MINISTRY OF EDUCATION & TRAINING
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

UNDERGRADUATE PROGRAM
Major of
CHEMICAL ENGINEERING TECHNOLOGY

(Issued under Decision No. 3744 /QĐ-ĐHSPKT dated 06 / 10 /2025 by the President of Ho Chi Minh City University of Technology and Education)

Education Program: Chemical Engineering Technology
Level: Undergraduate
Major: Chemical Engineering Technology
Major code: 7510401A

Ho Chi Minh City, 2025

THE MINISTRY OF EDUCATION & TRAINING
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

SOCIALIST REPUBLIC OF VIETNAM
Independence – Liberty – Happiness

UNDERGRADUATE PROGRAM

Education Program: Chemical Engineering Technology

Level: Undergraduate

Major: Chemical Engineering Technology

Major code: 7510401A

Type of Program: Full time

Graduation Diploma: ENGINEER

(Issued under Decision No. 3744 /QĐ-ĐHSPKT dated 06 / 10 /2025 by the President of Ho Chi Minh City University of Technology and Education)

1. Training Duration: 4 years

2. Admission Requirements: High school Graduates

3. Grading System, Curriculum and Graduation Requirements

Grading Scale: 10

Training Process: According to Decision No. 3116/QD-ĐHSPKT dated 22/08/2025 of Ho Chi Minh City University of Technology and Education on promulgating the university-level training regulations.

Graduation Requirements:

- General Requirements: According to Decision No. 3116/QD-ĐHSPKT dated 22/08/2025 of Ho Chi Minh City University of Technology and Education on promulgating the university-level training regulations.
- Specialized Requirements: According to the general regulations of Ho Chi Minh City University of Technology and Education.

4. The Objectives and Expected Learning Outcomes

Objectives

The graduates from Chemical Engineering Technology program will possess knowledge, skills, and competence to:

1. Apply fundamental and advanced scientific and technological knowledge to succeed professionally in the field of Chemical Engineering Technology or a related field aligned with their career goals.

2. Become capable technological engineers and managers, solving practical engineering challenges.

3. Be able to pursue further education and research to advance their careers.

Program Outcomes

ELO	Expected Learning Outcomes (ELO) (Upon completing the Chemical Engineering Technology program, graduates are expected to be able to)	Competency Level (CL)

ELO1	Evaluate engineering and technological issues in the field of Chemical Engineering Technology by applying principles of mathematics, science, and engineering.	**5**
ELO2	Assess experimental data to draw appropriate conclusions in the field of Chemical Engineering Technology.	**5**
ELO3	Recognize the ethics and professional responsibilities of an engineer.	**4**
ELO4	Recognize the need for and utilize essential elements to engage in lifelong learning.	**3**
ELO5	Work effectively in team environment.	**3**
ELO6	Communicate effectively in various forms, with different audiences, and be able to communicate in English.	**3**
ELO7	Identify engineering solutions in the field of Chemical Engineering Technology to meet societal needs.	**5**
ELO8	Implement engineering systems in the field of Chemical Engineering Technology.	**5**
ELO9	Operate and manage engineering systems in the field of Chemical Engineering Technology	**5**

COMPETENCY LEVEL DESCRIPTION

Competency Level		**Description**
$0.0 \leq CL \leq 1.0$	Basic	Remember: Students are able to recall/recognize/retrieve knowledge through actions such as defining, repeating, listing, identifying, classifying, etc.
$1.0 < CL \leq 2.0$	Qualified	Understand: Students are able to construct knowledge from materials, using actions like explaining, categorizing, illustrating, reasoning, etc.
$2.0 < CL \leq 3.0$		Apply: Students are able to apply knowledge to create products such as models, tangible items, simulations, or reports.
$3.0 < CL \leq 4.0$	Proficient	Analyze: Students are able to analyze knowledge into details and parts, identifying relationships among them using actions like analyzing, classifying, comparing, synthesizing, etc.
$4.0 < CL \leq 5.0$		Evaluate: Students can make assessments, predictions about knowledge/information based on established standards and criteria using actions like commenting, criticizing, proposing, etc.
$5.0 < CL \leq 6.0$	Excellent	Create: Students can create/organize/design/generalize components in a new/different way to produce new structures/models/ products.

5. Total program credits: 158 credits

(not including physical, national defense education and Enterprise Seminar)

Foreign Language Knowledge:

- Students with an IELTS >= 4.5 or equivalent (as per Decisions No. 3239/QĐ-ĐHSPKT dated 03/09/2025) will be exempted from the English placement test. Their scores will be converted for English courses in the program and English proficiency requirement (Outcome).
- English Placement Test for Level Classification: Students without IELTS certificate must participate in an English placement test to determine their proficiency level.
  - If a student achieves Level 1, they will study Communicative English 1,2.
  - If a student achieves Level 2, they will study Academic English 1,2.
- Sequence of English courses: Communicative English 1,2 → Academic English 1, 2.

Note:

- Communicative English 1 and 2 are supplementary courses designed to enhance English communication skills for students not accumulating credits in the program.
- Academic English 1 and 2 are academic courses that accumulate credits in the program.
- *For knowledge on Enterprise Seminar, Course code SEMI310026 - 1 credit (2 topics): not included in credit accumulation, becomes a necessary condition (assessed as Pass/Fail) for graduation consideration. (According to Minutes No. 54/BB-DT, dated March 20, 2025, on implementing the plan for the 2025-2026 school year and Instruction No. 1064/HD-ĐHPSKT dated March 26, 2025 on reviewing and revising university training programs).*

6. Allocation of credits

No.	Course name	Credits
GENERAL KNOWLEDGE BLOCK		**60**
A. Compulsory courses		**38**
I. Politics and Laws		**14**
1	Philosophy of Marxism and Leninism	3
2	Political Economics of Marxism and Leninism	2
3	Scientific Socialism	2
4	Ho Chi Minh’s Ideology	2
5	History of Vietnamese Communist Party	2
6	General Laws	3
II. Mathematics and Natural Sciences		**21**
1	Calculus 1	3

2	Calculus 2	3
3	Calculus 3	3
4	Physics 1	3
5	Physics 2	3
6	General Chemistry	3
7	Probability and Statistics in Engineering	3
III. Introduction to Chemical Engineering Technology		**3**
IV. English		**8**
B. Elective courses		**14**
V. Informatics		**3**
1	Information Technology Applications	3 (2+1)
VI. Social Sciences and Humanities (according to the catalog)		**4**
VII. Others		**7**
1	Safety and Techniques in Chemistry Lab	2
2	Technical Drawing - Basic course	3 (2+1)
3	AutoCAD in Chemical Engineering	2
C. Physical Education and National Defense Education		
VIII. Physical Education (Non-Accumulation)		
1	Physical Education 1	1
2	Physical Education 2	1
3	Physical Education 3	1
IX. National Defense Education (Non-Accumulation)		
1	National Defense Education 1	1
2	National Defense Education 2	1
3	National Defense Education 3	1
4	National Defense Education 4	1
D. Comunicative English (Non-Accumulation)		
1	Communicative English 1	4
2	Communicative English 2	4
E. Enterprise Seminar (Non-Accumulation)		1
PROFESSIONAL KNOWLEDGE BLOCK		**98**
Disciplinary group fundamental courses		**72 (70*)**
Fundamental courses		

Specialized courses	
Practical courses	**14 (16*)**
Internship	**2**
Graduation Thesis	**10**
TOTAL	**158**

(*) Pharmaceutical Chemical Engineering Technology Specialization

7. CONTENTS OF THE PROGRAM

A – COMPULSORY COURSES

7.1.a GENERAL KNOWLEDGE BLOCK

No.	Course's ID	Course name	Credits	Prerequisite
1.	LLCT130105E	Philosophy of Marxism and Leninism	3	HT_LLCT120205
2.	LLCT120205E	Political Economics of Marxism and Leninism	2	
3.	LLCT120405E	Scientific Socialism	2	HT_LLCT130105 HT_LLCT120205
4.	LLCT120314E	Ho Chi Minh's Ideology	2	HT_LLCT120205HT_LLCT130105 SH_LLCT120405
5.	LLCT220514E	History of Vietnamese Communist Party	2	HT_LLCT120205HT_LLCT130105HT_LLCT120405HT_LLCT120314
6.	GELA236939E	General Laws	3	
7.	MATH132401E	Calculus 1	3	
8.	MATH132501E	Calculus 2	3	HT_MATH132401E
9.	MATH132601E	Calculus 3	3	HT_MATH132501E
10.	PHYS130902E	Physics 1	3	
11.	PHYS131002E	Physics 2	3	HT_PHYS130902E
12.	GCHE130603E	General Chemistry	3	
13.	MATH132901E	Probability and Statistics in Engineering	3	HT_MATH132401E HT_MATH132501E
14.	ICHE130703E	Introduction to Chemical Engineering Technology	3 (2+1)	
15.	ITAP138785E	Information Technology Applications	3 (2+1)	

16.	TSCL120803E	Safety and Techniques in Chemistry Lab	2	
17.	TEDG130120E	Technical Drawing - Basic course	3 (2+1)	
18.	UCAD120403E	AutoCAD in Chemical Engineering	2	HT_TEDG130120E
19.	ACEN340535E	Academic English 1	4	
20.	ACEN340635E	Academic English 2	4	
21.	*COEN140135E*	*Communicative English 1*		*Non-Accumulation*
22.	*COEN140235E*	*Communicative English 2*		*Non-Accumulation*
23.	GDQP110131	Giáo dục quốc phòng 1 (*National Defence Education 1)*	1	*Non-Accumulation*
24.	GDQP110231	Giáo dục quốc phòng 2 (*National Defence Education 2)*	1	*Non-Accumulation*
25.	GDQP110331	Giáo dục quốc phòng (*National Defence Education 3)*	1	*Non-Accumulation*
26.	GDQP110431	Giáo dục quốc phòng 4 (*National Defence Education 4)*	1	*Non-Accumulation*
27.	PHED110130	Giáo dục thể chất 1 (*Physical Education 1)*	1	*Non-Accumulation*
28.	**Giáo dục thể chất 2,3 (***Physical Education 2,3)*		**2**	**Choose 2**
29.	FOOT112330	Bóng đá (*Football)*	1	*Non-Accumulation*
30.	VOLL112330	Bóng chuyền (*Volleyball)*	1	*Non-Accumulation*
31.	BASK112330	Bóng rổ (*Basketball)*	1	*Non-Accumulation*
32.	BADM112330	Cầu lông (*Badminton)*	1	*Non-Accumulation*
33.	TENN112330	Quần vợt (*Tennis)*	1	*Non-Accumulation*
34.	KARA112330	Không thủ đạo (*Karate)*	1	*Non-Accumulation*
35.	CHES112330	Cờ vua (*Chess)*	1	*Non-Accumulation*
36.	CHIN112330	Cờ tướng (Chinese Chess)	1	*Non-Accumulation*
37.	YOGA112330	Yoga (Yoga)	1	*Non-Accumulation*
38.	PICK112330	Pickle ball	1	*Non-Accumulation*
Total			**56**	

7.2.a PROFESSIONAL KNOWLEDGE BLOCK

7.2.1.a Disciplinary group fundamental courses

No.	Course's ID	Course name	Credits	Prerequisite
39.	ELEE220144E	Electrical Engineering	2	HT_MATH132401E HT_PHYS130902E
40.	FLUI220132E	Applied Fluid Mechanics	2	HT_MATH132401E HT_MATH132501E HT_PHYS130902E HT_PHYS131002E
41.	APME221021E	Applied Mechanics	2	HT_MATH132401E HT_MATH132501E HT_PHYS130902E HT_PHYS131002E
42.	THER220503E	Thermal Engineering in Chemical Engineering	2	HT_MATH132401E HT_MATH132501E HT_PHYS130902E HT_PHYS131002E HT_GCHE130603E
43.	ICHE231003E	Inorganic Chemistry	3	HT_GCHE130603E
44.	OCHE231403E	Organic Chemistry	3	HT_GCHE130603E
45.	PCHE221603E	Physical Chemistry 1	2	HT_MATH132401E HT_PHYS130902E HT_GCHE130603E
46.	PCHE221703E	Physical Chemistry 2	2	HT_GCHE 130603E HT_MATH132401E HT_PHYS130902E
47.	ACHE231203E	Analytical Chemistry	3	HT_GCHE 130603E
48.	IANM323303E	Instrumental Analytical Methods	2	HT_ACHE231203E
49.	AEPL230603E	Design of Experiments in Chemical Engineering	3	HT_MATH132401E HT_MATH132501E HT_MATH123601E HT_MATH132901E
50.	MPRO232103E	Mechanical Unit Operations	3	HT_FLUI220132E HT_APME221021E HT_THER220503E
51.	HTPE231903E	Heat Transfer Operations	3	HT_FLUI220132E

				HT_APME221021E HT_THER220503E
52.	MTPE232003E	Mass Transfer Operations	3	HT_MPRO232103E HT_HTPE231903E
53.	CREN222203E	Chemical Reaction Engineering	2	HT_MPRO232103E HT_HTPE231903E
54.	PROC221103E	Fundamentals of Process Control	2	HT_MTPE232003E HT_CREN222203E
55.	FDMF232603E	Fundamentals of Chemical Engineering Design	3	HT_MTPE232003E HT_CREN222203E
56.	POCH333103E	Physicochemical Polymers	3	HT_OCHE231403E
57.	QUMA320703E	Management and Quality Tools for Chemical Engineers	2	HT_POCH323103E HT_TINO322903E HT_TORS323003E
58.	CLEP320803E	Cleaner Production in Chemical Engineering Technology	2	HT_QUMA320703E
59.	PWPD322703E	*Project of machine and equipment design*	*2*	HT_FDMF232603E HT_TEDG130120E HT_UCAD120403E
Total			**51**	

7.2.2.a Fundamental courses

(I) Fundamental courses of the following majors: Organic Chemical Engineering Technology, Inorganic Chemical Engineering Technology, and Polymer Chemical Engineering Technology.

No.	Course's ID	Course name	Credits	Prerequisite
60.	TINO322903E	Technology of Inorganic Substances	2	HT_ICHE231003E
61.	TOCH421203E	Techniques in Organic Chemistry	2	HT_OCHE231403E
62.	FMSE232803E	Fundamentals of Materials Science and Engineering	3	HT_GCHE130603E HT_ICHE231003E
63.	ELET323203E	Electrochemical Technology	2	HT_PCHE221603E HT_PCHE221703E
Total			**9**	

(II) Fundamental courses of Pharmaceutical Chemical Engineering Technology

No.	Course's ID	Course name	Credits	Prerequisite
64.	PHAT337503E	Pharmaceutical Technology	3	HT_OCHE231403E
65.	PHAR327603E	Pharmacology	2	HT_PCHE221603E HT_PCHE221703E
66.	MBCH327703E	Biochemistry	2	HT_OCHE231403E
67.	BIOT328103E	Experimental Design of Bioactivity	2	HT_OCHE231403E
68.	PPTE428803E	Pharmaceutical Formulation Technology	2	SH_EPME417803E
Total			**11**	

7.2.3.a Practice courses

No.	Course's ID	Course name	Credits	Prerequisite
*(I) Laboratory course for all 4 majors (**12 credits**)*				
69.	EGCH110903E	*General Chemistry Laboratory*	1	HT_GCHE130603E HT_TSCL120803E
70.	EICH221103E	*Inorganic Chemistry Laboratory*	2	HT_ICHE231003E HT_EGCH110903E HT_TSCL120803E
71.	EOCH221503E	*Organic Chemistry Laboratory*	2	HT_OCHE231403E HT_EGCH110903E HT_TSCL120803E
72.	EPCH221803E	*Physical Chemistry Laboratory*	2	HT_PCHE221603E HT_PCHE221703E HT_TSCL120803E
73.	EACH221303E	*Analytical Chemistry Laboratory*	2	HT_ACHE231203E HT_TSCL120803E
74.	ERPD222303E	*Unit Operations Laboratory*	2	HT_PROC221103E HT_FDMF232603E
75.	EAAM416903E	*Modern Analytical Methods Laboratory*	1	HT_IANM323303E
Total			**12**	
*(II) Laboratory courses for the Pharmaceutical Chemical Engineering Technology Major (**2 credits**)*				
76.	EPME417803E	*Practice in Pharmaceutical Formulation*	1	SH_PPTE428803

77.	EBIO417903E	*Practice in Evaluation of Bioactivity*	1	HT_PHAT337503E HT_PHAR327603E HT_MBCH327703E HT_BIOT328103E
Total			***2***	

7.2.4.a Internship

No.	Course's ID	Course name	Credits	Prerequisite
78.	GRAP426703E	*Internship*	*2*	HT_ENGP427003E
Total			***2***	

7.2.5.a Graduation

No.	Course's ID	Course name	Credits	Prerequisite
79.	GRAS426603E	Seminar for Graduation	2	Complete 14 credits of specialized courses
80.	GRAT406803E	Graduation Thesis	10	Complete 14 credits of specialized courses Have no more than 7 uncompleted credits
Total			**12**	

B – ELECTIVE COURSES

7.1.b GENERAL COURSES *(Students are required to choose **4 elective credits** from the list of courses below)*

No.	Course's ID	Course name	Credits	Prerequisite
81.	GEEC220105E	General Economics	2	
82.	INMA220305E	Introduction to Management	2	
83.	WOPS120390E	Professional Skills for Technical Fields	2	
84.	ENPS220591E	Engineering Psychology	2	
85.	SYTH220491E	Systems Thinking	2	
Total			**4**	

7.2.b SPECIALIZED COURSES *(Students choose courses corresponding to one of the four specializations)*

No.	Course's ID	Course name	Credits	Prerequisite
(i) Organic Chemical Engineering Technology Specialization ***(****Students are required to complete **10 elective credits** by choosing from the following courses)*			**(10)**	

86.	TDET423503E	Detergents Technology	2	HT_OCHE231403E
87.	FSTE423703E	Fragrance Science and Technology	2	HT_OCHE231403E
88.	TECP423803E	Cosmetic Technology	2	HT_OCHE231403E
89.	SIOC423903E	Spectroscopic Identification of Organic Compounds	2	HT_OCHE231403E
90.	PSTE424003E	Pulp and Paper Production Technology	2	HT_OCHE231403E
91.	TEDY424203E	Dyeing and Finishing Technologies	2	HT_OCHE231403E
92.	CTNC431603E	Chemical Technology of Natural Products	3	HT_OCHE231403E
93.	CCHE431703E	Chemistry of Colorants	3	HT_OCHE231403E
94.	BIRE431803E	Biofuels and Renewable Energy	3	HT_OCHE231403E
(ii) Inorganic Chemical Engineering Technology Specialization *(Students are required to complete* ***10 elective credits*** *by choosing from the following courses)*			**(10)**	
95.	TFER424403E	Fertilizer Technology	2	HT_ICHE231003E HT_TINO322903E
96.	TCER420903E	Ceramic Technology	2	HT_ICHE231003E HT_TINO322903E
97.	TCEM424603E	Cement Technology	2	HT_ICHE231003E HT_TINO322903E
98.	SCIM424903E	Structural Characterization of Inorganic Materials	2	HT_FMSE222803E HT-ICHE231003E
99.	TPIG425103E	Pigment Technology	2	HT_ICHE231003E HT_TINO322903E
100.	AIMA425203E	Advanced Inorganic Materials	2	HT_ICHE231003E HT_FMSE222803E
101.	TGLA421003E	Glass Technology	2	HT_ICHE231003E HT_TINO322903E
102.	SOLC431303E	Solid-State Chemistry	3	HT_ICHE231003E
103.	CENA431403E	Nanocatalysts and Catalysis Engineering	3	HT_ICHE231003E

104.	ELPT431503E	Electrolysis and Electroplating Technology	3	HT_PCHE221603E HT_PCHE221703E
(iii) Polymer Chemical Engineering Technology Specialization ***(****Students are required to complete* ***10 elective credits*** *by choosing from the following courses)*			**(10)**	
105.	TPCM425403E	Polymer Composite Materials	2	HT_POCH323103E
106.	TPLA425503E	Plastics Manufacturing Technology	2	HT_POCH323103E
107.	FRUT425603E	Rubber Technology	2	HT_POCH323103E
108.	MAEP425703E	Analysis and Evaluation of Polymer Materials	2	HT_POCH323103E
109.	TPOP425803E	Polymer Processing	2	HT_POCH323103E
110.	ADPO426103E	Advanced Polymers	2	HT_POCH323103E
111.	TFIB426203E	Fiber Technology	2	HT_POCH323103E
112.	TPAI426303E	Paint Technology	2	HT_POCH323103E
113.	MSEL431903E	Material Selection	3	HT_POCH323103E
114.	AWRP432003E	Weathering Resistance and Stabilization of Polymer Materials	3	HT_POCH323103E
115.	APCH432103E	Advanced Physical Chemistry of Polymers	3	HT_POCH323103E
Total			**10**	
(iv) Pharmaceutical Chemical Engineering Technology Specialization ***(****Students are required to complete* ***6 elective credits*** *by choosing from the following courses)*			**(10)**	
116.	SAPH428003E	Spectroscopic Analysis in Pharmaceutical Chemistry	2	HT_OCHE231403E
117.	BIOT328103E	Experimental Design of Bioactivity	2	HT_OCHE231403E
118.	BIOM328203E	Pharmaceutical and Bio-Materials	2	HT_OCHE231403E
119.	RCMP428503E	Research Methods in Medicinal Plant Chemistry	2	HT_PHAT337503E
120.	DRUT428603E	Pharmaceutical Quality Control	2	HT_PHAT337503E

121.	MPTE428703E	Pharmaceutical Material Preservation Technology	2	HT_PHAT337503E
122.	PPTE428803E	Pharmaceutical Formulation Technology	2	HT_PHAT337503E HT_PHAR327603E HT_MBCH327703E
123.	FFPT428903E	Functional Food Production Technology	2	HT_PHAT337503E HT_PHAR327603E HT_MBCH327703E
124.	ANPT429003E	Antibiotics Production Technology	2	HT_OCHE231403E HT_MPRO232103E
125.	VACC429103E	Vaccine Production Technology	2	HT_OCHE231403E HT_MPRO232103E
126.	DRUE429303E	Pharmaceutical Manufacturing Technology	2	HT_OCHE231403E HT_MPRO232103E
127.	DRUD432203E	Chemistry of Drug Delivery Systems	3	HT_OCHE231403E
128.	TOXC432303E	Toxicology	3	HT_OCHE231403E
Total			**10**	

7.3.b Experiment courses

No.	Course's ID	Course name	Credits	Prerequisite
Elective Specialization *(Students are required to complete **2 credits** corresponding to one of the four specializations)*				
Organic Chemical Engineering Technology Specialization			**(2)**	
129.	ESOC424303E	*Specialized Laboratory in Organic Chemical Engineering Technology*	2	HT_AEPL230603E Complete 10 credits in the Organic Chemical Engineering Technology specialization
Inorganic Chemical Engineering Technology Specialization			**(2)**	
130.	EICT425303E	*Specialized Laboratory in Inorganic Chemical Engineering Technology*	2	HT_AEPL230603E Complete 10 credits in the Inorganic Chemical Engineering

				Technology specialization
Polymer Chemical Engineering Technology Specialization			**(2)**	
131.	ESPO426403E	*Specialized Laboratory in Polymer Chemical Engineering Technology*	2	HT_AEPL230603E Complete 10 credits in the Polymer Chemical Engineering Technology specialization
Pharmaceutical Chemical Engineering Technology Specialization			**(2)**	
132.	EPCT429403E	*Specialized Laboratory in Pharmaceutical Chemical Engineering Technology*	2	HT_AEPL230603E Complete 10 credits in the Pharmaceutical Chemical Engineering Technology specialization
Total			**2**	

C – INTERDISCIPLINARY COURSES

Students have the option to substitute 6 credits from interdisciplinary courses in place of specialized electives. Students must select **only one option**, and are required to complete **all 6 credits** within that chosen option.

No.	Course's ID	Course name	Credits	Prerequisite
	Option 1 (Environmental Major)		**6**	
133.	OHSM322110E	Occupational Safety and Health Management	*2*	
134.	EIAS323210E	Environmental Impact Assessment	*2*	
135.	ENTE227310E	Environmental Technology	*2*	
	Option 2 (Food Major)		**6**	
136.	FOPR423650E	Food Processing Technologies	*2*	
137.	FOEN423450E	Food Engineering	*2*	
138.	FOMA421050E	Food Quality Management	*2*	
	Option 3 (Economics Major)		**6**	
139.	BAMA231209E	Basic Marketing	3	

140.	TEMA321406E	Technology Management	3	
Total			**6**	

D – Massive Open Online Courses (MOOCs):

To enhance access to advanced training programs, students can choose from the suggested online courses listed below to be considered as equivalents for courses in the curriculum.

No.	Course's ID	Course name	Credits	Courses considered equivalent to MOOCs (registration link)
141.	PCHE221703E	Physical Chemistry 2	2	https://lms.hcmute.edu.vn/course/view.php?id=16259
142.	GCHE130603E	General Chemistry	3	https://www.coursera.org/learn/advanced-chemistry
143.	OCHE231403E	Organic Chemistry	3	https://www.universalclass.com/i/course/learn-organic-chemistry.htm

8. Curriculum Plan

SEMESTER 1:

No.	Course's ID	Course name	Credits	Term 1/2	Prerequisite
1.	ACEN340535E	Academic English 1	4	1	
2.	ACEN340635E	Academic English 2	4	1	
3.	LLCT130105	Philosophy of Marxism and Leninism	3	1	
4.	MATH132401E	Calculus 1	3	1	
5.	ICHE130703E	Introduction to Chemical Engineering Technology	3 (2+1)	1	
6.	TSCL120803E	Safety and Techniques in Chemistry Lab	2	2	
7.	ITAP138785E	Information Technology Applications	3 (2+1)	2	
8.	GCHE130603E	General Chemistry	3	2	
9.	PHYS130902E	Physics 1	3	1	
10.	PHED110130	Giáo dục thể chất 1 (*Physical Education1)*	1	2	
Total (*excluding Physical Education 1*)			**28**		

SEMESTER 2:

No.	Course's ID	Course name	Credits	Term 1/2	Prerequisite
1.	MATH132501E	Calculus 2	3	1	HT_MATH132401E
2.	PHYS131002E	Physics 2	3	2	HT_PHYS130902E
3.	EGCH110903E	Laboratory Course in General Chemistry	*1*	1	HT_GCHE130603E HT_TSCL120803E
4.	ICHE231003E	Inorganic Chemistry	3	1	HT_GCHE130603E
5.	OCHE231403E	Organic Chemistry	3	2	HT-_GCHE130603E
6.	APME221021E	Applied Mechanics	2	1	HT_MATH132401E HT_PHYS130902E
7.	ELEE220144E	Electrical Engineering	2	2	HT_MATH132401E HT_PHYS130902E
8.	GELA236939E	General Laws	3	2	
9.	GEEC220105E INMA220305E WOPS120390E ENPS220591E SYTH220491E	Social Sciences & Humanities (Choose 2 credits from the 10 credits listed below) General Economics Introduction to Management Professional Skills for Technical Fields Engineering Psychology Systems Thinking	2 2 2 2 2	2	
10.		Giáo dục thể chất 2 (tự chọn 1) *Physical Education 2 (Option 1)*	1		
11.		Giáo dục Quốc phòng	4		

		National Defence Education			
Total			**22**		

SEMESTER 3:

No.	Course's ID	Course name	Credits	Term 1/2	Prerequisite
1.	MATH132601E	Calculus 3	3	1	HT_MATH132501E
2.	MATH132901E	Probability and Statistics in Engineering	3	2	HT_MATH132401E HT_MATH132501E
3.	FLUI220132E	Applied Fluid Mechanics	2	2	HT_MATH132401E HT_MATH132501E HT_PHYS130902E HT_PHYS131002E
4.	THER220503E	Thermal Engineering in Chemical Engineering	2	1	HT_MATH132401E HT_PHYS130902E HT-_GCHE130603E
5.	PCHE221603E	Physical Chemistry 1	2	1	HT_GCHE130603E HT_MATH132401E HT_PHYS130902E
6.	ACHE231203E	Analytical Chemistry	3	2	HT-_GCHE130603E
7.	EOCH221503E	*Laboratory Course in Organic Chemistry*	*2*	2	HT-_OCHE231403E HT_TSCL120803E

8.	EICH221103E	*Laboratory in Inorganic Chemistry*	*2*	1	HT-_ICHE231003E HT_TSCL120803E
9.	GEEC220105E INMA220305E WOPS120390E ENPS220591E SYTH220491E	Social Sciences & Humanities (Choose 2 credits from the 10 credits listed below) General Economics Introduction to Management Professional Skills for Technical Fields Engineering Psychology Systems Thinking	2 2 2 2 2	1	
10.		Giáo dục thể chất 3 (tự chọn 2) *Physical Education 3 (Optional 2)*	1		
Total			**21**		

SEMESTER 4:

No.	Course's ID	Course name	Credits	Term 1/2	Prerequisite
1.	PCHE221703E	Physical Chemistry 2	2	1	HT_GCHE130603E HT_MATH132401E HT_PHYS130902E
2.	POCH333103E	Physicochemical Polymers	3	2	HT-_OCHE231403E
3.	IANM323303E	Instrumental Analytical Methods	2	1	HT_ACHE231203E
4.	HTPE231903E	Heat Transfer Operations	3	1	HT_THER222932E HT_FLUI220132E HT_MATH132601E

5.	MPRO232103E	Mechanical Unit Operations	3	2	HT_MATH132401E HT_MATH132501E HT_MATH132601E HT_PHYS130902E HT_PHYS131002E
6.	EACH221303E	*Laboratory Course in Analytical Chemistry*	*2*	2	HT_ACHE231203E HT_TSCL120803E
7.	TEDG130120E	Technical Drawing - Basic course	3 (2+1)	1	
Total			**18**		

SEMESTER 5:

No.	Course's ID	Course name	Credits	Term 1/2	Prerequisite
5A. Courses for Organic Chemical Engineering Technology, Inorganic Chemical Engineering Technology, and Polymer Chemical Engineering Technology Specializations					
1.	FMSE232803E	Fundamentals of Materials Science and Engineering	3	1	HT_GCHE130603E HT-_ICHE231003E
2.	TINO322903E	Technology of Inorganic Substances	2	1	HT-_ICHE231003E
3.	TOCH421203E	Techniques in Organic Chemistry	2	1	HT_OCHE231403E
4.	ELET323203E	Electrochemical Technology	2	2	HT_PCHE221603E HT_PCHE221703E
5.	MTPE232003E	Mass Transfer Operations	3	1	HT_MPRO232103E
6.	CREN222203E	Chemical Reaction Engineering	2	2	HT_MTPE232003E

					HT_HTPE231903E
7.	UCAD120403E	AutoCAD in Chemical Engineering	2	2	HT_TEDG130120E
8.	EPCH221803E	*Laboratory Course in Physical Chemistry*	*2*	2	HT-_PCHE221603E HT-_PCHE221703E HT_TSCL120803E
Total			**18**		
5B. Courses for Pharmaceutical Chemical Engineering Technology Specialization					
(I) Compulsory courses (16 credits):					
9.	PHAT337503E	Pharmaceutical Technology	3	1	HT_OCHE231403E
10.	PHAR327603E	Pharmacology	2	1	HT_PCHE221603E HT_PCHE221703E
11.	MBCH327703E	Biochemistry	2	1	HT_OCHE231403E
12.	MTPE232003E	Mass Transfer Operations	3	1	HT_MPRO232103E
13.	CREN222203E	Chemical Reaction Engineering	2	2	HT_MTPE232003E HT_HTPE231903E
14.	UCAD120403E	AutoCAD in Chemical Engineering	2	2	HT_TEDG130120E
15.	EPCH221803E	*Laboratory in Physical Chemistry*	*2*	2	HT-_PCHE221603E HT-_PCHE221703E HT_TSCL120803E
16.	BIOT328103E	Experimental Design of Bioactivity	2	2	HT_OCHE231403E

Total			**18**		

SEMESTER 6:

No.	Course's ID	Course name	Credits	Term 1/2	Prerequisite
6A. Compulsory courses					
(I) Compulsory courses for Organic Chemical Engineering Technology, Inorganic Chemical Engineering Technology, and Polymer Chemical Engineering Technology Specializations (5 credits)					
1.	PROC221103E	Fundamentals of Process Control	2	2	HT_MTPE232003E HT_CREN222203E
2.	FDMF232603E	Fundamentals of Chemical Engineering Design	3	1	HT_MTPE232003E HT_CREN222203E
(II) Compulsory courses for Pharmaceutical Chemical Engineering Technology Specialization (9 credits)					
3.	PROC221103E	Fundamentals of Process Control	2	2	HT_MTPE232003E HT_CREN222203E
4.	FDMF232603E	Fundamentals of Chemical Engineering Design	3	1	HT_MTPE232003E HT_CREN222203E
5.	PPTE428803E	Pharmaceutical Formulation Technology	2	1	SH_EPME417803E
6.	EPME417803E	*Laboratory Course in Pharmaceutical Formulation*	1	2	SH_ PPTE428803E
7.	EBIO417903E	*Laboratory Course in Determining Bioactivity*	1	2	HT_BIOT328103E
6B. Elective courses					
6B1. Organic Chemical Engineering Technology Specialization: *(Students may choose **10 credits** of specialized courses from the following list, or **6 credits** from one interdisciplinary group and **4 credits** of specialized courses)*			**(10)**		

8.	TDET423503E	Detergents Technology	2	1	HT_OCHE231403E
9.	FSTE423703E	Fragrance Science and Technology	2	1	HT_OCHE231403E
10.	TECP423803E	Cosmetic Technology	2	2	HT_OCHE231403E
11.	SIOC423903E	Spectroscopic Identification of Organic Compounds	2	2	HT_OCHE231403E
12.	PSTE424003E	Pulp and Paper Production Technology	2	1	HT_OCHE231403E
13.	TEDY424203E	Dyeing and Finishing Technologies	2	1	HT_OCHE231403E
14.	CTNC431603E	Chemical Technology of Natural Products	3	2	HT_OCHE231403E
15.	CCHE431703E	Chemistry of Colorants	3	1	HT_OCHE231403E
16.	BIRE431803E	Biofuels and Renewable Energy	3	1	HT_OCHE231403E
6B2. Inorganic Chemical Engineering Technology Specialization: *(Students may choose **10 credits** of specialized courses from the following list, or **6 credits** from one interdisciplinary group and **4 credits** of specialized courses)*			**(10)**		
17.	TFER424403E	Fertilizer Technology	2	1	HT_ICHE231003E HT_TINO322903E
18.	TCER420903E	Ceramic Technology	2	1	HT_ICHE231003E HT_TINO322903E
19.	TCEM424603E	Cement Technology	2	1	HT_ICHE231003E HT_TINO322903E
20.	SCIM424903E	Structural Characterization of Inorganic Materials	2	2	HT_FMSE222803E HT_ICHE231003E

21.	TPIG425103E	Pigment Technology	2	1	HT_ICHE231003E HT_TINO322903E
22.	AIMA425203E	Advanced Inorganic Materials	2	2	HT_ICHE231003E HT_FMSE222803E
23.	TGLA421003E	Glass Technology	2	2	HT_ICHE231003E HT_TINO322903E
24.	SOLC431303E	Solid-State Chemistry	3	1	HT_ICHE231003E
25.	CENA431403E	Nano catalysts and Catalysis Engineering	3	2	HT_ICHE231003E
26.	ELPT431503E	Electrolysis and Electroplating Technology	3	1	HT_PCHE221603E HT_PCHE221703E
6B3. Polymer Chemical Engineering Technology Specialization: *(Students may choose **10 credits** of specialized courses from the following list, or **6 credits** from one interdisciplinary group and **4 credits** of specialized courses)*			**(10)**		
27.	TPCM425403E	Polymer Composite Materials	2	2	HT_POCH323103E
28.	TPLA425503E	Plastics Manufacturing Technology	2	1	HT_POCH323103E
29.	FRUT425603E	Rubber Technology	2	2	HT_POCH323103E
30.	MAEP425703E	Analysis and Evaluation of Polymer Materials	2	2	HT_POCH323103E
31.	TPOP425803E	Polymer Processing	2	2	HT_POCH323103E
32.	ADPO426103E	Advanced Polymers	2	1	HT_POCH323103E
33.	TFIB426203E	Fiber Technology	2	2	HT_POCH323103E

34.	TPAI426303E	Paint Technology	2	1	HT_POCH323103E
35.	MSEL431903E	Material Selection	3	1	HT_POCH323103E
36.	AWRP432003E	Weathering Resistance and Stabilization of Polymer Materials	3	1	HT_POCH323103E
37.	APCH432103E	Advanced Physical Chemistry of Polymers	3	2	HT_POCH323103E
6B4. Pharmaceutical Chemical Engineering Technology Specialization: *(Students may choose **6 credits** of specialized courses from the following list, or **6 credits** from one interdisciplinary group)*			**(6)**		
38.	MPTE428703E	Pharmaceutical Material Preservation Technology	2	1	HT_PHAT337503E
39.	FFPT428903E	Processing Technologies of Functional Foods	2	1	HT_PHAT337503E HT_PHAR327603E HT_MBCH327703E
40.	DRUE429303E	Pharmaceutical Manufacturing Technology	2	2	HT_OCHE231403E HT_MPRO232103E
41.	ANPT429003E	Antibiotics Production Technology	2	2	HT_OCHE231403E HT_MPRO232103E
42.	BIOM328203E	Pharmaceutical and Bio-Materials	2	2	HT_OCHE231403E
43.	VACC429103E	Vaccine Production Technology	2	1	HT_OCHE231403E HT_MPRO232103E
44.	RCMP428503E	Research Methods in Medicinal Plant Chemistry	2	2	HT_PHAT337503E
45.	SAPH428003E	Spectroscopic Analysis in Pharmaceutical Chemistry	2	1	HT_OCHE231403E
46.	DRUT428603E	Pharmaceutical Quality Control	2	1	HT_PHAT337503E

47.	DRUD432203E	Chemistry of Drug Delivery Systems	3	1	HT_OCHE231403E
48.	TOXC432303E	Toxicology	3	2	HT_OCHE231403E
Total			**15**		

SEMESTER 7:

No.	Course's ID	Course name	Credits	Term 1/2	Prerequisite
(I) Compulsory courses: (13 credits)					
1.	AEPL230603E	Design of Experiments in Chemical Engineering	3	2	HT_MATH132401E HT_MATH132501E HT_MATH123601E HT_MATH132901E
2.	PWPD322703E	*Project of machine and equipment design*	2	2	HT_DOHT231903E HT_TSEP232003E HT_MPRO232103E HT_TREA222203E HT_FDMF232603E HT_TEDG130120E
3.	EAAM416903E	*Laboratory Course in Modern Analytical Methods*	1	2	HT_IANM323303E
4.	ERPD222303E	*Unit Operations Laboratory*	2	2	HT_PROC221103E HT_FDMF232603E
5.	GRAP426703E	*Internship*	2	1	HT_PWPD312703E
6.	CLEP320803E	Cleaner Production in Chemical Engineering Technology	2	2	HT_QUMA320703E
7.	QUMA320703E	Management and Quality Tools for Chemical Engineers.	2	2	HT_POCH323103E HT_TINO322903E HT_TORS323003E
(II) Elective courses: *(Students may choose **2 credits** from the following courses*)					
8.	ESOC424303E	*Specialized Laboratory in Organic Chemical Engineering Technology*	2	2	Complete 10 credits in the Organic Chemical Engineering Technology specialization

9.	EICT425303E	*Specialized Laboratory in Inorganic Chemical Engineering Technology*	2	2	Complete 10 credits in the Inorganic Chemical Engineering Technology specialization
10.	ESPO426403E	*Specialized Laboratory in Polymer Chemical Engineering Technology*	2	2	Complete 10 credits in the Polymer Chemical Engineering Technology specialization
11.	EPCT429403E	*Specialized Laboratory in Pharmaceutical Chemical Engineering Technology*	2	2	Complete 10 credits in the Pharmaceutical Chemical Engineering Technology specialization
12.	SEMI310026E	Enterprise Seminar	0(1)		
Total			**16**		

SEMESTER 8:

No.	Course's ID	Course name	Credits	Term 1/2	Prerequisite
1.	GRAT406803E	Graduation Thesis	10	2	HT_EAAM416903E HT_GRAP426703E
2.	GRAS426603E	Seminar for Graduation	2	1	HT_GRAP426703E
Total			**12**		

9. Course description and workload

9.1. Academic English 1 **Credits: 4**

Prerequisite course(s): Communicative English 1
Corequisite course(s): Academic English 2
Previous course(s): N/A
Course Description:

This is the first course of the Academic English series designed for students majoring in the areas other than English to achieve the intermediate level of English language proficiency (equivalent to B2.1 level of CEFR) in Speaking and Listening skills. The series aims to enhance students' English competence to deal with complex matters of everyday life in other countries, to exchange specific information and personal ideas with young people and adults who speak English, and to achieve a wider understanding of thoughts from people of other cultures. This course particularly provides students with the opportunities to understand the main ideas of complex oral English on quite abstract topics, including basic technical discussions in their fields of specialization. Students are asked to orally interact with a degree of fluency that makes regular interactions with native English speakers quite possible with some strain. They are also prepared to orally produce clear,

detailed texts on a limited range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of a few options. In addition, this course promotes students' development of presentation skills, teamwork ability, and learner autonomy by engaging them in various interactive activities.

Textbooks:

Kisslinger, E., & Baker, L. (2024). *Skillful 3 Listening and Speaking* (3rd ed.). Macmillan Education.

9.2. Academic English 2 **Credits: 4**

Prerequisite course(s): Communicative English 2

Corequisite course(s): Academic English 1

Previous course(s): N/A

Course Description:

This is the second course of the Academic English series designed for students majoring in the areas other than English to achieve the intermediate level of English language proficiency (equivalent to B2.1 level of CEFR) in Reading and Writing skills. The series aims to enhance students' English competence to deal with complex matters of everyday life in other countries, to exchange specific information and personal ideas with young people and adults who speak English, and to achieve a wider understanding of thoughts from people of other cultures. This course particularly provides students with the opportunities to understand the main ideas of complex English texts on quite abstract topics, including basic technical discussions in their fields of specialization. Students are asked to interact in written English with a degree of fluency that makes regular interactions with native English speakers quite possible with some strain. They are also prepared to produce clear, detailed written texts on a limited range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of a few options. In addition, this course promotes students' development of presentation skills, teamwork ability, and learner autonomy by engaging them in various interactive activities.

Textbooks:

Rogers, L., & Zemach, D. E. (2024). *Skillful 3 Reading and Writing* (3rd ed.). Macmillan Education.

9.3. < Philosophy of Marxism and Leninism > 3 credits

Time distribution: 3 (3/0/6)

Prerequisite: None

Previous course: Political Economics of Marxism and Leninism

Course description: Chapter 1 introduces the most general aspects of philosophy, philosophy of Marxism and Leninism and its role in social life. Chapter 2 presents the basic concepts of dialectical materialism, including the issue of matter and consciousness; dialectical materialism methodology; and the epistemology of dialectical materialism. Chapter 3 presents the basic concepts of historical materialism, including the issue of economic and social formations; class and nation; the state and social revolution; social consciousness; and philosophy regarding humanity.

9.4. < Political Economics of Marxism and Leninism > 3 credits

Time distribution: 3 (3/0/6)

Prerequisite: None

Previous course: None

Course description: The program consists of six chapters. Chapter 1 covers the subject, research methodology, and functions of political economics of Marxism and Leninism in line with the course objectives. Specifically, it addresses topics such as commodities, markets, and the roles of various actors in a market economy; the production of surplus value within a market economy; the socialist-oriented market economy and economic interest relations in Vietnam; as well as Vietnam's industrialization, modernization, and international economic integration.

9.5. < Scientific Socialism> 2 credits

Time distribution: 2 (2/0/4)

Prerequisite: None

Previous course: Philosophy of Marxism and Leninism, Political Economics of Marxism and Leninism

Course description: The course consists of 7 chapters: Chapter 1 introduces the basic, introductory concepts of scientific socialism (the process of formation and development of scientific socialism). Chapters 2 through 7 cover the fundamental aspects of scientific socialism in line with the course objectives.

9.6. < Ho Chi Minh's Ideology> 2 credits

Time distribution: 2 (2/0/4)

Prerequisite: None

Previous course: Philosophy of Marxism and Leninism, Political Economics of Marxism and Leninism

Co-requisite: Scientific Socialism

Course description: The course consists of 6 chapters, providing students with basic knowledge on the concept, subject, research methodology, and the significance of studying Ho Chi Minh's ideology. It covers the foundations, formation, and development process of Ho Chi Minh's ideology, focusing on his views on: national independence and socialism; the Communist Party of Vietnam and the people's state, for the people and by the people; national unity and international solidarity; culture, humanity, and ethics.

9.7. < History of Vietnamese Communist Party > 2 credits

Time distribution: 2 (2/0/4)

Prerequisite: None

Previous course: Philosophy of Marxism and Leninism, Political Economics of Marxism and Leninism, Scientific Socialism, Ho Chi Minh's Ideology.

Course description: This course equips students with an understanding of the subject, objectives, tasks, and research methodology for studying the history of the Communist Party of Vietnam. It provides core, systematic knowledge about the Vietnamese Communist Party's founding (1920-1930), its leadership during period 1930-1945 and in the two wars of resistance against French colonialism and American imperialism, completing the national liberation and unification of the country (1945-1975), and its leadership in the transition to socialism and the renewal process (1975-2018). The course emphasizes the successes, addresses the limitations, and summarizes the lessons learned from the Party's revolutionary leadership, with a focus on applying the knowledge gained to practical work, contributing to the defense of the Socialist Republic of Vietnam.

9.8. < General Laws > 3 credits

Time distribution: 3 (2/0/4)

Prerequisite: None

Previous course: None

Course description: This course equips students with basic knowledge of Vietnamese law in particular and international law in general, as well as the legal system of Vietnam in various fields of social activities, including regulations, clauses, sanctions, etc. The goal is to help students become skilled engineers with a strong understanding of the law, enabling them to live and work in accordance with the laws of the state.

9.9. < Calculus 1 > 3 credits

Time distribution: 3 (3/0/6)

Prerequisite: None

Previous course: None

Course description: This course provides students with fundamental knowledge of advanced mathematics, including number sets, limits, differential calculus of single-variable functions, integral calculus of single-variable functions, and number series, to support their future specialization studies.

9.10. < Calculus 2 > 3 credits

Time distribution: 3 (3/0/6)

Prerequisite: None

Previous course: Calculus 1

Course description: This course provides students with fundamental knowledge of advanced mathematics, including determinants and matrices, systems of linear equations, vector spaces, diagonalization of quadratic forms, and multivariable differential calculus, with the aim of applying these concepts in future engineering and technical fields.

9.11. < Calculus 3 > 3 credits

Time distribution: 3 (3/0/6)

Prerequisite: None

Previous course: Calculus 2

Course description: This course provides students with fundamental knowledge of advanced mathematics, including determinants and matrices, systems of linear equations, vector spaces, diagonalization of quadratic forms, and multivariable differential calculus, with the aim of applying these concepts in future engineering and technical fields.

9.12. < Electrical Engineering > 2 credits

Time distribution: 2 (2/0/4)

Prerequisite: None

Previous course: None

Course description: This course provides basic knowledge of electrical circuits (parameters, models, and fundamental laws), methods for calculating single-phase and three-phase circuits in steady-state conditions and introduces electrical measurement systems and non-electrical quantities. Additionally, the course covers the principles, construction, technical features, and applications of commonly encountered basic electrical machines.

9.13. < Physics 1 > 3 credits

Time distribution: 3 (3/0/6)

Prerequisite: None

Previous course: None

Course description: This course provides students with fundamental knowledge in mechanics, thermodynamics, electricity, and magnetism, with the aim of applying these concepts in future engineering and technical fields.

9.14. < Physics 2 > 3 credits

Time distribution: 3 (3/0/6)

Prerequisite: None

Previous course: Physics 1

Course description: This course provides students with fundamental knowledge in Einstein's theory of relativity, optics, and quantum physics, with the aim of applying these concepts in future engineering and technical fields.

9.15. < General Chemistry > 3 credits

Time distribution: 3 (3/0/6)

Previous course: None

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental knowledge of general chemistry theory. It covers the structure of atoms, explaining the formation of chemical bonds between molecules. Additionally, it introduces concepts in thermodynamics, reaction rates, chemical equilibrium, and the properties of solutions, as well as studies in electrochemical cells. This foundational knowledge prepares students to engage with core concepts in their specialized fields of study. It also provides basic knowledge in natural sciences, preparing students for higher-level studies or a second bachelor's degree.

9.16. < Technical Drawing – Basic course > 2 + 1 credits

Time distribution: 3 (2/1/6)

Previous course: None

Prerequisite: None

Co-requisite: None

Course description: This course equips students with knowledge and skills in the following areas: analyzing assembly drawings and detailed drawings, extracting details from assembly drawings, and creating simple assembly drawings. Chapter 1 introduces the course, Chapter 2 covers drawing standards, Chapter 3 focuses on geometric drawing, Chapter 4 covers projections, Chapter 5 discusses object representation (projections, sections, cutting planes, details), Chapter 6 covers axonometric projections, Chapter 7 addresses mechanical connections, Chapter 8 discusses gears and springs, and Chapter 9 covers detailed drawings.

9.17. < Information Technology Applications > 2 + 1 credits

Time distribution: 3 (2/1/6)

Previous course: None

Prerequisite: None

Co-requisite: None

Course description: This course provides students with both basic and advanced knowledge and skills in the field of office computing, such as word processing, spreadsheet creation and manipulation, and creating presentation files. Students will be able to apply the knowledge gained to proficiently use Microsoft Office software: Word, Excel, and PowerPoint, to design documents for study, research, and professional work.

9.18. < Introduction to Chemical Engineering Technology > 2 + 1 credits

Time distribution: 3 (2/1/6)

Previous course: None

Prerequisite: None

Co-requisite: None

Course description: The objective of this course is to assist students in:

Adapt to the new academic environment and successfully progress on the path to becoming engineers and graduates at the HCMUTE.

Gain career orientation, develop soft skills, and build a foundation in professional ethics. Specifically, students will have the opportunity to visit and gain insight from several companies in the chemical engineering technology field.

Acquire essential skills in reading and researching specialized materials, writing essays, and preparing presentations.

Understand fundamental concepts related to the field of chemical engineering technology.

9.19. < Inorganic Chemistry > 3 credits

Time distribution: 3 (3/0/6)

Previous course: General Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course equips students with the knowledge to understand inorganic chemistry in a systematic manner, based on the foundational knowledge of general chemistry that students have acquired primarily in the General Chemistry course, with some additional content from the Inorganic Chemistry course.

9.20. < Safety and Techniques in Chemistry Lab > 2 credits

Time distribution: 2 (2/0/4)

Previous course: None

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge related to chemical safety in the chemistry laboratory.

Introduce students to basic laboratory tools and equipment and their proper usage. This includes common laboratory techniques such as weighing, transferring, heating, distilling, and filtering.

Assist students in identifying the hazards, flammability, and toxicity of chemicals, and provide guidance on their safe usage.

Introduce fire and explosion prevention and control measures in the laboratory and trains students on how to handle laboratory accidents effectively.

9.21. < Applied Fluid Mechanics > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Calculus 1, 2, 3; Physics 1, 2

Prerequisite: None

Co-requisite: None

Course description: This course consists of 7 chapters and provides students with basic knowledge of fluid mechanics. Chapter 1 introduces the course, Chapter 2 covers the mechanical properties of fluids, Chapter 3 focuses on fluid statics, Chapter 4 deals with fluid kinematics, Chapter 5 covers fluid dynamics, Chapter 6 discusses flow in pipes, and Chapter 7 addresses fluid potential.

9.22. < Applied Mechanics > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Calculus 1, 2; Physics 1, 2

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental knowledge in the basic calculations of two subjects: theoretical mechanics (mathematics) and the strength of materials, specifically designed for students not majoring in mechanical engineering.

9.23. < Organic Chemistry > 3 credits

Time distribution: 3 (3/0/6)

Previous course: General Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental knowledge of the theoretical principles of Organic Chemistry, focusing on the relationship between the structure and reactivity of organic compounds. It covers the methods of synthesis and the most important physical and chemical properties of various organic compounds.

9.24. < Analytical Chemistry > 3 credits

Time distribution: 3 (3/0/6)

Previous course: General Chemistry

Prerequisite: None

Co-requisite: Students should have completed or be concurrently studying courses in Physical Chemistry, Inorganic Chemistry, and Organic Chemistry.

Course description: This course provides students with essential knowledge in calculating solution concentrations and introduces quantitative chemical analysis techniques, including gravimetric analysis, acid-base titration, complexation, precipitation, and redox reactions. It also covers various types of experimental data errors, statistical methods for data analysis, and effective presentation of analytical results.

9.25. < Instrumental Analysis Methods > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Analytical Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge of physical and physicochemical analytical methods used for the identification, quantification, and structural determination of compounds. It provides essential foundational knowledge that prepares students for specialized courses, completing assignments, conducting thesis projects, and engaging in scientific research. The course aims to equip students with a structured approach and critical thinking, enabling students to develop clear directions for their academic pursuits, research, and professional career development.

9.26. < Physical Chemistry 1 > 2 credits

Time distribution: 2 (2/0/4))

Previous course: General Chemistry, Calculus 1, Physics 1

Prerequisite: None

Co-requisite: None

Course description: This course equips students with knowledge related to:

Thermodynamics of Chemistry: thermal effects, potential, direction of chemical reactions, and physicochemical processes. It also covers chemical equilibrium and the factors influencing equilibrium.

Phase Equilibria in single and multi-component systems, molecular solutions. Basic theories of reaction kinetics, processes in homogeneous and heterogeneous catalysis, and biocatalysis.

9.27. < Physical Chemistry 2 > 2 credits

Time distribution: 2 (2/0/4))

Previous course: General Chemistry, Calculus 1, Physics 1

Prerequisite: None

Co-requisite: None

Course description: This course provides fundamental knowledge in the fields of colloidal chemistry, chemical kinetics, and electrochemistry.

Colloidal Chemistry: methods of classification, preparation and stabilization techniques, properties of colloidal systems, and surface phenomena.
Chemical Kinetics: kinetics of simple and complex reactions, reaction mechanisms, and homogeneous and heterogeneous catalysis.
Electrochemistry: properties of electrolytic solutions, conductivity, ionic activity, and electrochemical processes.

9.28. < Thermal Engineering in Chemical Engineering > 2 credits

Time distribution: 2 (2/0/4)

Previous course: General Chemistry, Calculus 1, Calculus 2, Physics 1, Physics 2

Prerequisite: None

Co-requisite: None

Course description: This course provides students with basic knowledge of thermodynamics, including the first and second laws of thermodynamics, the characteristics, properties, and energy transformations in thermodynamic processes, and the conversion of energy from heat to work in both forward and reverse cycles. The course also covers the thermal properties of materials to improve the efficiency of energy

conversion. In the section on heat transfer, students will learn the related concepts and laws of heat exchange: conduction, convection, and radiation.

9.29. < Heat Transfer Operations > 3 credits

Time distribution: 3 (3/0/6)

Previous course: Applied Fluid Mechanics, Thermal Engineering in Chemical Engineering, Calculus 3

Prerequisite: None

Co-requisite: None

Course description: This course equips students with knowledge related to:

Definitions and basic parameters in heat transfer processes, including heat transfer processes (conduction, convection, radiation, mixed heat transfer, heat exchanger calculations, and evaporation and condensation processes); methods for calculating mass and energy; structure, operational principles, usage conditions, and applications.

Refrigerants, conditions for their use, and safety considerations for refrigerants concerning human health and the environment. Refrigerant charts and methods for retrieving refrigerant data, refrigeration cycle on refrigerant charts, refrigerant states within the cycle, heat calculations, power calculations, selection of refrigeration equipment, and insulation and humidity control for cold rooms.

9.30. < Mass Transfer Operations > 3 credits

Time distribution: 3 (3/0/6)

Previous course: Mechanical Unit Operations

Prerequisite: None

Co-requisite: None

Course description: This course provides students with theoretical knowledge of mass transfer processes and methods for calculating and designing equipment that performs these mass transfer processes.

9.31. < Mechanical Unit Operations > 3 credits

Time distribution: 3 (3/0/6)

Previous course: Calculus 1, Calculus 2, Calculus 3; Physics 1, Physics 2

Prerequisite: None

Co-requisite: None

Course description: This course equips students with knowledge related to methods for transporting liquids, gases, and solid materials, methods for separating liquid-solid, liquid-liquid, gas-liquid, and solid-solid systems, as well as methods for filtration, agitation, and mixing of liquid-solid, solid-solid, and liquid-liquid systems. It also covers processing techniques for materials.

9.32. < Physicochemical Polymers > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge related to the basic properties of polymers, fundamental polymer concepts, and the basics of polymer

synthesis. It covers various industrial polymer synthesis technologies, as well as the physical properties, including mechanical, thermal, rheological, and solution properties of polymers. The course also explores the properties and applications of common polymers (e.g., PE, PP, PVC, PS) and engineering polymers (e.g., PET, ABS, PC, etc.).

9.33. < Design of Experiments in Chemical Engineering > 3 credits

Time distribution: 3 (3/0/6)

Previous course: Calculus 1, Calculus 2

Prerequisite: None

Co-requisite: None

Course description: This course provides students with the basic concepts, definitions, knowledge, and fundamental principles of modeling and optimization in chemical and food technology. It focuses on the study of modeling and optimizing technological processes for production, while helping researchers address specialized and academic issues, uncover new findings, and publish scientific work based on mathematical theory. The course enables the application and operation of equipment systems efficiently in production processes, providing a foundation for completing course projects and final theses. The course also helps students develop an approach and methodology for exploring subjects such as statistics, modeling, optimization, and simulation, thereby guiding individuals toward specific directions in their learning, research, and professional career development.

9.34. < Design Project of Chemical Engineering > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Heat Transfer Operations, Mass Transfer Operations, Mechanical Unit Operations, Fundamentals of Chemical Engineering Design, Technical Drawing - Basic course, Chemical Reaction Engineering

Prerequisite: None

Co-requisite: None

Course description: This course guides students in designing and calculating processes, as well as drawing equipment used in chemical and food technology.

9.35. < Enterprise Collaboration > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Introduction to Chemical Engineering Technology

Prerequisite: None

Co-requisite: None

Course description: This course provides students with an opportunity to closely engage with the real business environment. Experts from various fields will be invited to give specialized lectures, interact with students, answer questions, and offer job opportunities in areas such as production, operations, QA, QC, sourcing, sales, and technical services. Additionally, the course emphasizes soft skills, teamwork, critical thinking, interview techniques, and CV writing skills to support students' career development.

9.36. < Seminar for Graduation > 3 credits

Time distribution: 3 (3/0/6)

Previous course: Internship

Prerequisite: None

Co-requisite: None

Course description: This course provides students with the most up-to-date knowledge in one of the following four areas: Organic Chemical Engineering Technology, Inorganic Chemical Engineering Technology, Polymer Chemical Engineering Technology, or Pharmaceutical Chemical Engineering Technology. Students will be guided in how to access new materials and high-quality scientific articles, process information from diverse sources, and cultivate skills for acquiring new knowledge.

9.37. < Technology of Inorganic Substances > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Inorganic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with the most up-to-date knowledge in one of the following four areas: This course provides students with knowledge related to the fundamental chemistry and technology of producing ammonia, nitric acid, sulfuric acid, and phosphate fertilizers.

9.38. < Fundamentals of Materials Science and Engineering > 2 credits

Time distribution: 2 (2/0/4)

Previous course: General Chemistry, Inorganic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge on the definition of materials, concepts of material states such as: crystalline, amorphous, semi-crystalline, single crystals, polycrystals, types of defects, and the role of defects in material formation. It also covers the relationship between the structure and properties of materials, the correlation between phase diagrams and material formation, classification of materials, and their main applications.

9.39. < Chemical Reaction Engineering > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Heat Transfer Operations, Mass Transfer Operations

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge related to mathematical foundations, flow equation theory, and the chemical kinetics of homogeneous and heterogeneous systems. It covers thermodynamics, chemical equilibrium, reaction rates, the basis for calculating and designing reaction equipment, the operating principles and structure of reactors, and introduces concepts such as residence time and reaction process dynamics.

9.40. < Fundamentals of Chemical Engineering Design > 3 credits

Time distribution: 3 (3/0/6)

Previous course: Heat Transfer Operations, Mass Transfer Operations, Mechanical Unit Operations Applied Mechanics, Applied Fluid Mechanics

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge related to:

- Design methods and mechanical calculations for the construction and technology of common components and assemblies used in process equipment, such as shells, thin plates, bottoms and covers, flanges and gaskets, jackets, rotating components, drums, pipes, and vibration and anti-vibration mechanisms for equipment. Some components can also be designed based on the methods and approaches taught in this course, by applying appropriate assumptions and models.
- The process of implementing a plant construction project, from laboratory results to production, including process and equipment selection for a production process, material selection, construction site location, production facilities, and a brief overview of project economics.

9.41. < Electrochemical Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physical Chemistry 1, Physical Chemistry 2

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge related to the fundamental processes of electrochemical technology in fields such as machinery and equipment manufacturing, chemical product production, energy, and metallurgy.

9.42. < Techniques in Organic Chemistry > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with the necessary glassware and specialized equipment to perform techniques such as extraction, distillation, crystallization, sublimation, chromatography, and organic reactions under normal and low-pressure conditions in an Organic Chemistry laboratory. The techniques are demonstrated through small-scale experiments (microscale). Additionally, students will be introduced to methods for conducting organic reactions under inert conditions, high pressure, and green chemistry principles.

9.43. < Pharmaceutical Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course introduces students to the fundamentals of Pharmaceutical Chemistry and Pharmaceutical Technology. It also provides updates on the development and global use of pharmaceuticals, offering insights into the synthesis and applications of antibiotics, anti-parasitic drugs, antiseptics, antidotes, cancer treatments, contrast agents, and radiopharmaceuticals.

9.44. < Pharmacology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physical Chemistry 1, Physical Chemistry 2

Prerequisite: None

Co-requisite: None

Course description: This course provides fundamental knowledge of pharmacology, including pharmacokinetics, the effects and mechanisms of action, undesirable effects, and therapeutic applications of various drugs. Topics include drugs that affect the autonomic nervous system, central nervous system, organs, chemotherapeutic drugs, poisoning, and detoxification.

9.45. < Biochemistry**>** **2 credits**

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with essential knowledge on:

- The structure, properties, and roles of basic organic compounds that make up living organisms, such as carbohydrates, lipids, proteins, hemoglobin, nucleic acids, enzymes, and the metabolic processes of these substances within living organisms.
- The structure and function of genes, genome structure, the processes of DNA replication, transcription, and translation of genetic material, gene regulation and repair, recombination, and gene transfer.

9.46. < General Chemistry Laboratory > **1 credits**

Time distribution: 1 (0/1/2)

Previous course: General Chemistry, Safety and Techniques in Chemistry Lab

Prerequisite: None

Co-requisite: None

Course description: This course provides students with practical skills related to the use and calibration of basic glassware and chemical equipment, recording and evaluating experimental results. It also covers methods for environmental protection and safety in the laboratory, as well as handling safety incidents. The course serves as a foundation for practical courses, project work, and thesis writing, helping students gain clear directions for their learning, research, and professional development.

9.47. < Inorganic Chemistry Laboratory > **2 credits**

Time distribution: 2 (0/2/4)

Previous course: General Chemistry, Inorganic Chemistry, Safety and Techniques in Chemistry Lab

Prerequisite: None

Co-requisite: None

Course description: This course equips students with experimental skills in observing, reporting, and researching materials. Students will conduct experiments to observe the properties of compounds from common groups of elements. Additionally, students will perform synthesis of compounds such as alum-potassium, Mohr's salt, $Na_2S_2O_3$, $K2Cr_2O_7$, etc.

9.48. < Analytical Chemistry Laboratory > **2 credits**

Time distribution: 2 (0/2/4)

Previous course: Analytical Chemistry, Safety and Techniques in Chemistry Lab

Prerequisite: None

Co-requisite: None

Course description: This course provides students with practical skills in techniques such as cleaning glassware, using various instruments, preparing chemical solutions, titration, sample analysis, and quantification using chemical methods. It also includes error assessment and the use of modern analytical equipment. The course serves as a foundation for practical courses, project work, and thesis writing, helping students develop approaches and skills in analytical methods and modern laboratory equipment, guiding them toward specific directions for their learning, research, and career development.

9.49. < Organic Chemistry Laboratory > 2 credits

Time distribution: 2 (0/2/4)

Previous course: Organic Chemistry, Safety and Techniques in Chemistry Lab

Prerequisite: None

Co-requisite: None

Course description: This course provides students with theoretical and practical knowledge in organic chemistry, focusing on methods of synthesizing and preparing basic organic compounds. It also develops research and experimental skills related to organic chemistry.

9.50. < Physical Chemistry Laboratory > 2 credits

Time distribution: 2 (0/2/4)

Previous course: Physical Chemistry 1, Physical Chemistry 2, Safety and Techniques in Chemistry Lab

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge related to the application of thermodynamic principles in chemical systems. It includes a detailed study of chemical equilibrium and phase equilibrium. The course also focuses on reaction rates, reaction orders, electrochemical sources, electrical conductivity, ion transport numbers, and surface phenomena.

9.51. < Process Equipment Laboratory> 2 credits

Time distribution: 2 (0/2/4)

Previous course: Heat Transfer Operations, Mass Transfer Operations, Mechanical Unit Operations, Chemical Reaction Engineering

Prerequisite: None

Co-requisite: None

Course description: This course provides students with practical knowledge related to equipment modeling, operational methods, measurement techniques, and data processing for basic processes in chemical technology.

9.52. < Modern Analytical Methods Laboratory > 1 credits

Time distribution: 1 (0/1/2)

Previous course: Instrumental Analytical Methods

Prerequisite: None

Co-requisite: None

Course description: This course equips students with the skills to analyze and evaluate raw materials using modern analytical methods such as FTIR, DSC, TGA, SEM, DLS, HPLC, GC, and rheology.

9.53. < Practice in Pharmaceutical Formulation > 1 credits

Time distribution: 1 (0/1/2)

Previous course: Pharmaceutical Technology, Pharmacology, Biochemistry, Pharmaceutical Formulation Technology

Prerequisite: None

Co-requisite: None

Course description: This course provides students with practical skills in conducting experiments, observing, reporting, researching literature, and explaining phenomena. Students will perform techniques for the formulation, production, and packaging of various pharmaceutical products at the laboratory scale, including creams, tablets, and capsules.

9.54. < Practice in Evaluation of Bioactivity> 1 credits

Time distribution: 1 (0/1/2)

Previous course: Pharmaceutical Technology, Pharmacology, Biochemistry, Experimental Design of Bioactivity

Prerequisite: None

Co-requisite: None

Course description: This course provides students with practical skills, observation techniques, reporting, literature review, and explanation of phenomena by conducting experiments to determine the antibacterial, antioxidant, anti-inflammatory, and anti-diabetic activities on the α-glucosidase enzyme of certain pharmaceutical products.

9.55. < Internship > 2 credits

Time distribution: 2 (0/2/4)

Previous course: Accumulate 10 major credits

Prerequisite: None

Co-requisite: None

Course description: This course provides students with practical knowledge and skills by working in the production environment of one of the following four specialized fields: Organic Chemical Engineering Technology, Inorganic Chemical Engineering Technology, Polymer Chemical Engineering Technology, or Pharmaceutical Chemical Engineering Technology.

9.56. < Graduation Thesis > 7 credits

Time distribution: 7 (0/7/14)

Previous course: Internship, Modern Analytical Methods Laboratory

Prerequisite: None

Co-requisite: None

Course description: This course assists students cultivate skills in analyzing and synthesizing the knowledge gained throughout the program to solve a scientific or technical problem within one of the four specialized fields: Organic Chemical Engineering

Technology, Inorganic Chemical Engineering Technology, Polymer Chemical Engineering Technology, or Pharmaceutical Chemical Engineering Technology.

9.57. < Detergents Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental knowledge of surfactants used in cleaning products, the theory of detergency, key components in cleaning formulations, and their mechanisms of action. The course also discusses the theory and production technology of various detergent forms including liquid, powder, paste, and solid types.

9.58. < Fragrance Science and Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge related to natural fragrance sources (essential oils, resins, animal-derived aromatic compounds, etc.), methods for extracting natural aroma compounds, techniques for isolating key components in essential oils, and the synthesis and semi-synthesis of selected aromatic compounds. The course also covers important applications of common essential oils and introduces the fundamentals of perfumery and fragrance formulation.

9.59. < Cosmetic Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course equips students with knowledge related to various cosmetic targets (skin, hair, nails, oral care), as well as raw materials, gels, and emulsions. It also covers cosmetic production technology, including formulation, manufacturing techniques, hygiene and preservation, product forms, packaging, and labeling. Additionally, students learn about testing, evaluation, and personal care product development.

9.60. < Spectroscopic Identification of Organic Compounds > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge of modern spectroscopic techniques used to determine the chemical structure of organic compounds, including infrared spectroscopy (IR), two-dimensional nuclear magnetic resonance spectroscopy (2D-NMR), and mass spectrometry (MS). Upon completion of the course,

students will be able to interpret and analyze these spectra to identify the chemical structures of organic compounds that have been synthesized or isolated from natural sources.

9.61. < Pulp and Paper Production Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course equips students with knowledge related to the composition and properties of wood, an overview of pulp and paper, various methods of pulp production, pulp bleaching processes, recovered pulp and non-wood raw materials, additives used in the paper industry, and paper manufacturing techniques.

9.62. < Dyeing and Finishing Technologies > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental knowledge of the dyeing process, dyeing theory, properties of various types of dyes, auxiliary chemicals, and printing pastes used in dyeing. It also covers the methods for designing technological procedures in the stages of pre-treatment, dyeing and printing, and finishing of dyed products. The course also covers the development of dyeing process workflows, calculation of material and chemical consumption, color matching techniques, and evaluation of quality criteria for dyed products.

9.63. < Chemistry of Colorants > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course equips students with knowledge related to basic color theory and provides an overview of natural and synthetic color compounds, including chlorophyll, carotenoids, anthocyanins, and other colorants. The physicochemical properties and applications of organic colorants are also discussed.

9.64. < Fertilizer Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Inorganic Chemistry, Technology of Inorganic Substances

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental knowledge of the production technologies of various fertilizers, including phosphate fertilizers, nitrogen fertilizers, and multi-nutrient fertilizers (complex and mixed types).

9.65. < Ceramic Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Inorganic Chemistry, Technology of Inorganic Substances

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental knowledge of production processes, technical parameters, and basic characteristics of products such as ceramic tiles, sanitary ware, construction glass, and household glassware. Core technological aspects covered include raw materials, batching, forming, drying, firing, and defect treatment processes.

9.66. < Cement Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Inorganic Chemistry, Technology of Inorganic Substances

Prerequisite: None

Co-requisite: None

Course description: This course introduces fundamental knowledge of the production technology of Portland cement and other binders such as gypsum and lime. It covers raw materials and basic phase transformations during the clinker burning process, clinker grinding and additives, cement hydration and additives, as well as storage and environmental issues related to the production of inorganic binders.

9.67. < Structural Characterization of Inorganic Materials > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Inorganic Chemistry, Technology of Inorganic Substances

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge of the relationship between structure and properties of inorganic materials and presents analytical methods for structural characterization such as XRD, XRF, FTIR, SEM, and TEM. It also covers techniques for analyzing thermal behavior of inorganic materials under temperature influence, including TG, DTA, and DSC.

9.68. < Pigment Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Inorganic Chemistry, Technology of Inorganic Substances

Prerequisite: None

Co-requisite: None

Course description: This course provides students with knowledge related to inorganic pigments and surface coatings, which play an important role in enhancing the value of ceramic and inorganic material products. The course offers scientific foundations on the nature of inorganic colors, along with practical experience and technologies for the production of pigments and surface coatings.

9.69. < Advanced Inorganic Materials > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Inorganic Chemistry, Technology of Inorganic Substances

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental knowledge of optical, electrical, thermal, and corrosion properties. It also introduces basic concepts related to semiconductor materials, energy materials, and heat-resistant materials.

9.70. < Glass Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Inorganic Chemistry, Technology of Inorganic Substances

Prerequisite: None

Co-requisite: None

Course description: This course introduces the production processes, technical parameters, and fundamental characteristics of glass products. Core technological aspects include raw materials, batching, forming, drying, and firing. The course also enables the identification of common defects in glass products and provides an understanding of the corresponding correction methods.

9.71. < Polymer Composite Materials > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physicochemical Polymers

Prerequisite: None

Co-requisite: None

Course description: This course provides fundamental knowledge of polymer-based composite materials. It introduces the structure, characteristic properties, and applications of polymer matrices and reinforcing materials. Processing methods ranging from simple to advanced are covered. Additionally, the course presents techniques for evaluating the microstructure and mechanical strength of composite materials.

9.72. < Plastics Manufacturing Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physicochemical Polymers

Prerequisite: None

Co-requisite: None

Course description: This course provides fundamental knowledge in the production of commonly used plastics, focusing on two main synthesis methods: polymerization and polycondensation. It covers the chemical structure, basic properties, applications, production methods, and technological characteristics of various plastic materials.

9.73. < Rubber Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physicochemical Polymers

Prerequisite: None

Co-requisite: None

Course description: This course provides knowledge about rubber materials, including both natural and synthetic rubber. It introduces the structure, properties, and characteristics of rubber trees and latex. Topics include the production of standardized natural rubber, modification techniques, and the synthesis of synthetic rubber. In addition, the course covers technological processes for manufacturing essential products derived from latex and standardized rubber.

9.74. < Analysis and Evaluation of Polymer Materials > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physicochemical Polymers

Prerequisite: None

Co-requisite: None

Course description: This course introduces various methods for the analysis and evaluation of polymer materials. The covered methods include chemical composition analysis using spectroscopic techniques (UV, FTIR, NMR, etc.); mechanical property testing (flexural, tensile, compressive, and impact strength); structural analysis methods (SEM, TEM, X-ray diffraction); thermal analysis (DSC, TGA); thermomechanical analysis (DMA, DMTA); and rheological evaluation techniques.

9.75. < Polymer Processing Techniques > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physicochemical Polymers

Prerequisite: None

Co-requisite: None

Course description: This course provides foundational knowledge of polymer processing techniques. Three main groups of processing methods are introduced: forming methods (such as molding, casting, extrusion, thermoforming, and machining); joining methods (including welding and surface coating); and modification techniques (such as blending, surface activation, and polymer modification).

9.76. < Polymers with Special Properties > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physicochemical Polymers

Prerequisite: None

Co-requisite: None

Course description: This course introduces the chemistry, physicochemical properties, and applications of specialty polymers, including photoactive polymers, conductive polymers, smart polymers (such as thermo-responsive, pH-responsive, glucose-sensitive, magneto-responsive polymers, and biosensor polymers), as well as nanopolymers.

9.77. < Polymer Fiber Manufacturing Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physicochemical Polymers

Prerequisite: None

Co-requisite: None

Course description: This course provides foundational knowledge of fiber production technology based on polymeric materials. It covers the chemical structure, characteristic properties, manufacturing technologies, and applications of various types of fibers derived from materials such as cellulose, glass, carbon, polyester, polyamide, and acrylonitrile.

9.78. < Paint and Varnish Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Physicochemical Polymers

Prerequisite: None

Co-requisite: None

Course description: This course provides foundational knowledge of paints, paint production techniques, and coating methods. It examines the composition, manufacturing processes, technological characteristics, applications, and evaluation methods of basic paint materials. Three main categories of coatings are covered: oil-based paints, water-based paints, and varnishes. In addition, basic painting and coating techniques are also introduced.

9.79. < Spectroscopic Analysis in Pharmaceutical Chemistry > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides fundamental knowledge of spectroscopic techniques including ultraviolet-visible (UV-Vis) spectroscopy, infrared (IR) spectroscopy, one-dimensional and two-dimensional nuclear magnetic resonance (NMR) spectroscopy, and mass spectrometry (MS). These techniques are applied to the structural elucidation of pharmaceutical compounds.

9.80. < Experimental Design of Bioactivity> 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides foundational knowledge of *in vitro* and *in vivo* experimental techniques used to evaluate the biological activity of pharmaceutical compounds. Bioactivity screening is conducted across a variety of targets, including animals, fungi, bacteria, insects, tissues, cancer cells, and enzymes. The course equips learners with essential screening techniques and provides a scientific basis for drug development based on screening outcomes.

9.81. < Pharmaceutical and Bio-Materials > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides fundamental knowledge of the chemistry, structure, and typical applications of materials (inorganic, polymers, etc.) used in pharmaceutical and biomedical fields. It also addresses essential requirements such as bioactivity, stability, non-toxicity, and chemical inertness of these materials in pharmaceutical and biomedical contexts. In addition, the course introduces selected standards (e.g., ASTM, ISO) and basic analytical methods used to evaluate material properties, thereby supporting informed decisions regarding material selection and application in pharmaceutical development.

9.82. <Research Methods in Medicinal Plant Chemistry **> 2 credits**

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course equips students with knowledge of analytical methods and extraction techniques for isolating biologically active compound groups from plants, such as alkaloids, terpenoids, flavonoids, essential oils, and others.

9.83. < Pharmaceutical Quality Control> 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with general knowledge of pharmaceuticals and the fundamental methods for drug testing and quality control.

9.84. < Pharmaceutical Material Preservation Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental theoretical knowledge of pharmaceutical materials preservation. It emphasizes the importance of proper storage practices and highlights the influence of Vietnam's climatic conditions on the preservation of medicinal materials. The course focuses on factors affecting the quality of pharmaceutical materials and explores optimal preservation methods and techniques to maintain their quality.

9.85. < Pharmaceutical Formulation Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course equips students with theoretical foundations and practical techniques related to the formulation, quality control, packaging, and preservation of pharmaceutical dosage forms and preparations. The dosage forms covered include both homogeneous and heterogeneous dispersed systems. The course also introduces formulation techniques and technologies for certain modern drug types, as well as common incompatibilities encountered in drug compounding and methods for their resolution.

9.86. < Antibiotics Production Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with general knowledge of antibiotics, including definitions, measurement units, classification, quantification methods, therapeutic value, biological functions, the nature and mechanisms of antibiotic resistance, and principles regulating the biosynthesis of antibiotics. In addition, the course offers an in-depth analysis of production technologies for several representative antibiotics such as Penicillin, Cephalosporin, Cephamycin, and antibiotics from the Aminoglycoside, Tetracycline, Macrolide, and Nystatin groups.

9.87. < Vaccine Production Technology > 2 credits

Time distribution: 2 (2/0/4)

Previous course: Organic Chemistry

Prerequisite: None

Co-requisite: None

Course description: This course provides students with foundational knowledge of vaccines and the biochemical technologies involved in vaccine production. It covers the human immune system, the cells involved in immune responses, and the fundamental characteristics of immunity. Additionally, the course introduces vaccines currently in use in Vietnam, including their principles of application, mechanisms of action, essential characteristics, and classification. The course also delves into various vaccine production methods such as traditional techniques, antigen generation, antigen release and isolation, and purification processes.

9.88. < Pharmaceutical Manufacturing Technology> 2 credits

Time distribution: 2 (2/0/4)

Previous course:

Prerequisite: None

Co-requisite: None

Course description: This course provides students with fundamental and up-to-date knowledge of techniques used in the production of pharmaceutical raw materials through chemical synthesis, herbal extraction, and biosynthesis methods. It also introduces technologies for manufacturing finished pharmaceutical dosage forms.

9.89. < Specialized Laboratory in Organic Chemical Engineering Technology > 2 credits

Time distribution: 2 (0/2/4)

Previous course: 10 elective credits in Organic Chemical Engineering specialization

Prerequisite: None

Co-requisite: None

Course description: This course offers theoretical foundations and practical competencies in organic synthesis, production technologies for cleaning agents, fragrances, and cosmetics, as well as extraction techniques for essential oils and natural colorants derived from plant-based sources.

9.90. < Specialized Laboratory in Inorganic Chemical Engineering Technology > 2 credits

Time distribution: 2 (0/2/4)

Previous course: 10 elective credits in Inorganic Chemical Engineering specialization

Prerequisite: None

Co-requisite: None

Course description: This course provides foundational knowledge of the production and fabrication processes of selected inorganic products, with an emphasis on the analysis and evaluation of their technical properties and specifications through laboratory-scale experimentation.

9.91. < Specialized Laboratory in Polymer Chemical Engineering Technology > 2 credits

Time distribution: 2 (0/2/4)

Previous course: 10 elective credits in Polymer Chemical Engineering specialization

Prerequisite: None

Co-requisite: None

Course description: This course provides comprehensive knowledge and practical experience in the synthesis and characterization of polymer materials, the development of composite systems, production technologies for paints and adhesives, and techniques in rubber compounding and processing.

9.92. < Specialized Laboratory in Pharmaceutical Chemical Engineering Technology >

9.93. 2 credits

Time distribution: 2 (0/2/4)

Previous course: 10 elective credits in Pharmaceutical Chemical Engineering specialization

Prerequisite: None

Co-requisite: None

Course description: This course emphasizes the development of practical skills in experimental procedures, data observation, scientific reporting, literature analysis, and interpretation of results. It involves the synthesis or formulation of selected pharmaceutical compounds, quality assessment in accordance with pharmacopeial standards, and the evaluation of relevant biological activities based on the specific properties of each drug.

10. Campus Infrastructure

10.1. Laboratories

- Organic Chemistry Laboratory
- Analytical Chemistry Laboratory
- Inorganic Chemistry – Silicate Laboratory
- Polymer Laboratory
- Machines and Equipment Laboratory
- Pharmaceutical Chemistry Laboratory

10.2. Library and Website

- HCMUTE Library

11. Program Implementation Guidelines

The training program is implemented in accordance with the current regulations for full-time university-level credit-based training, as stipulated by the Ministry of Education and Training and Ho Chi Minh City University of Technology and Education.

The specified hours are calculated as follows:

- 1 credit = 15 hours of theoretical lectures or in-class discussions
- 1 credit = 30 - 45 hours of laboratory work or practical exercises
- 1 credit = 30 hours of self-study
- 1 credit = 45 - 90 hours of on-site internship
- 1 credit = 45 - 60 hours for project work or graduation thesis

The total hours for a course must be a multiple of 15.

Political Theory Knowledge: Implemented according to the regulations of the Ministry of Education and Training.

Foreign Language Knowledge: The foreign language output standard is determined by the university's Science and Training Council at the beginning of each admission cohort. Throughout their studies, the university will monitor the students' foreign language proficiency development each academic year to decide the number of credits for courses that students are allowed to register for in a semester. Students can self-study or register for the foreign language proficiency development program according to the university's plan.

Physical Education Knowledge: Implemented according to the regulations of the Ministry of Education and Training. For Physical Education 2 and 3, students can select from the course catalog when registering for modules.

National Defense Education Knowledge: Implemented according to the regulations of the Ministry of Education and Training. Students accumulate credits and are granted a certificate after completing the requirements of the module.

Elective Social Sciences and Humanities Knowledge: Students select 2 courses, equivalent to 4 credits, from the course catalog when registering for modules.

Elective Foundational Major Knowledge: Students select 2 courses, equivalent to 6 credits, from the course catalog when registering for modules.

Elective Specialized Major Knowledge: Students select 2 courses, equivalent to 6 credits, from the course catalog when registering for modules.

The remaining knowledge blocks are arranged into 8 semesters as presented in section 8.

VICE PRESIDENT	DEAN OF FACULTY OF INTERNATIONAL EDUCATION
Dr. Quach Thanh Hai	**Assoc. Prof. Dr. Truong Dinh Nhon**