Ngọc Thắng

Hanoi, Date

HEAD OF DEPARTMENT

Lê Đắc Tuyên

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title:

Classical Physics 9C
Course code: PHY 9C
Number of credits: 4(3-2-7)
Number of hours:
Theory: 35; Homework: 15; Practice/Laboratory: 20; Self-study: 105

2. Course management unit

2.1. Instructor(s):	**Instructor's code**
1. Assoc. Prof. Dr. Du Thi Xuan Thao	0102-10
2. Dr. Le Dac Tuyen	0102-13
3. Dr. Nguyen Manh Hung	0102-07
4. Dr. Dao Viet Thang	0102-16
5. M.S. Do Thi Hong Hai	0102-06
6. M.S. Nguyen Thi Dieu Thu	0102-11
7. Dr. Nguyen Xuan Chung	0102-03

2.2. Department: Physics
2.3. Faculty: Basic Sciences

3. Prerequisites (course code): Physics 9B, Mathematic 22A

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. Introduction to general principles and analytical methods used in physics for physical science and engineering majors. Basic knowledge of electricity and magnetism including circuits and Maxwells's equations.

4.1.2. Practice to investigate some of the phenomena and laws of physics.

4.2. Skills

4.2.1. Understand the concepts of physical quantities, laws and physical phenomena.

4.2.2. Understand and apply knowledge to solve exercises, explain some phenomena.

4.2.3. Know some methods of measuring and using basic measuring tools, know how to perform measurements, evaluate the accuracy of measurement results and write reports.

5. Course description:

- Concepts, characteristics of physical quantities of electric charge, electricity, current, magnetism, and electromagnetic waves.
- Use knowledge to solve exercises and explain physical phenomena.
- Practice tests that help students understand the physical phenomena, know how to use the instrument, calculate and evaluate the measurement error.

ADVANCE PROGRAM

TS. Công Ngọc Thắng

Hanoi, Date
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HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: PROPERTIES OF MATERIALS

Course code: ENG 45

Number of credits: 04

Number of hours:

Theory: 40 hours	Homework: 20 hours	Practice/Laboratory: 0
Internship: 0	Topics: 0	Self-study: 120 hours

2. Instructor:

2.1. Instructor: **Instructor's code**

Prof. Klaus Van Benthem

TA. Tong Thi Thanh Huong **(0603-06)**

2.2. Department of Oil Refining and Petrochemistry.

2.3. Faculty of Oil and Gas

3. Prerequisites (course code): none

4. Course objectives/goals/expectations (Relationship to learning outcomes)

4.1. Knowledge

4.1.1. Properties and characteristic of atomic bonding;

4.1.2. Properties and characteristic of crystalline structures;

4.1.3. Properties and characteristic of phase diagrams;

4.1.4. Properties and characteristic of Electronic and Mechanical properties of Materials.

4.2. Skills

4.2.1. Develop the student's ability in self- reliance and responsibility.

4.2.2. Operate in team work and accept his college's opinions.

5. Course Description

The propose of this course is relationship between the structure, processing, properties, and performance of materials. The application of physical and chemical principles in the context of engineering materials: atomic bonding, crystal structure, defects, thermodynamics, and kinetics.

6. Organization/ Structure of the course

Table 1. Course topics to be corved - tentative schedule

6.1. Theory

Content	Topics/ Activities	Hours	Objectives
	Organization/Introduction	**2**	
Chapter 1	**Atomic Bonding**	**8**	**4.1.1 4.2.1, 4.2.2**
	Atomic structure	1	
	The ionic Bond	1	
	The covalent bond	2	
	The metallic bond	2	
	Material - The bonding Classification	2	
Chapter 2	**Crystalline Structures**	**8**	**4.1.2 4.2.1, 4.2.2**
	Seven systems and Fourteen Lattices	3	
	Metal, Ceramic, Polymeric, Semiconductor Structures	3	
	X-Ray Diffractions	2	
Chapter 3	**Deffects**	**8**	**4.1.2 4.2.1, 4.2.2**
	Point Defects	2	
	Linear Defects	2	
	Planar Defects	2	
	Noncrystalline Solids	2	
Chapter 4	**Diffusion**	**8**	**4.1.2 4.2.1, 4.2.2**
	Thermally Activated Processes and Thermal Production of Point Defects	4	
	Point defects and solid-State Diffusion	4	
Chapter 5	**Mechanical Properties**	**8**	**4.1.4 4.2.1, 4.2.2**
	Elastic Deformation	3	
	Plastic Deformation	3	
	Hardness	2	
Chapter 6	**Phase Diagrams**	**8**	**4.1.3 4.2.1, 4.2.2**
	The phase rule	2	
	The phase diagram	4	
	The lever rule	2	

Chapter 7	**Electronic Materials**	**8**	**4.1.4** **4.2.1, 4.2.2**
	Charge Carriers and Conduction	2	
	Energy Levels and Energy Bands	2	
	Conductors	2	
	Semiconductors	1	
	Composites	1	
	General Recap and Comprehensive	**2**	**4.1.1, 4.1.2, 4.1.3,** **4.1.4** **4.2.1, 4.2.2**
6.2. Practice/Laboratory: Not applicable.			

7. Method of instruction:

Theory, exercises and discussion for essays

8. Requirements for student:

- No open laptops or phones
- Questions welcome
- No late homework
- All assignments written with pen, NOT pencil—assignments written with pencil will not be accepted (including homework, midterms, final exam).
- Homeworks, midterms and final exam present in A4 sheet.
- For final exam: The only thing allowed is a pen/pencil, calculator (without internet capabilities) and a straight edge; note: one side – A4 sheet. We will supply everything else.

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Proportion of Total Assessment
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework or activities.	30 %
3	Group collaboration	Reports/ Presentations	
4	Midterms	Writing/ Viva (60 minutes)	
5	Final exam	Writing/Multiple-choice/Viva (90minutes)	60 %
	Total		**100 %**

9.2.Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books

Textbook

J. F. Shackelford, Introduction to Materials Science for Engineers, Sixth Edition, Pearson Prentice Hall, New Jersey, 2005.

Reference Books: Michael F. Ashby, **Materials Selection in Mechanical Design,** Third Edition, Butterworth-Heinemann as an imprint of Elsevier, Burlington, 2005.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Organization/Introduction**	**4**	**0**	**0**	**4**	
2	**Atomic Bonding**	**10**	**6**	**0**	**16**	- Text book Chapter 2 - Reading assignments to the atomic bonding
	Atomic structure	2	0	0	2	
	The ionic Bond	2	0	0	2	
	The covalent bond	2	2	0	4	
	The metallic bond	2	2	0	4	
	Material - The bonding Classification	2	2	0	4	
3	**Crystalline Structures**	**10**	**6**	**0**	**16**	- Text book Chapter 3 - Reading assignments to the crystalline structures
	Seven systems and Fourteen Lattices	3	3	0	6	
	Metal, Ceramic, Polymeric, Semiconductor Structures	3	3	0	6	
	X-Ray Diffractions	4	0	0	4	
4	**Deffects**	**12**	**4**	**0**	**16**	- Text book Chapter 4 - Reading assignments to the
	Point Defects	3	1	0	4	
	Linear Defects	3	1	0	4	
	Planar Defects	3	1	0	4	

	Noncrystalline Solids	3	1	0	4	defect
5	**Diffusion**	**10**	**6**	**0**	**16**	- Text book Chapter 5 - Reading assignments to the diffusion.
	Thermally Activated Processes and Thermal Production of Point Defects	6	4	0	10	
	Point defects and solid-State Diffusion	4	2	0	6	
6	**Mechanical Properties**	**10**	**6**	**0**	**16**	- Text book Chapter 6 - Reading assignments to the mechanical properties.
	Elastic Deformation	4	2	0	6	
	Plastic Deformation	4	2	0	6	
	Hardness	2	2	0	4	
7	**Phase Diagrams**	**10**	**6**	**0**	**16**	- Text book Chapter 7 - Reading assignments to the phase diagrams
	The phase rule	4	2	0	6	
	The phase diagram	4	2	0	6	
	The lever rule	2	2	0	4	
8	**Electronic Materials**	**10**	**6**	**0**	**16**	- Text book Chapter 8 - Reading assignments to the electronic materials
	Charge Carriers and Conduction	3	2	0	5	
	Energy Levels and Energy Bands	3	2	0	5	
	Conductors	2	2	0	4	
	Semiconductors	1		0	1	
	Composites	1		0	1	
9	**General Recap and Comprehensive**	**4**	**0**	**0**	**4**	

Hà nội, 30th May 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

TS. Công Ngọc Thắng

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title:
Organic chemistry, part 1
Course code: CHE128A
Number of credits: 3
Number of hours: 45
Theory: 35; Homeworks: 10; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study:90;

2. Course management unit
2.1. Instructor (s): **Instructor's code**
1. Assoc. Prof. Bùi Thị Lệ Thủy 0603-12
2.2. Department: Oil and Petrochemistry Department
2.3. Faculty: Oil and Gas Faculty

3. Prerequisites (course code): CHE2A, CHE2B

4. Course objectives/goals/expectations (Relationship to learning outcomes):
Students should gain the basic knowledge of organic chemistry such as the structure, nomenclature, physical and chemical properties, origins, synthesis methods, practical applications of hydrocarbons (saturated, unsaturated and aromatic) as well as alkyl halides.
4.1. Knowledge

4.1.1 Basic knowledge of organic chemistry: classification, naming, structure, homogeneity, isomerism, covalent bonding, concepts of acid and base in organic chemistry, effect of electron transfer in organic molecules, classification and organic reaction mechanism;

4.1.2 Structure, name, physical and chemical properties, origin, synthesis, practical application of saturated hydrocarbons

4.1.3 Stereochemistry and chirality

4.1.4 Structure, name, physical and chemical properties, origin, synthesized methods, practical applicability of unsaturated hydrocarbons.

4.1.5 Substitution and Elimenation reaction

4.1.6 Structure, name, physical and chemical properties, origin, synthesis methods, practical applicability of alkyl halide.
4.2. Skills
4.2.1 Do the exercises in all chapters

4.2.2. Do the exercises about determination the composition of a substance, the predictive properties of a substance, the preparation of a chemical from a given substances
4.2.3. Exercises about completion of the transformation of substances.

5. Course description:

Introduction to the basic knowledge of organic chemistry: classification, naming, structure, homogeneity, isomerism, covalent bonding, conceps of acid and base in organic chemistry, effect of electron transfer in organic molecules, classification and organic reaction mechanism, classification and organic compound mechanisms; Stereoisomer, substitution and elimination. Knowledge of the structure, name, physical and chemical properties, origin, synthesis methods, practical application of hydrocarbons (saturated, unsaturated) and alkyl halide.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Objectives	***Objectives***	***Objectives***	***Objectives***
Chapter 1	**Introduction to organic chemistry**	6	
1.1	Definition and classification	**0.5**	4.1.1
1.2	Isomerism-isomer	**2.5**	4.1.1, 4.2.1, 4.2.2
1.3	The transfer of electron in organic compound molecules	**1.5**	4.1.1, 4.2.1, 4.2.2
1.4	Classification of organic reaction	1.5	4.1.1, 4.2.1, 4.2.2
Chapter 2	**Acids and bases**	4	
2.1	Definition	1	4.1.1, 4.2.1, 4.2.2
2.2	Acid Dissociation Constants, p*Ka, and the* Relative Strengths of Acids and Bases	2	4.1.1, 4.2.1, 4.2.2
2.3	The Position of Equilibrium in Acid-Base Reactions	3	4.1.1, 4.2.1, 4.2.2
2.4	Molecular Structure and Acidity	4	4.1.1, 4.2.1, 4.2.2
Chapter 3	**Alkanes and cycloalkanes**	**5**	
3.1	Classes of Hydrocarbons	0.5	4.1.2, 4.2.1, 4.2.2, 4.2.3
3.2	3.2: Structure of Alkanes	0.5	4.1.2, 4.2.1
3.3	3.3: Isomeric Alkanes (constitutional isomerism)	0.5	4.1.2, 4.2.1
3.4	3.4 Systematic Nomenclature (IUPAC System)	**0.5**	4.1.2, 4.2.1

3.5	3.5 Conformations	**0.5**	4.1.2, 4.2.1
3.6	3.6: Physical Properties of Alkanes and Cycloalkanes	**0.5**	4.1.2, 4.2.1
3.7	3.7: Chemical Properties	1.5	4.1.2, 4.2.1, 4.2.2, 4.2.3
3.8	3.8: Sources of Alkanes and Cycloalkanes	0.5	4.1.2, 4.2.1, 4.2.2, 4.2.3
Chapter 4	**Stereoisomerism ans Chirality**	**5**	**4.1.3, 4.2.1**
	Chiral and achiral - Chirality	3	4.1.3, 4.2.1
	Naming of configurations	2	4.1.3, 4.2.1
Chapter 5	**Alkenes**	**6**	**4.1.4, 4.2.1, 4.2.2, 4.2.3**
	Structure, isomers, nomenclature	1	4.1.4, 4.2.1, 4.2.2, 4.2.3
	Physical properties	0.5	4.1.4, 4.2.1, 4.2.2, 4.2.3
	Syntheses, alkenes	1.5	4.1.4, 4.2.1, 4.2.2, 4.2.3
	Reactional sites of alkene	2.5	4.1.4, 4.2.1, 4.2.2, 4.2.3
	Typical compounds	0.5	4.1.4, 4.2.1, 4.2.2, 4.2.3
Chapter 6	**Alkynes**	**6**	**4.1.4, 4.2.1, 4.2.2, 4.2.3**
	Structure, isomers, nomenclature	1	4.1.4, 4.2.1, 4.2.2, 4.2.3
	Physical properties	0.5	4.1.4, 4.2.1, 4.2.2, 4.2.3
	Syntheses of alkynes	1.5	4.1.4, 4.2.1, 4.2.2, 4.2.3
	Chemical properties of alkynes	2.5	4.1.4, 4.2.1, 4.2.2, 4.2.3
	Typical compounds	0.5	4.1.4, 4.2.1, 4.2.2, 4.2.3
Chapter 7	**Elemenation and Sustitution**	**7**	**4.1.5, 4.2.1, 4.2.2, 4.2.3**
	Introduction	**1**	
	S_N1	**2.5**	4.1.5, 4.2.1, 4.2.2, 4.2.3
	S_N2	**2.5**	4.1.5, 4.2.1, 4.2.2, 4.2.3

	E2	**1**	4.1.5, 4.2.1, 4.2.2, 4.2.3
Chapter 8	**Alkylhalide**	**6**	**4.1.6, 4.2.1, 4.2.2, 4.2.3**
	Structure, isomers, nomenclature	1	4.1.6, 4.2.1, 4.2.2, 4.2.3
	Physical properties	0.5	4.1.6, 4.2.1, 4.2.2, 4.2.3
	Syntheses of alkylhalides	1.5	4.1.6, 4.2.1, 4.2.2, 4.2.3
	Chemical properties of alkylhalides	2.5	4.1.6, 4.2.1, 4.2.2, 4.2.3
	Typical compounds	0.5	4.1.6, 4.2.1, 4.2.2, 4.2.3

7. Method of instruction:

- Introduction to the theory knowledge **and guild how to do the exercises**

- Discussion

8. Duties of students:

- Attendance, respectful classroom participation: 80 %
- Homework: 100%
- Special needs: 0

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing: 60 minutes)	
6	Final exam	Writing: 90 minutes	60 %

Midterm 1: 60 minutes
Midterm 2: 60 minutes
Final Exam: 90 minutes

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] William H. Brown, Christopher S. Foote, Brent L. Iverson, Eric V. Anslyn, Bruce M. Novak, 6th Edition, Organic chemistry, Cengage Learning, 2012

[2] Francis A. Carey, Organic Chemistry, 4th Edition, McGraw-Hill, 2000

[3] James F. Norris, The principles of organic chemistry, 2nd Edition, McGraw-Hill, 2000

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1 Introduction to organic chemistry** 1.1Definition and classification 1.2 Isomerism-isomer 1.3 The transfer of electron in organic compound molecules 1.4 Classification of organic reaction	6	6		12	+ Book **[1], [2], [3]**: Corresponding chapters + Reading assignments + Summary ....
2	**Chapter 2 Acids and bases** 2.1 Definition 2.2 Acid Dissociation Constants, p*Ka, and the* Relative Strengths of Acids and Bases	4	4	0	8	+ Book **[1], [2], [3]**: Corresponding chapters + Reading assignments + Summary ....

	2.3 The Position of Equilibrium in Acid-Base Reactions 2.4 Molecular Structure and Acidity					
3	Chapter 3 Alkanes and cycloalkanes 3.1Classes of Hydrocarbons 3.2Structure of Alkanes 3.3Isomeric Alkanes (constitutional isomerism) 3.4 Systematic Nomenclature (IUPAC System) **3.5** Conformations 3.6 Physical Properties of Alkanes and Cycloalkanes **3.7** Chemical Properties 3.8 Sources of Alkanes and Cycloalkanes	5	5		10	+ Book **[1], [2]**: Corresponding chapters + Reading assignments + Summary ....
	Chapter 4 Stereoisomerism ans Chirality Chiral and achiral - Chirality Naming of configurations	5	5		10	+ Book **[1], [2]**: Corresponding chapters + Reading assignments + Summary ....
	Chapter 5 Alkenes	6	6		12	+ Book **[1], [2]**:

	Structure, isomers, nomenclature Physical properties Syntheses, alkenes Reactional sites of alkene Typical compounds					Corresponding chapters + Reading assignments + Summary ....
	Chapter 6 Alkynes Structure, isomers, nomenclature Physical properties Syntheses of alkynes Chemical properties of alkynes Typical compounds	6	6		12	+ Book [1], [2]: Corresponding chapters + Reading assignments + Summary ....
	Chapter 7 Elemenation and Sustitution Introduction S_N1 S_N2 E2	7	6		14	+ Book [1], [2]: Corresponding chapters + Reading assignments + Summary ....
	Chapter 8 Alkylhalide Structure, isomers, nomenclature Physical properties Syntheses of alkylhalides Chemical properties of	6	6		12	+ Book [1], [2]: Corresponding chapters + Reading assignments + Summary ....

	alkylhalides Typical compounds					

Hanoi, 30th May.... 2018

ADVANCE PROGRAM

Công Ngọc Thắng

CHAIR OF DEPARTMENT

TS. Công Ngọc Thắng

MINISTRY OF EDUCATION AND TRAINING
HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Analysis in Biochemical, Chemical and Materials Engineering
Course code: ECM5
Number of credits: 2
Total number of hours: 90
Theory: 25; Homeworks/Problems/Discussion: 5; Practice/Laboratory: 0;
Internship: 0; Topics: 0; Self-study: 60;

2. Course management unit
2.1. Instructor (s): **Instructor's code**
1. Professor Robert Powell (email: rlpowell@ucdavis.edu).
2. Dr. Cong Ngoc Thang (email: congngocthang@humg.edu.vn). 0603-11
2.2. Department: Oil Refining and Petrochemistry
2.3. Faculty: Oil and Gas/ Advanced program office

3. Prerequisites (course codes):
CHE2B (Chemistry 2B - may be taken concurrently), MAT21B (Mathematics 21B - may be taken concurrently).

4. Course objectives/goals/expectations (Relationship to learning outcomes):
4.1. Knowledge
4.1.1. To introduce students to and to provide students with basic knowledge of analysis of systems of interest to chemical engineers and materials scientists.
4.1.2. To introduce students to and to provide students with the applications of differential, integral calculus and data fitting and analysis of errors.
4.1.3. To introduce students to and to provide students with the methods for calculating the mass balances as a basis for development of mathematical models.
4.1.4. To introduce students to and to provide students with basic knowledge of dimensional analysis and ideal chemical reactors.

4.2. Skills
4.2.1. Recognizing, distinguishing, and evaluating the basic knowledge of analysis of systems of interest to chemical engineers and materials scientists.
4.2.2. Determining designing and operating parameters and applying differential, integral calculus and data fitting and also analysis of errors.
4.2.3. Recognizing, analyzing, evaluating and defining informations relating to determining the mass balances as a basis for development of mathematical models.
4.2.4. Providing students with opportunities to develop basic skills in respect to group-working neatly and accurately and solving problems in accordance with applying appropriate phenomena.

5. Course description:

The course is designed to provide students with basic knowledge of analysis of systems of interest to chemical engineers and materials scientists and also of applications of differential, integral calculus and dimensional analysis. For more details, the course provides students with the introduction to engineering analysis and development of problem solving skills and also the use of mathematics to represent simple physical and chemical phenomena. The course also illustrates and demonstrates students with the methods for calculating the mass balances as a basis for development of mathematical models. Introduction to data fitting and analysis of errors; dimensional analysis; and ideal chemical reactors are also other main contents of the course.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
1	Introduction, statement of goals, introduction to tank-draining experiment	2	4.1.1/4.2.1/4.2.2
2	Observations and analysis, examples of tank-draining. Concepts of qualitative, quantitative, steady state and transient	2	4.1.3/4.2.1/4.2.2/4.2.3
3	Mathematical representation of a simple physical process: finding an equation to describe tank draining	2	4.1.3/4.2.1/4.2.2/4.2.3
4	Continuation of development of equations describing tank draining	2	4.1.2/4.2.1/4.2.2/4.2.3
5	Various approaches to data analysis	2	4.1.2/4.2.1/4.2.2/4.2.3
6	Principle of conservation of mass	1	4.1.1/4.1.2/4.1.3/4.2.1
7	Application to model development and analysis of tank-draining problem	2	4.1.2/4.2.1/4.2.2/4.2.3
8	Further systematization of analysis methodology in terms of tank-draining problem	2	4.1.2/4.2.1/4.2.2/4.2.3
9	Units and dimensional analysis: pendulum	2	4.1.2/4.2.1/4.2.2/4.2.3
10	Dimensional analysis: tank draining	2	4.1.2/4.1.3 4.2.1/4.2.2/4.2.3
11	**Midterm**	**1**	
12	Strategies for analyzing tank draining data in context of model	2	4.1.3/4.2.1/4.2.2/4.2.3
13	Data representation and model comparisons, continued	1	4.1.3/4.2.1/4.2.2/4.2.3
14	Using EXCEL for data fitting and error analysis	1	4.1.3/4.2.1/4.2.2/4.2.3
15	Theory of linear least squares	1	4.1.3/4.2.1/4.2.2/4.2.3
16	Simple fluid statics	1	4.1.1/4.2.1
17	Conservation of energy	1	4.1.1/4.1.2/4.2.1
18	Multicomponent mass balance equations	1	4.1.1/4.1.2/4.1.3/4.2.1/ 4.2.2/4.2.3
19	Mole balances; mixing and ideal reactors (CSTR, PFR, and batch)	1	4.1.1/4.1.2/4.1.4/4.2.1/ 4.2.2/4.2.3
20	Mole balances; comparison of ideal reactors (CSTR, PFR, and batch).	1	4.1.1/4.1.2/4.1.4/4.2.1/ 4.2.2/4.2.3
21	**Student Presentations/ Final Review Session (Optional)**		4.1.1/4.1.2/4.2.1/4.2.2/ 4.2.3/4.2.4
22	**Final Exam**	**2**	

7. Methods of instruction:

- Lectures and discussions.
- Cooperative learning groups and independent study.
- Debates and problem solving.
- Problem sets will be emailed to students. In presenting the solution of a problem that requires analysis, students should state briefly in words at the beginning
  - what is given
  - what is to be found
  - what the method of solution is

This preliminary information should be followed by the solution to the problem. The grading of the problems will be based on the preliminary information as well as on the solution.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the quizes, midterm and final exam.
- Homeworks, laboratory,...and exams: Students are expected to complete all assignments and homeworks. Students must take part in the final exam.
- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.
- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.
- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. Close books. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
...	...	...	...
...	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Quiz: Writing, 20 minutes
Midterm: Writing, 60 minutes
Course presentations: TBA
Final Exam: Writing, 120 minutes
The examinations will cover both the lecture material and the assigned reading in the posted notes.

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] Course notes written by the instructors.

[2] J. M. Smith, H. C. Van Ness, M. M. Abbott, Introduction to Chemical Engineering Thermodynamics, 7th Edition, McGraw Hill, New York, 2004.

[3] Warren L McCabe, Julian C. Smith, Peter Harriott, Unit operations of chemical engineering, Fifth Edition, Mc Graw – Hill, 1993.

[4] H Scott Foggler, Elements of Chemical Reaction Engineering, Fourth Edition, Prentice Hall, 2006.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Total self-study (hours)	Requirements for student
1	Introduction, statement of goals, introduction to tank-draining experiment	1.5	0.5	4	+ Book [1]: Chapter 1 (Introduction) + Summary
2	Observations and analysis, examples of tank-draining. Concepts of qualitative, quantitative, steady state and transient	1.5	0.5	4	+ Book [1]: Chapter 1 (Introduction) + Summary
3	Mathematical representation of a simple physical process: finding an equation to describe tank draining	1	1	4	+ Book [1]: Chapter 2 (Analysis of a draining tank) + Summary
4	Continuation of development of equations describing tank draining	1	1	4	+ Book [1]: Chapter 2 (Analysis of a draining tank) + Summary
5	Various approaches to data analysis	1.5	0.5	4	+ Book [1]: Chapter 2 (Analysis of a draining tank); Chapter 3 (Analysis guided by theory) + Summary
6	Principle of conservation of mass	1		2	+ Book [1]: Chapter 3 (Analysis guided by theory – The principle of conservation of mass)

					+ Summary
7	Application to model development and analysis of tank-draining problem	1	1	4	+ Book **[1]**: Chapter 2 (Analysis of a draining tank); Chapter 3 (Analysis guided by theory – The principle of conservation of mass) + Summary
8	Further systematization of analysis methodology in terms of tank-draining problem	2		4	+ Book **[1]**: Chapter 2 (Analysis of a draining tank); Chapter 3 (Analysis guided by theory – The principle of conservation of mass) + Summary
9	Units and dimensional analysis: pendulum	2		4	+ Book **[1]**: Chapter 4 (Units, dimensions and dimentional analysis); + Book **[2]**: Chapter 1 (Introduction); + Book **[3]**: Section 1, Chapter 1 (Definitions and principles); + Summary .
10	Dimensional analysis: tank draining	2		4	+ Book **[1]**: Chapter 2 (Analysis of a draining tank); Chapter 4 (Units, dimensions and dimentional analysis); + Book **[3]**: Section 1, Chapter 1 (Definitions and principles); + Summary .
11	**Midterm**	**1**			+ Book **[1]**: Appropriate contents and chapters + Summary ....
12	Strategies for analyzing tank draining data in context of model	2		4	+ Book **[1]**: Chapter 2 (Analysis of a draining tank); Chapter 4 (Units, dimensions and dimentional analysis) + Summary .
13	Data representation and model comparisons, continued	1		2	+ Book **[1]**: Chapter 2 (Analysis of a draining tank); Chapter 4 (Units, dimensions and dimentional analysis) + Summary .
14	Using EXCEL for data fitting and error analysis	0	1	2	+ Book **[1]**: Chapter 2 (Analysis of a draining tank); Chapter 4 (Units, dimensions and dimentional analysis) + Summary .
15	Theory of linear least squares	1		2	+ Book **[1]**: Chapter 2 (Analysis of a draining tank); Chapter 4 (Units, dimensions and dimentional analysis) + Summary
16	Simple fluid statics	1		2	+ Book **[1]**: Chapter 6 (Extras) + Book **[3]**: Section 2, Chapter 2 (Fluid statics and its applications)

					+ Summary
17	Conservation of energy	0.5	0.5	2	+ Book **[1]**: Chapter 3 (Analysis guided by theory – The principle of conservation of mass) + Book **[2]**: Chapter 2 (The first law of thermodynamics and other basic concepts) + Summary
18	Multicomponent mass balance equations	1		2	+ Book **[1]**: Chapter 3 (Analysis guided by theory – The principle of conservation of mass) + Book **[2]**: Chapter 2 (The first law of thermodynamics and other basic concepts) + Summary
19	Mole balances; mixing and ideal reactors (CSTR, PFR, and batch)	1		2	+ Book **[1]**: Chapter 3 (Analysis guided by theory – The principle of conservation of mass); Chapter 5 (Chemical reactors and chemical reactions) + Book **[4]**: Chapter 1 (Mole balances) + Summary
20	Mole balances; comparison of ideal reactors (CSTR, PFR, and batch).	0.5	0.5	2	+ Book **[1]**: Chapter 3 (Analysis guided by theory – The principle of conservation of mass); Chapter 5 (Chemical reactors and chemical reactions) + Book **[4]**: Chapter 1 (Mole balances); Chapter 2 (Conversion and reactor szing) + Summary
21	**Student Presentations/ Final Review Session (Optional)**				+ Book **[1, 2, 3, 4]**: Appropriate contents and chapters + Summary
22	**Final Exam**	**2**			

TOPICS TO BE COVERED (SUMMARY)

No	Topics/ Activities	Hours (Class)	Hours (Self-study)
1	Introduction, statement of goals, introduction to tank-draining experiment	2	4
2	Observations and analysis, examples of tank-draining. Concepts of qualitative, quantitative, steady state and transient	2	4
3	Mathematical representation of a simple physical process: finding an equation to describe tank draining	2	4

4	Continuation of development of equations describing tank draining	2	4
5	Various approaches to data analysis	2	4
6	Principle of conservation of mass	1	2
7	Application to model development and analysis of tank-draining problem	2	4
8	Further systematization of analysis methodology in terms of tank-draining problem	2	4
9	Units and dimensional analysis: pendulum	2	4
10	Dimensional analysis: tank draining	2	4
11	**Midterm**	**1**	
12	Strategies for analyzing tank draining data in context of model	2	4
13	Data representation and model comparisons, continued	1	2
14	Using EXCEL for data fitting and error analysis	1	2
15	Theory of linear least squares	1	2
16	Simple fluid statics	1	2
17	Conservation of energy	1	2
18	Multicomponent mass balance equations	1	2
19	Mole balances; mixing and ideal reactors (CSTR, PFR, and batch)	1	2
20	Mole balances; comparison of ideal reactors (CSTR, PFR, and batch).	1	2
21	**Student Presentations/ Final Review Session (Optional)**		
22	**Final Exam**	**2**	

Hanoi, 30th May. 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

TS. Công Ngọc Thắng

HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: PRINCIPLES OF POLYMER MATERIALS SCIENCE

Course code: EMS 147

Number of credits: 02

Number of hours: Theory: 30 hrs; Homeworks:15 hrs; Self-study: 90 hrs;

2. Course management unit

2.1. Instructor (s): **Instructor's code**

PhD. Nguyen Thi Linh 0603-08

2.2. Department: Oil Refining and Petrochemistry

2.3. Faculty: Oil and Gas Faculty

3. Prerequisites (course code): CHE 128B

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. To reinforce concepts presented in Principles of polymer materials science.

4.1.2. To understand methods in polymer production.

4.1.3. To supply knowledge of mechanism and kinetic of chain growth polymerization

4.1.4. To reinforce knowledge of condensation;

4.1.5. To supply knowledge of polymer modification;

4.1.6. To extend knowledge of polymer properties and applications

4.2. Skills

4.2.1. To develop skills in writting reports and solution of exercises

4.2.2. To develop skills in teamwork and self study

5. Course description:

This course is the first course in material science. It covers concepts of polymer materials science. The course supplies knowledge of mechanism and kinetic of chain growth polymerization including free radical polymerization, inonic polymerization, ring open polymerization, copolymerization, coordination with catalyst and condensation. In this course you will learn about polymer modification to produce new polymers from parent polymers and extend knowledge of polymer properties and its applications in life and industry. The course provides skills in homework solution, teamwork and self study.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***

Chapter 1	**Basic principles of polymer**	**3**	
1.1	Basic concepts and definitions	1	4.1.1
1.2	Classification of polymers	0.5	4.1.1
1.3	Intermolecular forces in polymers	0.5	4.1.1
1.4	Monomers for polymerization	1	4.1.1
Chapter 2	**Chain growth polymerization**	**10**	
2.1	Introduction	0.5	4.1.3
2.2	Free radical polymerization	4.5	4.1.3, 4.2.1
2.3	Ionic polymerization	1	4.1.3, 4.2.2
2.4	Coordination polymerization	1	4.1.1, 4.2.2
2.5	Ring open polymerization	1	4.1.3, 4.2.2
2.6	Copolymerization	2	4.1.3, 4.2.1
Chapter 3	Condensation polymerization	**9**	4.1.4, 4.2.1, 4.2.2
3.1	Basic concepts	0.5	4.1.4
3.2	Mechanism of condensation polymerization	2	4.1.4, 4.2.1, 4.2.2
3.3	Kinetics of polycondensation	1.5	4.1.4, 4.2.1, 4.2.2
3.4	Statistics of linear polycondensation	1	4.1.4, 4.2.2
3.5	Molecular weight control	2	4.1.4, 4.2.1, 4.2.2
3.6	Molecular weight distribution in linear condensation system	1	4.1.4, 4.2.1, 4.2.2
3.7	Molecular weight average	1	4.1.4, 4.2.1, 4.2.2
Chapter 4	**Polymer modification**	**4**	
4.1	Basic concepts	0.5	4.1.5
4.2	Techniques in polymer modification	3.5	4.1.5, 4.2.2
Chapter 5	**Polymer properties and applications**	**2**	
5.1	Solution of polymers	0.5	4.1.6, 4.2.2
5.2	Mechanical properties of polymers	0.5	4.1.6, 4.2.2
5.3	Polymer viscoelasticity	0.5	4.1.6, 4.2.2
5.4	Polymer applications	0.5	4.1.6, 4.2.2

Chapter 6	**Polymer processing**	**2**	
	Homogenous polymerization	1	4.1.2, 4.2.2
	Heterogenous polymerization	1	4.1.2, 4.2.2
6.2. Practice/Laboratory (if any)			
Content	***Topics/ Activities***	***Hours***	***Objectives***

7. Method of instruction: Theory, discussions, homeworks

8. Requirements for student:

- Attendance, respectful classroom participation: 80 %,....
- Homework: 03 homeworks and exams: 02 midterm exams and 01final exam
- Integrity: 100%
- Classroom rules of conduct: 80% attendance and integrity homewoks, midterm exams and final exam.

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
5	Midterms	Writing/ Viva... (75 minutes)	
6	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 75 minutes
Midterm 2: 75 minutes
Final Exam: 90 minutes

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1]. Christopher S. Brazel, Stephen L. Rosen, *Fundamental Principles of Polymeric materials*, Third Edition, Wiley Publisher.

[2]. George Odian, Principles of polymerization, Fourth Edition, Wiley Interscience

[3]. Arie Ram, *Fundamentals of polymer engineering*, Plenium Press

[4]. Nikolay D. Morozkin, Vadim P. Zakharov, Gennady E. Zaikov, *Key technologies in polymer chemistry*, Apple Academic press

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	Chapter 1. Basic principles of polymer 1.1. Basic concepts and definitions 1.2. Classification of polymers 1.3. Intermolecular forces in polymers 1.4. Monomers for polymerization	3	0	0	6	+ Book [1]: Content part 1: section 2- Polymer fundamentals, Section 3- Molecular structure of polymer + Recommended Reading: Book [2]- part 1 (page 1-35)
2	Chapter 2. Chain growth polymerization 2.1. Introduction 2.2 Free radical polymerization 2.3 Ionic polymerization 2.4. Coordination polymerization 2.5. Ring open polymerization 2.6. Copolymerization	10	10	0	40	+ Book [1]: Content part 2: section 9- Free radicel addition polymerization Section 10- Advanced polymerization methods Sectuon 11- Copolymerizatio n + Recommended Reading: Book

						[2]- section 3 (page 199-238) + Homework 1: exercises for chain growth polymerization + Homework 2: exercises for copolymerizatio n
3	Chapter 3. Condensation polymerization 3.1. Basic concepts 3.2. Mechanism of condensation polymerization 3.3. Kinetics of polycondensation 3.4. Statistics of linear polycondensation 3.5. Molecular weight control 3.6. Molecular weight distribution in linear condensation system 3.7. Molecular weight average	9	5	5	28	+ Book [1]: Content part 2: section 8- Step Growth polymerization Section 5- Characterization of molecular weight + Recommended Reading: Book [2]- section 3-11 (page 289-315) + Homework 3: exercises for condensation polymerization
4	Chapter 4. Polymer modification 4.1 Basic concepts 4.2 Techniques in polymer modification	4		0	8	+ Book [3]: Content part 3: section 9- Reaction of polymers + Recommended Reading Book [4]- section 2

						(page 38- 56)
5	Chapter 5. Polymer properties and applications 5.1 Solution of polymers 5.2 Mechanical properties of polymers 5.3 Polymer viscoelasticity 5.4 Polymer applications	2		0	4	+ Book [1]: Content part 3: section 13- Polymer properties + Recommended Reading Book [4]- section 6 (page 238- 336) + Oral Presentation: Topics of Polymer applications
6	Chapter 6. Polymer processing 6.1 Homogenous polymerization 6.2 Heterogenous polymerization	2		0	4	+ Book [1]: Content part 2: section 12- Polymerization practice + Recommended Reading Book [4]- section 5 (page 149- 234)

Hanoi, 30th May 2018

ADVANCE PROGRAM

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COURSE SYLLABUS

1. Course title: PETROCHEMICAL TECHNOLOGY

Course code: ADECH 04

Number of credits: 02

Number of hours: Theory: 30 hrs; Homeworks: 15 hrs; Self-study: 180 hrs;

2. Course management unit

2.1. Instructor: **Instructor's code**

PhD. Nguyen Thi Linh 0603-08

2.2. Department: Oil Refining and Petrochemistry

2.3. Faculty: Oil and Gas Faculty

3. Prerequisites (course code): ADECH 02, ADECH 03

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. To reinforce concepts presented in petrochemical technology courses.

4.1.2. To understand methods in petroleum fraction processing to produce organic compounds.

4.1.3. To know technologies in manufacture of the organic compounds, plastics, elastomers, fibers from refining products.

4.1.4. To develop skills in analysis and estimation of processes in industrial manufacture.

4.2. Skills

4.2.1. To develop skills in writting reports, analysis technical diagram and solution of exercises

4.2.2. To develop skills in teamwork and self study.

5. Course description:

It covers concepts of petrochemicl technology. The course supplies knowledge of operating condition and processes of chemical production from petroluem product such as ethylene, propylene from cracking, BTX extracted from reformate, upgrading C4, C5 cuts, syngas and chemicals from natural gas. In this course you will learn about polymer processing from product petroluem. The course supplies skills in reading and analysis PFD and P&ID in petrochemical technology. The course provides skills in homework solution, teamwork and self study.

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	**Fundamentals of petrochemical process**	**5**	
1.1	Introduction	1	4.1.1

1.2	The development of the petrochemical industry	0.5	4.1.1
1.3	Feedstocks for petrochemical processes	1	4.1.1, 4.2.2
1.4	Products in petrochemical industry	1	4.1.1, 4.2.2
1.5	Petrochemical Industry in Vietnam	0.5	4.1.1, 4.2.2
1.6	Technology of petrochemical processes	1	4.1.1, 4.2.2
Chapter 2	**Chemicals from ethylene**	**10**	
2.1	The manufacture of ethylene by steam cracking	4	4.1.2, 4.2.1, 4.2.2
2.2	Manufacture of Ethylene oxide	2	4.1.3, 4.2.1
2.3	Ethylene Glycol manufacturing	1	4.1.3, 4.2.2
2.4	Manufacturing Vinyl acetate	3	4.1.1, 4.2.2
2.5	Manufacture of Ethylene Dichloride	2	4.1.3, 4.2.2
2.6	Manufacture of Vinyl chloride	2	4.1.3, 4.2.1
Chapter 3	**Chemicals from propylene**	**10**	4.1.4, 4.2.1, 4.2.2
3.1	Materials for propylene manufacture and applications	0.5	4.1.4
3.2	Manufacturing Propylene oxide	2	4.1.4, 4.2.1, 4.2.2
3.3	Manufacturing Cumene	2	4.1.4, 4.2.2
3.4	Hydroformylation- Oxo synthesis: Butyl alcohol manufacture	2	4.1.4, 4.2.1, 4.2.2
3.5	Manufacture of Acrylic acid	2	4.1.4, 4.2.1, 4.2.2
3.6	Manufacture of Acetone	1	4.1.4, 4.2.1, 4.2.2
3.7	Manufacture of Acrylonitrile	2	4.1.4, 4.2.1, 4.2.2
3.8	Manufacture of Isoprene	0.5	4.1.4, 4.2.1, 4.2.2
Chapter 4	**Chemicals from C4, C5 cuts**	**5**	
4.1	Butadiene manufacture	2	4.1.2
4.2	Butene manufacture	2	4.1.2, 4.2.2
4.3	Chloroprene manufacture	1	4.1.2, 4.2.2
Chapter 5	**Chemicals from Benzene, Toluene, Xylene (BTX)**	**10**	
5.1	Benzene- Toluene- Xylene production	2	4.1.2, 4.2.2
5.2	Manufacture of Phenol	1	4.1.2, 4.2.2
5.3	Manufacture of Styrene	3	4.1.2, 4.2.2
5.4	Manufacture of Linear Alkylbenzene (LAB)	2	4.1.2, 4.2.2
5.5	Manufacture of Caprolactam	1	

5.6	Manufacture of Phtalic anhydride	2	
5.7	Manufacture of Terephtalic acid and dimethyl terephtalate	2	
Chapter 6	**Chapter 6. Production of synthesis gases and their derivatives**	**8**	
6.1	Materials for production of synthesis gases	0.5	4.1.2, 4.2.2
6.2	Manufacture of synthesis gasese by partial oxidation	1	4.1.2, 4.2.2
6.3	Manufacture of synthesis gasese by steam reforming	3	
6.4	Ammonia synthesis	2.5	
6.5	Urethane manufacture	2	
6.6	Methanol manufacture	1	
Chapter 7	**Polymer processing**	**3**	4.1.3, 4.2.1
	7.1 Technology for plastic manufacture	1.5	4.1.3, 4.2.1
	7.2 Technology for Fibre manufacture	1.5	4.1.3, 4.2.1
6.2. Practice/Laboratory (if any)			
Content	***Topics/ Activities***	***Hours***	***Objectives***

7. Method of instruction: Theory, discussions, homeworks

8. Requirements for student:

- Attendance, respectful classroom participation: 80 %,....
- Homework: 03 homeworks and exams: 02 midterm exams and 01final exam
- Integrity: 100%
- Classroom rules of conduct: 80% attendance and integrity homewoks, midterm exams and final exam.

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
5	Midterms	Writing/ Viva... (75 minutes)	
6	Final exam	Writing/Multiple-choice/Viva... (...minutes)	60 %

Midterm 1: 75 minutes

Midterm 2: 75 minutes

Final Exam: 120 minutes

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1]. Nguyen Thi Linh, Petrochemical Technology, Electric Lecture, 2016

[2]. Alain Chauvel, Gilles Lefebvere. Petrochemical Processes V1. Gulf Publishing Company, 1989.

[3]. Alain Chauvel, Gilles Lefebvere. Petrochemical Processes V2. Gulf Publishing Company, 1989

[4]. Sami Matar, Chemistry of Petrochemical Processes, 2nd Ed, Gulf Publishing Company, 2000

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student
1	**Chapter 1. Fundamentals of petrochemical process** 1.1 Introduction 1.2 The development of the petrochemical industry 1.3 Feedstocks for petrochemical processes 1.4 Products in petrochemical industry 1.5 Petrochemical Industry in Vietnam 1.6 Technology of petrochemical processes	5	0	0	10	+ Book [1]- Chapter 1 Book [4]- chapter 1- Primary Raw materials for Petrochemicals + Recommended Reading: Book [2]- Introduction (page 1-16)
2	**Chapter 2. Chemicals from ethylene** 2.1 The manufacture of ethylene by steam cracking 2.2 Manufacture of Ethylene oxide 2.3 Ethylene Glycol manufacturing 2.4 Manufacturing Vinyl	15	8	0	46	+ Book [1]: Chapter 2- + Book [4]- Chapter 7 Recommended Reading: Book [2]- chapter 2

	acetate 2.5 Manufacture of Ethylene Dichloride 2.6 Manufacture of Vinyl chloride					(page 117-148) + Homework 1: exercises for calculation of ethylene cracking efficiency + Homework 2 (Oral Presentation): VinylAcetate Production plant Evaluation and Proposal
3	**Chapter 3. Chemicals from propylene** 3.1 Materials for propylene manufacture and applications 3.2 Manufacturing Propylene oxide 3.3 Manufacturing Cumene 3.4 Hydroformylation-Oxo synthesis: Butyl alcohol manufacture 3.5 Manufacture of Acrylic acid 3.6 Manufacture of Acetone 3.7 Manufacture of Acrylonitrile 3.8 Manufacture of Isoprene	15	7		44	+ Book [1]-Chapter 3 + Book [3]-chapter 7, chapter 9 + Recommended Reading: Book [4]- chapter 8 (page 213-236) + Homework 3: exercises for calculation of Acrylic acid production efficiency
4	**Chapter 4. Chemicals from C4, C5 cuts** 4.1 Butadiene manufacture 4.2 Butene manufacture 4.3 Chloroprene manufacture	5		0	10	+ Book [1]: chapter 4 + Book [2]-chapter 4 +Recommended Reading Book [4]- chapter 9

						(page 238- 260)
5	**Chapter 5. Chemicals from Benzene, Toluene, Xylene (BTX)** 5.1 Benzene- Toluene- Xylene production 5.2 Manufacture of Phenol 5.3 Manufacture of Styrene 5.4 Manufacture of Linear Alkylbenzene (LAB) 5.5 Manufacture of Caprolactam 5.6 Manufacture of Phtalic anhydride 5.7 Manufacture of Terephtalic acid and dimethyl terephtalate	10	5	0	30	+ Book [1]- chapter 5 + Book [3]- chapter 4 Recommended Reading Book [4]- chapter 6 (page 238- 336) + Oral Presentation: Styrene production Plant Evaluation and Proposal
6	**Chapter 6. Production of synthesis gases and their derivatives** 6.1 Materials for production of synthesis gases 6.2 Manufacture of synthesis gasese by partial oxidation 6.3 Manufacture of synthesis gasese by steam reforming 6.4 Ammonia synthesis 6.5 Urea manufacture 6.6 Methanol manufacture	10	5	0	30	+ Book [1]- chapter 6 + Book [2]- chapter 2 + Recommended Reading Book [4]- chapter 3 (page 52- 89) + Oral Presentation: Ammonia production Plant Evaluation and Proposal
	Chapter 7. Polymer processing 7.1 Technology for plastic manufacture 7.2 Technology for Fibre manufacture	5			10	Book [1]- chapter 7 Recommended Reading Book [4]- chapter 11

						(page 238- 336)

Hanoi, 30th May 2018

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

TS. Công Ngọc Thắng

MINISTRY OF EDUCATION AND TRAINING
HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
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COURSE SYLLABUS

1. Course title: Topics on Gas Conditioning and Processing
Course code: ADECH03A1
Number of credits: 2
Total number of hours: 90

Theory: 24;	Homeworks/Problems/Discussion: 6;	Practice/Laboratory: 0;
Internship: 0;	Topics: 0;	Self-study: 60;

2. Course management unit

2.1. Instructor (s):

	Instructor's code
1. Dr. Cong Ngoc Thang (congngocthang@humg.edu.vn)	0603-11
2. Asso. Prof. Nguyen Anh Dung (nguyenanhdung@humg.edu.vn)	0603-04

2.2. Department: Oil Refining and Petrochemistry
2.3. Faculty: Oil and Gas

3. Prerequisites (course code):
ECH 143 (Mass transfer).

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. To introduce students to and to provide students with basic knowledge of natural gas.
4.1.2. To introduce students to and to provide students with the unit operations of gas conditioning and processing.
4.1.3. To introduce students to and to provide students with the methods for calculating the unit operations of gas conditioning and processing (Dehyration processes; Gas sweetening processes; Condensation and refrigeration in gas processing; Absorption in gas processing; Low temperature fractionation in gas processing).
4.1.4. To introduce students to and to provide students with technologies in Dinh Co gas processing plant. And also to orient students to the range of technological processes in gas conditioning and processing and to acceptable standards of work in the industry.

4.2. Skills

4.2.1. Recognizing, distinguishing, evaluating the unit operations of gas conditioning and processing.
4.2.2. Determining parameters and designing equipments and basic prosesses in gas conditioning and processing.
4.2.3. Recognizing, analyzing, evaluating and defining informations relating to determining parameters and designing equipments and basic prosesses in gas conditioning and processing.
4.2.4. Providing students with opportunities to develop basic skills in respect to group-working neatly and accurately and solving problems in accordance with applying appropriate operations.

5. Course description:

The course is designed to provide students with basic knowledge of natural gas: Components and classification of hydrocarbon gases; Physical properties of hydrocarbon systems; Products of hydrocarbon gases and applications. The course provides students with the unit operations of gas conditioning and processing: Planning the system; Dehyration process; Gas sweetening processes; Condensation and refrigeration in gas processing; Absorption in gas processing; Low temperature fractionation in gas processing; Diagrams and equipments in Dinh Co gas processing plant. The course also illustrates and demonstrates students with the methods for calculating the unit operations of gas conditioning and processing (Dehyration processes; Gas sweetening process calculations by amine; Fractionator design considerations).

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
Chapter 1	Components and classification of hydrocarbon gases	1.5	4.1.1/4.2.1/4.2.2
Chapter 2	Physical properties of hydrocarbon systems	2.5	4.1.3/4.2.1/4.2.2/4.2.3
Chapter 3	Products of hydrocarbon gases and applications	0.5	4.1.4
Chapter 4	Planning the system	0.5	4.1.2/4.2.1/4.2.2/4.2.3
Chapter 5	Dehyration process	5	4.1.2/4.2.1/4.2.2/4.2.3
Chapter 6	Gas sweetening processes	3	4.1.2/4.2.1/4.2.2/4.2.3
Chapter 7	Condensation and refrigeration in gas processing	2.5	4.1.2/4.2.1/4.2.2/4.2.3
Chapter 8	Absorption in gas processing	3.5	4.1.2/4.2.1/4.2.2/4.2.3
Chapter 9	Low temperature fractionation in gas processing	1	4.1.2/4.1.3 4.2.1/4.2.2/4.2.3
Chapter 10	Dinh Co gas processing plant	1.5	4.1.3/4.2.1/4.2.2/4.2.3
Chapter 11	Dehydration process calculations	4	4.1.3/4.2.1/4.2.2/4.2.3
Chapter 12	Sweetening process calculations by amine	2	4.1.3/4.2.1/4.2.2/4.2.3
Chapter 13	Fractionator design considerations	2.5	4.1.3/4.2.1/4.2.2/4.2.3
	Thesis		

General Overview/Syllabus, The scope of gas conditioning and processing

PART I. THE BASIC PRINCIPLES ON HYDROCARBON GAS

Chapter 1. Components and classification of hydrocarbon gases (1.5 hours)

1.1. Components (composition)
1.2. Classification of hydrocarbon gases
  1.2.1.Classification by producing sourses
    1.2.1.1. Natural gas or non-associated gas
    1.2.1.2. Associated gas
  1.2.2.Classification by H_2S content

1.2.3.Classification by C^{5+} content and C^{3+} content
1.3. Other nomenclatures

Chapter 2. Physical properties of hydrocarbon systems (2.5 hours)

2.1. Physical properties of hydrocarbon gas
2.1.1. The Clausius - Clapeyron equation
2.1.2. Flammability limits
2.1.3. Critical conditions
2.1.4. Heat of combustion
2.2. Basic equations of state for the ideal gas
2.2.1. Boyle's equation
2.2.2. Charles' equation
2.2.3. Avogadro's law
2.2.4. The equation of state for an ideal gas
2.2.5. Dalton's law of partial pressures (mixtures of ideal gases)
2.2.6. Amagat's law of partial volumes
2.2.7. Apparent molecular weight of a gas mixture and specific gravity of a gas
2.3. Equations of state for real gases (behavior of real gases)
2.3.1. General equation of state for the real gas
2.3.1.1 The compressibility equation of state
2.3.1.2 The law of corresponding states
2.3.2. Common equations of state for real gases
2.3.2.1. The van der Waals equation of state (1873)
2.3.2.2. Beattie – Bridgeman equation of state
2.3.2.3. Benedict – Webb – Rubin (BWR) equation of state
2.3.2.4. Soave – Redlich – Kwong (SRK) equation of state
2.3.2.5. Peng – Robinson (PR) equation of state
2.3.2.6. Stewart – Burkhardt – Voo (SBV) equation of state

Chapter 3. Products of hydrocarbon gases and applications (0.5 hour)

3.1. Products of hydrocarbon gases
3.2. Applications

PART II. BASIC PROCESSES

Chapter 4. Planning the system (1 hour)

4.1. Simple gas processing module (simple flow diagram for a typical gas processing plant)
4.2. Modules of main equipments
4.2.1 Gas conditioning module
4.2.2 Natural gas liquids extraction module
4.2.3 Stabilization module
4.2.4 Product treating module
4.3. Process selection and design basis

Chapter 5. Dehyration process (10 hours)

5.1. General concepts
5.1.1. Water content of gases

5.1.2. Water monitors
5.1.3. Water content applications
5.1.4. Gas hydrates and hydrate equilibrium
5.1.5. Hydrate prediction correlations
5.2. Dehyration methods
5.2.1. Hydrate inhibition
5.2.2. Absorption dehydration – glycol dehydration (wet method)
5.2.3. Adsorption dehydration (dry method)

Midterm 1

Chapter 6. Gas sweetening processes (removal of H_2S, R-SH, COS, CO_2) (6 hours)

6.1. Introduction
6.2. Amine processes
6.2.1. Concept and alkanolamine solvents
6.2.2. Process flow for typical alkanolamine sweetening unit
6.2.3. Typical processes
6.2.3.1. DGA process
6.2.3.2. ADIP process
6.2.3.3. ECONAMIN process
6.3. Gas sweetening processes by physical absorption methods and solvent mixture
6.3.1.1. FLUOR solvent process
6.3.1.2. SELEXOL process
6.3.1.3. RECTISOL - PURISOL processes
6.3.1.4. SULFINOL process
6.3.1.5. MEA and Sulfinol processes
6.4. Gas sweetening processes by adsorption method
6.5. Gas sweetening processes by membrane method

Chapter 7. Condensation and refrigeration in gas processing (5 hours)

7.1. Fundamentals of condensation and refrigeration
7.1.1. Basic principles of condensation and refrigeration systems
7.1.2. Flow diagram for a simple condensation and refrigeration process
7.2. Flow diagram for a low temperature condensation process using outside refrigeration system
7.2.1. Flow diagram for the one stage condensation process for separating C^{3+} using liquid propane
7.2.2. Flow diagram for the one stage condensation process for separating C^{3+} using mixed refrigerants
7.2.3. Flow diagram for the multi-stage condensation process (cascade refrigeration system)
7.3. Flow diagram for a low temperature condensation process with inner refrigeration system
7.4. Flow diagram for a low temperature condensation process with mixed refrigeration system

Chapter 8. Absorption in gas processing (7 hours)

8.1. Fundamentals of absorption process
8.1.1. Schematic view and nomenclature for an oil absorber
8.1.2. Basic equations
8.1.3. Kremser diagram (Kremser – Brown approach)
8.2. Flow diagram for an absorption process in gas processing
8.2.1. Flow diagram

8.2.2. Operating parameters
8.3. Some current flow diagrams for a low temperature absorption process in gas processing
8.3.1. General flow diagram
8.3.2. Flow diagram for Elvin plant (USA)
8.3.3. Flow diagram for Nizhevatousk (Russia)

Chapter 9. Low temperature fractionation in gas processing (2 hours)

9.1. Fractionation fundamentals
9.2. Typical fractionation systems

Chapter 10. Dinh Co gas processing plant (3 hours)

10.1. Introduction
10.2. AMF mode of operation
10.3. MF mode of operation
10.4. GPP mode of operation
10.5. MGPP mode of operation

Midterm 2

PART III. BASIC CALCULATIONS IN GAS CONDITIONAING AND PROCESSING

Chapter 11. Dehydration process (8 hours)

11.1. Absorption dehydration
11.2. Adsorption dehydration
11.3. Adsorbent (desiccant) regeneration

Chapter 12. Sweetening process calculations by amine (4 hours)

12.1. Introduction
12.2. Calculating procedure

Chapter 13. Fractionator design considerations (5 hours)

13.1. The design basis
13.2 Typical cases
13.2.1. Tower pressure
13.2.2. Equilibrium boiling temperature (the reboiler temperature)
13.2.3. Condensation temperature (dewpoint)
13.2.4. Vapour – liquid equilibrium temperature of mixture
13.2.5. The reflux ratio and number of theoretical stages
13.2.6. Convert theoretical stages to actual trays using tray efficiencies
13.2.7. Optimum feed tray location

7. Methods of instruction:
- Lectures and discussions.
- Cooperative learning groups and independent study.
- Debates and problem solving.

8. Requirements for student:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the quizes, midterms and final exam.

- Homeworks, laboratory,…and exams: Students are expected to complete all assignments and homeworks. Students must take part in the final exam.

- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input.

- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.

- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. Open or close books as announced. No notes are allowed in exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.*

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
6	Final exam – Thesis	Writing/Multiple-choice/Viva... (...minutes)	60 %

Final Exam – Thesis : Writing

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] John M. Campbell. Gas conditioning and processing, Volume 1, Eighth Edition, 2001.

[2] John M. Campbell. Gas conditioning and processing, Volume 2, Eighth Edition, 2001.

[3] William D, McCain, The properties of petroleum fluids, Second Edition, 1990.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Laboratory (hours)	Total self-study (hours)	Requirements for student

1	**Chapter 1:** Components and classification of hydrocarbon gases 1.1. Components (composition) 1.2. Classification of hydrocarbon gases 1.3. Other nomenclatures **Chapter 2:** Physical properties of hydrocarbon systems 2.1. Physical properties of hydrocarbon gas 2.2. Basic equations of state for the ideal gas		1.0		7	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5, 6, 7]** + Summary ....
2	**Chapter 2:** Physical properties of hydrocarbon systems 2.3. Equations of state for real gases (behavior of real gases) **Chapter 3:** Products of hydrocarbon gases and applications 3.1. Products of hydrocarbon gases 3.2. Applications **Chapter 4.** Planning the system 4.1. Simple gas processing module 4.2. Modules of main equipments 4.3. Process selection and design basis **Chapter 5:** Dehyration process 5.1. General concepts		1.0		7	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5]** + Summary ....
3	**Chapter 5:** Dehyration process 5.2. Dehyration methods		1.0		6	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5]** + Summary ....
4	**Chapter 6:** Gas sweetening processes (removal of H_2S, R-SH, COS, CO_2) 6.1. Introduction 6.2. Amine processes 6.3. Gas sweetening processes by physical absorption methods and solvent mixture 6.4. Gas sweetening processes by adsorption method 6.5. Gas sweetening processes by membrane		1.0		6	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5]** + Summary ....

	method					
5	**Chapter 7.** Condensation and refrigeration in gas processing 7.1. Fundamentals of condensation and refrigeration 7.2. Flow diagram for a low temperature condensation process using outside refrigeration system 7.3. Flow diagram for a low temperature condensation process with inner refrigeration system 7.4. Flow diagram for a low temperature condensation process with mixed refrigeration system **Chapter 8:** Absorption in gas processing 8.1. Fundamentals of absorption process				6	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5]** + Summary ....
6	**Chapter 8:** Absorption in gas processing 8.2. Flow diagram for an absorption process in gas processing 8.3. Some current flow diagrams for a low temperature absorption process in gas processing		1.0		7	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5]** + Summary ....
7	**Chapter 9:** Low temperature fractionation in gas processing 9.1. Fractionation fundamentals 9.2. Typical fractionation systems **Chapter 10:** Dinh Co gas processing plant		1.0		5	+ Book **[1, 2, 3]**: Content, chapter,... + Reading assignments**[2, 4, 5]** + Summary ....
8	**Chapter 11:** Dehydration process 11.1. Absorption dehydration		1.0		6	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5]** + Summary ....
9	**Chapter 11:** Dehydration process 11.2. Adsorption dehydration 11.3. Adsorbent (desiccant) regeneration **Chapter 12.** Sweetening process calculations by amine 12.1. Introduction		1.0		6	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5]** + Summary ....

10	**Chapter 12.** Sweetening process calculations by amine **Chapter 13.** Fractionator design considerations		1.0		4.0	+ Book **[1, 2, 3]**: Appropriate contents and chapters + Reading assignments**[2, 4, 5]** + Summary ....
	Final Exam – Thesis					

TOPICS TO BE COVERED (SUMMARY)

No	Topics/ Activities	Hours (Class)	Hours (Self-study)
1	**Introduction**		
2	Components and classification of hydrocarbon gases	1.0	3
3	Physical properties of hydrocarbon systems	1.0	5
4	Products of hydrocarbon gases and applications		1
5	Planning the system		1
6	Dehyration process	1.0	10
7			
8	Gas sweetening processes	1.0	6
9	Condensation and refrigeration in gas processing	1.0	5
10	Absorption in gas processing	1.0	7
11	Low temperature fractionation in gas processing	1.0	2
12	Dinh Co gas processing plant		3
13			
14	Dehydration process calculations	1.0	8
15	Sweeting process calculations by amine	1.0	4
16	Fractionator design considerations	1.0	5
17			
18	**Thesis**		

Hanoi, ... 20...

ADVANCE PROGRAM

TS. Công Ngọc Thắng

CHAIR OF DEPARTMENT

TS. Công Ngọc Thắng

MINISTRY OF EDUCATION AND TRAINING
HANOI UNIVERSITY OF MINING AND GEOLOGY
ADVANCED PROGRAM

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom - Happiness

COURSE SYLLABUS

1. Course title: Topics on unit operations of chemical engineering
Course code: ECH143A
Number of credits: 2
Total number of hours: 90

Theory: 15;	Homeworks/Problems/Discussion: 75;	Practice/Laboratory: 0;
Internship: 0;	Topics: 0;	Self-study: 120;

2. Course management unit

2.1. Instructor (s):	**Instructor's code**
1. Dr. Cong Ngoc Thang (email: congngocthang@humg.edu.vn).	0603-11
2. Dr. Toan Vu Van (email: vuvantoan@humg.edu.vn).	0603-13

2.2. Department: Oil Refining and Petrochemistry
2.3. Faculty: Oil and Gas/ Advanced program office

3. Prerequisites (course codes):

ECH51 (Material Balances), **ECH141** (Fluid Mechanics for Biochemical and Chemical Engineers).

You must have taken ECH 141 (Fluid Mechanics). Convection plays a dominant role in mass transfer and often is much greater than mass transfer by molecular diffusion. Thus you need to understand fluid mechanics. Further, you need to know solutions of ordinary differential and partial differential equations, such as separation of variables, boundary conditions, Sturm-Liouville eigenvalue problems, similarity transforms, Laplace transforms and Bessel functions (ECH140). You must know tensor analysis.

4. Course objectives/goals/expectations (Relationship to learning outcomes):

4.1. Knowledge

4.1.1. To introduce students to and to provide students with basic knowledge of heat and mass transfer and heat and mass transfer processes of interest to chemical engineers and materials scientists.

4.1.2. To introduce students to and to provide students with the applications of differential, integral equations for calculating the heat and mass rate, heat and mass flux, heat and mass transfer coefficient and overall heat and mass transfer coefficient.

4.1.3. To introduce students to and to provide students with the methods for calculating the heat and mass balances as a basis for development of mathematical models.

4.1.4. To introduce students to and to provide students with basic knowledge of testing and designing methods of heat and mass exchangers.

4.2. Skills

4.2.1. Recognizing, distinguishing, and evaluating the basic knowledge of heat and mass transfer and heat and mass transfer processes of interest to chemical engineers and materials scientists.

4.2.2. Determining designing and operating parameters and applying differential, integral equations for calculating the heat and mass rate, heat and mass flux, heat and mass transfer coefficient and overall heat and mass transfer coefficient.

4.2.3. Recognizing, analyzing, evaluating and defining informations relating to determining the heat and mass balances as a basis for development of mathematical models.

4.2.4. Providing students with opportunities to develop basic skills in respect to group-working neatly and accurately and solving problems in accordance with applying appropriate heat and mass transfer phenomena.

5. Course description:

The course is designed to provide students with basic knowledge of heat and mass transfer and heat and mass transfer equipments in applications to chemical and biochemical engineering.For more details, the course provides students with the introduction to heat and mass transfer and its applications and development of problem solving skills and also the use of mathematics to represent simple physical and chemical phenomena relating to heat and mass transfer and heat and mass transfer processes, including conduction, convection, radiation, combined heat transfer, diffusion equations for binary and multicomponent systems, diffusion coefficients, convective-diffusion equation, Stefan-Maxwell equations, Stefan diffusion tube, diffusion in solids, mass transfer across an interface, mass transfer coefficients, laminar flow mass transfer, mass transfer in fluid-fluid systems, mass transfer with chemical reaction, mass transfer and reaction in catalysts, boundary layer analysis. The course also illustrates and demonstrates students with the methods for calculating the heat and mass balances as a basis for development of mathematical models and designing methods of unit operations and equipments of chemical engineering (double-tube heat exchanger, shell-tube heat exchanger, plate heat exchanger, reboiler, other heat exchangers, gas absorption, distillation, liquid/liquid extraction, adsorption, mass exchangers or processing towers).

6. Organization/ Structure of the course:

Table 1. Course topics to be corved - tentative schedule

6.1. Theory			
Content	***Topics/ Activities***	***Hours***	***Objectives***
1	**Heat transfer**	**7**	4.1.1/4.1.2/4.2.1/4.2.2 4.1.3/4.2.1/4.2.2/4.2.3 4.2.4
2	**Mass transfer**	**7**	4.1.1/4.1.2/4.2.1/4.2.2 4.1.3/4.2.1/4.2.2/4.2.3 4.2.4
3	**Final Review Session (Optional)**	**1**	
4	**Final Exam - Thesis**		4.1.1/4.1.2/4.2.1/4.2.2 4.1.3/4.2.1/4.2.2/4.2.3 4.2.4

7. Methods of instruction:

- Lectures and discussions.
- Cooperative learning groups and independent study.
- Debates and problem solving.
- Homework problem sets will be distributed in class or homework files will be sent to your email. Some homework will be graded. In presenting the solution of a problem that requires analysis, students should state briefly in words at the beginning:

- what is given
- what is to be found
- what the method of solution is

This preliminary information should be followed by the solution to the problem. The grading of the problems will be based on the preliminary information as well as on the solution.

8. Requirements for students:

- Attendance, respectful classroom participation: at least 80 % of lectures. Students are encouraged to attend every class with the desire to gain, grow, and develop the necessary concepts, skills and understanding needed to successfully pass the quizes, midterm and final exam.

- Homeworks, laboratory,...and exams: Students are expected to complete all assignments and homeworks. Students must take part in the final exam.

- Integrity: Students are expected to be in class on time ready to work and participate in activities and provide input. The most productive learning atmosphere occurs when you ask questions. You are encouraged to ask questions in class. Questions and answers help to clarify *concepts*, and you are encouraged to share *concepts* and *ideas* concerning homework problems. However, the work that you submit for a grade in this course *must be your own*, i.e., **you must be the sole master and owner of the material that you submit for course credit.**

- Classroom rules of conduct: Students must follow the **HUMG rules regarding attendance.** Students who are absent for 20 % consecutive lectures will be dropped from the class and final exam immediately.

- Special needs: *In all exams please distribute as equally as possible in the room to ideally leave free space between you and your neighbor. Close books. No notes are allowed in all exams. Only non-programmable, non-graphing calculators are allowed in exams. Absolutely no cell phones in exams! Put them on silent during normal class.* Answers to the homework problems and the grading key for the quizzes and exams will be available or discussed in class. **If a personal emergency** occurs, contact the instructor **before** any examination. During an examination or quiz, all personal belongings must be stored under your chair during exams. If you have a disability that has an impact on your learning, we encourage you to talk with me about it on a confidential basis so that we might collectively devise a strategy to overcome whatever barriers may exist. The classroom will be a place of orderly discussion of contents of the course. If you wish to discuss personal matters with your neighbor, *you must do so elsewhere*. **If you want to sleep, the classroom is not the place for it.**

9. Course grading plan

9.1. Grading methods

Table 2. Course grading plan

No	Grading components	Regulations/Rules	Weighted
1	Attendance	Hours/ Total lecturing hours	10 %
2	Homeworks	Homework numbers/ Total homework numbers	30 %
3	Group collaboration	Reports/ Presentations	
4	Practice/Laboratory/ Internship	Reports/ Presentations/Skills	
5	Midterms	Writing/ Viva... (.....minutes)	
6	Final exam – Thesis	Writing/Multiple-choice/Viva... (...minutes)	60 %

Final Exam – Thesis: Writing,

9.2. Grading scale system

The 10-scale grading system, which can be converted into 4-scale system (letter or number grade), is to be used in accordance with the Regulation of Credit-based Academic System of HUMG.

10. Text/ required books and other interesting books: (at least 3 books)

[1] Robert E. Treybal, Mass-Transfer Operations, Third Edition, Mc Graw – Hill, 1981.

[2] R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot. Transport Phenomena, Revised Second Edition, John Wiley & Sons, Inc, 2007.

[3] Warren L McCabe, Julian C. Smith, Peter Harriott, Unit operations of chemical engineering, Fifth Edition, Mc Graw – Hill, 1993.

[4] Frank P. Incropera, David P. Dewitt, Theodore L. Bergman, Adrienne S. Lavine. Fundamentals of Heat and Mass Transfer, Six Edition, John Wiley & Sons, Inc, 2007.

[5] Carl R. Branan, Rules of Thumb for Chemical Engineers, Third Edition, GPP.

11. Instruction for self-study:

Table 3. Contents to be prepared - tentative schedule

No	Topics/ Activities	Theory (hours)	Homeworks/ Problems/ Discussion (hours)	Total self-study (hours)	Requirements for student
1	**Heat transfer**	7	14	28	+ Book **[1]**: + Book **[2]**: + Book **[3]**: + Book **[4]**: + Book **[5]**: + Summary
2	**Mass transfer**	7	14	28	+ Book **[1]**: + Book **[2]**: + Book **[3]**: + Book **[4]**: + Book **[5]**: + Summary
3	**Final Review Session (Optional)**	1	2	6	+ Book **[1]**: + Book **[2]**: + Book **[3]**: + Book **[4]**: + Book **[5]**: + Summary
4	**Final Exam - Thesis**				

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ADVANCE PROGRAM

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