HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY AND EDUCATION
FACULTY OF CHEMICAL AND FOOD TECHNOLOGY

HCMUTE

SELF-ASSESSMENT REPORT FOR AUN-QA PROGRAMME ASSESSMENT

BACHELOR OF ENGINEERING IN CHEMICAL ENGINEERING TECHNOLOGY

AUN-QA
A Touch of Quality

The 305th AUN-QA Programme Assessment
29 November - 1 December 2022

SELF-ASSESSMENT REPORT FOR AUN-QA

BACHELOR OF ENGINEERING IN

CHEMICAL ENGINEERING TECHNOLOGY

AUN-QA SELF-ASSESSMENT REPORT

of the Bachelor of Engineering in

CHEMICAL ENGINEERING TECHNOLOGY

We hereby confirm to approve this AUN-QA Self-Assessment Report of the Bachelor of Engineering in Chemical Engineering Technology programme for assessment according to AUN-QA Criteria (V4.0)

Assoc. Prof. Dr. Nguyen Tan Dung

Dean

Faculty of Chemical and Food Technology

Table of Content

List of Abbreviations

AAO	Academic Affair Office
ASAO	Admissions and Student Affairs Office
BUILD- IT	Build University-Industry Learning and Development through Innovation and Technology
CDIO	Conceive – Design - Implement – Operate
CEFT	Chemistry Environment and Food Technology
CET	Chemical Engineering Technology
CLO	Course learning outcomes
COET	Construction Engineering Technology
COMET	Connecting the Mekong through Education and Training
CV	Curriculum vitae
DCT	Department of Chemical Technology
DLC	Digital Learning Center
ECET	Electronics and Communications Engineering Technology
EEET	Electrical Electronics Engineering Technology
ELO	Expected learning outcomes
ERO	Enterprises Relations Office
FCFT	Faculty of Chemical and Food Technology
GAPAO	General Administration and Personnel Affairs Office
GPA	Grade Point Average
GTSD	Green Technology and Sustainable Development
HCC	Health Care Center
HCMUTE	Ho Chi Minh City University of Technology and Education
HEEAP	Higher Engineering Education Alliance Programme
HOD	Head of Department
ISO	Organization for Standardization
KPI	Key Performance Indicator,
LMS	Learning Management System
MET	Mechatronics Engineering Technology
MTT	Master Teaching Training
MMT	Machine Manufacturing Technology
MOET	Ministry of Education and Training
MOOC	Massive Open Online Courses
PDCA	Plan-Do-Check-Act
PI	Performance Indicator

QA	Quality Assurance
QA-ABET	Quality Assurance - Accreditation Board for Engineering and Technology
QAO	Quality Assurance Office
SAR	Self-Assessment Report
SSC	Student Service Center
STEM	Science-Technology-Engineering-Mathematics
STIAO	Science Technology and International Affairs Office
USAID	United States Agency for International Development
VULII	Vocational University Leadership Innovation Institute
YSA	Youth – Student Association

List of Table

List of Figures

PART 1: INTRODUCTION

- Programme: **Chemical Engineering Technology**
- Institution: **Ho Chi Minh City University of Technology and Education**
- Faculty: **Faculty of Chemical and Food Technology**

1.1 Executive summary

Following the Environmental Engineering Technology programme, the Chemical Engineering Technology Programme (CET) is the second programme provided by the Faculty of Chemical and Food Technology (FCFT) at Ho Chi Minh City University of Technology and Education (HCMUTE) to be selected for AUN-QA (Version 4.0). To effectively prepare the Self-Assessment Report (SAR) as well as to collect necessary evidences supporting all the criteria under assessment, an implementation team with the support from the Quality Assurance Office (QAO) was formed in December, 2020, based on the decision of HCMUTE on forming CET SAR team *[Exh. 0.1. HCMUTE decision on forming the SAR teams].*

The 150-credit CET programme has been implemented since 2015. This programme satisfies the requirements of the Higher Education Law, as well as the HCMUTE and FCFT's vision and mission.

In the period 2016-2019, HCMUTE had 14 programmes that meet the AUN-QA. By 2025, HCMUTE plans to have 19 more programmes meeting the AUN-QA standards. The CET department has decided to participate in AUN-QA (version 4.0) in November, 2022.

1.2 Organization and Approach of Self-Assessment Report

The leader of CET SAR team is the head of the Chemical Engineering Department, with the enthusiastic support and advice from the QAO and the Vice Dean who is charge of quality assurance. The SAR team members are lecturers who have extensive experience in teaching CET. Each member is responsible for writing some criteria in the SAR and prepare the relevant evidences. The first version of the SAR was finished in July, 2022 and sent to QAO for reviewing by external experts. From the comments, we revised SAR one more time to get the final version in August, 2022. Then, the full SAR will be submitted for the AUN-QA assessment in August, 2022. The SAR (version 4.0) is divided into four parts as follows:

- **Part 1 – Introduction:** provides an overview of HCMUTE, FCFT and CET programme.
- **Part 2 – AUN-QA criteria** (Version 4.0): describes and analyzes all the AUN criteria in details.
- **Part 3 – Strengths and weaknesses Analysis**: analyzes the strengths and weaknesses and proposes a few solutions to improve CET programme in the future.
- **Part 4 – Appendices:** presents the evidences for AUN-QA criteria and full related documents.

1.3 Brief History of the University

1.3.1 Vision, mission and core values of HCMUTE

HCMUTE was established on 05th, October 1962 based on the Technical Education College Department. HCMUTE is located in the eastern gateway to Ho Chi Minh City – the biggest city of Vietnam. About 10km from the city centre, HCMUTE is bordered by major industrial provinces in the south of Vietnam, such as Binh Duong, Dong Nai and Ba Ria - Vung Tau.

❖ **Vision**

HCMUTE is a fully autonomous entity. The university aims at becoming a leading hub for training, research, innovation and entrepreneurship in Vietnam, which can be on par with other regional and international prestigious universities.

❖ **Mission**

HCMUTE provides services of practical training, applied research and community outreach. It is committed to continuous innovation and creativity, offering high quality human resources and scientific products to the field of vocational education, science and technology to meet the demands of the socio-economic development of the country.

❖ **Core values**

The core values of a progressive and modern education which have always been and will be appreciated, preserved, and creativity implemented by HCMUTE are (1) upholding and implementation of Vietnamese people's human traditional values; (2) cultivation of talent and creativity which a focus on training professional skills and responsibility; (3) respect for the learners and community's benefits and building an ever-learning society; (4) high regard for quality, effectiveness, and innovation in activities; and (5) integration cooperation and sharing.

1.3.2 Organizational structure of HCMUTE

HCMUTE has two campuses with a total area of 21 hectares and 128,128 square meters of construction area, serving about 26,000 students (19,000 full-time undergraduate and 7,000 part-time). Until now, HCMUTE has 14 academic faculties, 1 institute and 21 centers, 16 functional offices, 98 workshops (with 16,980 square meters) and 58 laboratories (with 10,362 square meters). There are 808 staffs (including 206 PhDs) teaching 7 PhD, 15 Master, 38 bachelor and 18 international bachelor programmes.

The organizational structure of HCMUTE is show in *Figure 01*.

1.3.3 Quality assurance system of HCMUTE

Quality Policy of HCMUTE

The university continuously improves its quality of teaching, learning, research and community services to provide students optimal opportunities for all-round competence development, meeting the national demands of the socio-economic development and international integration.

Quality Assurance System of HCMUTE

The quality management at HCMUTE was managed by the Academic Affair Office (AAO) until 2008. However, in 2008, HCMUTE decided to establish the Quality Assurance Office (QAO) in order to comply with the regulation of the Ministry of Education and Training (MOET) and enhance the education quality in the whole university. QAO is responsible for quality management according to International Organization for Standardization (ISO) 9001 with 48 procedures. It is also in charge of enhancing internal quality assurance system and quality assessment as well as accreditation at institutional and programme level in accordance with national, regional and international standards.

QAO has 6 staff members who regularly attend QA training courses to continuously improve our QA system based on the AUN-QA model. HCMUTE also has one member who is among the AUN assessors and one education accreditor in the Department of Education Testing and Accreditation (MOET) since 2014. Until now, 14 undergraduate programmes at HCMUTE have successfully been assessed by AUN-QA. We plan to assess 19 more programs under AUN-QA by 2025.

The overview of the assessment/accreditation of HCMUTE was shown in *Table 1*.

1.4 Brief description of Faculty of Chemical and Food Technology

- **History**

FCFT was established under Decision No. 38/QD DHSPKT-TCCB/21-01-2007 on January 21st, 2007 *[Exh. 0.2. HCMUTE decision on forming FCFT]* by the President of HCMUTE, in order to perform engineering training responsibilities in three disciplines: Food Technology, Chemical Engineering Technology and Environmental Engineering Technology.

The total number of students currently enrolled in FCFT is about 1000 students. Since its inception, FCFT has trained over 1,300 engineers in Food Technology, Environmental Engineering Technology and Chemical Engineering Technology.

The staff of FCFT consists of 44 official lecturers and staffs, including 04 Associate Professors, 25 PhDs, 13 Masters and 02 Engineers. FCFT's human resource structure is moving gradually towards the way which increases slowly in number but promotes quality; the teaching staff is vigorously improving studying at doctoral level. Under the direction of HCMUTE to improve the quality of teaching staff, FCFT members also participate intensely in training courses on teaching innovation,

diversification of assessment methods, English language proficiency and professional competencies. FCFT is proudly said to possess the teaching staff with good qualifications, being dynamic and enthusiastic in teaching and conducting scientific research.

UNIVERSITY COUNCIL

PRESIDENTIAL BOARD

OFFICES
- Academic Affairs Office
- Academic Inspectorate Office
- Admissions and Student Affairs Office
- Dormitory Management Office
- Enterprise Relation Office
- Equipment and Maintenance Office
- Facility Management Office
- Finance and Planning Office
- General Administration and Personnel Affairs Office
- Health Care Office
- Library
- Non-official Academic Affairs Office
- Press and Media Office
- Project Mangagement Department
- Quality Asssurance Office
- Science Technology and International Affairs Office

FACULTIES & INSTITUTE
- Faculty of Applied Sciences
- Faculty of Chemical and Food Technology
- Faculty of Civil Engineering
- Faculty of Economics
- Faculty of Electrical and Electronics Engineering
- Faculty of Fashion and Tourism
- Faculty of Foreign Languages
- Faculty of Graphic Arts and Media
- Faculty for High Quality Training
- Faculty of Political Science and Law
- Faculty of Mechanical Engineering
- Faculty of Vehicle and Energy Engineering
- Faculty of International Education
- Faculty of Information Technology
- Institute of Technical Education

CENTERS
- Continuous Training Center
- Civil Engineering Research and Application Center
- Digital Learning Center
- Dong A – UTE Korean Language Center
- Engineering Synthesis Center
- Environmental Engineering and Technology Center
- Foreign Languages Center
- Industrial Device Design and Fabrication Advisor Center
- Information and Network Center
- Information Technology Center
- Innovation and Entrepreneurship Center
- Instruction Technology Center
- Language Learning Center
- National Capacity Training and Skills Assessment Center
- Physical Education and National Defense Center
- Renewable Energy Center
- Software Technology Center
- Student Services Center
- Technology Research and Transfer Center
- Training and Fostering Center
- Vietnam – Japan International Orientation and Education Center
- Vietnam Germany Center

Figure 01. Organizational Structure of HCMUTE.

Table 1. Overview of the assessment/accreditation of HCMUTE.

Year	Programme / Institution	Assessed / Accredited by
2005	Quality Accreditation at Institutional level	MOET
2007	Quality management certification	ISO 9001
2011	External Assessment of TVET in EEE	MOET
Mar. 2016	AUN-QA Assessment at Programme level: *1. Automotive Engineering Technology* *2. Electrical and Electronics Engineering Technology* *3. Mechatronics Engineering Technology*	AUN - QA
Nov. 2016	Quality Accreditation at Institutional level	MOET
Dec. 2016	AUN-QA Assessment at Programme level: *1. Construction Engineering Technology*	AUN - QA
Nov. 2017	AUN-QA Assessment at Programme level: *1. Machine Manufacturing Technology* *2. Thermal Engineering Technology* *3. Electronics Communication Engineering Technology* *4. Environmental Engineering Technology*	AUN - QA
Dec. 2018	AUN-QA Assessment at Programme level: *1. Mechanical Engineering Technology* *2. Automation and Control Engineering Technology* *3. Industrial Management*	AUN – QA
Nov. 2019	AUN-QA Assessment at Programme level: *1. Garment Technology* *2. Information Technology* *3. Printing Engineering Technology*	AUN-QA

- **Vision**

The Faculty of Chemical and Food Technology aims to become a leading center for training, research, innovation and entrepreneurship in Viet Nam, which can be on par with other regional and international prestigious centers in the fields of Chemical – Food – Environmental Technology.

- **Mission**

The mission of the Faculty of Chemical and Food Technology is to provide training, research, technology transfer and community outreach, be continuously innovative and creative to offer high-quality human resources and scientific-technological products in the fields of Chemical – Food – Environmental Technology to meet the demands of socio-economic development.

- **Core values**

The learning spirit: nurturing the desire for learning, understanding, respecting knowledge and the truth.

Creative thinking: actively exploring, creating ideas, innovations and new solutions in all activities.

Responsibility: being responsible for themselves, their families and communities; for learning, work and life.

Ethics: Listening, sharing and respecting the differences.

- **Organizational structure**

FCFT has 3 departments as shown in *Figure 02*, 03 undergraduate programmes and 02 Master programmes as follows:

1. Bachelor in Environmental Engineering Technology
2. Bachelor in Food Technology
3. Bachelor in Chemical Engineering Technology

4. Master in Environmental Engineering Technology
5. Master in Food Technology
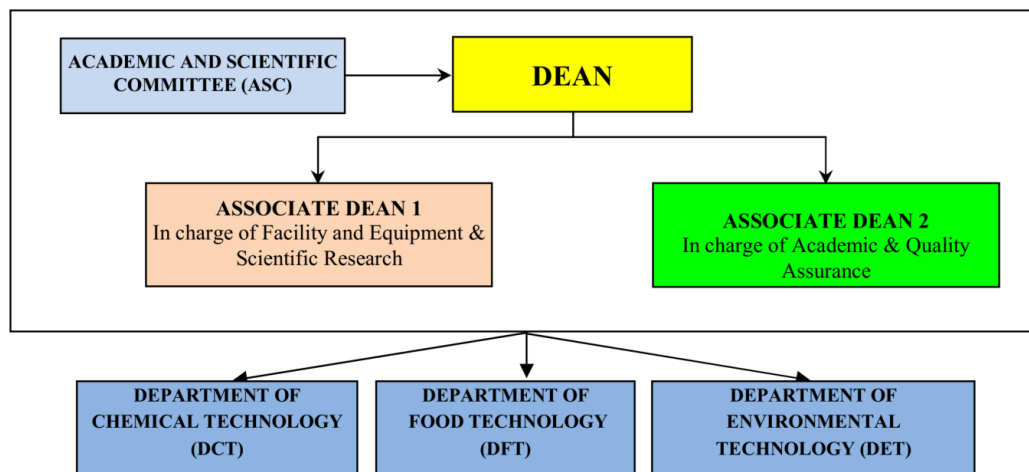
Figure 02. Organization Structure of FCFT.

1.5 Introduction to programme

1.5.1 Brief History of the Programme

CET programme was introduced in 2015 with 150 credits including General courses, Fundamental courses and Specialized Courses (students choose one from three majors including Organic, Inorganic and Polymer Chemistry Technology). In 2018, CET programme was revised and modified to 132 credits. In 2020, it was revised one more time to 150 credits to be consistent with the new Higher Education Law. Currently, there are about 400 students studying the CET programme. Until 2022, there have been 4 cohorts with over 250 students graduating and from the CET programme.

The CET programme's outcomes are as flows.

PO1. Graduates will be able to apply the scientific and technological knowledge to achieve career success in the chemical engineering technology or other related fields, and being a responsible citizen in the society.

PO2. Graduates will be able to become competent team leader or qualified team member who can solve practical scientific and technical challenges

PO3. Graduates will be able to participate in further education or research to pursue their professional development.

1.5.2 Job Opportunities

The CET programme equips graduates with competences to meet various of requirement of different labor market, especially in some main sectors including: operate production system, production management, quality assurance, quality control, R&D, technical sale, technical service… Job opportunities are show in *Table 2.*

Table 2. Job Opportunities.

Place of work	Possible tasks
1. Factories in the field of Inorganic, Organic and Polymer Chemical Engineering.	- Design, supervise and operate the production system. - Quality Assurance: evaluate and assure the quality of the production system. - Quality Control: inspect and evaluate quality of final products. - R & D: research and develop new product to meet customer's requirements. - Sale Technical: technical advice - Technical service: solve technical problems for customers
2. Universities	Teach on Chemical Engineering Technology fields.
3. Research Institutions	Research in the field of Chemistry

PART 2: AUN-QA CRITERIA

1. Expected Learning Outcomes

1.1 The programme to show that the expected learning outcomes are appropriately formulated in accordance with an established learning taxonomy, are aligned to the vision and mission of the university, and are known to all stakeholders.

The vision and mission of HCMUTE are stated as "HCMUTE is a fully autonomous entity. The University aims at becoming a leading hub for training, research, innovation and entrepreneurship in Vietnam, which can be on par with other regional and international prestigious universities. HCMUTE provides services of practical training, applied research and community outreach. It is committed to continuous innovation and creativity, offering high quality human resources and scientific products to the field of vocational education, science and technology to meet the demands of the socio-economic development of the country."

The CET programme is built with the main purpose of training chemical engineers with deep knowledge, skills and strong professional and highly responsible attitude, meeting the requirements of employers, and being a responsible citizen in society. CET programme's objectives are related to the FCFT mission and HCMUTE mission as described in *Table 1.1.*

Table 1.1. Aligning POs of CET to HCMUTE and FCFT Vision and Missions.

POs	Degree of alignment	HCMUTE vision and mission	FCFT vision and mission
PO1. Graduates will be able to apply the scientific and technological knowledge to achieve career success in the chemical engineering technology or other related fields, and being a responsible citizen in the society.	F	HCMUTE is committed to continuous innovation and creativity, offering high quality human resources and scientific products to the field of vocational education, science and technology to meet the demands of the socio-economic development of the country.	The Faculty of Chemical and Food Technology is to provide training, research, technology transfer and community outreach, be continuously innovative and creative to offer high-quality human resources and scientific-technological products in the fields of Chemical – Food – Environmental Technology to meet the demands of socio-economic development.
PO2. Graduates will be able to become competent team leader or qualified team member who can solve practical scientific and technical challenges.	F	HCMUTE aims at becoming a leading hub for training, research, innovation and entrepreneurship in Vietnam, which can be on par with other regional and international prestigious universities.	The Faculty of Chemical and Food Technology aims to become a leading center for training, research, innovation and entrepreneurship in Viet Nam, which can be on par with other regional and international prestigious centers in the fields of Chemical – Food – Environmental Technology.

| PO3. Graduates will be able to participate in further education or research to pursue their professional development. | M | HCMUTE provides services of practical training, applied research and community outreach. | The Faculty of Chemical and Food Technology is to provide training, research, technology transfer and community outreach, be continuously innovative and creative to offer high-quality human resources and scientific-technological products in the fields of Chemical – Food – Environmental Technology to meet the demands of socio-economic development. |

F – Fully fulfilled; M – Moderately fulfilled

Based on the requirement of Vietnam Higher Education Law, HCMUTE mission and vision, FCFT mission and vision, programme objectives, requirements of employers and feedback from alumni, 9 expected learning outcomes (ELOs) of the CET programme were formulated as shown in *Table 1.2.*

Table 1.2. Expected learning outcomes of CET Programme.

ELOs	Bloom's Taxonomy Scale					
	(1)	(2)	(3)	(4)	(5)	(6)
ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering Technology by applying principles of engineering, science, and mathematics.					x	
ELO2. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions in field of the Chemical Engineering Technology.					x	
ELO3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.				x		
ELO4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.			x			
ELO5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.			x			
ELO6. an ability to communicate effectively with a range of audiences, and to communicate in English language.			x			
ELO7. an ability to apply engineering design to produce solutions that meet specified needs in field of the Chemical Engineering Technology with consideration of public health, safety, and welfare, as					x	

Expected Learning Outcomes						
well as global, cultural, social, environmental, and economic factors.						
ELO8. an ability to implement engineering systems in field of the Chemical Engineering Technology.						x	
ELO9. an ability to operate and manage engineering systems in field of the Chemical Engineering Technology						x	

(1) Remember, (2) Understand, (3) Apply, (4) Analyse, (5) Evaluate, (6) Create

The relationships between the programme ELOs and the programme objectives of CET programme is tabulated in *Table 1.3.*

Table 1.3. Relationship Between Programme Educational Objectives and Programme Learning Outcomes.

Expected Learning Outcomes	Programme Educational Objectives		
	PO1	PO2	PO3
ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering Technology by applying principles of engineering, science, and mathematics.	x		
ELO2. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions in field of the Chemical Engineering Technology.	x		
ELO3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.		x	
ELO4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.			x
ELO5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.		x	
ELO6. an ability to communicate effectively with a range of audiences, and to communicate in English language.		x	
ELO7. an ability to apply engineering design to produce solutions that meet specified needs in field of the Chemical Engineering Technology with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	x		
ELO8. an ability to implement engineering systems in field of the Chemical Engineering Technology.	x		
ELO9. an ability to operate and manage engineering systems in field of the Chemical Engineering Technology	x		

The programme ELOs are fully compatible with the HCMUTE and FCFT's mission and vision. Among them, the outstanding ELOs are ELO7, ELO8 and ELO9. These ELOs have focused on teaching the design, implementation, operation, and management of an engineering system to meet research or production requirements.

The programme ELOs are known by staff members and students in many ways. For example, they were the results of the consultancy with all lecturers in the Department of Chemical Engineering Technology. The programme ELOs are also informed at the meetings of the Department. Moreover, the curriculum with ELOs is posted on the FCFT website, and announced at the Orientation Day to students. Students can also learn about the ELOS in the course "Introduction to Chemical Engineering Technology" in the first semester. In addition, potential students are usually introduced to these ELOs on the Open Day held annually at HCMUTE. *[Exh. 1.1. Publication of ELOs of programme].*

1.2 The programme to show that the expected learning outcomes for all courses are appropriately formulated and are aligned to the expected learning outcomes of the programme.

The ELOs of programme established in 2015 and modified in 2021 had been formulated based on the labor market demand, accommodating the requirements of Higher Education Law as well as the Vision and Mission of the HCMUTE *[Exh. 1.2. Meeting minutes of stakeholders for ELOs of CET programme and Higher Education Laws, Mission and Vision of HCMUTE].* To strengthen and validate the ELOs, during the formulation process, we had considered opinions of constituencies including the faculty members, employers, senior students, and alumni so that the ELOs can be compatible with the demands of the labor market and the globalization as well as the vision and mission of the university and the FCFT faculty. Moreover, the programme developers had also been taken into account the training programmes from developed countries such as those developed by University of Texas, University of Edinburgh, National Taipei University of Technology, etc. to improve student's competitiveness in different working environments *[Exh. 1.3. Benchmarking between CET programme and other programmes].*

The course curriculum determined the specific and measurable ELOs of the programme following the Bloom's taxonomy as shown in *Appendix 3.* Besides, the lecture of each course has been designed to achieve the specific CLOs of the course which must align with the designed programme of ELOs *[Exh. 1.4. Sample of syllabus].*

1.3 The programme to show that the expected learning outcomes consist of both generic outcomes (related to written and oral communication, problem-solving, information technology, teambuilding skills, etc) and subject specific outcomes (related to knowledge and skills of the study discipline).

To translate into the CET programme, the ELOs were analyzed and divided into two main groups, including generic outcomes (related to written and oral communication, problem-solving, information technology, team building, soft skills, ethic, attitude and life-long learning…) and subject specific outcomes (related to knowledge and skills of the study discipline) that will be taught to students throughout the trainning programme.

The relationship between knowledge, skills, attitudes and ELOs of CET programme is illustrated in *Table 1.4* which was divided into generic and specific knowledge skill.

Table 1.4. Generic and specific ELOs of CET programme.

ELOs	General knowledge and skill	Specific knowledge and skill
ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering		x

Technology by applying principles of engineering, science, and mathematics.		
ELO2. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions in field of the Chemical Engineering Technology.		x
ELO3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	x	
ELO4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	x	
ELO5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	x	
ELO6. an ability to communicate effectively with a range of audiences, and to communicate in English language.	x	
ELO7. an ability to apply engineering design to produce solutions that meet specified needs in field of the Chemical Engineering Technology with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.		x
ELO8. an ability to implement engineering systems in field of the Chemical Engineering Technology.		x
ELO9. an ability to operate and manage engineering systems in field of the Chemical Engineering Technology		x

After completing the CET programme, students will gain ELOs through courses (including general, foundation and specialized courses) and extra-curriculum activities such as field trips, practicum, internship, seminars, and cultural and social activities.

For courses, in addition to professional knowledge and skills, lecturers also apply active teaching methods such as discussion, group work, feedback, presentations, reports, asking questions, making short video clips... so that students can achieve ELOs on soft skills.

Moreover, ELOs on soft skills and professional ethics are transferred to the CET programme by many positive activities of the course "Introduction of Chemical Engineering Technology," seminars from specialized courses, training workshop from factories and foreign experts, graduation internship, essays, theses and many other cultural and social activities such as Green Day, Volunteering Spring, Open Day, etc.… *[Exh. 1.5. Soft skills and professional ethics of the CET programme]*

The matrix for contribution of extracurricular activities for ELOs is shown in *Table 1.5.*

Table 1.5. Skill matrix for contribution of extracurricular activities for ELOs.

Extracurricular activities	ELOs on soft skills and professional ethics			
	ELO3	ELO4	ELO5	ELO6
Field trips	X	X		
Practicum	X	X	X	
Internship	X	X	X	X

Seminars, training workshop	X	X	X	X
Cultural and social activities				X

1.4 The programme to show that the requirements of the stakeholders, especially the external stakeholders, are gathered, and that these are reflected in the expected learning outcomes

The preliminary CET programme had been constructed from the general ISO procedure of HCMUTE in the period of 2015 - 2017 with the 150-credit system. Annually, about 10% of syllabus had been revised and modified to update knowledge, teaching and training methods and outcome measurement *[Exh. 1.6. Report of faculty members for updating the curriculum]*. In 2018, the curriculum was reduced to 132 credits to accelerate student autonomy in foreign language and internship time; therefore, the CET programme was also transformed into 132 credit system with the elimination of all English courses *[Exh. 1.7. Decision No. 1273/QĐ-ĐHSPKT-03/08/2018 on the implementation of the 132-credit programme]*. Compared to the preliminary version, there are four main changes, including 6 credits of courses for interdisciplinary subjects to increase students' flexible learning and major choice; approval of Massive Open Online Courses (MOOC) to improve students' self-learning ability; the Enterprise Collaboration course added into the curriculum to boost students' soft skills and career competencies, and the increase of internship time from 4 to 12 weeks in the 2018 CET programme. As a result, the ELO6 and the ELO4 of the 2018 CET programme have been updated in comparison with the 2015 version. However, this version showed some limitations such as the lack of background knowledge in Mathematics for Engineering, Heat Engineering and English skills.

For this reason, the 2018 CET had been revised following the obtained feedback from employers, senior students, and alumni via a conference after 2 years of operation *[Exh. 1.8. Minute of conference between faculty and stakeholders for revision of curriculum of CET programme]*. Since the 2019 enrollment year, the CET programme has been re-operated in the 150-credit system with the addition of English courses, Heat Engineering and Experiments for Modern Analysis Methods courses based on stakeholders' suggestions, also thanks to the equipment upgrade in the CET department.

Besides, meetings of faculty members, as well as conferences between students and faculty have been performed twice a year to get their opinions about the training programme. *[Exh. 1.9. Minute of semesterly meeting between faculty and students for revision of curriculum of CET programme]*. Specifically, after each semester, the Quality Assurance Office (QAO) conducts a survey to collect student's feedback on teaching and learning method of lecturers, the results from which serve as the information for the lecturers to improve their courses and achieve the expected learning outcomes *[Exh. 1.10. Report on the teaching activities of the lecturer]*. Moreover, the opinions from employers are also collected during student's internship time in companies/factories, while alumni can provide their feedback via website or the feedback surveys on Alumni Reunion Day, which is annually conducted. In addition, course learning outcomes (CLOs) of each course are determined through performance indicators (PIs) evaluated through the student assessment system. Overall, the results showed that the possibility to achieve PIs must be equal or over 60%. Therefore, the CLOs of these subjects are unchanged.

The employer, student, and alumni's opinions as well as the contribution of faculty staff members have been taken into account during the ELOs formulation process as shown in *Table 1.6*. Hence, it reflects the major requirements of stakeholders, as demonstrated in *Table 1.7.*

Table 1.6. Summary of Meeting minutes between stakeholders and FCFT for revision of CET programme.

Stakeholders	Method of data collection	When	Opinions
Alumni	Conference, survey	March 2021, Jan 2019 - 2021	English
Employers	Conference, Recruitment Day, Recruitment Week, Survey	Annually, Every 2 years (for survey)	Communication skills, soft skills

Lecturers	Meeting, Portfolio	Twice per year	Self – learning
Students	Conference, feedback survey, Conversation between faculty members and students	Twice per year	Auto-Cad, Microsoft office, base subject addition
Graduates	Survey	Annually	Auto-Cad, communication skills

Table 1.7. Stakeholders' requirements for revision versus the current ELOs of CET programme.

Requirements	Improvement of ELOs	Notes
Enhancing communication skills/English (foreign languages)	ELO5 (an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives) ELO6. an ability to communicate effectively with a range of audiences, and to communicate in English language.	Employers, students, graduates
Enhancing basic knowledge	ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering Technology by applying principles of engineering, science, and mathematics.	Students
Auto-cad/ Microsoft Office	ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering Technology by applying principles of engineering, science, and mathematics. ELO6. an ability to communicate effectively with a range of audiences, and to communicate in English language.	Alumni, students, graduates
Self-learning	ELO4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	lecturers

Following the opinions of stakeholders shown in the *Table 1.7*, the compatibility of ELOs to the real work in accordance with the employer and alumni's opinions showed that the CET programme could enhance soft-skills such as communication, English and Microsoft Office. Besides, the feedback of lecturers focused on students' self-learning skills. To adapt the updated MOET requirements for engineering programmes as well as fulfill stakeholders' requirements of English and soft skills improvement (shown in the *Table 1.6*. and *Table 1.7.*), the FCFT's Scientific and Academic Committee decided to add the English courses into the CET programme again, as described in the version 2020. Moreover, the learning and teaching methods in the subject portfolios have been modified to accelerate the self-learning of students *[Exh. 1.11. Sample of E-portfolios]*. All improvement in the CET programme is to strengthen labour market needs.

Overall, the current ELOs of CET programme have aligned with the expectations and requirements of the stakeholders as listed in *Table 1.8.*

Table 1.8. Alignment between the ELOs and the Stakeholders' Expectation and Requirements.

ELOs	Stakeholder' Expectations and Requirements			
	Academic Staffs	Students	Alumni	Employer
ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering	-Be knowledgeable in science, engineering and mathematics -Remember and understand core knowledge of course	- Enhance basic knowledge -Understand equation and formulation -Solve detailed study case in	-Be knowledgeable in theory. -Understand equation and formulation and be	- Understand and calculate basic parameters. -be applied theoretical

Technology by applying principles of engineering, science, and mathematics.	- Solve detailed study case in chemical Engineering Technology.	chemical Engineering Technology.	usable in proper situation	knowledge in a given situation.
ELO2. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions in field of the Chemical Engineering Technology.	- Apply the knowledge, skills, and suitable tools in chemical engineering technology such as inorganic, organic or analytical chemistry - Operate tools and equipment - Perform an appropriate experiment in chemical engineering technology such as extraction, recrystallization, synthesis of materials, etc… - Analyze and judge data - Discuss and explain data of experiment - Write a scientific laboratory report - Be solving problems happened during experiment	- Operate tools and equipment - Explain technical phenomena occurred during experiment - Build a scientific report.	- Use specialised knowledge, skills, and suitable tools in chemical engineering technology - Operate tools and equipment in chemical processing - Build a scientific report.	- Operate tools and equipment in chemical processing -Analyze and interpret technical data - Predict and analyze related limitation and problems of chemical processing - Build a scientific report.
ELO3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	- Be honest in course experiment/ report or exam - Be aware of impact of technical solution in chemical engineering on environment and society	- Be aware of impact of chemical engineering techniques/ process on environment and society	- Be aware of impact of technical solution in chemical engineering on environment and society	- Be aware of impact of technical solution in chemical engineering on environment and society - Be able to propose solution to improve the effect of chemical processing on environmental and societal context
ELO4. an ability to acquire and apply	-Be able to access updating specialized	- Improve English communication	- Improve English communication	-Be able to access updating

new knowledge as needed, using appropriate learning strategies.	knowledge in inorganic, polymer and organic processing - Be flexible - Demonstrate ability to use new tools/software in a given cirriculum	- Be a self-learner - Be able to use digital learning effectively	- Be able to self-study	specialized knowledge in inorganic, polymer and organic processing - Be a self-learner
ELO5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	- Demonstrate team work skills - Be able to handle conflict - Be able to work with other people - Present ability to set up tasks/goal	- Be a leader - Be patient - Be responsible - Be self-confident.	-Have a good network - Be self-confident -Have a good interaction	- Have team work skills - Be responsible - Stay focused on work - Be enthusiastic - Be thinking outside the box - Open minded
ELO6. an ability to communicate effectively with a range of audiences, and to communicate in English language.	-Apply English terminologies in chemical engineering technology -Prepare process reports, technical specifications in English	-Have a 550 - TOEIC certificate - Understand English technical report	-Be able to prepare technical report -Be able to communicate in English.	-Have ability to read and understand English technical report -
ELO7. an ability to apply engineering design to produce solutions that meet specified needs in field of the Chemical Engineering Technology with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	-Analyze and estimate problems in the manufacturing process in chemical engineering technology -Select a suitable solution to design or solve problems in inorganic, polymer or organic chemical/materials processing - Be validating impact of engineering solution on economic and environmental factors	-Analyze and estimate problems in the manufacturing process in chemical engineering technology - Be able to design solution in chemical engineering technology	-Select a suitable solution to design or solve problems in inorganic, polymer or organic chemical/materials processing	- Understand a given processing in chemical engineering and affect of different factors on process efficiency -Analyze and estimate problems in the manufacturing process in chemical engineering technology - Be validating impact of solution of solution on economic and

				environmental factors
ELO8. an ability to implement engineering systems in field of the Chemical Engineering Technology.	-Be able to implement tools/ systems to improve process efficiency	-Understand working principle of tools/system of chemical engineering process.	- Connect between theoretical knowledge and a given circumstance -Be able to implement tools/ systems to improve process efficiency	- Select a suitable tools/ systems to improve product quality
ELO9. an ability to operate and manage engineering systems in field of the Chemical Engineering Technology	-Summarize the operation of a given chemical product manufacturing such as paint, plastic, textile, etc… - be able to operate system of a given product - Find and fix errors/problems occurring in the system	-Summarize the operation of a given chemical product manufacturing such as paint, plastic, textile, etc…	- Evaluate the operation of a given chemical product manufacturing such as paint, plastic, textile, etc… - Find and fix errors/problems occurring in the system	- Operate a engineering system of a give product such as paint, plastic, textile, etc… - Find and fix errors/problems occurring in the system

1.5. The programme to show that the expected learning outcomes are achieved by the students by the time they graduate.

The expected learning outcomes (ELOs) are designed based on the Bloom's taxonomy scale and were fully assessed through mid-term tests and final tests of each course throughout all academic years.

An increasing level of the Bloom rate is constructed consistently and appropriately for each semester and each course throughout the training programme. For examples, general courses such as "General Chemistry", "Mathematics", "Physics", etc. will be assigned with low level of Bloom rate as 2 (understanding) whereas for those fundamental courses such as "Inorganic Chemistry", "Organic Chemistry", and "Analytical Chemistry" etc. the Bloom rate of 3 (applying) is applied. After then, the Bloom rate are pushed up to higher levels of 4 (analyzing) and 5 (evaluation) for some fundamental and specialized courses in upcoming semesters as shown in *[Appendix 3]*.

To ensure the achievement of ELOs before graduation, the course contents, the teaching and assessment methods for each course are also periodically reviewed and adjusted after each semesters. Normally, the lecture-based teaching and paper based tests are applied for general and fundamental courses. However, for specialized courses, students are asked to conduct self-study and deliver presentations or essays/reports related to certain specific topic under guidance from lecturers. For those courses related to experiments like "Lab Experiments for Polymer Chemistry, Experiment in Organic Chemistry, Inorganic Chemistry or Analytical Chemistry" etc. the demonstration and visualization-based teaching and the report/ presentation assessment methods are usually used, alternatively, along with rubric-based assessment. *[Exh. 1.12. Samples of paper based exam and experimental based Rubric]*

In addition, the University has also provided necessary supports to help students to achieve ELOs via modern facilities and equipment, well-updated library resources, teaching assistant system, self-study space, learning management system (LMS). Besides, factory tours, internship programmes and other

supportive services such as the students and the enterprise relation affairs are also included. *[Exh. 1.13. List of teaching and learning supported facilities]*

Since the academic year 2019-2020, the University has implemented step-by-step the measurement of achievement for each ELOs in the curriculum with targeting at least 50 % of achievement from the academic year 2020-2021 onward. Following the University regulation, in the academic year 2020-2021, the CET department has also conducted the assessment, targeting at least 60% of achievement for each evaluated ELOs. Each ELOs is assigned with three corresponding pre-established PIs (performance indicator), except for the ELO3 and ELO6 which have four PIs each. Therefore, with 9 ELOs being measurement, there are totally 29 assigned PIs. *[Appendix 5].* An increasing level of ELO achievement is also aimed for upcoming semester. For the second semester in the academic year 2020-2021, 5 ELOs correlated to the total of 15 PIs and 12 correlated courses have been evaluated including the ELO1, ELO2, ELO5, ELO7, and ELO9. The percentages of achievement are calculated based on the number of students who satisfies the requirements over the total number of investigated students. The results show that all examined ELOs are outperformed in which the achievements of 62%, 97%, 77%, 70% and 72% are obtained corresponding to the ELO1, ELO2, ELO5, ELO7, and ELO9, respectively. However, 3 PIs out of the 15 evaluated PIs, including the PI1.1, PI7.1 and PI9.1, failed to achieve the target. It is accounted for the online classes which have been implemented as the alternatives to traditional classes since the widespread of covid-19. The students may find it difficult to immediately adapt to this new teaching and learning approach, especially for those courses which requires lots of exercises and interactions like "inorganic chemistry". Besides, the high level of Bloom's rate (up to 5) which are assigned for these examined courses might be another reason for the failure of the PI7.1 and PI9.1.

Similarly, the PI1.3, PI6.4, and the PI 9.1 in the 1st semester, academic year 2021-2022, and the PI1.2, PI4.1, PI4.3 in the 2nd in the academic year 2021-2022 have failed to achieved the target.

Nevertheless, these preliminary results are strong indicators for the CET programme to adjust its curriculum in upcoming semesters and thereby continuing to improve its quality in education

In details, we plan to:

- Continue to measure the achievement of ELOs with their corresponding PIs for different courses in upcoming semesters
- Assign higher levels of achievement in the next measurements, especially for those PIs exceeding the requirement.
- Continue to adjust the teaching, learning and assessments methods over time, especially to adapt the new circumstance of pandemic. More extracurricular activities such as seminars, workshops, factory tours and illustrated videos would be involved.
- Adjust PIs which fail in the measurement with more appropriate ones

The graduate profiles of the students in the CET programme which are built up throughout academic years can be specified as:

- Be fully equipped with general, fundamental and specialized knowledge and skills related to the chemical engineering and technology.
- Develop the ability of self-studying: willing to learn new knowledge and skills with appropriate strategies in order to adapt well in different working environments.
- Develop the diligent and professional attitudes in working.

2. Programme Structure and Content

2.1 The specifications of the programme and all its courses are shown to be comprehensive, up-to-date, and made available and communicated to all stakeholders.

The ELOs are fully integrated into the curriculum programme and courses *[Exh. 2.1. Curriculum mapping]*. According to MOET requirements, the CET training programme consists of 150 credits, arranged over 8 semesters. Compulsory and elective courses are divided into 3 groups, including: general, fundamental and specialized courses.

The CET programme specification provides core and important information about training programme as follows:

1. Awarding institution: Ho Chi Minh City University of Technology and Education (HCMUTE)
2. Name of final award: Bachelor of Engineering
3. Name of programme: Chemical Engineering Technology
4. Training Degree: Bachelor
5. Programme code: 7510401
6. Training time: 4 years
7. Admission criteria pass the entrance examination
8. Programme objective: 3
9. Expected learning outcomes: 9
10. Programme structure
11. Programme content
12. Curriculum planning
13. Progression points
14. Special features
15. Job opportunities
16. Facilities and infrastructure
17. Date of issue: 01/06/2015
18. Revised and modified date : 01/06/2020

In general, the CET programme specification contains all the necessary information as suggested by AUN-QA and meets all the requirements of the MOET. *[Appendix 1]*

The course specification is standardized throughout the CET training programme through course syllabus. *[Exh. 2.2. Sample of syllabus]*

The structure and content of a standard course syllabus shows all important information, as following:

1. Logo of HCMUTE
2. Name of HCMUTE and faculty
3. Major and training degree
4. Course name by Vietnamese
5. Course code
6. Course name by English
7. Number of credits (theoretical periods/ practical period/ self-study periods)
8. Course lectures
9. Course requirements such as pre-requisite and previous courses.
10. Course description
11. Course learning outcomes (CLOs) and their alignment to the programme ELOs and PIs
12. Detailed content of course (is listed under topics)
13. Teaching methods
14. Student assessment: students are assessed throughout the course by a variety of methods, including individual homeworks, group exercises, presentations, quizzes, midterm test and final exams… In general, grading weight are as follows:
    - Formative assessment 50%: at least three score columns (with or without attendance, presentation, project, mid-term test, etc…). This is assessed actively by the instructor.
    - Summative assessment 50%: oral or written exams, projects, seminars, etc…
15. Learning materials

16. General information: scientific ethics, note for changing, copyright

17. Date of first approval

18. Approver: Writer, HOD, Dean.

19. Revised and modified date

The dean of FCFT and HOD are responsible for internal and external quality assurance. Before each semester, the course syllabi are reviewed and revised by the teaching teams of the course, then approved by the HOD. There are many details that can be revised in the course syllabi, such as: course content, teaching and learning plan, student assessment, learning materials, etc.… The revision of a course syllabus is the result of receiving feedback from many stakeholders such as: academic staff teaching the course in the previous semester, students through the end-of-course surveys, alumni through the surveys after 1 year of graduation, the review observation in class of other lecturers, self-reflection of the lecturers at the end of the semester. *[Exh. 2.3. Feedback for the revision of a course syllabus].*

The specification of CET programme is widely published to stakeholders using a variety of methods. They are posted on the FCFT website so that it can be easily accessed by any interested stakeholders such as lecturers, students, high school students, alumni, employers, enterprises. Besides, they are also included in the poster (via QR Code) in front of the faculty office, in the brochure which is distributed to high school students on the Open Day at HCMUTE or during admission counseling at high schools. Moreover, the trainning programme with specification is communicated to all freshman in the Orientation week of the first semester, in the content of the course Introduction of Chemical Engineering Technology. *[Exh. 2.4. Publish programme specification to stakeholders]* The course syllabi containing lots of important information about the courses and assessment plans are discussed with students in the first lesson and are posted on the Learning Management System (LMS) for students to refer to *[Exh. 2.5. Sample of E-Learning Course].*

2.2 The design of the curriculum is shown to be constructively aligned with achieving the expected learning outcomes.

To ensure the design of a suitable curriculum, HCMUTE issued an ISO procedure to guide the development of a new curriculum and the adjustment of an existing one *[Exh. 2.6. ISO procedure of HCMUTE about the development and revision of the curriculum].* Based on the ISO procedure of HCMUTE for curriculum development and review, each programme must be reviewed periodically at least two years according to MOET regulations. In addition, according to the curriculum revision regulations in 2021, 10% of the specialized courses offered by FCFT can be adjusted annually *[Exh. 2.7. The curriculum revision regulations].*

Head of DCT responsible for designing the curriculum. All lecturers in the DCT contribute ideas to improve the curriculum. Then, the final curriculum was submitted to the Scientific and Academic Committee of FCFT for evaluation and approval.

The Scientific and Academic Committee of FCFT consists of 9 members *[Exh. 2.8. Decision to establish the Scientific and Academic Committee of FCFT].* All of members are Associate Professors or PhD holders. They are responsible for carefully evaluating, recommending, approving or rejecting a new or revised curriculum.

Lecturers of DCT are divided in to 6 teams, including: General Chemistry, Physical and Analytical Chemistry, Process and Equipment, Organic Chemistry, Inorganic Chemistry, and Polymer Chemistry. Each group has a team leader responsible for academics, teaching and assessment.

The examination committee consists of the HOD, the lecturers and the secretary of FCFT. Exam questions and assessment methods are provided by lecturers, appraised by the HOD before being transferred to FCFT to organize the exam. Paper based exams and test results are also managed by FCFT *[Exh. 2.9. ISO procedure of Examination].*

The curriculum is recommended by the HOD. The draft is sent to all academic staff for comments. At the department meetings, lecturers present their views and propose necessary amendments *[Exh. 2.10. The minute of Department meeting].*

Every year, the curriculum is reviewed and re-designed based on the suggestions of lecturers and students at meetings such as department meetings, student dialogue meetings or student feedback at the end of the course *[Exh. 2.11. The minute of the meetings and student feedback].*

The curriculum is implemented by a wide range of stakeholders. After being approved by HCMUTE, the curriculum was transferred to the AAO to upload to the training system. At the beginning of each semester, AAO will release to FCFT a training schedule including the courses that will be taught for each class. The HOD checks the suitability of this schedule, recommends adding or removing courses under the Dean's approval. In the next step, the HOD assigns the lecturers to be responsible for the courses required by AAO. Students will enroll and study appropriate courses based on recommendations from the AAO or individual plans. Lecturers will implement the courses and have a formative assessment using appropriate methods according to the syllabi. FCFT organizes and administers the final exam, in which the exam questions are given by the lecturer under the approval of the HOD.

Table 2.1. The matrix of correlation between ELOs and knowledge blocks.

ELOs	Knowledge block			
	(1)	(2)	(3)	(4)
ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering Technology by applying principles of engineering, science, and mathematics.	x	x	x	
ELO2. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions in field of the Chemical Engineering Technology.	x	x	x	x
ELO3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.				x
ELO4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.				x
ELO5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.				x
ELO6. an ability to communicate effectively with a range of audiences, and to communicate in English language.				x
ELO7. an ability to apply engineering design to produce solutions that meet specified needs in field of the Chemical Engineering Technology with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	x	x	x	
ELO8. an ability to implement engineering systems in field of the Chemical Engineering Technology.	x	x	x	
ELO9. an ability to operate and manage engineering systems in field of the Chemical Engineering Technology	x	x	x	

(1) General knowledge, (2) Fundamental knowledge, (3) Specialized Knowledge, (4) Soft skill, ethic and attitude

ELOs are fully integrated into the curriculum through the courses and supporting activities as shown in *Appendix 3.* The courses of theory, experiment, project, factory visiting, internship, seminar, graduation thesis and other supporting activities are divided into different knowledge blocks such as general knowledge, fundamental knowledge, specialized knowledge, soft skills and attitude, to make sure that the design of each course constructively aligns with the programme ELOs. The matrix of correlation between ELOs and knowledge blocks as shown in *Table 2.1.* Achievements of the ELOs programme are confirmed through the courses and CLOs which are clearly defined in the syllabus. In general, the CLOs of each course are showed in the course syllabus along with the course content, teaching methods as well as student assessment, in order to clearly identify the CLOs students can achieve after completing the course *[Exh. 2.2. Sample of Syllabus].* CLOs need to align with ELOs and are completely measurable through Performance Indicators (PIs) *[Exh. 2.12. Table of PIs].*

ELOs related to knowledge blocks can be obtained through most of theoretical courses such as General Chemistry, Safety and Techniques in Chemistry Lab... (for general knowledge block); Inorganic Chemistry, Organic Chemistry, Physical Chemistry, Polymer Chemistry… (for Fundamental knowledge block); Technology of Plastic manufacture, Technology of Fertilizer, Technology of Detergent… (for specialized knowledge block). Meanwhile, ELOs related to soft skills such as using Lab, data collection and processing, report writing, teamwork, using English, presentation, communication… are achieved through experimental and specialized courses with increasing levels. For example, for the course of Experiment on General Chemistry, the assessment requirement is at the level 2 (Understand) of the Bloom Taxonomy, while for the course of Lab Experiment for Polymer Technology is at level 5 (Evaluate). In addition, most specialized theoretical subjects require students to conduct and report on seminars *[Exh. 2.13. Syllabi related to soft skill].*

ELOs related to ethics, attitudes, and other soft skills are also obtained through extracurricular activities such as factory visiting, workshop, recruitment day, enrollment counseling, Open day, Green Day, Spring Volunteer…

The course of Design Project in Chemical Engineering Technology and Graduation Thesis help students achieve all 9 ELOs with high levels in the Bloom Taxonomy *[Exh. 2.14. Syllabi with high levels in Bloom Taxonomy].*

Teaching and learning methods are selected based on the types of the CLOs, level of learning and are guaranteed to align with the ELOs. For example, to ensure students have communication skills (including written and verbal), activities like group discussions, presentations, asking and answering questions, writing project reports, writing and defending dissertations… are used. Another example is the CLOs related to "experiment" would require experiment skills such as using lab equipment to conduct experiments; using data acquisition systems, hardware and software to collect data; analyzing and interpreting data and preparing professional technical reports.

Assessment methods are also selected based on the content of CLOs. For example, to achieve CLOs "communicate effectively with a range of audiences," lecturers will assess through the presentation of a specific topic and ensure all members in the working team must present, understand and answer audience questions effectively. For the general courses, lecturers use the assessment level 2 (understand) of the Bloom Taxonomy with some common methods such as multiple-choice questions, short answer questions, numerical questions, writing tests, and oral examinations. For the fundamental courses, the assessment is levels 3 – 4 (apply and analyze) of the Bloom Taxonomy with some advanced methods such as problem-solving questions. Finally, the master level of assessment is required for specialized coursers with some special methods such as doing research, solving the technical problems at the Labs and factories.

Teaching and assessment methods aligning with the ELOs are also illustrated in the following example. In order to design a convection drying system, students are required to study a group of courses including Fundamental of Chemical Engineering Design, Mass Transfer Operations, Experiment on Process Equipment, and Design Project of Chemical Engineering which have the CLOs well mapped with ELOs as shown in the *Table 2.2.*

Table 2.2. Contribution of a group of Convection drying system design courses to the ELOs.

Courses	ELO									Teaching Methods	Assessment Methods
	1	2	3	4	5	6	7	8	9		
Fundamental of Chemical Engineering Design	x				x		x	x		- Lecture method - Visualization method - Assign and solve homework	- Regular class attendance - Homework - Pass in formative tests and summative test
Mass Transfer Operations	x			x			x			- Lecture method - Visualization method - Assign and solve homework	- Regular class attendance - Homework - Pass in formative tests and summative test
Experiment on Process Equipment		x			x				x	- Each group has 2-3 students. - conduct experiments at lab. - collect, analyze and interpret data - Prepare professional technical reports.	- Regular class attendance - Report - Question and answer - Weekly short report - Teamwork - Participation in group activities
Design Project of Chemical Engineering		x					x	x		- Each group has 2 students. - Complete a given project	- Report - Question and answer - Weekly short report - Project completion - Teamwork - Participation in group activities - Presentation

2.3 The design of the curriculum is shown to include feedback from stakeholders, especially external stakeholders.

The curriculum design of the CET programme is based on the ISO procedure of HMCUTE *[Exh. 2.15. ISO procedure of HCMUTE about the design of the new curriculum]* in which formation process including survey, result statistics and improvement of external stakeholder contentment and student satisfaction during programme are described step by step.

Indeed, the feedback of stakeholders such as the MOET, professional associations, employers, alumni plays a key role in the HCMUTE progression of the curriculum design and development. In details, the CET programme was first oriented toward the framework of the MOET for the undergraduate programme combined with the CDIO (Conceive – Design - Implement – Operate) model for engineering programme. Then, the FCFT and CET department had conducted many meetings with employers, alumni, lecturers and students through workshops, meeting to propose and implement the ELOs of programme in accordance with the labor market needs. Afterwards, the Scientific and Academy Committee of the FCFT had revised the obtained ELOs to suit all stakeholders *[Exh. 2.16. Meeting minute of the FCFT Scientific and Academic Committee for CET programme formation]*. The procedure of CET programme was summarized in the *Table 2.3.*

As mentioned above, the curriculum of CET programme was established in 2015 with 150 credits. During the operation of programme, the stakeholders' needs, and feedback have been collected throughout many activities such as conference, feedback survey, conversation between faculty members and students, etc. to improve the curriculum. From 2015- 2017, the survey of QAO to

evaluate student's satisfaction with courses and lecturers were performed after the end of each semester. After getting the survey report, the faculty board and HOD discussed with these lecturers about course content, teaching, learning and assessment method to improve teaching quality for the next semesters if necessary. However, the curriculum did not change in this period.

Table 2.3. The procedure of design and formulation of CET programme.

Time	Stakeholder's meeting	Contents
2015	Employers, Lecturers, Alumni, Students	Formulate ELOs of the 2015 curriculum Programme; Develop syllabus according CDIO model.
2015	Lecturers, scientific committee	Revision of ELOs integrated with framework programme of the ministry of Education and Training

In 2018, the credits of CET programme were reduced from 150 to 132 following the decision of HCMUTE for all programmes *[Exh. 2.17. HCMUTE decision about authority of the curriculum with 132 credits]*. Together with credit reduction, opinions of stakeholders such as industry, internal academic staff, experienced academic staff from other universities, and students were collected through workshops and faculty meetings to implement suitable ELOs for the 2018 curriculum. Following the 2018 curriculum formation, the procedure of teaching quality course evaluation is carried on as usual. Moreover, the feedback of stakeholders is frequently obtained to develop the curriculum. In summary, all feedback of stakeholders and curriculum improvement are shown in the *Table 2.4.*

Table 2.4. The correlation between feedback and development of CET curriculum.

Academic year	Stakeholders	Requirements	Fulfillment	Proof *[Exh. 2.18. Development of CET curriculum]*
2016-2017	Lecturers Students	Improve self-learning skills of students	Modification of course assessment method with the increase of seminars/projects	Course portfolio and survey report from QAO
2017-2018	Employers Students	Students need to improve soft-skills	- Addition of Enterprise Collaboration course -Increase of internship time from 4 to 12 weeks	Curriculum 2018 and 2015
	Employers Alumni Lecturers	Enhance interdisciplinary knowledge of student	Add the Environmental Technology course into the curriculum	
	Lecturers	Decrease amount of credits: -Integrate knowledge amongst related course - Improve self-learning ability of students	Combination of Experiment in Analytical Chemistry and Experiment in Instrumental Analytical Methods course	
	University	Improve self- study ability of students	Approval of Massive Open Online Courses (MOOC)	Decision of MOOC approval

2018-2019	Employers Lecturers Students	Students and need to increase English skill to enhance career opportunities, self-learning ability	Add English course and upgrade teaching and learning quality of English course	2021 curriculum
	Employers Alumni	Students should be improved communication skills	Increase of internship time from 4 to 12 weeks	Internship evaluation of employers
2019-2020	Students Lecturers	Students need to improve fundamental knowledge	Addition of Heat Engineering course	The 2021 Curriculum
2020-2021	Employers Alumni Lecturers	- Increase English skills, soft-skills. - should be introduce and update knowledge and practice in modern analytical methods	- Addition of English courses - Add the Experiments for Modern Analysis Methods course in the curriculum.	

2.4. The contribution made by each course in achieving the expected learning outcomes is shown to be clear.

The ELOs are constructively aligned between each course and the CET programme to ensure that each programme ELO is sufficiently supported by a number of courses throughout the training period. *Appendix 3* clearly defines the correlation between the programme ELOs and supported courses. Even though the same ELOs were assigned, the requirements for each supported courses are different in terms of the level of Bloom's rate. For example, general and fundamental courses which are mainly held in early semesters are usually assigned with low levels of Bloom's rate. Meanwhile, in later semesters, for specialized courses, the higher levels of Bloom's rate are applied.

For examples, for the group of courses in "organic chemical and technology," students are required to participate in "organic chemistry" course in the 2nd semester which provides students with fundamental knowledge as a prerequisite course. After that, the "experiment in organic chemistry" course which is arranged in the 3rd semester equips students experimental and problem-solving skills as a reinforcing course. Following this, the course "Fragrance Science & Technology" as a specialized course in the 6th semester is to equip students with practical knowledge and modern technology that helps them get ready to enter the workforce later. The assigned ELOs for these courses with increasing requirements for knowledge and skills are summarized in *Table 2.5.*

Table 2.5. Contribution of a group of courses related to organic chemistry.

Courses	Expected Learning Outcome								
	1	2	3	4	5	6	7	8	9
Organic Chemistry	x			x			x		
Experiments in Organic Chemistry		x	x			x			
Fragrance Science & Technology	x					x	x		x

2.5. The curriculum to show that all its courses are logically structured, properly sequenced (progression from basic to intermediate to specialised courses), and are integrated.

Generally, the CET programme of total 150 credits is logically distributed into 4 academic years with total 8 main semesters. In order to fulfill all established POs and to help students approach necessary knowledge and skills conveniently, the whole programme is divided into three main knowledge blocks including the general courses, the fundamental courses, and the specialized courses. The purposes of each course blocks in the CET programme are logical designed and summarized as following:

-The general course block: provides students with basic knowledge in natural and social science as well as a first overview of the CET field. This block is considered as a preparation step for further study.

-The fundamental course block: provides students with fundamentals knowledge and skills in the field of CET, for examples, chemistry-, machine/ processing-, and experiment-related subjects. These courses help students to adapt well with different working environments and to prepare themselves for specialized courses.

-The specialized course block: equips students with core and practical knowledge and skills for specific majors, depending on students' interests and the needs of society and labor market.

In details, the general course block with 63 credits occupies 42.0 % of the whole programme. The fundamental course block (38.7 %) is divided into theoretical courses of 43 credits (28.7 %) and practical courses and internship courses of total 15 credits (10.0 %). The specialized course block of total 29 credits (19.3 %) comprises of compulsory and elective courses of 19 credits (12.6 %) in which 16 out of 19 credits (10.6 %) are assigned to the specialized theoretical courses and 3 out of 19 credits (2.0 %) are for specialized practical courses. Lastly, the specialized courses related to graduation thesis are of 10 credits (6.7 %). For the graduation thesis, students can choose either doing research in laboratories at HCMUTE or other research institutes or participating in projects related to machine/factory design. The pie charts in *Figure 2.1* and *Figure 2.2* exhibit the correlation between different course blocks.

Moreover, the CET programme is also benchmarked with other programmes from different universities in Vietnam in term of the proper balance and coherence of different knowledge blocks as described in *Figure 2.3.*

In addition to compulsory courses which are mostly applied for general course block, the CET programme has also provided elective interdisciplinary, specialized, and practical courses. Therefore, students are flexible to plan their own study by choosing alternative and equivalent courses of their interests.
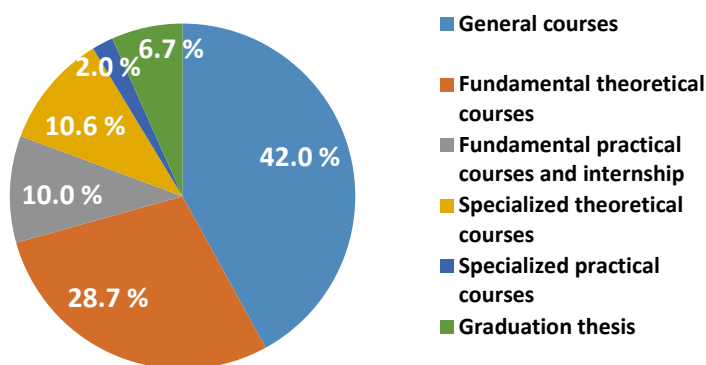
Figure 2.1. The percentage values of general, fundamental and specialized courses.
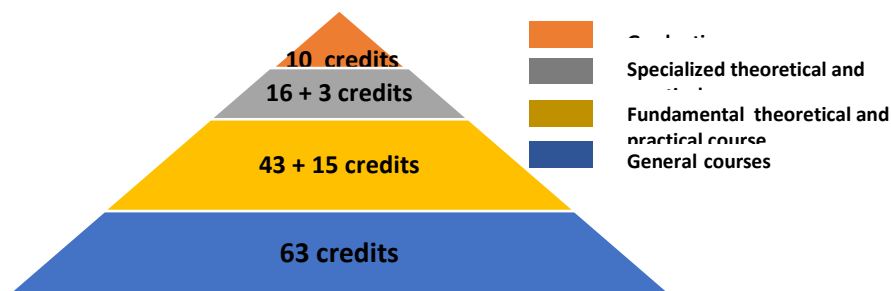
Figure 2.2. Distribution of credits in different course blocks in the CET programme.

Regarding the curriculum sequence, the CET programme with total 150 credits is logically arranged in 8 semesters with increasing levels of difficulties and requirements for knowledge and skills from

the 1st to the 7th semester whereas the last semester is for graduation thesis. However, students are allowed to extend up to 8 years to finish their degrees. Besides, in order to shorten the training time, students are also flexible to plan their own study schedule in each semester or participate in summer semesters.

Rate (%)
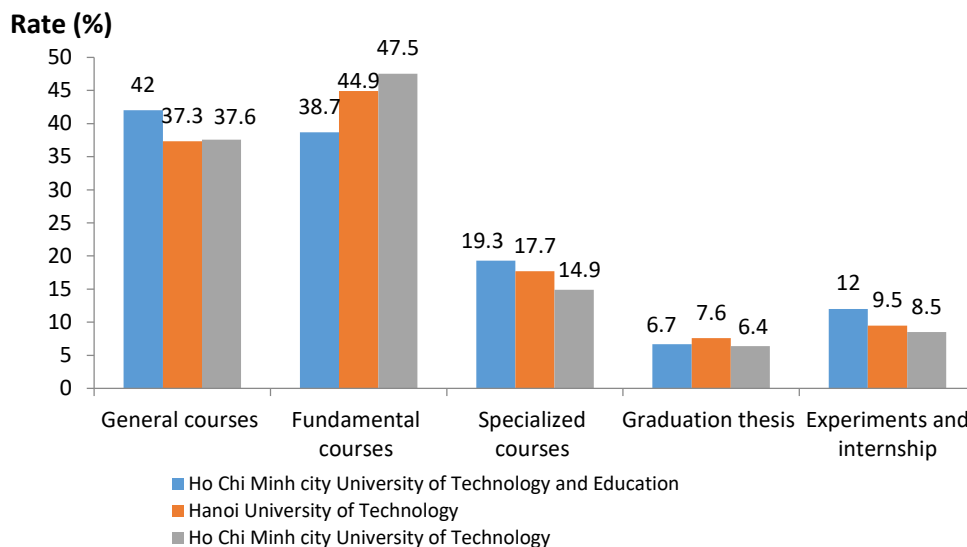
Figure 2.3. A comparison in the distribution of different course blocks of different CET programmes.

In details, students are required to take general and orientation courses mostly in the first two semesters which are related to physics, math's, chemistry, politics, informatics, etc. These courses are to equip students with basic knowledge and background that any engineering graduates need to have. Besides, the "Introduce to the Chemical Engineering Technology" course in the 1st semester also provides students soft skills and a first overview of the CET programme. From the 2nd to the 5th semesters, the CET programme is built up with mostly fundamental courses such as "Analytical Chemistry", "Organic Chemistry", "Mass Transfer Operations" etc. These fundamental courses aim to provide students with fundamental knowledge and skills related to the CET field which also help students to adapt well in different working environments in future. These courses are also to prepare students for specialized courses later. The specialized courses are divided into compulsory and elective specialized courses which are mostly arranged in the 5th to the 7th semesters. The compulsory specialized courses including "Electrochemistry technology", "Technology of inorganic substances", and "Technology of organic substances" are to reinforce students with general core knowledge and skills in the CET field. Moreover, students are also allowed to follow minor specializations from the 6th semester onward including "Specialization in inorganic chemical technology", "Specialization in organic chemical technology" and "Specialization in polymer chemical technology" via elective specialized courses. The elective specialized courses provide students practical knowledge and skills in minor specific technology such as "Ceramic technology", "Fragrance science and technology", "Technology of plastics manufacture", etc. that prepare them to enter real workforces at factories or enterprises in future. At the 7th semester, students are also oriented to choose one specialized experimental course which is correlated to their major although it is not compulsory.

All these general, fundamental, and specialized courses are to support the final graduation thesis which is held in the last semester. The graduation thesis requires students to work in specific projects to solve practical problems related to CET field. To accomplish it, students must manipulate all knowledge and skills that they have obtained in earlier semesters. *[Exh. 2.19. Sample of a graduation thesis]*

Besides, the CET programme also pays much attention to enhance the self-studying abilities and interest for life-long learning of students via "Enterprise collaboration", "Design project of chemical engineering" courses, or internship programmes. In summary, the curriculum at the CET department

is logically sequenced with coherence and seamless relationship of different knowledge blocks at various academic semesters as described in *[Appendix 6].*

Based on the ISO procedure released by HCMUTE, the CET programme need to meet all requirements from stakeholders and being revised periodically every two years to ensure it is up-to-date. Therefore, the current CET programme with 150 credits is based on the programme which has been built up since 2015 with the major revision in 2018 after receiving responses from stakeholders on soft skills related to presentation, problem-solving, English proficiency, and self-studying ability *[Exh. 1.8. Minute of conference between faculty and stakeholders for revision of ELOs and curriculum of CET programme; Exh. 1.9. Minute of a semesterly meeting between faculty and students for revision of ELOs and curriculum of CET programme; Exh. 1.10. Report on the teaching activities of the lecturer].* Compared to the programme operated in 2015, the current programme has integrated 6 more credits for interdisciplinary courses as alternatively elective specialized courses that enable students to flexibly plan their own study. Along with the approval of MOOC courses and the "Enterprise cooperation" course altogether help enhance the students'interest for self-studying and thereby developing the life-long learning ability. In addition, the ELOs, course content, teaching and assessment methods for each course are also annually modified to remove overlapping contents and to help student to develop necessary soft skills to the most. For example, to accomplish requirements for the "Design project of chemical engineering" course, students must manipulate integrated knowledge and skills from various courses related to chemistry-basics, machine, and process design in earlier semesters.

2.6. The curriculum to have option(s) for students to pursue major and/or minor specialisations.

To improve the career opportunities for graduates in the future, at the 6th semester, students are oriented to pursue minor specializations after finishing some compulsory specialized courses in the 5th semester. The CET programme currently has three minor specializations including: "Specialization in Inorganic chemical technology", "Specialization in Polymer chemical technology" and "Specialization in Organic chemical technology". The minor specializations are selected based on the student's aspirations and GPA. After that, at the 7th semester, students also need to choose a specialized experimental course which occupies 2 credits. Although it is not compulsory, students are oriented to choose the course which is mostly correlated to their major. For example, students with major in inorganic chemical technology will likely to choose the "Specialized experiments in inorganic chemical technology" course. Especially, if students wish to shift to other majors, there are three sets of interdisciplinary elective courses correlated to environment, food technology, and economy for their choice. Each elective specialized courses in each majors is carefully chosen in order to meet all demands from stakeholders to the best. For example, the courses in the Specialization in "Polymer chemical technology" group are related to key industrial fields in Vietnam such as Polymer composite materials, Technology of plastics manufacture, Rubber technology, Techniques of polymer processing, Technology of paint.. Although, at the 5th semester, students start to choose their interested major; however, the advisory and orientation activities have been initiated much earlier throughout the "Introduction to Chemical Engineering Technology" course, "Enterprised collaboration" course, annual orientation meetings as well as notification on FCFT website. Moreover, students can also ask for consultants from instructors personally.*[Exh. 2.20. Major specialized orientation for students].* In addition, the University also encourages students to take certain courses correlated pedagogy which could expand their career opportunities in future.

2.7. The programme to show that its curriculum is reviewed periodically following an established procedure and that it remains up-to-date and relevant to industry.

In general, the procedure for reviewing the programme is sequentially divided into 5 main stages *[Exh. 2.21. Process for reviewing curriculum].* First at all, the AAO set up plan for programme review. The Faculty Board and Scientific and Academic Committee then arrange workshops, survey

as well as department meeting to get the feedback on the compatibility curriculum and labor market needs; students' and lecturers' satisfaction *[Exh. 2.22. The data from stakeholders for reviewing the programme]*. After collected and analyzed feedback, ELOs of programme are adjusted. Subsequently, the revised curriculum is sent to faculty members, experienced lecturers from other universities and industry such as employers, alumni to check again. Afterwards, the final revision of curriculum is approved by the HCMUTE Vice President and published on the FCFT website. Stakeholders are informed every modification of the programme by email or through website of the faculty *[Exh. 2.23. Notify CET programme to stakeholders]*.

Until now, there are two main revisions of ELOs' programme in comparison with the first version built in 2015. In 2018, the CET programme added 6 credits of interdisciplinary subjects to increase flexible learning and major choice of students (shown in the *Table 2.4*); approved of Massive Open Online Courses (MOOC) to improve self-learning ability of students; integrated Enterprise Collaboration course added into the curriculum to enhance soft skills and career competencies of students and increase of internship time from 4 to 8 weeks in the 7th semester. Then, the current version of CET programme has integrated English courses, Heat Engineering and Experiments for Modern Analysis Methods courses in 2020 due to the stakeholders' feedback *[Exh. 1.8. Minute of conference between faculty and stakeholders for revision of ELOs and curriculum of CET programme]*.

In 2018, the 132-credit programme was applied for students who enrolled in 2018 and 2019 academic year; however, programme credits were upgraded from 132 to 150 in 2020 due to MOET requirements for engineer programmes. Therefore, the CET programme was also revised to adapt for credit increase. A comparison of the CET programmes in 2015, 2018 and 2020 is shown in *Table 2.6*.

Table 2.6. Comparison of CET programmes in 2015, 2018 and 2020 in term of different knowledge blocks.

	2020		**2018**		**2015**	
	Credits	%	Credits	%	Credits	%
General courses	63	42.00	51	38.64	55	36.67
Fundamental theoretical courses	43	28.67	44	33.33	52	34.67
Practical course and internship	18	12.00	14	10.61	16	10.67
Specialized courses	16	10.67	16	12.12	17	11.33
Graduation thesis	10	6.67	7	5.30	10	6.67

Moreover, during the review of ELOs, we also referred to other chemical engineering programmes in Vietnam and abroad such as those from VNUHCM University of Technology (Vietnam), National Taipei University of Technology (Taiwan), University of Edinburgh (Scotland), University of South Alabama (USA) and University of Texas at Austin (USA) *[Exh. 2.24. Benchmark between CET programme and other Programmes]*. Besides, about 10% of the academic programme can be changed every year; however, this modification needs to have the agreement of Scientific and Academic Committee of the faculty. Additionally, the programme revision has to be performed each two years, based on stakeholders' needs.

Indeed, employer and alumni's feedback is the most important in the curriculum review procedure. In particular, the FCFT selects and invites prominent specialists in chemical, environmental and food industry in order to build an Industry Advisory Committee of all programmes belonging to the FCFT *[Exh. 2.25. Decision on establish the Industrial Advisory Committee of FCFT]*. Actually, this committee provides useful contribution for designing and reviewing process of the curriculum through workshops and evaluation of student's internship. Besides, the thesis examination committees of the CET department also consists of the members from the industry. Furthermore, many companies have strongly supported CET students in many aspects such as job training in real condition, evaluation of student performance, accommodation, stipend during internship in the 7th semester. Moreover, the FCFT established the alumni association that provides the great connection

between the employers and faculty to give more opportunities for students such as internships, scholarships, and job opportunities.

Course review process is based on CLOs achievement and its contribution to ELOs. Specifically, course syllabi including outline of course content, teaching and learning plan, assessment plan and method as well as references are published on the website at the beginning of each semester. During each semester, lectures on the subject and assessment results are presented in e-portfolio; moreover, the faculty coordinated with the AAO and the QAO to get feedback from students about the courses and lecturers through http://online.hcmute.edu.vn. At the end of each semester, the department in charge organizes a meeting to get lecturers' opinions about student attitudes and course assessment results of each course. The feedback from surveys and meetings was then recorded and sent back to the Vice Dean in charge training, HOD and lecturers to help them boost teaching and learning methods, and course assessment in the next semester, in order to achieve CLOs and ELOs.

3. Teaching and Learning Approach

3.1. The educational philosophy is shown to be articulated and communicated to all stakeholders.

The HCMUTE's educational philosophy stated as "Humanity, Creativity, Integration" is the guideline for the teaching and student assessment at HCMUTE and FCFT. The CET programme is constructed to train Chemical Engineers to gain fundamental and professional knowledge, achieve activeness and creation, solve practical issues, develop careers, and become valuable and responsible citizens for social development. The educational philosophy is disseminated on the websites of HCMUTE and FCFT, and on on-campus banners *[Exh. 3.1. Publishing the educational philosophy of HCMUTE].* All lecturers fully understand the philosophy and are often reminded during meetings with the faculty and the university board. The students are introduced to the philosophy by lecturers in the Admission Ceremony the CET students, in the course of Introduction to CET, and in the Dialogues between the Faculty and students *[Exh. 3.2. Activities to articulate HCMUTE's educational philosophy]*

"Humanity" was realized in the constructive alignment of teaching and learning activities in the CET programme to promote the learning process. The learner-centered approach is used for the teaching activities to help students acquire firm fundamental knowledge and develop necessary skills and self–awareness. Students are stimulated to share their difficulties and support lecturers and classmates when they have learning issues. Significantly, the sharing and accompanying have become a tradition of lecturers and students in FCFT, which is spread in the event "Admission Ceremony of Chemical Engineering Technology" *[Exh. 3.3. Activities to support students].*

"Creativity" was utilized during the programme by diverse teaching and learning methods, such as presentation, discussion, teamwork, projects, workshops, and extracurricular activities such as the academic competitions "Chemistry and Applications", "Eureka", "Scientific research for students", Chemistry Olympiad. Through this, students learn to analyze, evaluate, and solve technical problems from simple to complicated levels. Additionally, students become active, creative, well-planned, and develop their leadership. The effective employment of teaching means and online training systems promote students to develop their skills, creation, responsibility, and lifelong learning.

"Integration" in teaching, students can participate in international competitions and student exchange programmes that encourage them to learn foreign languages and integrate into the world. In CET courses, the latest knowledge is continuously updated to match the development of society and the world. Some courses such as graduation practice, enterprise collaboration, and seminars give opportunities for students to learn knowledge and experiences from experts. *[Exh. 3.3. Activities to support students].*

3.2. The teaching and learning activities are shown to allow students to participate responsibly in the learning process.

The various teaching methods that support students to obtain the programme ELOs are shown in *Table 3.1.* For instance, to achieve the ELO5 relating to teamwork, some courses such as lab

experiments, graduation practice, and theoretical subjects are performed with group-based and project-based teaching and learning methods such as presentations, group discussions, video reports, and small projects. For ELO2, which is related to the ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions, the teaching methods involve lab works, presentation, discussion, demonstration, and reports with rubric evaluation. To achieve ELOs, students need to take responsibility for their learning such as: attending classes on time and regularly, being prepared for classes with all necessary supplies, and completing all lab reports and homework. In particular, students need to know how to plan, follow the work schedule, search documents to solve problems and implement engineering systems. Moreover, students' feedback on the subject is collected and helps teachers understand students' aspirations and opinions so that teachers can change teaching methods accordingly. *[Exh. 3.4. Teaching method and Responsibilities of students].*

Table 3.1. Some assessment methods relevant to ELOs.

ELOs	Teaching methods	Responsibilities of students
ELO1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	- Presentation - Discussion	- Attending classes on time and regularly - Being prepared for classes with all necessary supplies - Taking good care of school property - Completing all homework assignment
ELO2. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	- Presentation - Demonstration - Visualization - Large exercise	- Attending classes on time and regularly - Being prepared for classes with all necessary supplies - Completing all practical reports - Organizing their time well - Reading regularly
ELO3. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in the global, economic, environmental, and societal context	- Presentation - Discussion - Large exercise -Project-based learning	- Attending classes on time and regularly - Being prepared for classes with all necessary supplies - Completing all practical reports - Organizing their time well - Reading regularly
ELO4. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	- Presentation - Discussion - Large exercise -Project-based learning	- Attending classes on time and regularly - Being prepared for classes with all necessary supplies - Completing all practical reports - Organizing their time well - Reading regularly
ELO5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	- Project - Video - Case study - Report	- Attending classes on time and regularly - Complete work on schedule - Organizing their time well

ELO6. An ability to communicate effectively with a range of audiences and to communicate in foreign languages	- Presentation - Discussion - Report	- Attending classes on time and regularly - Complete work on schedule - Organizing their time well
ELO7. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	- Large exercise -Discussion - Project - Visualization - Project	- Attending classes on time and regularly - Complete work on schedule - Organizing their time well
ELO8. An ability to implement engineering systems	- Large exercise - Graduation project - Report	-Attending classes on time and regularly - Being prepared for classes with all necessary supplies - looking for suitable references - Complete work on schedule - Organizing their time well -
ELO9. An ability to operate and manage engineering systems	- Large exercise -Project-based learning	- Organizing their time well - Reading regularly - Complete work on schedule - Completing all reports

Every theoretical course is carried out both offline and online. The online classes are well designed with learning resources and various teaching and assessment activities that help students be flexible in learning and doing assignments (https://utexlms.hcmute.edu.vn/).

The well-equipped system of information technology and good facilities at FCFT support the learning and teaching to achieve high effectiveness. In particular, classrooms are equipped with LCD monitors and speakers. WiFi is widespread in the central building, library, and self-study areas to facilitate document searching and online communication. Additionally, CET students learn in an active and supportive learning environment with various activities, including open technical space (labs), extracurricular activities, enterprise collaboration, specialized trading fairs, talking with businessmen, employment consultation, and academic seminars of the faculty and department *[Exh. 3.5. Activities to support teaching and learning processes]*.

3.3. The teaching and learning activities are shown to involve active learning by the students.

The practical training courses are mandatory to train engineers to solve the practical challenges of science and technology, as well as develop their careers. These courses account for 25 credits (16.7%), including courses of lab experiments, graduation practice, and graduation thesis. Moreover, the experience activities, group work, enterprise collaboration, and social activities are also held in parallel with the learning activities *[Exh. 3.6. Syllabi of practical courses]*

The practical training activities help students get familiar with lab experiments, practical working in enterprises, know how to use instruments, and solve practical issues. These activities create a strong foundation for developing students' careers and allow enterprises to employ qualified employees who possess firm knowledge, activeness, and creativity *[Exh. 3.7. Activities of practice/experimental courses]*

Students can be also partially or fully supported to do research and research-based learning through the HCMUTE scientific research fund. By doing the research, students develop independent thinking and reflective learning. Furthermore, to increase students' learning motivation and promote their curiosity besides doing research in the university, lecturers also guide students to participate in contests such as Chemistry Olympic, Eureka, Chemistry and Application, where students' creative thinking is stimulated and fostered *[Exh. 3.8. Student research and contests]*.

The enterprise collaboration and workshops give students the opportunities to converse and exchange with experts, approach the working cultures, and learn skills for employment. These activities stimulate the student's passion and orient their suitable career *[Exh. 3.9. Activities of enterprise collaboration]*

Participation in social activities helps students to widen their relations with more people, develop their teamwork skills, and support others to deal with problems. The organizers train and assess students with a social activity grading. The students of FCFT are active in participating in social activities such as the production of hand sanitisers during the Covid-19 pandemic, supporting high school STEM, organizing the "Chemistry and Applications" competition, participating in the Spring Volunteer Campaign and the Summer Volunteer Campaign, helping high school students in their admission *[Exh. 3.10. Activities to improve interpersonal and social skills].*

Students can participate in student exchange programmes with universities in Indonesia, Thailand, and Taiwan or conduct graduation theses at enterprises. In addition, students were encouraged to register for MOOC courses (general chemistry, organic chemistry, chemical safety and lab technique) and get certificates *[Exh. 3.11. Activities of student exchange programmes].*

However, the practical activities still meet some challenges. For example, the enterprises are normally located in places far from HCMUTE, causing students difficulty travelling and dwelling. Besides, enterprises are usually not willing to share technical secrets, thus restricting the student's learning.

3.4. The teaching and learning activities are shown to promote learning, learning how to learn, and instilling in students a commitment for life-long learning (e.g., commitment to critical inquiry, information-processing skills, and a willingness to experiment with new ideas and practices).

Teaching and learning activities in courses of the CET programme aim to provide students with the necessary capabilities to promote life-long learning including the 8 key competencies according to the European Reference Framework: Communication in native languages; Communication in foreign languages; Competence in mathematics, science and technology; Digital competence; Learning to learn; Social and civic competences; Sense of initiative and entrepreneurship; Cultural awareness and expression.

Communication skills in the mother tongue are forged through written lab reports, essays, and verbal presentations. Students are instructed on how to write formal emails in the course Introduction to CET. Besides, HCMUTE organizes workshops for students on how to write a CV and answer questions in job interviews *[Exh. 3.10. Activities to improve interpersonal and social skills].*

Communication in foreign languages, especially English, is of critical importance for future engineers. First-year students must take the entrance English test to determine their present level of English competency and to plan their future studies to acquire the HCMUTE graduating requirements (TOEIC 550 or equivalent certificates). Without a certificate proving a high competency in English, students must complete 12 credits of English (4 courses). Moreover, students have to read materials in English in most courses over 4 years of education in the CET program, such as General Chemistry, Organic chemistry, Physical chemistry, etc. *[Appendix 1]* and *[Exh. 3.12. Decisions related with English requirements for students].*

Competence in mathematics, science and technology is ensured by 42% of coursework (63 credits) in the CET programme. Firstly, students are provided with fundamental courses including Mathematics (9 credits, 3 courses), Physics (6 credits, 2 courses), Chemistry (34 credits, 16 courses), Electrical engineering (3 credits), Technical Drawing (3 credits) and courses related with many other areas including Applied Mechanics, Mechanism of Fluid, Thermal Engineering, Mass-transfer Process and Equipment, Heat-transfer Process and Equipment, Mechanical Process and Equipment, Statistics and Experimental design in chemical technology. Thanks to such a wide range of fundamental courses, students in the CET programme could easily adapt to several industries and further take Master's degrees in Material Technology, Food Technology and Environmental Technology. *[Appendix 1].*

Digital competence is firstly introduced in the course of Advanced Office Information Technology, where students practice different software for office work, data analysis and technical drawing. The skills introduced in this course are then periodically practised when students prepare lab reports, essays, presentations, projects and graduation thesis. The UTE Library often organize seminars and workshops to instruct students to find information and literature on the Internet. Moreover, all courses in UTE are accompanied by LMS, which helps students use digital technology in education *[Exh. 3.13. Activities to enhance digital and leaning-to-learn competence of students].*

Learning to learn is a critical skill for life-long learning. In specialization courses, students are frequently given topics to compose essays on modern technologies, which require their capacities of searching, analyzing and synthesizing information. In courses such as Introduction to CET, Experiments in Inorganic chemistry, and Laboratory techniques and Chemical safety, students also learn by making paper models, and video clips about experiments or safety situations in the lab. In the 6th term, each student has to do equipment and process design under the guidance of a supervisor, who helps him/her develop reflective learning by a series of actions of stating problems, analyzing data, suggesting solutions, testing ideas and learning from failures.

Almost all graduation theses in the CET program are research-based, hence requiring students to educate themselves in literature survey, experiment design, lab works, data analysis and result evaluation. All these research works help students to explore new knowledge by themselves and learn by doing research.

The LMS and MOOCs of HCMUTE help students get acquainted with a modern way of learning in a flexible manner, where they can study the materials, do online homework and self-evaluate.

To improve *social and civic competencies*, students in HCMUTE have to take part in social and cultural activities and be evaluated by Training Scores and Social Activity Scores. Students would gain these Scores when they participate in volunteer activities, help organize activities of HCMUTE, the faculties, or the Youth Union, and take part in seminars about laws. For example, every year students participate in Spring Volunteer Campaign and Green Summer Volunteer Campaign during spring and summer vacations to help poor communities. Besides students can take part in the National Exam Support Campaign to help and guide examinees coming to HCMUTE from different provinces.

Sense of initiative and entrepreneurship is introduced to students in the course Leadership and Entrepreneurship in Engineering. During four years of education, students have to complete 4 seminars presented by entrepreneurs, go sightseeing in factories and do Graduation practice in companies or factories. The sense of initiative is also shown in the Graduation Thesis, where students take the initiatives to solve a series of problems encountered during the 6 months of the thesis *[Exh. 3.14. Activities building entrepreneurial mindset].*

To promote *cultural awareness and expression*, CET students frequently take part in musical events and contests. The Youth Union and The Student Association of HCMUTE annually organize activities such as tributing the heroes of Vietnam, giving presents and supporting children in orphanages and raising subscriptions for people in flood zones *[Exh. 3.10. Activities to improve interpersonal and social skills].*

3.5. The teaching and learning activities are shown to inculcate in students' new ideas, creative thought, innovation, and an entrepreneurial mindset.

There are 5 laboratories to support CET students in realizing their novel and creative ideas in scientific research and graduation thesis. Students can do scientific studies since their first year in HCMUTE with financial support from HCMUTE and facility support from FCFT. Research with good results can be rewarded by HCMUTE and chosen to take part in the student scientific contest Eureka. Moreover, the FCFT annually organizes three contests for their students: Chemistry and Applications, Green Environment and Safe Food, and Product Development. Students can participate in groups to show their talents and creative ideas for new products. *[Exh. 3.8. Student research and contests].*

In the course Introduction to CET, students can work in teams and make models of chemical technologies. In the course of Specialized Experiments, students can do a small project in 2-3 lab

sessions. Some teachers applied the project-based approach in lab courses to promote the creative thinking of students. In these courses (Experiments in Physical Chemistry, Experiments in Instrumental Analyses, Organic Specialized Experiments), the lecturer's research methods and objects are used in the experimental works. On the other hand, the results of scientific studies done by CET lecturers are incorporated in theoretical courses, such as Medicinal Chemistry, Advanced Inorganic Materials, Electrochemical Technologies, and Physical Chemistry *[Exh. 3.7. Activities of practice/experimental courses].*

The project on equipment design in the 6th term and the graduation thesis in the 8th term are chances for students to try, explore and realize their creative thinking and innovation to solve technical and practical problems. In these activities, students are guided and supervised in literature surveys, designing and conducting experiments, analysing data and suggesting novel solutions. The topics of the graduation theses are usually the research topics of the CET lecturers-supervisors, therefore students have access to actual research methodology and modern analytical equipment. Some studies and graduation theses were conducted to solve practical problems in Provincial Research Projects and won international prizes *[Exh. 3.10. Activities to improve interpersonal and social skills].*

Students get familiar with the entrepreneurial mindset in several courses taught by lecturers-entrepreneurs, such as in the courses Aromatizers, the Process and Equipment for Thermal Transfer, and Organic Specialized Experiments. In the Graduation internship, students have a chance to work in companies, hence becoming familiar with the actual business environment and gradually inculcating the entrepreneurial mindset. After the Graduation internship, some students were asked to continue their work at the companies to solve their technical and technological problems as a part of the Graduation theses *[Exh. 3.10. Activities to improve interpersonal and social skills].*

The entrepreneurial mindset is also transferred to CET students through the series of 6 seminars presented by managers of companies. In these seminars, the students learn about the required characteristics of entrepreneurs, their mindset of accepting risks in solving practical problems in society, how to commercialize a new product etc. In the CET programme, basic knowledge of Economics and management is taught in the courses Introduction to Quality Management, Economics, Introduction to Administration, and Working Skills in Technical Environment.

In the 2020-2021 academic year, the Center of Innovation and Entrepreneurship organized the HCMUTE Real Star-up for all students. Besides, HCMUTE also built the Idea Café, HCMUTE MakerSpace and UTE Ecosystem of Innovation and Entrepreneurship to support students in realizing their innovative ideas and starting-up *[Exh. 3.14. Activities building entrepreneurial mindset].*

3.6. The teaching and learning processes are shown to be continuously improved to ensure their relevance to the needs of industry and are aligned to the expected learning outcomes.

HCMUTE follows several ISO procedures to ensure the quality of teaching and learning, including evaluations of internal control, inspections of teaching activities according to the regulations, and peer review to improve teaching quality *[Exh. 3.15. ISO procedures related with teaching and learning].*

For every half of the education cycle (2 years), HCMUTE organizes a conference to collect surveys from stakeholders (companies, lecturers, alumni and students) to give opinions about the obstacles and how to improve the courses and the CET programme. Besides, the CET department also sends online surveys to alumni for feedbacks about difficulties in their work and how the CET programme and courses can be changed to help future chemical engineers. The quality of future chemical engineers is also evaluated by the feedbacks from the companies in which the students work for their graduation internship *[Exh. 3.16. Feedbacks from stakeholders].*

Based on all these feedbacks from the stakeholders, HCMUTE, FCFT and CET department decide all necessary changes in the CET programme structure and the teaching and learning methods to improve the extent of ELO achievement by future chemical engineers and to meet the requirements of the industry. As the result of the demand for continuous self-education from industries, UTE now

allows students to complete high-quality MOOCs of UTE and other universities to replace the traditional in-class courses *[Appendix 1].*

The syllabi are composed and improved continuously according to the PDCA (Plan-Do-Check-Act) cycle. Firstly, the lecturers of each course with the CET department CLOs with suitable expected PI that correspond to 3-4 ELO. After building the course contents that support attaining the suggested CLO, appropriate teaching and assessment methods were *planned* and claimed in the syllabus. Second, the lecturers *do* all the teaching and assessing activities following the syllabus. *[Exh. 3.17. Alignment between syllabus, learning-teaching activities and assessments].*

During the course, the lecturers *check* the progress of students, their strengths and weakness using different assessment techniques (rubrics, quizzes, Q&A, etc.) and adjust the teaching plan accordingly. For example, the lecturer can slow down the teaching pace for difficult content, give more explanation and demonstration of abstract concepts, and tutor weak students. Senior colleagues may *check* and give constructive feedback to help less-experienced lecturers in improving their lessons. The students can also give their opinions and suggestions for improvement in the survey after the course, as well as in the Conversations with the FCFT and HCMUTE administration about teaching and learning problems, infrastructure and needed supports. After every term, each lecturer has to complete their e-portfolios, where they summarize the PI of the students, the feedbacks from the peers and the students to adjust the teaching process. *[Exh. 3.18. Activities facilitating continuous improvement].*

Moreover, to improve the teaching methods, lecturers participate in many pedagogical courses which are hosted by HCMUTE or international corporation programmes (mostly funded by USAID and Intel Vietnam) such as Higher Engineering Education Alliance Programme (HEEAP), Vocational University Leadership Innovation Institute (VULII), Connecting the Mekong through Education and Training (COMET) or Build University-Industry Learning and Development through Innovation and Technology (BUILD-IT). Besides, lectures have observed and learned teaching methods at foreign universities in America, Finland, and India *[Exh. 3.19. List of workshops for Pedagogical Methods and Quality Assurance]*

4. Student Assessment

4.1. A variety of assessment methods are shown to be used and are shown to be constructively aligned to achieving the expected learning outcomes and the teaching and learning objectives.

The assessments of CET students start with the entrance exam, then continue with formative and summative assessments in courses, and finish with the graduation thesis to evaluate the achievement of the ELOs of CET programme.

The CET students are enrolled annually based on their results from National High School Exam with the subject combinations including Mathematics, Physics, Chemistry (group A00); Mathematics, Chemistry, Biology (group B00); Mathematics, Chemistry, English (group D07); Mathematics, English, Combined Fundamental Science (group D90). Alternatively, candidates who graduated from high school can be directly enrolled based on their high school transcripts. Especially, to attract good students to HCMUTE, the admission process offers priorities to students with high achievements in national academic competitions, learning records, aptitude exams, IELTS, and International SAT Certificate. *[Exh. 4.1. Student enrollment scheme]*

English proficiency is a critical requirement for any engineer, freshmen at UTE are tested for English proficiency to classify their English capacity. Based on the results, they are arranged into appropriate classes including English 1, English 2, English 3, or English 4. From the 2018-2019 academic year, students were not required to assess the entrance English. Freshmen achieving specified scores in International English Certificates (IELTS, TOEIC, TOEFL iBT, TOEFL ITP) or other English Certificates approved by HCMUTE are allowed to skip and convert scores in English1, 2, 3, 4 courses. The output English standards such as TOEIC are mandatory for graduating students; for example,

TOEIC points above 500, 550, 600, and 650 points for students s of the years 2017, 2018, 2019, 2020, and 2021.*[Exh. 4.2. Activities to assess English ability]*

The studying process is the accompanying and construction of knowledge, skills, and attitude of students to achieve the ELOs of CET programme. All courses require scores from at least two formative assessments and one summative assessment. A variety of assessment methods are used including essays, oral exams, multiple choice quizzes, reports, presentations, projects, modelling, simulations, etc. For instance, to achieve the ELO5 relating to teamwork, some courses such as lab experiments, graduation practice, and theoretical subjects are assessed based on videos, reports, and small projects. For ELO2, which is related to the ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to conclude, the assessment methods were report, rubric, and oral (*Table 4.1*). The assessments are flexibly taken place in traditional classrooms and/or on the LMS. Students pass a course when the course overall score is at least 4.0 and none of the overall formative score nor the summative score is lower than 2.5. If a student fails a course, he/she has to learn the course again. For experimental or practical courses, students are assessed through skill tests, oral presentations, reports, essays, and projects. Each question in summative assessments is required to match at least one CLO and must be approved by Department Head or Department Deputy Head. *[Exh. 4.3. Activities to satisfy course learning outcomes].*

Table 4.1. Criteria and assessment methods for ELOs.

ELOS	Criteria	Assessment methods
ELO1	an ability to identify, formulate, and solve complex engineering problems in the field of the Chemical Engineering Technology by applying principles of engineering, science, and mathematics.	Essay, multiple-choice.
ELO2	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions in field of the Chemical Engineering Technology.	Report, rubric, oral.
ELO3	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Report, rubric, project
ELO4	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Report, rubric, project
ELO5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	Report, video, project
ELO6	an ability to communicate effectively with a range of audiences, and to communicate in English language.	Essay, report, oral
ELO7	an ability to apply engineering design to produce solutions that meet specified needs in field of the Chemical Engineering Technology with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Essay, report, project
ELO8	an ability to implement engineering systems in field of the Chemical Engineering Technology.	Essay, report, project, simulation, rubric
ELO9	an ability to operate and manage engineering systems in field of the Chemical Engineering Technology	Essay, report, project, simulation, rubric

For the graduation practice, students are sent to suitable enterprises that match their CET major. During the practice (1-2 months), students are advised not only by experts at the enterprise but also by CET lecturers. The assessment of students includes evaluation from the enterprise and the lecturers in a defense of graduation internship *[Exh 4.4. Assessment of graduation internship].*

CET students are allowed to do the graduation thesis only if less than 7 credits are incomplete. Students lacking required credits need to fulfil the credits before conducting the graduation thesis. The graduation thesis is conducted in the 8th semester under the supervision of an advisor. The advisor accompanies the student throughout the planning and doing experiments and writing the thesis. The criteria for assessing graduation theses are declared in score sheets and rubrics, which evaluate knowledge (quantity, content, research method), working process, creativity, novelty, technology, presentation skills, and responses to questions. Especially, students are encouraged to write the thesis and defend in English. Additionally, to improve the applicability of the thesis, a graduation thesis can be conducted under advice from an expert from the enterprise and/or conducted at the enterprise. Finally, the students show their obtained knowledge, skills, and attitude at the graduation thesis defense. Students failing at the graduation thesis defense need to conduct their graduation thesis again and then defend later. *[Exh. 4.5. Assessment of graduation thesis].*

Social activities are mandatory for all students to improve their social manner and awareness. Every semester the Admissions and Student Affairs Office (ASAO) summarizes, and reports students' social activity scores based on their participation in activities organized by the university, the faculties, and the Youth Union. According to HCMUTE regulations, students must earn sufficient social activity scores to graduate. *[Exh. 4.6. Assessment of interpersonal and social skills].*

4.2. The assessment and assessment-appeal policies are shown to be explicit, communicated to students, and applied consistently

For every course, students are evaluated by at least two formative assessments and one summative assessment through essays, oral exams, multiple choice quizzes, reports, presentations, projects, modelling, simulations, video, etc... The course result is assessed by the final score which is calculated from the assessments with a clear proportional weight: 50% for the overall formative score, and 50% for the summative score. The scores are on a 10-point scale with one decimal. A student passes a course if the final score is at least 4.0 and both the overall formative score and the summative score must be at least 2.5 *[Exh. 4.7 Formative and Summative assessments].*

For project courses, the summative score includes scores from the advisor (60%) and reviewer (40%). For experimental and practical courses, the final score is calculated from two components including formative (50%) and summative (50%) assessment scores; the formative score is based on the evaluation of experimental skills and attitude, and the report; the summative assessment is evaluated through an oral exam or experimental exam. For practical courses at the enterprise, the summative score is calculated by components including advisor at the enterprise (30%), report (20%), and committee board (50%). For the graduation thesis course, the final score is calculated from components including advisor (30%), reviewer (30%), and defense committee board (40%). The committee consists of three members in which the advisor is not included *[Exh. 4.8. Assessments of practice courses].*

In the Covid-19 pandemic, online assessment is applied to theoretical and project courses. Experimental courses are not assessed online. All online assessments must be registered to the AAO, announced to students timely, and recorded *[Exh. 4.9. Assessments in the Covid-19 pandemic].*

Students get their assessment results and feedbacks in a timely manner (*Table 4.2*). Students can ask about their assessment results and register for review within 7 days after the day of the grade announcement. The grade appeal is announced to the applying student within 5 days through AAO. If grade appeal changes, lecturers will be reminded by the Department and Faculty, maybe reducing the competition rank. HCMUTE regulates the feedback process to satisfy the complaint of the students. The regulations are disseminated to students through HCMUTE website and the student handbook. The information is timely and clearly sent to students through LMS, in dialogues between

students and the faculty and HCMUTE boards, and on the FCFT and HCMUTE websites *[Exh. 4.10. Notification of student assessment]*.

Table 4.2. Feedback frequency of assessment methods.

Assessment method	Feedback frequency
Presentation	After presenting and answering questions
Test, essay	1 week
Experiment	After every experiment students can repeat to get the correct results; the results will be submitted after lessons
Graduation thesis, projects	Advisor feedbacks every week; Reviewer and defense committee feedback at the defense.

4.3. The assessment standards and procedures for student progression and degree completion, are shown to be explicit, communicated to students, and applied consistently.

The student assessment is carried out with various methods and clear marking criteria (*Table 4.3*). For every course, the lecturer announces timelines, forms of formative and summative assessments, rubrics, weights of scores, and regulations on the first day of the course in class and on LMS *[Exh. 4.10. Notification of student assessment]*. The assessment criteria are identical and explicit for all lecturers of the same course. For theoretical courses, the final exam (summative assessment) is the same for all classes with different lecturers in charge and must be approved by the HOD. For practical courses, reports, essays and video presentations, the assessment is done using rubrics *[Exh. 4.8. Assessments of practice courses]*.

Table 4.3. Assessment methods for various objects.

Assessment Object	Diagnostic assessment	Formative assessment	Summative assessment
Theoretical courses	- Regular class attendance, - Participation in discussions, - Quiz test, 5 minute test, non-marking test	- Presentation - Essay - Questions and answers - In-class task completion - Homework and project completion - Participation in group activities - Report - Video	- Essay, multiple-choice, questions and answers, fill in blank questions, explain a procedure, draw a diagram, explain a phenomenon, etc - Oral examination
Practical courses	- Regular class attendance, - Participation in discussions	- Participation in group activities - Daily Short report	- Report (final tests) - Oral examination
Graduation practice	- Regular factory attendance	-Report - Presentation essay	
Course project	- Regular factory attendance	- Supervisors assess students through regular attendance and attitude in doing the project - Assessors assess students through solving problems and report (and drawings, etc.)	
Graduation thesis	- Regular factory/lab attendance	- Supervisors assess students through regular attendance and attitude in doing the project - Reviewers assess students through the solving problems; defense committee assesses students through the presentation and answers to questions	

The course score is calculated from component scores multiplied by corresponding weights and rounded to one decimal. The lecturers are required to input the scores to the LMS.

Table 4.4. Score point for classification of student's studying results.

10-point scale	Equivalent letter	Equivalent of scale of 4	Classification
9.0 - 10	A+	4.0	Pass
8.5 – 8.9	A	3.7	
8.0 – 8.4	B+	3.5	
7.0 – 7.9	B	3.0	
6.5 – 6.9	C+	2.5	
5.5 – 6.4	C	2.0	
5.0 – 5.4	D+	1.5	
4.0 – 4.9	D	1.0	
<4.0	F	0	Fail

A course is considered passed if the cumulative score is above F. The students passed a course can register to study the course again if they want to improve their score. The final score of the course is considered the latest one.

For each course, the lecturers thoroughly assess students with various methods. For example, in theoretical courses, students are assessed not only based on their tests results but also their attendance regularity, and participation in class activities. For experimental courses, besides the assessment of reports and the final exam, students can also get scores by recording experiment videos or obtaining outstanding products.

HCMUTE uses IT to manage the academic progress of students. Annually in March and September, the Academic Affairs Office checks the students' academic results and announces them to those getting academic warnings and sacks, and approves for graduation for those qualified.

At the end of each main semester, students may receive an academic warning in the following conditions: The total earned credits are below 50% compared to the registered credits, or the total failed credits are over 24; GPA below 2.0 for the first semester and GPA below 1 for the next semester; Cumulative GPA below 3.0 for the first academic year, below 3.5 for two academic years, below 4.0 for the three academic years, and below 4.5 for next academic years based on the grade-scale of 10. *[Exh. 4.7. Formative and Summative assessments]*

The AAO announces academic warnings to the students through LSM, email, and simultaneously to the student's faculty and ASAO. The ASAO then announces the situation to the consulting team for them to do the consultancy. Marks with feedback are given individually to students on the website https://online.hcmute.edu.vn.

Besides academic scores, the students are assessed for their training scores in a 100-points scale according to their learning awareness, obeying regulations, participation in social activities and sports competitions, crime and evil prevention, participation in class managers and organization. Besides academic and training scores, each student is required to complete four days of social activities to be qualified for graduation *[Exh. 4.6. Assessment of interpersonal and social skills]*.

HCMUTE uses statistical software to follow the annual student status, including the ratio of passing a course, the ratio of early graduation, the ratio of on-time graduation, the ratio of drop-out, and the average duration for graduation, etc. The results are used to compare with those of previous academic years and are shown in the dashboard of HCMUTE and in reports of the faculty and department at *http://dashboard.hcmute.edu.vn/#/management/home*

The information sent to students is fast and updated through LSM, student mailbox, consulting team, and communication channels such as the faculty's website, the department's social network (Facebook). The assessment methods are public in the LSM, in detailed outline, and on the first day of courses *[Exh. 4.10. Notification of student assessment]*.

4.4. The assessments methods are shown to include rubrics, marking schemes, timelines, and regulations, and these are shown to ensure validity, reliability, and fairness in assessment.

HCMUTE has clear rules and regulations about assessment: passing score of 4/10 (5/10 for students enrolled before the 2021-2022 year), the 50:50 ratio of formative/final exam scores, marking schemes, and timelines. All these regulations are declared in the 2021 Regulations on Undergraduate education and the HCMUTE Student handbook, which are based on the Regulations of the Minister of Education and Training *[Exh. 4.11. Regulations on Undergraduate education].*

The form and content of all assessments of every course, including frequency, time, assessment methods, and the weight of scores, are formally declared in the course syllabus and informed to students in the first lesson *[Exh. 4.12. Some course syllabi].*

In every course, the students are evaluated by formative and summative assessments. The formative assessment may be scored or not. There are at least 2 formative assessments with various forms depending on the evaluated knowledge, skill, or attitude.

Rubrics are usually used to evaluate skills such as experiments, presentations, teamwork, essays, practice, projects, and graduation thesis. All rubrics include criteria and performance levels with detailed descriptors for each level. The rubrics are informed to the students when the task is announced and before the scoring *[Exh. 4.13. Sample of some rubrics].*

The weight of each question (down to 0.25/10) in a test or exam is always declared on the questions sheet. The alignment between each exam question and the CLO is also declared and approved by the department head to ensure validity *[Exh. 4.14. Paper-based exam questions].*

Important timelines in a course, including assessments, are declared in the course syllabus. The exam dates are given in the online schedule of all students. From the middle to the end of each semester, students can give online feedbacks about not only the quality of assessments, but also the teaching methods, the course content, the style of teaching, etc. Based on these feedbacks, the lecturers can adjust and improve their teaching and assessing techniques to meet the CLOs and appropriate expectations of students *[Exh. 4.15. Surveys on students satisfication with teaching-learning activities and assessments].*

For courses given by more than one lecturer, the exam content and questions are constructed based on the CLOs, then agreed upon by those lecturers and approved by HOD.

To ensure reliability and fairness, the exam paper must include questions from easy to hard. The questions must not be based on skills or equipment not required in the CLOs such as English ability, laptop, or webcam. In case a student has an accident or serious illness, he/she can receive a score I (incomplete score) for the delayed exam and would take the exam in the next semester. If a student misses a test for objective and acceptable reasons, he/she can take the test again *[Exh. 4.16. Procedures for incomplete score and regrading].*

Each course has its own assessment plan, including the number of assessments, their weights, and assessment techniques. The techniques and content of assessments must be chosen properly from Table 4.3 to evaluate CLOs and PIs.

The lecturer and the department head adjusts the distribution of course assessment methods in a semester to ensure appropriateness. For example, there should not be too many courses assigning presentations in the same week; there should be a variety of assessment techniques used in each course; the assessment techniques should be aligned with the CLO. *[Exh. 4.17. Alignment between CLOs and assessment techniques].*

If students are not satisfied with the test or exam grades, they can request for re-grading within one week after the results are announced. They can also ask to review their test papers and discuss with examiners when the reassessment is executed. To maintain objectiveness and fairness, the department head assigns two other examiners to regrade the student's test paper. If there are changes in the grade, it must be informed to and approved by the first examiner and the department head. The final grade must be announced to the student within 5 working days since the regrading request. *[Exh 4.16. Procedures for incomplete score and regarding].*

According to the HCMUTE regulations, the answers to exams must be announced on the website of FCFT within 3 days from the exam date [*Exh. 4.18. Announcement of exam answers*]. For online quizzes, the students can see their scores, and even the answers immediately after the exam. The examination procedure is ensured by HCMUTE and FCFT by requiring at least two internal proctors for one testing room. One external proctor covers some testing rooms. Moreover, to ensure fairness, HCMUTE supplies lecturers and students with a Turnitin account for plagiarism checking in essays, project works and graduation theses *[Exh. 4.19. Procedures for planning and conducting examinations]*.

UTE regulations require the test papers to be kept for one year and exam papers for two years for post-check if necessary. The exam questions and exam papers are digitalized and kept for long storage.

4.5. The assessment methods are shown to measure the achievement of the expected learning outcomes of the programme and its courses.

Since the 2020-2021 year, performance indicators (PIs) of 5/10 ELOs were measured through the results of the formative and summative assessments. Each ELO was evaluated by 3 PIs in 12 courses. The HOD chose the PIs and corresponding courses to assign to lecturers *[Exh. 4.20. Plans and results of the PIs measurment]*. The lecturers then construct proper assessment techniques to measure the PIs of students.

At the end of the semester, the lecturers report the measured PIs to evaluate the achievement of the ELO of the programme and its courses. The achievement of each ELO is evaluated by the PIs in at least two courses in different semesters to show the progress of students. Besides, PIs of the same ELO in the same course for students of different years are compared to evaluate the improvement of teaching methods.

The PIs report showed that the achievement of 5 ELOs was higher than the 60% goal. Among the 15 PIs measured, 3 did not pass the goal. The reasons and solutions were suggested to improve the achievement of these 3 PIs. In the 2021-2022 year, CET measured 100% of PIs, thus all tests and exams are designed to appropriately evaluate CLOs and ELOs *[Exh. 4.20. Plans and results of the PIs measurment]*.

4.6. Feedback of student assessment is shown to be provided in a timely manner.

Lecturers use in-class mini-surveys (short questions, one-minute papers, online quizzes) to evaluate the preparation and the comprehension of students during and after the lessons. Based on this immediate evaluation, the lecturers can adjust the lesson pace, explain the difficult content, and help weak students in a timely manner.

With the LMS system in HCMUTE, lecturers can give homework with answers and individual feedbacks for students to self-evaluate and self-improve. After each weekly homework, the lecturers can gather statistics of the results and questions from students, then give individual and general feedbacks to the class and answer difficult questions in the next week's lesson *[Exh. 4.21. Questions and Feedbacks on UTExLMS]*.

When evaluating skills such as presentations, experiments, and projects, the lecturers can give immediate oral feedback, and even demonstrate the correct skills.

According to HCMUTE regulations, the answers to exam questions must be announced within 3 days from the exam for students to recognize their mistakes.

For graduation theses, the advisor may use a progress checklist to give feedbacks, advice and supports to the students every two weeks. At the theses defence, the feedbacks of the committee, the referee and the advisor must be read officially right after the student's presentation and answers to questions. The scores of the theses must be given after the defence *[Exh. 4.5. Assessment of graduation thesis]*.

4.7. The student assessment and its processes are shown to be continuously reviewed and improved to ensure their relevance to the needs of industry and alignment to the expected learning outcomes.

HCMUTE Regulations of Training issued in 9/2021 had several updates and improvements from the Regulations in 2018 and were based on the 2018 Law of Higher Education and the 2021 Regulations of Undergraduate Training of the MOET *[Exh. 4.11. Regulations on Undergraduate education]*.

In the current trend in education technology and the Covid pandemic since 2020, HCMUTE has issued Regulations for online teaching, learning and assessments. According to the Regulations, HCMUTE uses the online environment for education through the UTEx system developed and managed by the HCMUTE Center of Software Technology instead of the rent LMS system. For full-time programmes, no more than 30% of each programme is conducted in online classes. The online form of education contributes no more than 50% of the course's final score. HCMUTE issued a separate Regulation for the online organization and assessment of projects and graduation theses *[Exh. 4.22. Regulations of online teaching, learning assessments]*.

In the first semester of the 2021-2022 academic year, all courses are assessed using online forms. Several techniques were used for assessments, such as online quizzes, online oral exam, and online defense of graduation practice and graduation theses *[Exh. 4.23. Online assessments techniques]*.

At the end of each semester, students are surveyed about their satisfaction and the appropriateness of the assessment techniques used by the lecturers. Each lecturer then reviews the feedbacks of students and peers, recognized the strength and weakness of the assessment plan and suggest ways to improve it. These suggestions are recorded in the eportfilio of each course. *[Exh. 4.24. Results of student satisfaction on the assessment techniques]*.

The entrepreneurs of companies where the students had the graduation practice give feedbacks and suggest ways to improve the attitude, knowledge, and skills of the students. Students that do graduation thesis in companies also receive direct feedback from the entrepreneurs. *[Exh. 4.4. Assessment of graduation internship]*

The PIs are measured mainly in the final exam to evaluate the achievement of CLOs after the course and the achievement of ELOs at the end of a semester. Finally, the PIs are measured based on the graduation thesis to evaluate the progress of students after completing the CET programme. The students are considered for graduation only after attaining the required PIs. The measurement of PIs helps recognize ELOs in which the students are weak and suggest ways to improve them in further courses and semesters. The CET department annually reviews the PIs results and discusses necessary changes in the CET programme to improve the PIs *[Exh. 4.20. Plans and results of PIs measurment]*.

5. Academic Staff

5.1 The programme to show that academic staff planning (including succession, promotion, re-deployment, termination, and retirement plans) is carried out to ensure that the quality and quantity of the academic staff fulfil the needs for education, research, and service.

Every five years, the HCMUTE evaluates the implementation of the current development strategic plan and considers the global situation to develop the future plan. Aligning on the HCMUTE development strategic plan, the FCFT makes a faculty-level development strategic plan based on the evaluation of the previous strategic plan and the analysis of the impact factors *[Exh. 5.1 The development strategic plans of HCMUTE and FCFT]*. The development strategic plans for each stage always include strategies for education, research, facilities, finance, human resource, attached specific goals and performance targets. The people strategy outlines human resource needs for the coming five years in both quantity and quality as listed in *Table 5.1*. The human resource needs were based on the education strategy regarding to the number of students, new planned programmes, ongoing developed academic levels, and the scientific research strategy. From the long-term development strategic plan, the FCFT has developed recruitment, succession, promotion, and training plans. The personnel development plan is built on foundational principles, including attracting highly qualified lecturers, fostering current academic staff, and promoting successors. In parallel with enrolling lecturers in doctoral programme according to the schedule, the recruitment plan is deployed each year to ensure enough personnel to handle the workload from time to time. From people strategy outlined

in the long-term development strategic plan, the academic staff development plan in the short term is planned in the FCFT's quality targets annually. At the beginning of an academic year, the academic staffs register their professional, pedagogy, foreign language, or IT training plans, coordinated or held by General Administration and Personnel Affairs Office (GAPAO) *[Exh. 5.1 The development strategic plans of HCMUTE and FCFT], [Exh. 5.2. Human resource development planning for academic staff], [Exh. 5.3. Regulation on competence improvement]*. Beside academic staff planning, periodically, The GAPAO also conducts a leadership planning process to find potential key appointment holders at faculty and departmental levels *[Exh. 5.4. Planning of human resources of the Party Committee]*. FCFT has also planned to foster successors for the management positions at department and faculty levels.

Table 5.1 Manpower Plan.

Category	Baseline 2020	Target					Total 2025
		2021	2022	2023	2024	2025	
Academic Qualification							
Professors	0	0	0	0	0	0	0
Associate Professors	2	3	3	3	3	6	6
Lecturers	26	34	39	44	49	50	50
Visiting Professors/Lecturers	12	38	38	38	38	38	38
Education Qualification							
PhD	22	22	25	29	33	45	45
Master	6	15	17	18	19	11	11
Recruitment	0	9	5	5	5	4	4
Retirement	1	0	0	0	0	0	0

Policies for the future development of academic staff were developed by GAPAO based on the Law on Public Employees and the Law on Education. The policies support the current academic staff to improve their professional competencies and promote them by a degree or academic title (Master, Ph.D., Associate Professor, Professor) and professional title (Lecturer, Principal Lecturer, Senior lecturer) *[Exh. 5.2. Human resource development planning for academic staff], [Exh. 5.3. Regulation on competence improvement]*. In addition, the cases of termination, retirement, and social welfare are planned and well implemented by GAPAO. Besides, HCMUTE has a policy of working time extension for high academic title or professional title academic staff. For instance, at the particular retirement, academic staff would extend the working time in 5-year, 7-year and 10-year for Ph.D., Associate Professor and Professor, respectively, if HCMUTE has needs at that time *[Exh. 5.5. Regulations on working]*. Furthermore, the policies to reward academic staffs for completing their doctoral thesis on time, as well as to reward newly recruited lecturers with doctoral degrees, also contribute to encouraging them to quickly complete doctoral dissertations and attract high-quality personnel *[Exh. 5.3. Regulation on competence improvement]*.

Building human resources is a long and persistent process. From the first day of FCFT's establishment in 2007 until now, the human resource development achieved a promising result in both quantity and quality. The achievements are presented in *Table 5.2* and *Figure 5.1*, which exhibited the ratio of Ph.D and academic staffs of the FCFT and DCT in each year compared with the targets set by FCFT's development strategic plans in each term *[Exh. 5.2. Human resource development planning for academic staff]*. In general, the percentages of the Ph.D academic staff of FCFT and DCT have gradually increased, met, and exceeded the targets set out by the FCFT and HCMUTE's development strategic plans since 2015 (22.9 % for FCFT's target and 25.7 % for HCMUTE's target) . Until 2019, the DCT achieved 100% academic staff with doctoral degrees. This goal was achieved because from 2013 to 2019, full-time lecturers were scheduled to attend doctoral programme at home-country and abroad (7 members). In addition, the recruitment policy attracts high-quality human resources, and the recruitment is processed according to the plan (from 2013 to 2022, 10 members). The above two

fundamental issues have created the human resource foundation to launch the CET programme in 2015 and ensure its training progress in each stage *[Exh. 5.3. Regulation on competence improvement], [Exh. 5.6. HCMUTE recruitment procedure]*.

Table 5.2. Ratio of Ph.D and academic staff in the DCT and FCFT compared with the FCFT's development strategic plan targets.

Year			2013	2014	2015	2016	2017	2018	2019
Development strategic plan target	FCFT	PhD/AS	7/35	4/32	8/35	13/38	18/41	20/44	20/44
		Percentage	20.00%	12.50%	22.86%	34.21%	43.90%	45.45%	45.45%
In Practice	FCFT	PhD/ AS	5/29	6/28	12/29	16/30	15/28	17/28	23/30
		Percentage	17.24%	21.43%	41.38%	53.33%	53.57%	60.71%	76.67%
	DCT	PhD/ AS	1/9	2/9	3/9	6/10	8/11	10/11	12/12
		Percentage	11.11%	22.22%	33.33%	60.00%	72.73%	90.91%	100.00%
Year			2020	2021	2022	2023	2024	2025	
Development strategic plan target	FCFT	PhD/AS	22/37	22/37	25/42	29/47	33/52	45/56	
		Percentage	59.46%	59.46%	59.52%	61.70%	63.46%	80.36%	
In Practice	FCFT	PhD/AS	23/32	27/36	29/38				
		Percentage	71.88%	75.00%	76.32%				
	DCT	PhD/AS	12/12	15/15	16/16				
		Percentage	100.00%	100.00%	100.00%				

AS: Academic Staff
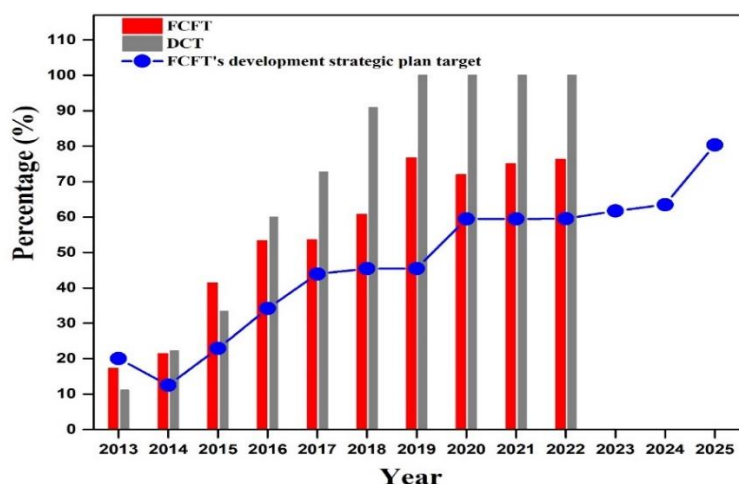
Figure 5.1. Ratio of Ph.D and academic staff in the DCT and FCFT in comparison with the FCFT's development strategic plan targets.

The CET programme is divided into four main groups of knowledge, including Inorganic Chemistry, Organic Chemistry, Polymer Chemistry and Machinery-Equipment *(Appendix 7)*. Following these specialized orientations, groups of academic staff with the relevant specialization share their knowledge and experiences, mentor the new members to ensure the human resources for each major. Basing on the actual personnel situation, the additional recruitment plan will be carried out to ensure the human resource sufficiency in personnel shortage due to termination, retirement, or maternity.

Human resource to meet the needs of the CET programme has gradually stabilized in quantity and quality, and are continuing to thrive. The strong point of the FCFT human resource is a team containing academic staffs who are young, enthusiastic, eager to learn, boldly innovative, adaptable, and accessible new teaching methods and modern technology for their profession. At the moment, it is a mature development stage of the FCFT human resources, and it is necessary to exploit this human resource effectively, or the brain drain would occur. The challenge of the HCMUTE and FCFT is to create enough commensurate quality works to meet the academic staffs' working capacity. FCFT has developed plans to launch a high-quality training CET programme, open a specialization in

43

Pharmaceutical Chemistry, develop the graduate CET programme, and establish the key research programme *[Exh. 5.1 The development strategic plans of HCMUTE and FCFT].*

5.2 The programme to show that staff workload is measured and monitored to improve the quality of education, research, and service.

Due to FCFT's good human resource planning, 100% Ph.D achieved full-time academic staffs of DCT participate CET programme, along with part-time lecturers from FCFT and other faculties. Visiting lecturers have been invited from Ho Chi Minh City University of Technology or Ton Duc Thang University and the leading universities in the South of Vietnam in the Chemical engineering field, to participate in lecturing, sharing, and academic exchange. The full-time equivalents (FTEs) is calculated using the teaching load method. The official full-time teaching load of a full-time lecturer is ascribed as 1 FTE. For a part-time or visiting lecturer, the FTE coeffiecient is calculated as 0.17. The number of academic staffs and FTEs are presented in *Table 5.3.*

Table 5.3. Number of academic staffs and full-time equivalents (FTEs) till May, 2022.

Category	Male	Female	Total		Percentage of Ph.D
			Headcount	FTE	
Associate professors	2	0	2	2*1=2	100%
Full-time lecturers	6	8	14	14*1=14	100%
Part-time lecturers	10	8	18	18*0.17=3.1	50%
Visiting Professors/ Lecturers	5	5	10	10*0.17=1.7	100%
Total	**23**	**21**	**44**	**20.8**	

The student-academic staff ratio is approximately 1:20, in line with the MOET regulation under the Higher Education Law (*Table 5.4*). This ratio increased sharply in the academic year 2019-2020 due to the large number of entrance students, which was achieved after the first batch of K2015 students graduated, and HCMUTE's CET programme gradually asserted its position and attracted incoming students. Understanding this trend and following the planned roadmap, the FCFT recruited additional permanent academic staffs in 2021.

Academic staff's workload quota on teaching, research, and service is regulated by MOET and modified by GAPAO for each specific title, presented in *Table 5.5*. However, the HCMUTE also has a flexible policy for lecturers in choosing the ratio of teaching and researching. Each year, the academic staff relies on their research plan and the workload in their responsibilities to register and adjust this ratio.

Table 5.4. Ratio of students and academic staffs.

Academic year	Total of academic staffs	Total of students	Staff-to-student
2017-2018	15.5 (0+10+2.9+2.6)	308	1/19.87
2018-2019	17.3 (0+12+2.9+2.4)	358	1/20.69
2019-2020	18.0 (1+11+3.4+2.6)	409	1/22.72
2020-2021	19.8 (1+14+3.1+1.7)	405	1/20.45
2021-2022	20.8 (2+14+3.1+1.7)	415	1/19.95

Table 5.5. Normalized working hour per year for academic staffs.

Academic title	Teaching hour	Research hour	Other service's hour	Total
Senior lecturer, Professor	270	240	20	530
Associate Professor	270	240	20	530
Ph.D	270	195	60	525
Principal lecturer – Master	270	189	70	529
Lecturer – Master	270	177	80	527
Unofficial lecturer	270	75	180	525
Probating lecturer	135	0	400	535

HCMUTE has a mechanism to monitor the quantity and quality of academic staff work in three areas: teaching, research, and service by Key Performance Indicator (KPIs) software *[Exh. 5.7. Academic staff assessment]*. The workload data of teaching is collected from the AAO's academic management system, and the quality of teaching is reflected in the results of the academic staff evaluation survey of students. The workload of research is collected and statisticized by STIAO through lecturers' reports in each academic year. The service workload includes many different activities such as education support activities, student support activities, collective activities, and social activities. Basing on the workload assessment through the KPIs system, the FCFT Dean and HOD balances and adjusts the appropriate workload for faculty members.

Annually, QAO takes a university-wide survey on the satisfaction of employees with the working environment. The survey results in 2021 revealed that 85.22% of employees are satisfied with the assigned workload, expected deadline standard and specific quality *[Exh. 5.8. Employee Satisfaction with Working Environment]*. The DCT's meetings also receive positive feedbacks from lecturers in contributing efforts to the general activities of the department (100% DCT lecturers agreed). *[Exh. 5.9 DCT's employee satisfaction].* Everyone is willing to participate in service activities outside of teaching and research, such as student support activities, for example, taking students to visit factories, guiding students to participate in creative competitions, proctoring exams, teaching observation, blood donation, scholarship resource seeking, job seeking for students, participating art of sport festivals, etc.

5.3 The programme to show that the competences of the academic staff are determined, evaluated, and communicated.

Academic staffs need to own professional competencies that meet their work, including professional competence, pedagogical competence, research capacity, foreign language ability, and information technology capacity. These competency requirements are indicated in the Academic staff Handbook, Labor Contract, and Job Description *[Exh. 5.10. Decision on functions, tasks, authority definition]*. These competencies are intended to cover three working areas within the academic staff's responsibilities, including teaching, research, and service.

For teaching, the academic staffs need to have professional and pedagogical competence. They must be able to participate in the design and implementation of the CET programme, build courses and lectures to meet the ELOs of the CET curriculum, and apply various teaching and assessment methods to help the learners achieve the CLOs of the courses. In addition, academic staffs need to be able to use a diversity of teaching tools. Especially, in the context of the Covid pandemic ongoing global, the competence to apply teaching methods and using modern media to adapt to online teaching is important. Besides, lecturers must be competent to monitor and evaluate their teaching activities, which reflect their teaching reality.

For research, lecturers must carry out a sufficient research workload, which is quantified through scientific research projects, domestic or international articles, reports at conferences, technology transfer projects, contributions to the professional community such as reviewing articles, etc.

For service, lecturers are responsible for service activities contributing to the implementation of the training programme such as advising students, taking students on factory tours, contacting enterprises for internships, finding job opportunities, looking for scholarships, admission counseling, organizing training or extracurricular activities for students, etc. *[Exh. 6.13. Student's competitions and extracurricular activities]*

Every academic staff in the DCT is involved in constructing and implementing the CET programme, including designing, evaluating, and adjusting the CET curriculum. Therefore, DCT members clearly understand the ELOs of the programme, and they comprehend how the CLOs of the subjects they are responsible for aligning with the ELOs of the programme and the relationship to other subjects in the curriculum. The specific major groups consisting of lecturers who are teaching the same or relevant subjects, unified on the course content, the exam format and the assessment criteria (*Appendix 7*). In

addition, the members also share their experiences on teaching and assessment methods or jointly build a bank of exam questions.

There are two channels for lecturers to collect information about the quality of their teaching and reflect on their teaching. The online academic management system developed by AAO automatically launches online surveys. It collects students' feedback to evaluate the teaching quality of the lecturers for each class at the midterm. In addition, from the class observation activities between the lecturers carried out during the semester, academic staff also receive comments from colleagues and discuss teaching experiences. From this information, the academic staff record on the E-portfolio and self-reflect or evaluate their teaching activities to self-adjust in the following semester.*[Exh. 5.7. Academic staff assessment]*

The competencies of academic staff are assessed from the recruitment process, during the first year of probation, and throughout the working life. When recruiting, professional capacity is demonstrated through academic degrees and scientific research ability is determined through published works. The pedagogical capability is proved through mock lecturing, foreign language and IT competencies are exhibited through tests, interviews, or certificates *[Exh. 5.6. Recruitment procedure]*. In the first year of probation, academic staff is continuously fostered and evaluated their competencies to obtain a decision on signing a Labor contract or not. At this stage, the required certificates are a Pedagogical Professional Certificate including competencies in curriculum design, lecture design, LMS using, teaching methods, assessment methods, etc., the foreign language certificate at least TOEIC 600, and the B-Level Office Informatics Certificate *[Exh. 5.11. HCMUTE Probation period policies]*. In the following years, the core competencies continue to be assessed through work in three areas of teaching, research, and service, in which the KPIs system was used as an evaluation tool. The teaching quality validates competencies for a course and lecture designing, LMS and teaching tool, lecturing in English, etc *[Exh. 5.7. Academic staff assessment]*.

5.4 The programme to show that the duties allocated to the academic staff are appropriate to qualifications, experience, and aptitude.

The principle of DCT's teaching assignment is to ensure that the workload can be solved and assigned personnel fairly and appropriately. DCT's teaching assignment policy is that each subject is assigned to at least two lecturers. Each lecturer must be responsible for at least two theoretical subjects and related practical/experimental subjects. Machinery and equipment projects are assigned to the academic staffs who own technical specifications *[Exh. 5.12. Regulations on appointment statutes, re-appointment, resignation, dismissal of administrators, and duty allocation]*. In addition, HCMUTE encourages lecturers to implement projects, research and transfer technology with businesses to gain more practical experience in the specific fields of teaching and research belonging to their responsibility.

All DCT's academic staffs have Ph.D degrees, so the teaching assignment is almost equal from theoretical subjects to experimental/practical subjects, or to guiding graduation thesis. Based on the scientific research field of each lecturer, there is an appropriate assignment, but on the principle that the opportunity for everyone is the same.

For other service activities, the assignment is based on the aptitude and experience of each staff. Youth Union - Student Union activities are often assigned to young, dynamic lecturers who are experienced or have been involved in union activities since their student time. Activities to establish and maintain relationships with businesses are assigned to long-time working lecturers. The admission consulting is assigned to the DCT board. Lecturers with achievements or application of scientific research or technology transfer are assigned to write articles to promote the image of the university/faculty/department *[Exh. 5.12. Regulations on appointment statutes, re-appointment, resignation, dismissal of administrators, and duty allocation]*.

The standards for management positions are based on professional qualifications, research capacity, management capability, and experience. For a position of Dean, the requirements are a Ph.D degree, a reputable lecturer, teaching and research experience, and management capacity. The Vice-Dean

position must have a master's degree or higher and other capabilities similar to the Dean position. Remarkably, the Vice-Dean in charge of training, scientific and technological activities must have a Ph.D. degree. The HOD must be a reputable scientist with a Ph.D. degree *[Exh. 5.10. Decision on functions, tasks, authority definition], [Exh. 5.12. Regulations on appointment statutes, re-appointment, resignation, dismissal of administrators, and duty allocation]*.

5.5. The programme to show that promotion of the academic staff is based on a merit system which accounts for teaching, research, and service.

Promotion can be rewards for good performance of individuals. At HCMUTE, promotion includes ranking, an increase in salary and management promotion *[Exh. 5.13 The official statement of guidance for emulation – bonus]*. Ranking is considered as the promotion to the rank of the lecturer, in which lecturers will be appointed to be trainee, senior lecturer, associate professor and professor. In addition, the academic rank is also attached to a person as soon as he/she holds Master or Ph.D degrees.

In order to ascend the ranking, lecturers must be consistent with the requirements issued by MOET and Viet Nam Laws of Higher Education such as teaching experience, scientific publication, English level… The academic staffs have been promoted as principal lecturers in the ranking at the DCT of the HCMUTE *[Exh. 5.12. Regulations on appointment statutes, re-appointment, resignation, dismissal of administrators, and duty allocation]*.

Promotion in career corresponds to an increase in salary. The employee will be automatically increased in salary for every 3 years if the university's requirements are satisfied. In particular, the employee will be early raised salary if they performed well and achieved excellent results in scientific research and workplace innovation *[Exh. 5.14. The announcement of the annual salary increase].* Up to now, there have been lecturers from the DCT received an increase in salary earlier than regular schedule due to their outstanding performance *[Exh. 5.15. Decision on early raise of salary for lecturers of FCFT].*

5.6. The programme to show that the rights and privileges, benefits, roles and relationships, and accountability of the academic staff, taking into account professional ethics and their academic freedom, are well defined and understood.

Each member at the HCMUTE plays a crucial role on the development of the University. Therefore, the HCMUTE has emerged the regulations to help academic staffs comprehend their roles and relationships. As a result, the employee would understand how to perform with superiors and colleagues.

The HCMUTE has stipulated the roles and responsibilities of lecturers. The express demands have been printed in lecturer's principle, handbook and job description *[Exh. 5.10. Decision on functions, tasks, authority definition]*. Fully, the roles and responsibilities of lecturers can be found in details in their contracts with the University and finally, their benefits are described in the Internal Expenditure Regulations of the HCMUTE *[Exh. 5.13. The official statement of guidance for emulation – bonus]*.

For example, to become an official lecturer, the recruited academic staffs must pass the probation for 2 years (from 2002 backwards) or 1 year (from 2003 onwards). During the probation time and under the instruction of the HOD, the staff must comply with the rules and regulations the University/Faculty/Department. As normal, the recruitment of lecturer is suggested by HOD. Hence, the HOD will assign whom to be responsible for the course/laboratory based on his/her major. When work is in progress and done, the academic staff must give a report to the HOD *[Exh. 5.11. HCMUTE probation period policies]*.

Moreover, in order to share the teaching experiences, lecturers often participate the class of the others. After that, the competent and prestige lecturers would give valuable advices on his/her lecture for improvements *[Exh. 5.16. Plan and minutes of class observation].*

Beside teaching, scientific research is one of important tasks of academic staffs. The connection between lecturers is necessary to implement a project. Research groups containing researchers often

from the same Faculty, specialized on the same subject, working together on the topic have been accomplished. By this way, the research group, namely Chemistry Environment and Food Technology (CEFT) consisting of lecturers from the DCT has published scientific articles in the prestige journals. From 2017 to 2021, the number of papers published in the national/international (Web of Science-WoS) journals by academic staffs from the DCT is 137 *(Table 5.6)*. This number is increasing annually with increasing in both quantity and quality of academic staffs from the DCT. It is noted that the number of papers published in WoS journals has been increased significantly from 2020 to 2021 *[Exh. 5.17. Statistics on Scientific publication 2017-2021 of DCT]*.

Lecturers must strictly comply with the Education Law, the Public Officials Law and the regulations promulgated by the HCMUTE and the rules presented in the contract of employment. Academic staffs are in charge of the content of courses. Lecturers have academic freedoms to select teaching methods, assessments but must align with ELOs and be approved by the HOD. Similar to teaching activities, lecturers feel free in scientific research to select the scientific subjects, fields, which are in agreement with their major and the vision/mission of the University/Faculty/Department. In addition, lecturers have to be aware of the professional ethics, e.g., copyright compliance, intellectual property rights *[Exh. 5.18. The registration process in intellectual property rights for scientific research products].*

Table 5.6. Scientific publication statistics of DCT from 2017 to 2021.

| Academic year | Types of Publication | | Total | Number of Academic Staffs | Number of Publications per Academic Staff |
	National	*Web of Science*			
2017-2018	9	7	16	9	1.8
2018-2019	15	10	25	9	2.8
2019-2020	3	11	14	11	1.3
2020-2021	8	26	34	11	3.1
2021-2022	13	35	48	15	3.2

5.7. The programme to show that the training and developmental needs of the academic staff are systematically identified, and that appropriate training and development activities are implemented to fulfil the identified needs.

Lecturer training and development is the most important strategy of the HCMUTE and the FCFT, which is planned and implemented annually by the University and the Faculty. Academic staffs are encouraged and supported for trainings in professional career, teaching methods and scientific research every year. The process is implemented by following 5 steps *(Appendix 8).*

The training needs are identified from the needs of lecturers and the HCMUTE. Firstly, for the needs of lecturers, at the beginning of the academic year, academic staffs who wish to improve their professional competence suggest some courses organized inside/outside the University and submit their needs to the FCFT for approval. For examples, the theme of the academic year is international integration, innovation in testing and assessment, IoT and artificial intelligence and thus, lecturers prefer to be trained in English courses.

Secondly, the needs are based on the strategic plans or quality goals of the HCMUTE through the theme of academic year and then, the University organizes and encourages lecturers to participate. The University and the Faculty have long and short-term training courses to encourage lecturers to participate. For long-term training, the academic staff will register the Master/Ph.D programme. At the present, there are academic staffs of the FCFT pursuing Ph.D degrees *[Exh. 5.2. Human resource development planning for academic staff].* Lecturers at the FCFT are encouraged to participate the short-term training courses including teaching and learning methods, student assessments, LMS, QA, English, IoT. In addition, pedagogical courses and international conferences and programmes are open for lecturers, which hosted by the HCMUTE or international corporation programmes (funded by USAID and Intel Vietnam) such as Connecting the Mekong through Education and Training (COMET), Higher Engineering Education Alliance Programme (HEEAP), Vocational University Leadership Innovation Institute (VULII), or Build University-Industry Learning and Development

through Innovation and Technology (BUILD-IT) *(Table 5.7), [Exh. 5.19. Certificate list of long/short-term courses for lecturers at the FCFT].*

Table 5.7. The long/short-term courses for lecturers at the HCMUTE.

Topics of long/short term-courses	Names of long/short term-courses
English	- Organized annually at HCMCUTE, Philippines - Organized at ILA, ACET according to 2020 project
IT	- Learning Management System (LMS)
Education skill and Quality assurance	- HEEAP/VULII/BUILD-IT - Master Teaching Training (MMT) - Fulbright learners (QA-ABET, student leadership)
Scientific research	- Instruction on Scientific papers writing - Regulations in copyright compliance, intellectual property rights
Professional career	- Instruction on Scientific papers writing - Regulations in copyright compliance, intellectual property rights
Conference/Seminar	- Conference on the Green Engineering Science and Technology is held annually at HCMUTE - International Conference on Green Technology and Sustainable Development (GTSD) - Lecturers is supported the APC, accommodation, travel fees when participating national/international conferences.
Master/Ph.D program	- 322, 911 projects from MOET - HCMUTE introduces Master/Ph.D scholarships from foreign countries

In order to support lecturers to participate the long/short-term training courses, the University offers financial supports such as tuition fee, travel. For example, the University annually budgets for the activities at the FCFT. The faculty makes an estimate for each activity. The long/short-term training activity for academic staffs is one them *[Exh. 5.20. Annual budget at the FCFT for long/short-term training activity for academic staffs].* Furthermore, the University offers a reducing teaching time, a reasonable schedule for lecturers when they are taking part in the training courses. In particular, to support lecturers who are pursuing doctoral degrees, the HCMUTE offers fare for one-way international flight tickets *[Exh. 5.13. The official statement of guidance for emulation - bonus].*

Training evaluation reports of academic staffs are important for the University. When training is in progress and done, the academic staffs must give a report to the University. The effectiveness of training projects has been evaluated basing on results such as English score, LMS levels, certificates…The University awards a bonus for individuals with excellent results and/or open the additional courses for improvement *[Exh. 5.21. Decisions on rewards and recognition for lecturers with their outstanding contribution].*

5.8. The programme to show that performance management including reward and recognition is implemented to assess academic staff teaching and research quality.

The HCMUTE has used the KPIs software as performance management system including rewards and recognition to evaluate workloads of individuals, faculties and units.

Before 2016, the performance report was taken a note in paper documentation. Academic staffs had no plans for teaching, researching and other activities at the beginning of the semester. In addition, the superiors gave no specific targets and there were no specific evaluation criteria. In this respect, the fairness of the assessment process would not stimulate and encourage the spirit of work of individuals and their dedication.

Since 2016, the HCMUTE has emerged the KPIs system (https://kpis.hcmute.edu.vn/) in which described criteria and indicators to evaluate exactly the work achievements of individuals *[Exh. 5.7. Academic staff assessment]*. According to the KPIs system, the individuals have to register their plans

and workloads in teaching, researching and other activities at the beginning of the semester. At the end of the semester, each academic staff must assess his/her workload completion and show proofs. Finally, the leaders would rank levels for honors with rewards basing on the KPIs results and consensus. In particular, the individuals who have not yet completed their work would receive positive feedbacks and helpful advices from leaders and colleagues to improve themselves.

Assessment results from KPIs of individuals are used to increase their salary, which are dependent on the rank categorized A, B, C, D, E. The categorization is based on the KPI score of each individual *(Table 5.8)*. In addition, the excellent individuals get not only the titles, awards and bonuses offered by the HCMUTE but also the recognitions from MOET or Vietnam government to acknowledge their crucial contributions on the development of Vietnam such as Certificate of Merit, Best Teacher Certificate, Teacher of The Year…*[Exh. 5.21. Decisions on rewards and recognition for lecturers with their outstanding contribution].* Since 2016, all individuals of the DCT have been increased in salary ahead of schedule/for every 3 years and promoted as senior lecturers due to their excellent/good KPI results.

Table 5.8. The categorization based on the KPI score of the employees at the HCMUTE.

Rank categorization	KPI score (max: 100 points)
A	90-100
B	73-89
C	53-72
D	38-52
E	< 37

The HCMUTE always support the scientific research. Academic staffs are encouraged to participate and register the projects which annually granted by the University, NAFOSTED, Ministry of Education and Training, Provinces… In addition, the staffs who have already published the scientific papers on the SCIE/ISI/Scopus journals are awarded a bonus up to 120 million (5.224 USD approximately) per SCIE paper. Moreover, the academic staffs who get the scientific research awards and the high ranks of the competitions…can be also received a bonus by the University President *[Exh. 5.13. The official statement of guidance for emulation - bonus]*.

The extra amount of money as a reward for good performance given to the mentors who supervise students to win at competitions for students. For example, the academic staffs from the FCFT and the DCT have received bonuses from the HCMUTE when they guided students to participate in the National Olympiad in Chemistry and SV_STARTUP-2020 organized by MOET *[Exh. 5.13. The official statement of guidance for emulation - bonus], [Exh. 5.21. Decisions on rewards and recognition for lecturers with their outstanding contribution].*

6. Student Support Services

6.1. The student intake policy, admission criteria and admission procedures to the programme are shown to be clearly defined, communicated, published, and up-to-date.

The admissions process applied at HCMUTE is based on the regulation of MOET and HCMUTE's enrollment scheme. HCMUTE select students base on:

Admission is based on their high school academic achievement (maximum 50% of the total enrollment), GPA of 5 semesters (except the 2nd semester of grade 12) of 3 subjects in a group and based on their result of National High School Certificate Examination. Candidates can use their scores in groups of Mathematics, Physics, Chemistry (A00), or in groups of Mathematics, Chemistry, English (D07) or Mathematics, Chemistry, Biology (B00) or group of Mathematics, English, natural sciences (D90) to apply for admission to the CET programme. HCMUTE selects candidates based on quotation and the cut-off scores of Ministry of Education and Training (MOET). Candidates will be selected with priority from high to low according to their scores *[Exh. 6.1. Student enrollment scheme]*.

Besides, HCMUTE has many policies to attract talent students to elevate admission quality such as direct enrolling students who are awarded 1st, 2nd, 3th prizes in Olympic Competition at National level for high school students or STEM competence. The priority of admission is also considered for high school student awarded 1st, 2nd, 3th prizes in Olympic Competition at Province level; 4th or extra prizes Olympic awards organizing for high school students at National levels; good students from gifted high schools; top 200; enrolling students with good scores in English examinations (IELTS, SAT) and also applied for HCMUTE-linked high schools.

HCMUTE has financial policies to attract talent students such as scholarships for freshman who get highest admission scores in each faculty, 100% discount tuition fee for first semester and extended semesters in cases of good results for awarded students at National or Province levels. Besides, HCMUTE also provides scholarships (50% tuition fee for entire courses) for female students who apply for specific programme. Furthermore, HCMUTE also adding bonus marks and giving tuition fee for students from remote areas, ethnic minority groups. *[Exh. 6.2 HCMUTE's enrollment notice and admission procedure]*. Besides, HCMUTE provides high-quality human resources in the field of vocational education such as training teachers working at vocational schools and colleges. HCMUTE is completely free of technical pedagogical programme.

To attract potential talents, there are several policy changes in 2021: HCMUTE gives full scholarships (4 years of tuition fee) which will be re-considered after each year. There are also 6 full English-using courses for talent students including Robots and Artificial Intelligence, Information Technology (Major in Artificial Intelligence), Automotive engineering technology, Mechatronics engineering technology, Control engineering and automation, Logistics and Apartment management. These programmes enroll students who achieve 1st, 2nd, 3th awards in Olympic Competition at National level for high school students in Mathematics, Chemistry, Physics, Informatics and English. There are scholarships awarded to the potential students based on National High School Certificate Examination results of student who have achieved total scores greater or equal to 24/30. Scholarships in 2021 will be given for students equivalent 36 billion VND. Besides, families have second child studying at HCMUTE will be received 20% discount on tuition fee.

HCMUTE has many policies to attract talent students to elevate admission quality. The number of students entering the CET from 2015 to 2020 generally increased. The admission standards are always in the top of the HCMUTE during these years. In the first 3 years of enrollment, the benchmark of the DCT was equal to that of the food technology department. In the next 3 years from 2018 to 2020, the chemical engineering technology department had the highest standard score among the 3 departments of FCFT as shown in *Table 6.1*. In 2021, HCMUTE was in top 3 of technical universities in Viet Nam requiring the highest enrolment standard for chemical engineering technology with 26.5 (D07, D09) and 26.0 (A00, B00).

Table 6.1. The benchmarks of CET and other programmes at FCFT.

Year	CET	Food Technology	Environmental Engineering Technology
2015	31.25	31.25	29.75
2016	22.75	22.75	21.25
2017	25	25	21.5
2018	21	20.85	18.35
2019	22.4	22.2	19
2020	25.5	25.25	21.5
2021	26	26	23.5

The policy and enrollment documents which support the admission process is published and posted on the official website (*http://tuyensinh.hcmute.edu.vn*), Facebook, booklets of MOET, newspapers, online newspapers, flyers, broadcast, delivered to high schools. Besides, HCMUTE promotes consulting activities at local high schools such as Café consulting or online consultation on UTE – TV Channel: *http://utetv.hcmute.edu.vn*. Furthermore, staffs of University and Faculties join in consulting days which are organized by MOET and social media. The activities such as Job

orientation fair – Open day – are frequently hold at HCMUTE which will share potential carrier development experience from graduated students. In addition, professional clubs in HCMUTE support high schools organize academic activities to promote, orient students and create enrollment sources. For the selection, HCMUTE will inform to these students and their families via social media, official HCMUTE's website, and admission letter to their private addresses *[Exh. 6.3 Approaches to inform the HCMUTE student intake policy and admission criteria]*.

Besides, the level of achievement of entering students, first-year students after admission will be given an English language entrance exam to classify their foreign language proficiency. Students who pass this examination will learn English 1 course.

Every year, HCMUTE surveys incoming students to see how they know about the university and based on that information the university chooses admission-counseling channels to promote efficiency. In addition, the university also analyzes enrollment data by regions, majors to enhance promotion to less-known areas for students. HCMUTE has built the software: *http://tuyensinhdss.hcmute.edu.vn/* to support the consulting activities. From there, HCMUTE adjust and update admission policy every year via media channels to inform students on time.

Table 6.2. Total Number of Students (last five academic years).

Academic Year	Students					
	1st Year	2nd Year	3rd Year	4th Year	>4th Year	Total
2015-2016	85	-	-	-	-	85
2016-2017	73	83	-	-	-	156
2017-2018	80	73	83	-	-	236
2018-2019	83	78	68	72	-	301
2019-2020	97	81	74	64	18	334
2020 - 2021	107	97	80	74	47	405

Table 6.3. Intake of First-year Students (last five academic years).

Academic Year	Applicants		
	No. Applied	No. Offered	No. Admitted/Enrolled
2015-2016	-	86	85
2016-2017	-	130	73
2017-2018	-	88	80
2018-2109	-	86	83
2019-2020	-	102	97
2020-2021	-	173	107
2021-2022	-	209	171

6.2. Both short-term and long-term planning of academic and non-academic support services are shown to be carried out to ensure sufficiency and quality of support services for teaching, research, and community service.

The university develops a medium-term strategic plan every 5 years (2011-2015, with vision to 2020; 2017-2022, with vision to 2030). In addition, faculties also have plan according to the Rector's tenure 2013- 2018, 2020-2025 which closely adhere to the specific plans and targets set by the University. Among of them, personnel development plan is one of the major targets with following foundational principles: increasing the number of support staff throughout the HCMUTE, improve the foreign language skills of officials and employees, improve management efficiency and work quality according to advanced management systems, review and adjust in detail functions and tasks as well as the working processes of the units to ensure the effective coordination of all activities in the HCMUTE *[Exh. 6.4 Quality plan in long and short terms of HCMUTE and FCFT]*.

Planning for the development of supporting staff is based on HCMUTE's plan in terms of the expected number of students, the number of faculties/departments, service centers, and the faculty/department's annual staffing needs to meet teaching, research and service requirements *[Exh.6.5. Human resource*

development planning for support staff]. From the *Table 6.4*, it can be seen the list of supporting services of HCMUTE support staff. At present, HCMUTE has 181 support staff in different units/offices. Most of the services for students are centralized at university level, supplemented by the faculty levels. The number and qualification of supporting staffs are describe in *Table 6.5*. FCFT have plan for development of supporting staff (Laboratory staff, Secretary) is based on HCMUTE's plan in terms of the expected number of students.

Every year, HCMUTE evaluates the support staff's abilities to reward and give training plan. In addition, the Quality Assurance Office has an annual service quality survey to help them improve their support services *[Exh. 6.6. Survey on students for supporting service quality]*. In addition, the support staff also give opinions on improving the working environment through the annual survey. Survey results show that support staff are satisfied with the working environment at HCMUTE [*Exh. 6.7. Annual survey about working environment]*.

Table 6.4. Supporting services.

No.	Supporting unit	Students' services
1	Academic Affairs Office	Consulting on course selection and registration for students; instructing students how to make study plan for each semester and the whole study period.
2	Science Technology and International Affairs Office	Consulting on scientific research and organizing scientific research competitions for students. Organizing exchange activities between of HCMUTE's student and international student.
3	Admissions and Student Affairs Office	Counseling students about admission, policies, scholarship, tuition exemptions.
4	Enterprises Relations Office	Organizing career orientation activities for students such as job fairs, golden recruitment week to help graduate students find a job. Organizing short-term course for soft skills for students. Building relationships with enterprises to support teachers and students in finding internships. Creating meeting between employers and students to equip students with experience about job market demands.
5	Student Service Center	Finding part-time jobs for students, looking for sponsors to support students in need.
6	Youth Union & Students' Association	Supporting students to join useful social activities, cultural and artistic activities.
7	Library	Providing students with learning materials and information search systems. Providing students with space for reading and seft-study.
8	Information and Network center	Building and administering the online education system, supporting students to register for courses, schedules, course information, scores.
9	Dormitory Management	Assisting students with accommodation.
10	Health Care Center	Consulting and caring students'health.

Table 6.5. The number and qualification of supporting staffs.

No.	Unit	Total	Assoc. Prof.	Doctor	Master	Bachelor	College	Intermediate
1	Quality Asssurance Office	**6**	1	0	3	2	0	0
2	Academic Affairs Office	**12**	0	0	5	7	0	0
3	Finance and Planning Office	**13**	0	0	3	9	1	0
4	Science Technology and International Affairs Office	**11**	2	2	3	4	0	0

5	Enterprise Relation Office	8	0	0	3	5	0	0
6	Facility Management Office	7	0	0	3	2	1	1
7	Academic Inspectorate Office	5	0	0	3	2	0	0
8	Equipment and Maintenance Office	13	0	1	2	5	0	5
9	General Administration and Personnel Affairs Office	41	0	1	6	9	0	25
10	Press and Media Office	8	0	0	3	5	0	0
11	Admision and Student Affairs Office	12	0	1	4	6	1	0
12	Library	12	0	0	5	5	2	0
13	Health Care Office	2	0	0	0	0	1	1
14	Software Technology Center	4	0	0	1	3	0	0
15	Digital Learning Center	4	0	0	3	1	0	0
16	Student Services Center	8	0	0	3	5	0	0
17	Physical Education and National Defense Center	17	1	0	9	7	0	0
18	Center for Language Learning	2	0	0	1	1	0	0
19	Innovation and Entrepreneurship Center	5	0	0	4	1	0	0
20	Information and Network Center	6	0	1	0	4	1	0
Total		**196**	**4**	**6**	**64**	**83**	**7**	**32**

6.3. An adequate system is shown to exist for student progress, academic performance, and workload monitoring. Student progress, academic performance, and workload are shown to be systematically recorded and monitored. Feedback to students and corrective actions are made where necessary.

Student progress, performance and workload are monitored by the ASAO, the AAO and the Faculties. Through the website *https://online.hcmute.edu.vn*, lecturers can access data about the list of students and manage the classes which they are in charge of, enter the progress and final scores at the end of semesters. Students can register for the courses, tract the timetable, track exam schedules and other announcements of the HCMUTE. At the same time, students can monitor the score, the number of accumulated credits of the learning situation through the statistical chart of the average scores over semesters. On web pages *http://utex.hcmute.edu.vn*, lecturers can upload lectures, exercises, exams and monitor student feedback on the subjects. *[Exh. 6.8. E/M learning activities]*.

In addition, the AAO's academic monitoring and alerting system performs filtering at the end of each course, showing the GPA and cumulative number of credits of each student in order to consider granting scholarships to students with high scores, alerting students having low scores and listing students accumulating enough conditions for graduation, students subjected to academic warnings sent to the faculty. From the 2014-2015 school year, HCMUTE deployed to build a Dashboard

system: *http://dashboard.hcmute.edu.vn/* to monitor the entire data system related to the situation and learning results of students in the whole university. From there, ASAO find out students with low GPA and give advice for registering for the next semesters. HCMUTE has financial support for students with difficult circumstances, creating jobs on the spot for students. In addition, the student service center and student assistance center of HCMUTE will assist students in finding part-time jobs which students can have a source of income to pay for their studies. Students can work and focus on studying or organize tutoring classes for first-year students who can't keep up with the lessons. In addition, the class staff, the youth union - the student union monitor the university's rules, social work activities to consider training scores. Student grading each semester will be based on GPA and training score. Besides, the team of collaborators assist lecturers to take students on a field trip to manufactures almost every year. Lecturer connect with enterprises to take final-year students for internships.

Students can find out information about the programme, detailed course outline through the FCFT website and through the introductory course or through the HOD and counselors. Students can register and withdraw more or less subjects than the studying plan according to their ability via the electronic portal system but not more than 28 and less than 10 credits/semester. Number of credits per semester is shown in *Table 6.6.*

FCFT bases on the student's subject scores, cumulative GPA, and accumulated credits to advice students. Our consulting team (including faculty and students) will advise and support students with low GPA scores, low cumulative credits by giving advice on how to study effectively. These students can also directly ask the consultant team via FCFT's website, email, social network, and phone-line. The teachers and TAs in FCFT support lectures for weak students through online or face-to-face meetings *[Exh. 6.9. FCFT's team of consultants].* FCFT also has scholarships to support students with difficult circumstances.

Table 6.6. Number of credits per semester of CET.

Semester	1	2	3	4	5	6	7	8
No. credits	20	22	23	21	21	19	14	10

6.4. Co-curricular activities, student competition, and other student support services are shown to be available to improve learning experience and employability.

To create the passion for learning orientation for first-year students who received special attention from FCFT, the Freshmen Welcome Ceremony, the exhibition of scientific research products, training to use the Library, and The Introduction to Chemical Engineering course is organized by FCFT at the beginning of each academic year. These activities aim to help freshmen to communicate with alumni, present the purpose and significance of their career, create the link between the students and society and introduce HCMUTE and FCFT *[Exh. 6.10. Activities in Orientation week].*

Moreover, a Student Handbook that contains full of information about HCMUTE regulations for students, student support policies, and graduation requirements is delivered to freshmen to help them adapt to the new life in university. There are also some clubs in HCMUTE such as English clubs, sports clubs, soft skill clubs, dance clubs, and social activities. Some clubs were organized in FCFT to enhance foreign language and soft skills for the first-year students *[Exh. 6.11. Students' clubs in UTE and FCFT].*

Lecturers in FCFT play a key role in informing and coaching students. Lecturers perform teaching activities (subjects in theory or laboratory experiments), and supervisor activities (guiding the project work, thesis, the actual working-place visiting, and especially scientific research). In FCFT, lecturers are mentors and also the supervisor who encourages and guide students to participate in the creative competition from scientific research funding of HCMUTE and the technology transfer activities *[Exh. 6.12. Creative competition from scientific research funding].*

To enhance students' learning experiments and employability, there are activities for the student including extracurricular activities and competitions. For extracurricular activities, there are career orientation sessions and seminars on how to write curriculum vitae (CV) and soft skills, equipment

exhibitions, short-term training courses, and factory visiting tours which are organized by enterprises. In competitions, Green Environment & Clean Food Competition, Environment festival date are organized for students of HCMUTE and other universities to show their eco-friendly products and knowledge about environmental protection *[Exh. 6.13. Student's competitions and extracurricular activities]*.

Students in FCFT are armed with professional skills to easily find a job after graduation and follow their favorite training programme. Those skills are equipped for students through part-time employment, participation in social activities, and short-term training courses on soft skills that are actively found by the cooperation of FCFT and functional offices. To create opportunities for graduates and students, FCFT also co-works with ERO to organize job fairs, golden week of recruitment, and virtual recruitment program 2021. Graduates and students will have an opportunity interviewed by employers at the job fairs *[Exh. 6.14. Job support services and careers guidance]*. In 2021, the university developed an application to create a connection between students and businesses, that students can upload their personal information via this application, and businesses can log in to the link to search for suitable candidates *[https://careerhub.hcmute.edu.vn]*.

The good infrastructure of HCMUTE supports students including learning activities with a study room, library, laboratory, and self-study sessions with free wifi. Besides, arts and cultural activities are frequently held in the hall, and schoolyards, as well as many sports activities, are organized at sports fields for volleyball, basketball, football, and Karate. Additionally, 311 rooms accommodating 2,416 students are also managed at 02 dormitories for students accommodations along with 04 cafeterias-canteens and supermarkets which provide safe eating foods with essential shopping and good price for students *[Exh 6.15. HCMUTE's physical environment]*.

Students in FCFT are encouraged to organize and join clubs or activities organized by YSA for soft skills and entertainment such as music clubs, dance clubs, sports clubs, and soft skill clubs. There are also social activities with many topics associated with charities such as art performances in the remote regions, free lunch for children and the homeless, or gifts for children who are exposed to Orange Agent. Besides, students also participate in volunteer activities such as blood donation or visiting orphans. These social activities are helpful for students to gain practical knowledge, develop a good personality, and have a sense of responsibility to society *[Exh. 6.16. Social environment of HCMUTE and FCFT]*.

In 2014, HCMUTE established a team of consultants who are staff from functional offices, lecturers, and students, supporting students in regulation, policy, academics, and so on. Underperformed students will get an academic warning at the end of the semester. The team of consultants can directly contact warning-study students by phone or email to solve their trouble. Besides, these students also can directly ask the consultant team via FCFT's website, email, social network, and phone line *[Exh. 6.9. FCFT's team consultants]*.

Moreover, students can get help from the experts from Health Center (HC) or Student Service Center (SSC) to relieve their psychological problems. HC has supplied health care services including medical insurance, regular-full health care for students, and initial medical examination for students at the time of admission. Besides consolidating and improving knowledge, students will get relaxation from activities such as joining open-air tours, sightseeing practicing, activities of physical education or sports games *[Exh. 6.17. HCMUTE's psychological environment]*.

The counselors from FCFT also help students to search for scholarships to help them overcome their economic difficulties *[Exh. 6.18. List of students awarded scholarships]*. For the concerns as well as the difficulties of student's life, there is also the financial support policy from the ASAO giving students a loan. For advanced students, there are some supporting programmes such as international scholarship, a programme for exchange students, or funding for scientific research which help students to develop their talent *[Exh. 6.19. Supporting programmes for advanced students]*.

6.5. The competences of the support staff rendering student services are shown to be identified for recruitment and deployment. These competences are shown to be

evaluated to ensure their continued relevance to stakeholders needs. Roles and relationships are shown to be well-defined to ensure smooth delivery of the services.

Each year the GAPAO will recruit new support staff based on the need of some needing staff informed by faculties and offices. There is an ISO procedure for the recruitment of new support staff in HCMUTE. For each position, information and recruitment criteria are clearly defined and informed on the website of HCMUTE and also published in the newspaper and online presses including Nguoi Lao Dong (The Laborers), Tuoi Tre (The Youth), Giao Duc va Thoi Dai (Education and Times).

The instructions for the process of staff recruitment are clearly described step by step as planning, recruitment notification, receiving applications, reviewing applications, testing of the professional qualifications, foreign language, and information technology, interviewing at the faculty and Admission Council, informing recruitment results, and lastly signing a contract for the first time *[Exh. 6.20. Procedure of recruitment]*. In the announcement of recruitment, the competencies of the job position are clearly defined including general competencies and specific competencies. In HCMUTE support staff is supposed to have general competencies including teamwork, interpersonal skills, work safety, literacy, English, IT and job-specific technical skills *[Exh. 6.21. Competences and Job description]*. Besides, there are also specific competencies identified for each job position by FCFT (*Table 6.7*).

Table 6.7. Competency of support staff in FCFT.

Support staff	Job responsibility	Qualification	Number
Secretary	1. Counseling and assisting students in implementing the university's regulations: Support students in the university regulations, and administrative work. 2. Administrative work: Transfer information and announcements from the Faculty's Executive Board to the Departments and staff in the Faculty (in print or by email); Drafting administrative documents at the request of the Dean and Vice Deans; Secretary for all Faculty meetings; Planning and purchasing stationery for each semester according to actual needs; Monitor and manage records, equipment, and assets in the faculty office. 3. Management of ISO quality records and KPIs: Monitor and update the evidence in the ISO file of the unit. Manage records of KPIs performed at the unit	Bachelor's or Master's	1
FCFT Consultant team	1. Be in charge of academic matters about choosing and registering courses each semester, learning methods, in-debt credits, and credits accumulation for graduation; how to do thesis projects, scientific research, and so on, through direct ways of consultation such as phone, email, website, Facebook, and so on. 2. Consult students in supporting policies, and psychology.	Bachelor's or Master's	8 Including: 1 FCFT Vice Dean 3 Lecturers 1 Secretary 3 Students

Laboratory	1. Laboratory management: Manage the laboratory following the teaching plan. Assist lecturers teaching in the Lab. Manage and arrange tools, machinery, and equipment Check the operating status of machinery and equipment regularly. Support and guide students to use machinery and equipment properly when students participate in scientific research. 2. Control of records related to laboratory and workshop: Report the inventory and demand for chemicals, and necessary items for the laboratory at the beginning of each semester. Check the asset inventory related to Laboratory to make a maintenance plan and purchase equipment and chemicals. 3. Support teaching experiments and scientific research.	Bachelor's or Master's	1

Based on the staff's qualifications and working experience as well as depending on the employees' tasks and job descriptions, the Dean of Faculty or Head of Unit arranges a suitable position for newly recruited staff *[Exh 6.21. Competences and Job description]*. To guide these newly recruited staff and verify their performance before passing the probation period, there is the assigned instructor. New staff has to pass the one-year probation period before becoming an expert *[Exh. 6.22. Probation period policies and procedures]*.

The appointment process of qualified staff at the Faculty, Office, and Centre is issued by GAPAO. This appointment process for Dean and Vice Dean of Faculty, Head of Centre, and Office is taken democratically, openly, and transparently through clear steps. These steps include taking letters of recommendation and polling the credibility of staff and key staff in the unit *[Exh. 6.23. Decision on appointment statutes, re-appointment]*.

In HCMUTE, a manpower plan has been established actively based on management staff sources, which has increased in quality to meet the requirements of the development of the management team. The management position will be appointed to staff who has professionally competent and adequately ethical following standards and criteria of the Viet Nam Laws of Higher Education and the Charter of the University to ensure completion of the assigned work. Support staff who has good working performance will have a promotion in their career. This means that they will get an increased salary, continuing to sign the contract from 1 year, 3 years, or long-term contract as well as getting a higher position.

Every three months, the competencies of support staff are evaluated using an online KPIs system *(www.kpis.hcmute.edu.vn)*. The evaluation process includes staff self-evaluation and the evaluation of their immediate supervisors *[Exh. 6.24. Support staff evaluation process]*. Through a survey of undergraduate students and also annual meetings and conversations with students, student service quality, the competencies, and expertise of the support staff are received *[Exh. 6.6. Survey on students for supporting service quality]* Moreover, QAO has organized a survey about the university service quality presenting the preliminary results of the assessment and improvement activities to evaluate the competencies of support staff annually. Besides the university's survey, there is also the evaluation of the Head of Consultant Team in FCFT for the service quality of consultant team with 3 levels (excellent, good, fair) and then proposes a reward for active and effective staff every semester *[Exh. 6.25. Survey on service quality of consultants]*. The support staff has the motivation to work more effectively when they obtained good performance assessments. The criteria for evaluation of staff's performance are based on quality and productivity, quantity, and also compliance with

regulations *[Exh. 6.26. KPIs system and Paper self-report]*. Results evaluation in annual competition is used for reward and recognition of staff by giving the appellation, increasing salary additionally, and giving a productivity bonus. There is also the reward with money and salary increase ahead of schedule for emulative titles at HCMUTE and MOET levels or the rewards from the HCMUTE President for guiding students to win the prizes at competitions. The excellent support staff is polled for the appellation of "Character of Year", "Primary Competitor", and "Progressive Laborer" at the end of the academic year. Based on the result of that poll, the rewards and recognition for staff are determined and implemented by giving appellation, increasing salary additionally, or giving productivity bonus. *[Exh 6.27. Emulation and rewards for support staff]*.

The support staff is always given the opportunity to present or feedback on their satisfaction with their work to HCMUTE through an annual staff meeting, annual summer conference for key staff, a survey of employees on the working environment conducted annually by QAO, mailbox, or e-mail, meeting and conversation with The Board of Directors in Thursday on the last week of the month and people's inspection boards receive complaints *[Exh 6.28. Activities of staff meeting, summer conference]*. An annual survey of employees on the working environment has shown that from 2016 to 2020, the percentage of employees satisfied with their current job is higher than 90% meaning that staff in HCMUTE are feeling happy with their job (*Figure 6.1.*) *[Exh 6.7. Annual survey of employees on working environment]*.
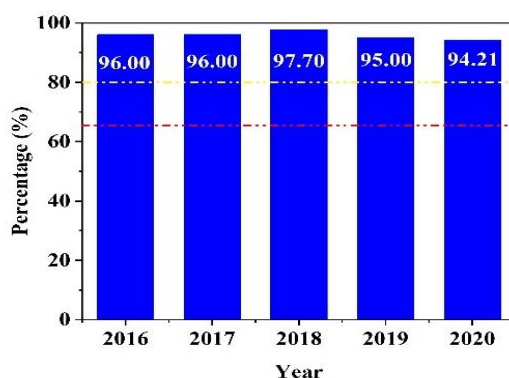
Figure 6.1. Percentage of employees satisfied with their current job.

6.6. Student support services are shown to be subjected to evaluation, benchmarking, and enhancement.

Every year, HCMUTE organizes a survey on student satisfaction about the quality of student services for improvement. There are several methods for getting students' feedback about the quality of student services. Every semester, in the meeting with students, the FCFT's Dean, Vice Deans and Head of departments listen to their feedback and request in different areas from academic issues to support services or facilities. Then the HCMUTE management board: the President, Vice Presidents, and Heads of support offices would meet with students in the University Hall to listen to students' feedback and request. There is the process of assessing student satisfaction during the study period for a survey of students about the quality of service in the university to improve the quality of student service. The survey is conducted every year by the QAO. All full-time university students take an online survey on the website *http://danhgia.hcmute.edu.vn.*

The assessing students' satisfaction is a survey of students' satisfaction with competency and attitude of support staff, the schools' facilities, and the school's service quality (Figure 6.2), *[Exh 6.6 Survey on students for supporting sevrvice quality]*. Survey results were presented on a scale of 100 points. When the evaluation point of factors is under 65 (redpoint), these factors are alarming factors that need improvements and fixes. The blue point (evaluation point of factors between 65 and 80) is acceptable, meaning this is a potential factor and the strong point of the university, and further improvements are needed. The excellent point is the yellow point, between 80 and 100. The yellow point is the school's strong point, which should be maintained and developed.
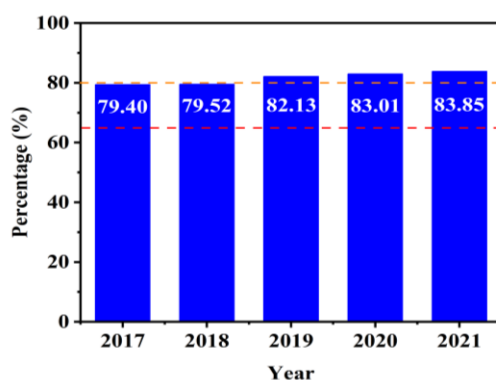
Figure 6.2. Student satisfaction with the support staffs.

In the last five years, significant enhancement in support services and facilities has been made. Firstly, the SSC provides students with various student services, such as supporting students' English clubs, and soft skill clubs, providing student counseling and helping students to do community services *[Exh 6.29. Student service center activities]*. Also, the ERO focus on career services such as inviting experts from companies to talk to students about careers in a particular field, helping them to prepare a CV and job interview, train students in a soft skill such as problem-solving, teamwork, communication, organizing job fairs twice a year, organizing field trips, connecting with industry for an internship, sponsorship both in equipment and scholarship *[Exh 6.30. ERO's activities]*. Other enhancements to facilities are classroom repaired, laboratory equipment checked and prepared, and a new Buildings has started to build. Classrooms are frequently repaired and upgraded with LCD screens, projectors, and cameras. A digital learning studio with modern multimedia facilities was built to assist online learning as well as developing materials. Every year, laboratory equipment is checked and repaired periodically. The measuring instruments are calibrated according to an approved process. In addition, the purchase of additional equipment is planned and implemented at the end of each semester in advance to prepare for the next semester *[Exh 6.31. Calibration, maintenance and repair equipment]*. The cost of the new building is 60 million USD. Moreover, to provide more comfortable spaces for students to read books and study or just to have a rest, apart from the HCMUTE Library in Building A, it is equipped with modern facilities, spacious reading rooms, and professional librarian staff in the basement of the Central Building. The open hour, regulations, and guidelines are published on the website of the Library. The Library often conducts surveys of students' satisfaction with their activities to continually improve in order to give the best service. In 2017, HCMUTE has built a modern self-study area to meet the learning needs of students on the fifth floor of the Central Building *[Exh 6.32. Renovation, repairs and acquisition]*.

7. Facilities and infrastructures

7.1. The physical resources to deliver the curriculum, including equipment, material, and information technology, are shown to be sufficient.

HCMUTE has two campuses with a total area of 21 hectares, the main campus is located at 1 Vo Van Ngan St. and the second campus is at Le Van Viet St., both in Thu Duc city. HCMUTE has 176 classrooms, 98 practice workshops, 58 laboratories, 2 libraries: 1 traditional library in block A and 1 high quality library in the basement of the Center building with reading room, borrowing room, green learning space, self-study areas, group learning rooms. Classrooms can be accommodated from 40 to 100 students.The general subjects are basically shared the large rooms. Specialized classes are usually small classes of about 30 students per class. In addition, there are discussing rooms in Faculty and Department for teachers to interact with students and guide projects as well. All classrooms are air-conditioned and most of them are equipped with multimedia systems such as microphones, televisions, projectors and some classrooms have cameras, thus lecturers can select the most appropriate teaching device for each lesson. The computer roomsare equipped with quite high-quality computers which are installed with necessary software for students to study fundamental and specialized knowledge in chemical technology such as AutoCAD, Access, Excel, SPSS, Minitab, etc.

The self-learning opened areas located on the 5th floor and the basement of centre building, and the open areas in building A are equipped with tables and chairs, prohibited devices, free wifi connection so that outside of class time, students can study, search information and discuss with each other. Laboratories are provided with fundamental and advanced equipment and instruments for students to study and conduct research, graduation thesis, and academic playground.

HCMUTE's infrastructure and equipment are renovated, repaired and added every year. In 2021, the university opens the F building to increase the number of laboratories and classrooms. Every year, HCMUTE invests hundreds of billions of VND to build and expand more classrooms for theoretical subjects, invests facilities and modern multimedia equipment to support teaching for many classrooms and laboratories for scientific research, many high-quality practice workshops. The classrooms have multimedia equipment with projectors or LED TVs. The university also has a Digital Learning Center was built in 2013 with modern equipment, sponsored by Intel Viet Nam for group study, seminars with remote professors or recorded videos from teachers uploaded to LMS. Besides, HCMUTE also organizes regular procurement of additional equipment with a total purchase amount of about 6 billion VND/year. In 2021-2021, HCMUTE also invested 22 billion VND to upgrade and expand infrastructure, apply IT in training service, improve management quality, serve the needs of teachers and students in credit learning process, implementation of online training system e-Learning, Mobile Learning, etc.

7.2. The laboratories and equipment are shown to be up-to-date, readily available, and effectively deployed

CET has 5 laboratories, namely: organic chemistry laboratory, analytical chemistry laboratory, inorganic chemistry laboratory, polymer chemistry laboratory, machine and equipment laboratory which are fully equipped with tools and machines to serve the teaching of basic experimental subjects, majors of CET as well as scientific researches of students, lecturers and graduate theses of students. In 2020, the CET's laboratories have just been invested more than 12 billion VND to buy modern equipment for study on the structure of solid materials, advanced analysis equipment such as: SEM, EDX , PL, UV-Vis, preparative chromatography, DLS and DSC to aid teaching and researching *[Exh. 7.1. CET laboratories]*. Moreover, in 2 years from 2022 to 2023, CET will be invested by HCMUTE with 2 more laboratories specialized in pharmaceutical chemistry with an investment of 30 billion VND. Every year, CET has a budget of about 500 million for maintain labs and equipments

CET laboratories are managed by 1 laboratory staff to ensure that CET laboratories are operated stably, according to procedures and well support teaching preparation. The status of the machines is reported and updated regularly by the laboratory staff through the operating logs. Every year, the equipment management department will coordinate with the Chemical Engineering Department to check and classify machines and equipment to have a plan for maintenance, repair or replacement. Every year, CET is invested from 200 to 500 million VND to buy new tools or small machines *[Exh. 7.2. Financial plan for facilities and equipment]*.

Relating to safety issues, each lab has enough the on-site fire-fighting equipment (fire extinguishers, hammers, fire alarms), first-aid kit, personal protective equipment (blouses, safety glasses, masks, gloves etc.). In the laboratory, the people (lecturers, students, visitors) are protected through: panels, guidelines, document management system, training programs, personal protective equipment. Contact information to the lab manager is always available on the main doors to all of students and staffs. Everyone has to record their personal information in the laboratory diary kept by the manager if they want to enter the laboratory. The missions of the laboratory staff are managing equipment and activities within the room, preparing for lessons. Machinery and equipment are always in a state of operational readiness. Over 100 chemicals also have Material Safety Data Sheet – MSDS. All hazardous wastes generated from the labs are classified, collected, stored and treated in accordance with current legal requirements *[Exh. 7.3. Health Safety Chemical Security management system in LABs – HSCSMS]*.

In addition, the CET also links to laboratories of Faculty of Chemical Engineering of Ho Chi Minh City University of Technology, Ho Chi Minh City University of Food Industry, and Ho Chi Minh City University of Natural Sciences for research collaboration of lecturers and students. Every year, the CET organizes visiting for students, and undergraduate students can do internships at production facilities to increase the practical skills.

7.3. A digital library is shown to be set-up, in keeping with progress in information and communication technology.

The library of HCMUTE includes various types of reference books in Vietnamese, reference books in foreign languages mainly in English, textbooks, various types of dictionaries, technical standards, scientific research reports, theses and projects of undergraduate students. 354,793 Textbooks; 119,890 Vietnamese Literature Books; 8,510 foreign language books; 7,984 graduation projects,master thesis - scientific research reports; and more than 137 newspaper and magazine titles and 50 externally linked electronic libraries for all disciplines. Students can borrow 10 books/semester. Additionally, the Library has 01 computer room with 93 computers with internet access for searching documents, 4 reading rooms with 2,000 seats to serve teachers and students from 7 am to 5 pm, especially during the exam period, the library will be opened through noon and night to serve the high learning needs of students *[Exh. 7.4. Library resources]*.

Since 2012 the library has built a portal to provide information and electronic documents to readers via website: *https://odilo.hcmute.edu.vn/*. These portal serves information for lecturers and students in 24/7. Each reader is provided with an account to log in to the digital library, so that they can read or download e-books. HCMUTE has purchased user rights of the national Agency for Science and Technology and foreign publishers (such as Springer) to serve the searching and exploitation of information for key research groups via website: *http://csdl.hcmute.edu.vn/*. Several links below allow accessing valuable searching information from library including www.ybook.vn, www.sachweb.com, www.alezaa.com, www.ebook.hcmute.edu.vn.

To organize self-study spaces, the library is designed with 2 floors in area A, the basement of the central building and 5th floor of the central building, including: Common reading room, room to borrow reference books and textbooks, community reading room, tutorial rooms, 4 group study rooms. To create favorable conditions for the exploitation of readers, the library has equipped a system of computers for information searching. In addition, the library has provided a wireless network system that covers the entire library. The library is also added documents every year based on the faculty list. Since 2015, the library has been upgraded with library management software to serve the borrowing, returning items, and document searching through the networked computer system. Readers can look up documents, check the availability of documents in the warehouse and register to wait for books to be borrowed when they are ready. Moreover, over the years, HCMUTE's library has also expanded the self-study, rest area, installed air conditioning, has a self-study room, a teamwork room, expanded and enhanced wifi coverage...

Every year, the library organizes activities to encourage readers such as: celebrating Vietnamese Book Day, exchanging old books for new books, book and business week, book fair, seminars, thematic reports and organizes a contest to introduce books by video clips *[Exh. 7.5. Annual events in the Library]*. Moreover, the library regularly receives feedback from readers through surveys, readers' satisfaction evaluation, and comments on letters *[Exh. 7.6. Feedbacks from readers]*. Institute through dialogue meetings of HCMUTE leaders with students held periodically each semester. Feedback and comments from readers are considered, processed and put into action by the library in order to continuously improve the service quality of the library *[Exh. 7.7. Feedbacks about quality of service]*.

7.4. The information technology systems are shown to be set up to meet the needs of staff and students.

HCMUTE has a complex information system including student information system, staff information system, curriculum information system, learning management system, research management system,

financial system, etc. For instance, in order to manage the common database to help manage school activities conveniently and effectively, HCMUTE has built a special software system to serve training, asset management, library management, human resource management, survey of staff, students. The school has provided each staff member and student with an email account bearing the school's domain name (*@hcmute.edu.vn* and *@student.hcmute.edu.vn*) to provide and exchange information on time to the staff, students. In addition, the University also provides information to staff through http://hcmute.onlineoffice.vn. Through curriculum information and learning management system Students can view course registration results, view scores, view exam schedules, academic information on the page, and lecturers can view timetables, enter test scores, report break, cancelation, and replacement via *http://online.hcmute.edu.vn*. Students register for online courses via *https://dkmh.hcmute.edu.vn*, view and download documents on *http://thuvien.hcmute.edu.vn*, and study online on *https://utexlms.hcmute.edu.vn*, etc. In addition to the main website of the university, all units in the university have their own websites to promote and provide information of their units. Moreover, HCMUTE has built a system to update and monitor important data of the University in terms of training, scientific research, community service activities, and feedback from related sites via the website *http://dashboard.hcmute.edu.vn* to support HCMUTE to have a view from a detailed overview of each training program to promptly urge, remind, propose improvement solutions and make decisions *[Exh. 7.8. HCMUTE Information technology system]*.

To innovate teaching methods, a digital learning center (DLC) was established, classrooms equipped with modern technology (an investment of 300,000 USD), a co-investment between HCMUTE and the HEEAP Alliance partners, specifically ASU, Intel and Pearson in 2013. The classrooms have capacities for 50 people arranged in 7 work stations. Each group is equipped with multimedia tools and supported to connect to lecturer by virtual collaboration. DLC allows UTE to connect with the University of Arizona (ASU) and other higher education institutions around the world to create an interactive channel between faculties and students to train important skills needed such as: teamwork, problem solving, project planning, presentation skills and English training. After the training courses from DLC, UTE encouraged teachers to participate in Blended learning, E/M learning. Up to now, there have been more than 8358 lectures conducted by lecturers and posted on the internet *[Exh. 7.9. Digital Learning Centre]*.

Furthermore, HCMUTE built the UTEx online training system (*https://utex.hcmute.edu.vn*) under supervisor of HCMUTE in April 2019 with a total investment of 160 billion VND. Through this system, lecturers can teach online, test and evaluate online, approaching modern teaching technology. Due to the serious impact of the Covid-19 pandemic in the 2020-2021, online teaching, testing, and assessment are being well implemented on *https://utex.hcmute.edu.vn*. UTEx also serves as a network for networks connected to the online university's education ecosystem *[Exh. 7.10. Online teaching system]*.

7.5. The university is shown to provide a highly accessible computer and network infrastructure that enables the campus community to fully exploit information technology for teaching, research, service, and administration.

HCMUTE has networked computer systems for units throughout the university to ensure effective teaching, learning and management. The number of computers for students in the whole school is 1512 units. The transmission server system includes: 134 dedicated Cambium Access Point devices, internet bandwidth: Leased line VNPT: 500Mbps domestic/5Mbps international, Leased line VIETTEL: 500Mbps domestic/5Mbps international.

The campus wifi system is covered in the central building, the high-tech building area, some outdoor learning areas for students, and the student service center. Some units also actively equipped wifi for teachers and students to use in learning and research. Staff and students can use the internet for free in the university and are assigned access speed for each object. For the wifi system, the university manages login authentication via email addresses of students, teachers and staff provided by the university. The university uses wifi regularly because high demand of teaching and studying activities

from lectures and students, such a combination of classroom learning and online learning and using the online applications. Currently, HCMUTE is planning to install public wifi systems for all areas and invite telecommunications corporations to design and install special wifi devices to ensure that the wifi system can serve needs of the whole school. Annually, HCMUTE has regularly maintained accessible computers and network infrastructure. From the survey of service collected every year, reports about number of computers, status of wifi system, etc. are carefully recorded. Based on this information, plans for upgrade, maintenance will be carried out. *[Exh. 7.11. HCMUTE wifi system]*.

7.6. The environmental, health, and safety standards and access for people with special needs are shown to be defined and implemented.

HCMUTE always cares about the working environment, health and safety of all staff and students. In 2019, the University issued general regulations on management of safety, health and working environment. For people with special needs, HCMUTE has also constructed special infrastructure to improve service quality such as special road for disable people, toilet for these has special zone and staircase is also lower designed in special areas. Besides, green, safe, beautiful environment is also oriented these people.

The university orients to build a green, clean and beautiful environment, planting more trees every year. Classrooms and work areas are kept clean. The school has implemented a ban on smoking on campus since 2000. The school always has a policy to save electricity and water. Wastewater, chemicals and solid waste are treated according to regulations, having a contract with a collection company, periodically spraying insecticides to kill mosquitoes, termites and seasonal insects throughout the university to prevent diseases. Currently, the university is implementing a project of 1.5 million USD to build a new wastewater treatment system. From November 2017, the university inaugurated an artificial turf field, a multi-purpose gymnasium with a dome for students to participate in sports activities. Students can play football on the grass field of campus 1 and dormitory 2. In addition, HCMUTE also has a tennis court and two basketball courts to serve sports activities of staff and students. The inaugurated has renovated many areas with green trees, lawns, and stone tables and chairs for students to study on their own or relax after stressful classes. In addition, HCMUTE also has a canteen, cafe shop, coffee shop, milk tea shop to serve staff and students. *[Exh. 7.12. Working environment at HCMUTE]*.

HCMUTE has a medical station to take care of the daily health of staff and students, a health station to carry out health insurance and accident insurance for staff and students every year. Once a year at medical centers in Ho Chi Minh City and students are given an initial general health check at the time of admission. In addition, the health station regularly propagates disease prevention and control, checks food safety and hygiene at the university's cafe shop and in 2 dormitories.*[Exh. 7.13. Health care]*.

Safety is high priority in the university. HCMUTE has a security team of 21 people to protect facilities, ensure violations on campus. HCMUTE also equips fire protection equipment in classrooms, laboratories and office rooms in the university and regularly conducts fire drills. On another hand, HCMUTE has installed surveillance camera system in the central building and in important areas of the university as well to help observe security. There are also clear information for exit instructions, emergency hotline numbers (02837221 223 – 48570) *[Exh. 7.14. Security and safety at HCMUTE]*.

FCFT manages many laboratories for students and teachers to conduct experiments on chemical reactions that are highly toxic and explosive. Therefore, safety in FCFT laboratories is a top priority. Lecturers and students are trained in safety and laboratory techniques and protective equipment usage (blouses, eyeglasses, gloves, masks) before entering the laboratory. In addition, FCFT's experimental rooms are also equipped with medical supplies and first-aid tools when an accident occurs during the experiment. The chemicals are classified and stored in specialized cabinets; the waste is taken to treatment.

7.7. The university is shown to provide a physical, social, and psychological environment that is conducive for education, research, and personal wellbeing.

HCMUTE has a spacious area separated from the outside compared with other universities. Many trees inside the university created a green, beautiful and spacious environment for students' learning and living as lecture halls, classrooms, libraries, learning resource centers, laboratories, practice workshops, and dormitories for serving students. Because of the rapid increase in the number of students, the university has developed new infrastructures such as Central Building, Complex Building, and Hi-Tech Center. Some blocks have been renovated (blocks A, B, and E). HCMUTE has 256 classrooms fully equipped with a multimedia system that includes cameras, microphones, televisions, projectors, and free wifi. Besides, there are one digital teaching center, one library, self-study spaces, 158 laboratories, practice workshops supplied with chargers for devices, and free wifi connection to meet the demand of group working or self-studying. Also, two dormitories support the accommodation and four cafeterias-canteens, and supermarkets supply safe eating foods and essential shopping for students. Besides, there are many areas for students' self-study, gathering, and meeting on the 5th floor, in a basement and library. Also, a stadium and a dome are constructed for students to learn and play sports. For student's recreation, there are parks, canteens, coffee shops, and convenience stores inside HCMUTE's area *[Exh. 6.15. HCMUTE's physical environment].*

In FCFT, there are 14 Laboratories and 3 Workshops in Building B for teaching students in Faculty experimental subjects. Lecturers and students in FCFT are also doing research in those Labs and workshops. With the strong investment of HCMUTE in Labs/workshops and equipment for FCFT, lecturers and students in FCFT have a great opportunity to enhance their potential skills in scientific research *[Exh. 7.15. FCFT's physical environment].*

Besides, students in HCMUTE are encouraged in participating clubs for soft skills and entertainment. These clubs are organized by Youth – Student Association (YSA) including music clubs, dance clubs, sports clubs, skill clubs, and other activities.

The security aspect is strictly controlled at HCMUTE so that all people (lecturers, staff, students, and visitors) should be protected. All the equipment in classrooms should be checked and maintained every semester. Also, the support staff comes early before each class to open doors and check all equipment to ensure readiness. The checking before classes in laboratories is required more strictly since there are many machines and chemicals which are hazardous and flammable. Moreover, the entire campus is monitored via a security camera system that connects to a security center. The security staff is divided into small groups responsible for security, ensuring the campuses are safe all day *[Exh. 7.14. Security and safety at HCMUTE].*

The Health Center (HC) is responsible for healthcare and first aid for everyone on university campuses. Also, HC is responsible for the health checking of students as a requirement in the admission process. Furthermore, together with SSC, HC offered psychology advice for students. *[Exh. 7.13. Health care].*

Moreover, students can get advice from advisors when they are in trouble. These counselors from functional offices and FCFT are willing to help students overcome the psychological pressure that arises from their academic activities and lives. They also help students to overcome economic difficulties by searching for scholarships or looking for support; for example, the support policy of ASAO for giving students a loan to help them overcome their financial difficulties. Besides a long time of consolidating and improving knowledge, students can participate in activities such as open-air tours, sight-seeing practicing or sports games, or physical education. They will have more time for fun and relaxation from these activities after the stress of learning knowledge. In addition, health care services for students such as initial medical examination at the time of admission, medical insurance, and regular-full health care are supplied by HC on HCMUTE's campus *[Exh. 7.16. FCFT's psychological environment].*

7.8. The competences of the support staff rendering services related to facilities are shown to be identified and evaluated to ensure that their skills remain relevant to stakeholder needs.

The specific competences required for each job position are clearly defined and identified by the corresponding unit/offices which are shown in the announcement of recruitment. Support staffs in HCMUTE are required to have general competences in skills such as IT and English. The competences and job descriptions are detailed for each job position *[Exh. 7.17. Competences and Job description]*. For example, the competences required for support services within FCFT are shown in *Table 6.6.*

The support staffs are required to attend training courses organized by HCMUTE or other institutions. These courses are based on job requirements arising from the theme of the academic year quality targets. To participate in training courses, support staffs need to propose which course they would like to attend at the beginning of the academic year *[Exh.7.18. Training and development plans for support staff]*.

Support staffs will be required to undergo a one-year probation period before becoming full-time employees. FCFT will focus on the training or retraining of personnel and related activities during this probation process. The training requirements for support staffs are based on FCFT's staff development plan. In HCMUTE there are many open classes such as IT, English, and management classes for support staffs. Besides, support staffs are sent to attend courses outside HCMUTE; for example, fire protection training or how to operate the equipment in the lab *[Exh. 7.19. List of reports and certificate of training courses]*.

Support staffs are also encouraged and facilitated to improve their qualification by taking higher education programmes such as graduate programmes in National institutes *[Exh. 7.20. Regulation on qualification improvement]*. The expenditure on the staff's training programmes is supported by the HCMUTE budget *[Exh. 7.21. Internal Cost Norms]*.

For employee evaluation, rewards, and recognition, every 3-months competences of support staffs in HCMUTE are evaluated using a Key Performance Indicators system which is online *(www.kpis.hcmute.edu.vn).* There are self-evaluation by the support staff and the evaluation of their immediate supervisors for employee evaluation which are based on 3 areas including work volume and performance, work quality, and compliance with other regulations.

A survey on undergraduate students about student service quality and through annual meetings with students and conversations is organized to get information on service quality. QAO has surveyed the university service quality presenting the preliminary results of the assessment and improvement activities for the evaluation of competences of support staffs. Furthermore, the Head of the Consultant Team in FCFT also comments on the service quality of the consultant team with 3 levels (excellent, good, fair) and declares rewards for active and effective staff every semester *[Exh. 7.22. Survey on service quality of staff and student]*.

7.9. The quality of the facilities (library, laboratory, IT, and student services) are shown to be subjected to evaluation and enhancement.

To collect ideas for enhancement and improvement, there is a survey conducted by HCMUTE, and the dialogue between faculty and university students is held periodically about student satisfaction with services and facilities. Each kind of support service and the facility has a suitable type of evaluation. For instant:

For the Library's evaluation, some surveys are held both online and on paper for students and academic staff *[Exh. 7.23. Library's enhancement]*. The results from the survey of students and graduates showed that they are highly satisfied with the yellow point (evaluation point between 80 and 100, good point). *[Exh. 7.24. Student feedback on support services and facilities]. [Exh. 7.25. Graduates feedback]*.

Every semester, a meeting of the FCFT's Dean, Vice Deans, and Heads of Departments with students are held to listen to students' feedback and request. Then students will present their opinions to the HCMUTE management board including the President, the Vice Presidents, and Heads of support offices in a meeting which is organized in the University Hall. The feedback and request can vary from academic issues to support services or facilities. Based on these opinions the President will request the corresponding offices to address the problems for enhancement of the facilities and services; for example, how to improve the wifi access, how to make the process of some services faster, etc. The feedback from students for facilities showed that classrooms, stadium, self-study area, and public area get yellow points (highly satisfied) while laboratories, computer center, and restrooms get blue points (satisfied). Only the Internet and Wifi system get an acceptable point (under 60). For the support services, the results showed that the provided information (at units, from the university's website, email, and media), scholarships, tuition payment, and security and safety get the yellow points. Health care, dormitories, canteens, and student support (for development skills, practice, and searching for a job) get blue points. Again, only the parking area is acceptable with the evaluation points below 60. For those facilities and support services with the red points, the university made some upgrades. For example, in the 2nd semester of 2021, Computer Information Center renovated and upgraded existing equipment in use as well as upgrade bandwidth Internet connection. Moreover, the university will invite large corporations and companies to come to survey and install new coverage areas which do not have Wifi. *[Exh. 7.24. Student feedback on support services and facilities].*

The survey for evaluation of support services and facilities is also held for graduating students when they come back for the Graduation Ceremony. Graduates will evaluate all areas of the programme in this survey including ELOs, curriculum, teaching and learning style, student assessment, support services, facilities, and other aspects. The survey's results of graduates illustrate that the equipment for laboratories/workshop and consultant team get the blue point (evaluation point of factor between 65 and 80, satisfied) which is acceptable while other facilities such as classrooms, laboratories, stadium, and Health Care get the yellow point (good point, between 80 and 100, highly satisfied) *[Exh. 7.25. Graduates feedback].*

There are significant enhancements to support services and facilities which have been made in the last 5 years. Firstly, for the assessment of online learning as well as developing materials a digital learning studio with modern multimedia facilities was built. In addition, classrooms are frequently repaired and upgraded with LCD screens, projectors, and cameras. Moreover, a new F1 Building with the cost of 60 million USD has been finished building for FCFT classrooms and laboratory. Also, HCMUTE built a modern self-study area to meet the learning needs of students on the fifth floor of the Central Building in 2017. Also, the basement of the Central Building is equipped with modern facilities, spacious reading rooms, and professional librarian staff providing more comfortable spaces for students to study and have a rest. All the information such as open hours, regulations, and guidelines are published on the website of the Library.

Since 2014, HCMUTE has upgraded internet servers and the wifi system covers the entire campus with high-speed access. It is helpful for lecturers and students searching for information on the internet. Thanks to this innovation in IT facilities, the teaching and learning activities in HCMUTE can be made online through LMS websites (*https://utexlms.hcmute.edu.vn/* and *https://fhqx.hcmute.edu.vn/).* Through the LMS system, lecturers can send information to students who are studying in their class; for example, lecture notes, videos, notifications, and the student's scores. Similarly, students can receive information from lecturers such as lecture notes, videos, schedules, and scores. They can also submit their homework or do quizzes and tests online through the LMS websites. Moreover, new information from HCMUTE, faculties, and related departments can be updated when lecturers and students access their personal page at *http://online.hcmute.edu.vn/.* Students can receive the schedule, and transcripts and receive announcements as well as send their feedback. Based on the students' feedback at the end of each semester, lecturers will adjust their teaching activities and teaching methods *[Exh 7.26. Renovation, repairs, and acquisition].*

Each year, the measuring instruments in FCFT are calibrated according to an approved process, and laboratory equipment is checked and repaired periodically. At the end of each semester, purchasing of additional equipment is planned and implemented in advance to prepare for the next semester. *[Exh 7.27. Calibration, maintenance, and repair equipment].* There is a new laboratory that has been built for students learning practical subjects as well as doing research (the Laboratory for Process and Equipment in Chemical Engineering) in 2021. Also, there are other projects for building new laboratories in the next academic years.

8. Output and Outcomes

8.1. The pass rate, dropout rate, and average time to graduate are shown to be established, monitored, and benchmarked for improvement.

The quality objectives and training plan of the Faculty are informed to all lecturers and staff at the beginning of each academic year through a conventional meeting *[Exh 8.1. The faculty quality objective and training plan].* In this meeting, Training Programme develops indicators of training effectiveness including training results (graduation rate, dropout rate, average time to graduate), scientific research, employment rate, and stakeholder satisfaction regarding the quality of training for each training programme. In addition, the means to obtain these goals are also discussed. *[Exh 8.2. Department meeting minute]*

By default, the Dashboard system will assign these criteria with the value of the reference benchmark, the Faculty can adjust according to the actual situation (if necessary) through the minutes of the department/faculty/institute meetings. The reference benchmark for the default indicators is the corresponding average value of the last 5 years by faculty/institute or training programme *[Exh 8.3. No. 2919-Regulations on management and benchmark of training efficiency indicators of HCMUTE]*

Table 8.1 shows the pass rate and dropout rate of FCFT students from 2019 to 2022 for 04 cohors. The result indicates that the actual pass rate and the dropout rate are light different from the plan and fluctuate over the years. The dropout rate has trend decreased thanks to enhancing admission consultants. The average on-time pass rate of CET is higher than other programmes in HCMUTE such as EEET, MMT, and MET and the dropout rate of CET is also higher than EEET and on par with other ones MMT, and MET *(Table 8.2).*

Table 8.1. The planned and actual rate of average graduation time 2019-2022.

Year	2019		2020		2021		2022	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Pass rate (%)	90	84.7	90	86.3	90	87.5	90	89.2
Dropout rate (%)	10	15.3	10	13.7	10	12.5	10	10.8

Table 8.2. Benchmark of average on-time graduation among Programmes 2019-2021

Programmes	CET	EEET	MMT	MET
On-time Pass rate (%)	65.2	39.24	40.97	51.56
Dropout rate (%)	13.08	4.44	14.84	13.32

EEET-Electrical Electronics Engineering Technology; MMT-Machine Manufacturing Technology; MET- Mechatronics Engineering Technology

On average, students at HCMUTE can complete their undergraduate studies in 04 years. The period can be extended up to 08 years. To fulfill the requirement of university regulations, students need to complete 150 credits with an average grade of 5.0 or higher, in addition, that, they need to obtain the level of English equal to TOEIC 550 within 04 years to be considered graduated in time, otherwise will be considered late graduation. *[Exh 8.4. Regulation of academic programme lasting]* The CET average rate of graduation within 4 years and more than 4 years is shown in *Table 8.3*. The result shows that between 2019 and 2022 the actual average percentage of students who graduated in time (65.2%) is more than the plan (60%).

Table 8.3. The planned and actual rate of average graduation time 2019-2022.

Year	2019	2020	2021	2022

	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Within 4 years (%)	60	63.9	60	71.4	60	70.0	60	55.4
More than 4 years (%)	30	26.1	30	18.6	30	20.0	30	34.6

Since 2014, an internal quality assurance model followed by AUN-QA has been introduced in HCMUTE, the so-called Dashboard system (http://dashboard.hcmute.edu.vn/#/management/home). Dean, Vice Deans, and Heads of the departments have accessibility to this system to monitor the pass rates, dropout rates each semester, and the percentage of graduates at the end of each academic year. Based on the data, FCFT reports results and analyzes the causes as well as proposes suitable solutions to achieve better results in the next year. Some action plans will be included in the FCFT's annual quality objectives to ensure feasibility, such as increasing the proportion of scientific researchers and increasing the number of students who have jobs after graduation.

Based on the statistic result from Dashboard, FCFT analyzed the average pass/fail rate in the recent 4 years as shown in *Table 8.4*. The results indicate that the average pass rate was 65.2%, and the average dropout rate (after 4 years) was 13.08% from 2019 to 2022. The reasons for dropout were identified as follows: Most quit-out university students are freshmen who find out the training programme is too difficult training, over their competence; while some others cannot complete all the courses within the training time; some others have planned to study abroad.

Table 8.4. Pass and dropout rates of CET students in the last 4 cohorts

Academic Year	Cohort size	% completed the first degree in			% dropout during			
		3 years	4 years	> 4 years	1st year	2nd year	3rd year	4th year & beyond
2015-2016	85	0	63.5	21.3	2.3	0	12.9	0
2016-2017	73	0	71.4	9.5	0	6.8	4.1	2.7
2017-2018	80	0	70.0	22.5	2.5	5	0	0
2018-2019	83	0	55.4	33.8	2.4	4.8	3.6	0

To increase the pass rate and dropout rate, the Board of Faculty have used some solution such as Enhancement the role of the consultant board to help students solve their problems in study and life *[Exh. 8.5. Decision established on consultant board]*. Make a name list of those students whose studying progress is low by each semester, and send for the consultant board to support students in time *[Exh. 8.6. List of students with low studying progress].* Set up the teaching assistant team to instruct how to do the exercises out of class time. *[Exh. 8.7. Teaching assistant team of FCFT].* Open some skill clubs, and English clubs to have students improve their soft skills. *[Exh. 8.8. List of clubs of HCMUTE].* Integrate soft skills in all subjects. Open more classes in the extra semester for students to complete the courses in time. In addition, to help students achieve good results in the exam, from 2016 up to now, the Youth Union - Student Union also organizes training sessions and preparation before the exam. From organizing face-to-face to online reviews (in line with the current epidemic situation). *[Exh 8.9. Exam season review programs].*

For some students who have difficulty in finance, HCMUTE has made a policy to reduce and support tuition fees for low-income students. Also, HCMUTE issued a financial hardship scholarship support for them *[Exh 8.10. Hardship scholarship support information]*. The student services center (SSC) supports searching and provide part-time jobs for students after class time.

8.2. Employability as well as self-employment, entrepreneurship, and advancement to further studies, are shown to be established, monitored, and benchmarked for improvement.

In addition to developing the indicators of training effectiveness, the graduate employment rate, the alumni self-employment rate, student further study rate is also established at the beginning of each academic year. Faculty combined with QAO will conduct surveys to be able to develop the above goals as well as and propose solutions to ensure that the stated objectives are achieved.

QAO conducts a survey which was developed on ISO-based surveying process to collect information about the percentage of HCMUTE students who found a job after graduation. The survey is applied twice a year, includes an online survey about employment status after three months of graduation on awarding diplomas ceremonies day and an online survey for alumni after 1 year of graduation. Survey results from 2019 -2021 of HCMUTE are shown in *Table 8.5.*

Table 8.5. Employability rate of HCMUTE graduates within 3 months (2019-2021).

Survey time	2019		2020		3/2021	
	HCMUTE	**CET**	**HCMUTE**	**CET**	**HCMUTE**	**CET**
Number of graduates	3384	46	2195	45	1210	49
Number of surveyed graduates	2352	35	1511	40	290	40
Rate of surveyed graduates *(%)*	69.5	76.1	68.8	88.9	20.5	81.6
Rate of surveyed graduates who were employed (%)	67.3	74.3	77.0	72.5	65.6	75.0
Average employability rate *(%)*	**70.82 (HCMUTE) and 73.9% (CET)**					

[Exh 8.11. HCMUTE survey report]

Statistical results show that the percentage of students responding to the survey of CET is higher than HCMUTE (82.2% on average vs 53.9% on average). Students had completed the survey procedures before they came back to university for receiving their degrees on Graduation Day. However, in the past year, due to the impact of the covid epidemic, the rate of students returning to the school to receive degrees is very low, affecting the survey rate of the whole university. Meanwhile, CET actively surveyed the link sent directly to students, so the survey participation rate was quite high.

The rate of students getting a job within 3 months after graduation at HCMUTE is considerably high, with an average of 70.82%. While that, the survey result of CET, average rate of employability within 3 months after graduation is 73.9%, being approximate to HCMUTE survey result

From 2016-2020, QAO conducted an online survey by emailing former students who has graduated for 1 year. The survey results over the years are in *Table 8.6* shows that the percentage of employed students after 1 year of graduation is remarkably high, with an average of 95.16%. On the other hand, the percentage of students who are still looking for a job after 1 year of graduation is quite insignificant at 2.2%. The main reason is that the former student has changed job but has not found a new job during the period of the survey. About 2.6% of alumni have other plans for the future such as further study.

Table 8.6. Employability rate of HCMUTE graduates within 1 year (2016-2020).

Survey time	2016	2017	2018	2019	2020
Immediately after graduation (%)	49.0	59.6	56.7	60.5	60.7
Within 6 months after graduation (%)	42.0	37.1	36.3	30.7	29.6
Within 6 months to 1 year after graduation (%)	4.0	1.3	1.5	3.3	3.5
Unemployed (%)	2.0	0.7	3.7	3.2	1.4
Pursuing another plan in future (%)	3.0	1.3	1.8	2.3	4.8
Rate within 1 year after graduation (%)	**95.0**	**98.0**	**94.5**	**94.5**	**93.8**
Rate within 1 year after graduation (%)	**95.16**				

According to the report of the Center of Forecasting Manpower Needs and Labor Market Information, from 2019 through 2025, the chemical-pharmaceutical industry group will become an industry group with high human resource demand, with more than 10,000 human resources each year to serve the socio-economic development for Ho Chi Minh City and the Southeast provinces in the period of 2020-2025 and towards 2030.

Table 8.7. Benchmark of employment rate within 3 months after graduation among Programmes 2019-2021 (%).

Year	CET	MMT	EEET	MET	ECET
2019	74.3	69.7	62.9	59.3	77.1

| 2020 | 72.5 | 72.0 | 68.6 | 58.9 | 74.6 |
| 2021 | 75.0 | 74.3 | 67.1 | 60.2 | 75.6 |

MMT-Machine Manufacturing Technology; EEET-Electrical Electronics Engineering Technology; MET- Mechatronics Engineering Technology; ECET- Electronics and Communications Engineering Technology.

Table 8.7 displays that the employment rate within 3 months after graduation of CET's students compared to other programmes illustrates the high value. It appears that the *CET* are aligning their curriculum and indicates high relative demand for graduates in this field.

In the 2020-2021 school year, HCMUTE planned to measure the learning outcomes of all training programmes to evaluate training effectiveness and include them in the quality goals. FCFT planned to obtain the goal of measuring 50% of the learning outcomes of each programme, including the CET. and set a goal in 2021-2022 to measure 100% learning outcomes of the training programme.

From the plan, FCFT sets PIs for each learning outcome, on average, each learning outcome includes 3 PIs, for each PI some relevant subjects will be selected to match the Correlation Matrix table between learning outcomes and training programme. The data from selected subjects are collected through assessment tests and measurement indicators are established. The measurement results are used to provide information on the training quality as well as assess the level of learning outcome achievement of students.

In addition, through the annual survey of alumni and businesses, HCMUTE and FCFT can partly assess the ability of graduates to meet the requirements of employers, thereby offering solutions to improve the training quality and increase the employment rates for students after graduation.

To attain the goal of improving graduates employment rates which are fully documented in the Quality Objective Plan, HCMUTE and FCFT have taken the following actions: Maintain and reinforce relationships with outside businesses as well as state management agencies by sharing work experience, collecting feedback for programme contribution, taking feedback from HCMUTE graduates about the employment; improve soft skills for students through extra-curricular activities, organize skills training for fourth-year students such as problem-solving skills, planning skills, writing skills, interview skills. Feedback from employers and alumni are used to adjust the programme more and more in line with the social trends of the employers; organize field trips to bring students to the business, access to the real work environment... These activities help graduates have better job opportunities.

Improvement plan:

- Online consult for admission on different channels such as UTE_TV, on Facebook, university web and faculty web, industry facebook... and direct consult for enrollment in high schools, introducing careers and job positions in the future to help students have a suitable selection for their study.

- Organize an Open Day to promote HCMUTE annually, this activity attracts thousands of students from high schools across the country to visit, thereby helping students have the opportunity to access the learning environment at the university level, to see equipment, machinery, and facilities of the University and Faculty, as well as have interesting experiences with the chemical technology through activities such as doing fun chemistry experiments for students.

- Continuously assess and improve training programme (according to ISO procedure) to meet the needs of employers, be in line with the development trend of science, technology, and society. Strengthen soft skills, lifelong learning skills… through training sessions or integrated subjects. Increase the number of English lessons to improve the language skills of students, to achieve the learning outcome, and meet the requirements of employers.

- Organize many job fairs, connect with businesses to find vacancies to introduce to students

8.3. Research and creative work output and activities carried out by the academic staff and students are shown to be established, monitored, and benchmarked for improvement.

In general, training and scientific research are the two main tasks of HCMUTE. When formulating and implementing the annual training plan, scientific research activities for students are also planned

based on several practical conditions such as the number of subjects given by lecturers, the number of students applying for scientific research, budget, and time for research... The process of conducting scientific research is based on the regulations promulgated by the Science Technology and International Affairs Office, which includes the type of research, participants, research conditions, quantity, budget support, and reward policy.

The target of research is to set up the Quality Objective Plan of FCFT annually and declare it to each department by the Vice-dean who duties on. Research topics are based on professional knowledge aimed at helping students develop more in-depth knowledge, soft skills, especially self-learning and lifelong learning skills, ensuring standardized outputs of programme, meeting the vision and mission of FCFT.

The registration of scientific research projects is carried out according to the ISO process, and lecturers are provided with annual scientific research project registration forms at all levels: University level, University Key level, Ministry level ... In addition, the process also ensures monitoring, urging as well as reporting progress to ensure lecturers/students complete the topic on time.

There are regulations on the corresponding funding for each level of the scientific research project. As shown in the annual notification on scientific research project registration, HCMUTE gives priority to increasing funding for the University Key Research level. The university has a policy to support the scientific research of young teachers.

The content of the scientific research project is consistent with the vision and mission of the HCMUTE and the FCFT, following two directions of academic research and technology transfer applied research.*[Exh 8.12. List of paper]*

To improve research outputs, FCFT implements a policy of only recruiting doctorates, giving priority to funding key scientific research projects, and creating conditions for lecturers to study for doctoral degrees. *Table 8.8* shows the type and the number of research publication of CET lectures between 5 years. *[Exh 8.13. Policy to improve research output]*

Table 8.8. Type and number of research publication of CET lectures.

Academic year	Types of Publication				Total	No. of Publications per Academic staff
	In-house institutional	National	Regional	International		
2020-2021	3	8	0	28	39	2.6
2019-2020	2	3	0	11	16	1.3
2018-2019	1	9	0	14	24	2.0
2017-2018	4	8	1	12	25	2.3
2016-2017	3	9	0	8	20	1.7

To encourage students to research and create a useful playground for students, FCFT established a Key Scientific Research Team called CEFT in 2012, which organizes 2-4 seminars each year for FCFT teachers and students, invites participants to reports, and shares research results. Students carry out a one-year research project, and they need to report the progress of each period to ensure the workload and implementation progress.

The process of implementing a scientific research project for students is based on the ISO process, guiding students to register and implement scientific research. Each topic allows up to 3 students to work together, the project funding for student research is allocated by the University to the Faculty based on the quantity and quality of the projects registered by the students. The faculty establishes a review committee and provides funding for each project. Topics with high quality will be selected to participate in awards such as Nafosted, Holcim Prize, Eureka, Scientific research Student of MOET...*[Exh 8.14. The process of implementing scientific research project for students]*

Table 8.9. Number of research topics for FCFT students 2016-2020

Faculty	No. of enrolled students	No. of research projects						Average rate
		2016	2017	2018	2019	2020	2021	
FCFT	1255	10	8	7	6	6	5	**7 (0.6%)**
FEEE	6712	29	8	14	11	6	7	**12.5 (0.2%)**
FME	4530	11	9	11	13	21	12	**12.8 (0.3%)**
FVEE	3183	8	6	5	3	6	3	**5.2 (0.2%)**

FCFT-Faculty of Chemical and Food Technology; FEEE-Faculty of Electrical Electronics Engineering; FME-Faculty of Mechanical Engineering; FVEE- Faculty of Vehicle and Energy Engineering

According to the statistical data from the Science Technology and International Affairs Office, the types and numbers of research projects of student and other projects from different Faculties in HCMUTE for comparison in the period 2016-2020 are shown in *Table 8.9* Some of the subjects registered for the contest and won prizes of competitions such as Eureka, Vifotex, Holcim Prize ... as presented in *Table 8.10*. Besides, students also carry out big projects and solve technical problems of enterprises through the capstone project.

Table 8.10. Student Prizes

Year	Number	List of Prizes
2017	2	Eureka
2018	1	Eureka
	1	Scientific research Student of MOET
2019	2	Eureka
2020	1	Student -starup 2020 of MOET
	1	Initiative to reduce plastic emissions-WWF

[Exh 8.15. List of student's Research Project/ Poster/Certificate of Merit]

Every year, the implementation of scientific research (topic/project/paper) is allocated from the University, FCFT assigns goals to each Departments and establishes the Faculty quality objective. The scientific research topics of the lecturers are carried out following the professional research fields of each lecturer and the research direction of the Key Scientific Research Team. The research results are reported through annual scientific seminars at Faculty and the university level, applied for transferring technology to the community and businesses, and flexibly integrated into the lectures to help students acquire new knowledge in the context of social development, improve training quality, ensure the quality of student output, demonstrate the mission of providing human resources and scientific and technical products to meet the social needs.

According to the results in *Table 8.8*, the quantity and quality of research are increasing, partly due to the young teaching staff who has 100% doctoral degrees; and the University invests in research facilities to promote scientific research capacity. The achievements of DCT/FCFT scientific research have contributed to the overall achievements of the University. Most of the FCFT's scientific publications are published in prestigious international journals, reflecting the FCFT/HCMUTE's vision as a leading unit of scientific training and research in Vietnam, and on a par with prestigious universities in the world.

However, scientific research at the student level is still weak, averaging around 0.6% over the years (as shown in *Table 8.9*). There are several reasons for this situation:

- Course is grade-heavy, so students want to spend more time studying.

- Freshmen and Sophomores do not have sufficient knowledge to participate in independent student scientific research projects, and Junior has not been assigned a specific major to orient their research until at the end of the third year.

- Senior are not allowed to register for scientific research according to regulations.

- Students receive very little funding for doing research and registration and admission procedures are complicated.

This is some suggestion for improvement:

- Adjusting the teaching plan in the division of majors for students at the beginning of the 3rd year to create conditions for Students to start scientific research

 - Encourage lecturers and students to participate in student scientific research projects.

- Proposal to increase funding for scientific research and reduce project implementation procedures.

- Propagate, and create activities to promote the passion for scientific research among students.

8.4. Data are provided to show directly the achievement of the programme outcomes, which are established and monitored.

The level of achievement of the programme outcomes is established:

The school year 2020-2021: Implement measures to achieve 50% of the learning outcome of the entire programme within HCMUTE. Based on the results, FCFT develops a plan to measure and evaluate the level of achievement of Programme outcomes. At the end of each academic year, FCFT collects and analyzes data, and propose improvement solutions, and to continue measure in the next school year.*[Exh 8.16. Annual measurement plan and result report]*

CET measurement result of Level of achievement of Expected Learning Outcome in 2021-2022 with 100% ELOs is presented in *Table 8.11* and Figure 1. CET measures 9 learning outcomes in Semester 2/the School year 2021-2022, and a total of 27 PIs are measured. The number of subjects taking data for measurement and proof is 22 subjects.

Table 8.11. Expected learning outcome measurement result

No.	Expected Learning Outcomes	Result			Result of PIs			
		Total number of passed students	Total number of measured students	Rate (%)	PI 1	PI 2	PI 3	PLO
1	ELO1	105	132	79.5	78	44	61.7	Pass
2	ELO2	88	109	80.7	96	100	67	Pass
3	ELO3	92	97	94.8	100	85	98	Pass
4	ELO4	51	100	51	54	66	32	Fail
5	ELO5	81	82	98.8	100	96	31	Pass
6	ELO6	145	161	90.1	94	80	93	Pass
7	ELO7	73	89	82	65	89	93	Pass
8	ELO8	81	94	86.2	100	67	80	Pass
9	ELO9	67	72	93.1	77	100	100	Pass
	The achievement of the ELOs	**783**	**936**	**83.65**	**Pass**			

With the set target of 60%, the achievement rate of ELOs is 80%, 81%, 95%, 99%, 90%, 82%, 86%, and 93%, respectively for ELO1, ELO2, ELO3, ELO5, ELO6, ELO7, ELO8, and ELO9. Notably, ELO4 only reached 51%, smaller than the set target. Of the 27 PIs evaluated, 23 PIs passed, and 3 PIs failed.

For PI1.2 and PI4.1, because the subject is challenging, it requires students to have a high level of knowledge and reasoning ability. Meanwhile, mass classes often have high-class sizes, so students can lose focus, and lecturers do not follow students' learning closely.

For PI4.3, the PI is assessed through a specialized subject in the Organic Chemistry industry. Although that is also characterized as a complicated subject, IR or NMR spectroscopy techniques are tricky things, so the learning results of students are not high.
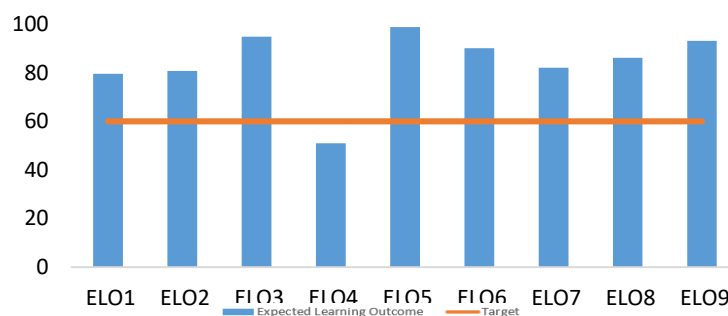
Figure 8.1. Level of achievement of Expected Learning Outcome of CET (2021-2022)

8.5. Satisfaction levels of the various stakeholders are shown to be established, monitored, and benchmarked for improvement.

To continuous improvement for promoting quality of teaching and service, increasing the satisfaction of stakeholders, HCMUTE has developed an online survey system, shown in *Table 8.12* which contains clear guidelines for conducting surveys on lecturers, students, employees, alumni, and companies. Based on this feedback, HCMUTE gives a plan to continuously improve the quality of training and services provided to stakeholders.

Table 8.12. Survey types

No.	Survey type	Audience	Frequency	Time	Method	Responsible Unit
1	Service quality survey	Student	Once a year	March/April	Online http://khaosat.hcmute.edu.vn/auth/login	QAO
2	Teaching quality survey	student	Twice a year	From middle to the end of each semester	Online http://online.hcmute.edu.vn/	QAO
3	Graduates survey	Graduated student after 3 months	Twice a year	According to the schedule of awarding diplomas to students	Online http://khaosat.hcmute.edu.vn/auth/login	QAO
4	Alumni survey	Graduated student after 1 year	Once a year	Sept./Oct.	Online http://khaosat.hcmute.edu.vn/auth/login	Faculty
5	Staff survey	All staff	Once a year	Jul./Aug.	Online http://khaosat.hcmute.edu.vn/auth/login	QAO
6	Enterprise survey	Enterprises that use students graduate of HCMUTE	Once two years	From Oct. to Dec.	Online http://khaosat.hcmute.edu.vn/auth/login	ERO

Staff

Annual staff meetings are held at the department, faculty, and school level not only to gather input from faculty and staff on HCMUTE policies/ activities but also to make suggestions for improving working conditions.

Questionnaires are sent to all stakeholders each academic year, with various appropriate contents for each subject, such as working conditions; training and promotion possibilities; direct management; colleagues; satisfaction with the support offices... The results of surveys will be collected by QAO and sent to the HCMUTE leadership.

To improve the satisfaction level of the criteria, HCMUTE organizes a summer staff meeting every year to summarize annual activities, discuss policy achievements and failures, determine the direction of action next year, share ideas, and help HCMUTE grow. In addition, HCMUTE has implemented a KPI system to assess the level of personal work achievement. In addition, since 2016, HCMUTE has held a dialogue between the President, lecturers, and staff to pay full attention to aspirations as well as acknowledge the initiatives proposed.

The results of the 2018-2021 satisfaction survey show that all criteria of satisfaction are above 80%. The average satisfaction rate and the satisfaction rate of most criteria have decreased gradually over the years, but it may mean this score is still within the "acceptable" level (65-80)

Table 8.13. The satisfaction level of staff in the working environment

Criteria	2018	2019	2020	2021	Average
Working conditions	86.93	82.98	82.11	77.10	**82.28**
Training and promotion policies	90.50	82.30	82.90	73.48	**82.30**
direct management level	91.38	86.98	87.11	84.57	**87.51**
Colleague	94.05	90.50	89.34	90.54	**91.11**
The satisfaction level with support offices	82.35	75.63	73.64	69.92	**75.39**
Average	**89.04**	**83.68**	**83.02**	**79.12**	**83.72**

Student

The online survey system provided by QAO is frequently used to collect student feedback on the curriculum, output standards, teaching activities for each course, exam assessments, and attitudes of service personnel at the end of each semester. The results of the survey will be collected, analyzed, and uploaded to the QAO website and sent to the head of the department. Survey data from 2018 to the present shows that the quality of teaching, service capacity and attitude, facilities, and quality of service has improved over years.

Each semester, student feedback is recorded through student-to-faculty dialogues with faculty and students. Feedback is collected by FCFT (Faculty dialogue) or ASAO (University dialogue) and reported to HCMUTE leaders. At the Faculty dialogue, the Board of Faculty is responsible for answering all the questions of the students in the jurisdiction. Questions outside the jurisdiction will be recorded and reported to the University leaders. ASAO will collect reports from all faculties to carry out University dialogue, where the Board of University has to answer all questions in faculty dialogues.

After reporting the results, HCMUTE instructs FCFT to provide feedback to students and take action to overcome and improve in the next semester. In addition to quickly obtaining student feedback, HCMUTE leaders have a fixed students timetable on the last Thursday of each month. Students also receive notifications through the HCMUTE's web calendar. Students can send their comments via email, each Faculty, and University's Facebook. In particular, in the first semester of 2015-2016, HCMUTE implemented an online system to recognize the desire of parents, students, and faculties of the University's operations.

At the end of each semester, students are asked to respond to an online survey to assess the teaching quality of each lecturer in 03 criteria: teaching method; teaching content, examination and assessment; and pedagogy style. The results in *Table 8.14* show that the quality of teaching in three categories is improving, without the lecturer scored below 72 points (average score). Based on the results of student feedback and data analysis, the Department has solutions to improve the quality of teaching.

Table 8.14. The quality of teaching of FCFT

Year	Criterion 1 (%)	Criterion 2 (%)	Criterion 3 (%)	Average (%)
2017-2018	87.2	87.9	88.7	87.9
2018-2019	89.425	89.46	90.005	89.63
2019-2020	90.64	90.55	91.11	90.76
2020-2021	92.77	92.64	93.03	92.81

Criterion 1: teaching method; Criterion 2: teaching content, examination, and assessment; Criterion 3: pedagogy style

In recent years, the quality of teaching has improved considerably thanks to the exchange of experiences and teaching methods among lecturers. By comparing student assessment results with those of other Departments, as shown in the *Table 8.15,* FCFT lecturers are assessed as performing well.

Table 8.15. Benchmark on The quality of teaching of FCFT amongst others

Year/Faculties	FCFT	FEEE	FME	FVEE	FCE
2017-2018	87.9	87.56	87.97	87.13	87.90
2018-2019	89.63	88.18	89.55	89.78	89.78
2019-2020	90.76	88.95	90.28	91.75	91.25
2020-2021	92.81	89.72	90.80	91.42	92.34

FCFT: Faculty of Chemical and Food Technology; FEEE: Faculty of Electrical and Electronics Engineering; FME: Faculty of Mechanical Engineering; FVEE: Faculty of Vehicle and Energy Engineering; FCE: Faculty of Civil Engineering

In addition to the teaching quality survey, QAO also conducts the HCMUTE service quality survey on students (since 2015). The survey is conducted online annually to receive feedback about criteria such as capacity and attitude of support staff; facilities include internet system; quality of services such as parking garage, canteen, medical service, dormitory*...[Exh 8.17. Questionnaire and survey report from 2017-2022]*

The results of the student survey on service quality presented in *Table 8.16* show that the service quality of HCMUTE has gradually increased over the years. Specifically, the overall satisfaction rate for university students has increased from 79.9% (2017) to 85.64% (2021), which proves that the solutions to improve the service quality of HCMUTE have brought certain success, meeting the needs of learning, scientific research, entertainment… of students.

Table 8.16. Student satisfaction with service quality

Criteria	2017	2018	2019	2020	2021	Average
Capacity and service attitude of support staff	79.4	79.52	82.13	83.01	83.85	**81.58**
Infrastructure	72.59	71.25	75.48	78.43	79.98	**75.55**
Quality of services	77.87	78.47	81.07	79.36	80.8	**79.51**
General satisfaction about HCMUTE	79.9	78.6	81.14	86.87	85.64	**82.43**

Each semester, the Library has surveyed to receive feedback about students' satisfaction with the service and other activities. Moreover; along with the quality goals and continuous improvement, the Library always receives the response from readers through surveys and the periodic meeting between the board of HCMUTE and students to estimate the level of satisfaction of readers.

The AIO is the place that has the responsibility to receive students' complaints at HCMUTE about study activities that they are not satisfied with, their complaints will be reviewed and responded to by parties who are responsible. For example, if students are not satisfied with the results of the course assessment, they can apply for re-examination at the faculty office. Two lecturers will be assigned to revise the question and report the result within seven days.

Graduates/Alumni

As mentioned above, QAO surveys to receive feedback from graduates on the Graduation Ceremony each year. The main content of the questionnaire focuses on evaluating the suitability of the programme, the level of satisfaction with the courses, the employment status of the alumni. The survey results will be collected and sent to the FCFT Leaders. There are suitable improvements.

The survey process is conducted by FCFT to alumni one year after graduation through an online form. In addition to the annual alumni meeting, a quick survey is also conducted to collect feedback. The results of the survey of alumni in 2021 are shown in *Figure 8.2* suggest that more than 90% of alumni are satisfied with the training programme and believe that the training programme is good for their capabilities.
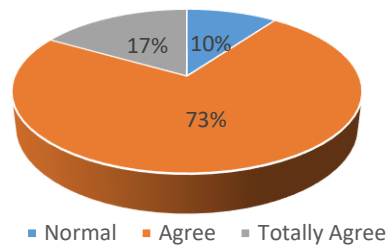
Figure 8.2. Alumni satisfaction level with the training programme

Periodically, in November, the FCFT organizes Alumni Meeting Day, thereby creating a bridge between FCFT, current students, and alumni to share their curriculum and student support, information about internships, job... Through this, the FCFT can get opinions on the curriculum from the alumni to support the improvement of the programme.

Some opinions of alumni about the training program and the competencies achieved after completing the training programme. Need to increase the time for specialized subjects and foundation subjects; practical subjects, graduation internship, business internship; soft skills courses, specialized English. By the way, maybe reduce the time for general subjects or political theory subjects. Encourage students to spend more time on developing soft skills, join English clubs, developed skills clubs…

Specific improvements after receiving comments at the dialogue meeting and survey results from students and alumni had been carried out, such as: Add more special foundation knowledge; Increase the time of internship, field trips…Update and add new content to the training programme to flexibly meet the human resource needs of the labor market and development trends of the society. Organize seminars on soft skills, integrate activities required soft skills into lectures Strengthen the scientific research capacity of lecturers and students, reinforce the connection between scientific research and technology transfer with the faculty's training activities associated with business needs.

Enterprise

ERO and FCFT conduct surveys every year to get feedback from outside businesses on the quality of students from 2019 through conferences, seminars, or job fairs. In addition, through field visits and internships at the factory, the FCFT also received many ideas and feedback from businesses about the programme, the number of courses or credits in the programme, knowledge and soft skills. Satisfaction of trainees of CET in 2019-2020 shown in the *Figure 8.3* shows that 86.9% were satisfied with the quality of students (for average of three criteria) , only 3.2% were not satisfied with soft skills and English. *[Exh 8.18. Enterprise survey]*
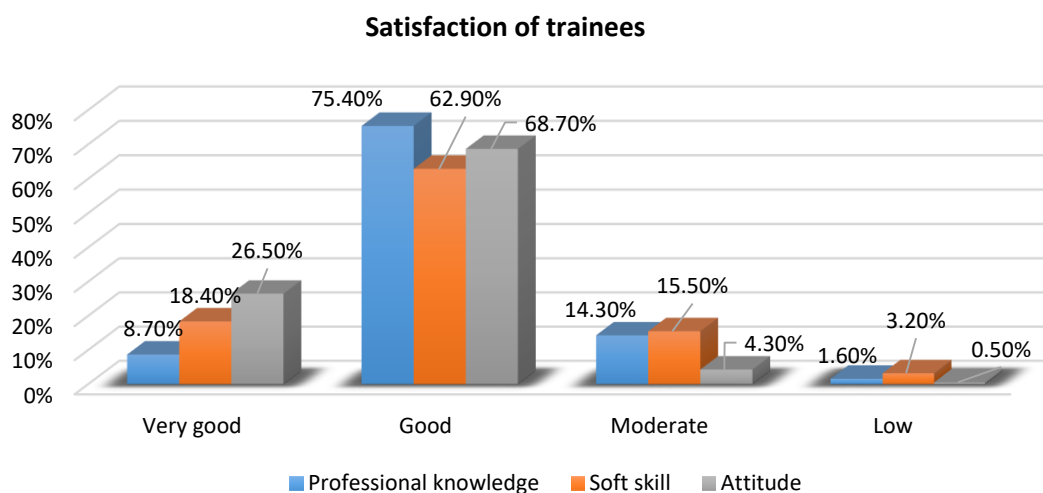
Figure 8.3. The result of the survey of trainees

Some feedback of enterprise such as having solid professional knowledge, good communication and presentation skills, a positive working attitude, willingness to learn; need to improve English more, and problem-solving skills

To improve the level of satisfaction of the stakeholders, HCMUTE has issued many solutions and policy improvements. For lecturers and staff, issue KPIs to evaluate the workload and volume of each individual, provide a payroll incentive for good people by the end of the academic year, build an LMS that helps lecturers interact with students more easily, promulgate regulations on teaching assistants using good students to support lecturers to solve problems in class, promulgate policies encouraging lecturers.

PART 3: STRENGTHS AND WEAKNESS ANALYSIS

1. Criterion 1. Expected learning outcomes

Strengths:

The ELOs are built from MOET standards and higher education law, the need for high quality human resource, feedback of stakeholder, aligned to the vision and mission of HCMUTE, FCFT and CET's expectation. Moreover, ELOs are announced to stakeholders through website and other effective channels.

The ELOs were analyzed and divided into two main groups, including generic outcomes (related to written and oral communication, problem-solving, information technology, team building, soft skills, ethic, attitude and life-long learning…) and specific outcomes (related to knowledge and skills of the study discipline) that are logically mapped and fully transferred into the curriculum via courses, teaching and learning activities, scientific research activities and other support activities.

The ELOs are regularly evaluated and adjusted based on the major requirements of the stakeholder, especially the external stakeholder.

The evaluation of PIs ensures that the ELOs are achieved by the students by the time they graduate.

Weakness:

The participation of companies related to technical business is still modest.

Not too many companies participate in stakeholder meetings to develop ELOs.

Improvement plan:

Need more and more frequent feedbacks from companies and alumni. In particular, technical business companies and longtime alumni.

2. Criterion 2. Programe structure and content

Strengths:

The curriculum based on MOET requirements with clear structure and is aligned with achieving the expected learning outcomes. It is divided into 3 main groups, including: general, fundamental and specialized courses. A detailed syllabus with complete content, study plans, ELOs, references materials and assessment methods is provided for all subjects.

CET is designed with wide and specialized knowledge to help students have enough knowledge and skills to meet the increasing requirements of the labor market, capable of self-study and lifelong learning. In particular, CET offers students the opportunity to choose one of three majors that match their aptitudes and interests, including: Organic Chemical Engineering Technology, Inorganic Chemical Engineering Technology and Polymer Chemical Engineering Technology.

CET is regularly reviewed and updated following major requirements of the stakeholders with modern content related to the field of chemical engineering technology.

Weakness:

The credits for specialized experiments and graduate internship is still small.

There is no course on how to use modern analytical machines.

There are no orientation courses for students before the graduation thesis.

There are not enough majors in the field of Chemical Engineering Technology

Improvement plan:

Increase the credits for laboratory courses specifically for specific experiments, add the course of experiment with modern analytical methods, add the course of pre-graduation thesis to provide for students the necessary skills before undertaking a graduate thesis.

Increase the internship time at the factory.

Increase some majors so that students have more choices, such as Pharmaceutical Chemistry, Electrochemical Technology…

3. Teaching and learning approach

Strengths:

CET's teaching strategies are quite diverse from traditional to modern to help students understand and apply knowledge in their work.

CET students have access to active learning methods through a series of activities such as exercises, projects, factory tour, internships, seminars, experiments and graduation theses...

The quality assurance process is well run at HCMUTE, FCFT and DCT.

Weakness:

Active learning methods are difficult due to overcrowded classes.

Students' English proficiency is still limited

Improvement plan:

Propose to reduce the number of students in a class to ensure active learning methods are highly effective.

Implementing the teaching of courses in English.

4. Student Assessment

Strengths:

The schedule and methods of assessment is announced to students on the first day of the course.

Used rubrics to assess design project, graduation thesis, seminars and other soft skills.

With the Institute for Technical Education as a part of it, HCMUTE often organized workshops and seminars on assessment methods for lecturers. CET lecturers creatively and flexibly use a variety of assessment techniques to assist the teaching and learning process.

Weakness:

Infrastructure and organization limitations (large classes, weak on-campus wifi) in some cases limit the range of formative and summative assessment techniques used by CET lecturers.

The question banks of the multiple-choice test is limited.

Improvement plan:

Improve wifi quality

Propose to reduce the number of students in a class

Improve existing question banks.

5. Academic staff

Strengths:

All CET lecturers are PhD. The teaching staff are young, highly qualified, enthusiastic, ethical and have in-depth knoweledge in the field of chemical engineering technology as well as modern teaching methods to ensure the implementation of training programme.

With HCMUTE's good policy on scientific research, lecturers can improve their knowledge and professional skills via scientific research activities and public paper in prestigious international magazines.

Weakness:

There are many visiting lecturers, especially in specialized courses.

Improvement plan:

Recruit and train lecturers to undertake specialized courses.

6. Student support service

Strengths:

The admission process is quite diverse. HCMUTE has many policies to attract talent students to elevate admission quality, so the quality and quantity of admision student is annually increased.

HCMUTE etablishes many departments and clubs to support students in academic, administration activities and improve soft skills.

Supporting staff at HCMUTE are well-qualified, enthusuastic and effectively support students.

The quality of supporting sevices and the performance of supporting staff are annually evaluated by students. The student feebacks are gathered, reviewed, evaluated and improved.

Weakness:

There is no professional school psychology counseling department.

Extracurricular activities in English are limited.

The ratio of students to service staff is still quite high.

Improvement plan:

Establish a school psychology consulting department, and recruited professional psychologists.

Establish English clubs in faculties and departments.

Expand number of supporting staff and up-to-date the standard of supporting services.

7. Facilities and infrastructure

Strengths:

In recent years, HCMUTE and FCFT have a policy of expanding laboratories, purchasing modern machines and equipment. This has well supported the teaching and learning activities of CET. The lecturers have enough space to work and do scientific research in the department offices and laboratories. Students have enough classrooms, function rooms, library, self-study area and laboratories for learning and scientific research.

All CET students study at the main campus. This is a spcaious, fresh and clean area that ensures the health and well-being of students.

The school health system at HCMUTE ensures primary health care for students.

Weakness:

Because of the rapid development of science and technology, HCMUTE cannot update the most modern machines for teaching and learning activities. The increasing scientific research proficiency of lecturers and students requires more mordern analytical machines and equipments to be purchased.

Functional laboratories are just enough for basic needs in learning and scientific research

Improvement plan:

Add more modern analytical machines.

Establish more new fucntional laboratories.

8. Output and outcomes

Strengths:

Higher on-time pass rate with 65.42% compared to other programmes.

The labor market recognizies the quality of graduated students. They can quickly integrate into the new working environment.

High employability rate of graduated students, more than 73% get a job within 3 months and more than 95% within 01 year of graduation.

Weakness:

Students' English proficiency is still limited.

The percentage of students doing scientific research is not high

Improvement plan:

Improve the English proficiency of students to meet the output requirements to help them graduate on-time after 4 years.

Maintain and expand the Teaching Assistant system to well support students in academic and scientific research activities.

PART 4: APPENDICES

Appendix 1. The CET programme Specification

Appendix 2. Checklist for AUN Quality Assessment at Programme Level

Appendix 3. Mapping of ELOs and CLOs at the CET programme

Appendix 4. Supporting documents and evidences

Appendix 5. Summary of the ELOs, assigned PIs and results on the ELOs accessment for the academic year 2020-2021, 2nd semester at the Deparment of chemical technology

Appendix 6. Curriculum sequence

Appendix 7. List of academic staff in major

Appendix 8. The process for trainings at the HCMUTE

Appendix 1. The programme Specification
CHEMICAL ENGINEERING TECHNOLOGY

1. Awarding institution: HCMC University of Technology and Education

2. Name of final award: Bachelor of Engineering

3. Name of program: CHEMICAL ENGINEERING TECHNOLOGY

4. Training degree: Bachelor of Engineering

5. Programme code: 7510401

6. Training time: 4 years (The normal period of study is four years and the maximum period is eight years).

7. Admission criteria

Admission is based on their high school academic achievement (maximum 50% of the total enrollment), GPA of 5 semesters (except the 2nd semester of grade 12) of 3 subjects in a group and based on their result of National High School Certificate Examination. Candidates can use their scores in groups of Mathematics, Physics, Chemistry (A00), or in groups of Mathematics, Chemistry, English (D07) or Mathematics, Chemistry, Biology (B00) or group of Mathematics, English, natural sciences (D90) to apply for admission to the CET programme. HCMUTE selects candidates based on quotation and the cut-off scores of Ministry of Education and Training (MOET). Candidates will be selected with priority from high to low according to their scores.

Besides, HCMUTE has many policies to attract talent students to elevate admission quality such as direct enrolling students who are awarded 1st, 2nd, 3th prizes in Olympic Competition at National level for high school students or STEM competence. The priority of admission is also considered for high school student awarded 1st, 2nd, 3th prizes in Olympic Competition at Province level; 4th or extra prizes Olympic awards organizing for high school students at National levels; good students from gifted high schools; top 200; enrolling students with good scores in English examinations (IELTS, SAT) and also applied for HCMUTE-linked high schools.

8. Programme objectives

The CET programme is to prepare students:

PO1. Graduates will be able to apply the scientific and technological knowledge to achieve career success in the chemical engineering technology or other related fields, and being a responsible citizen in the society.

PO2. Graduates will be able to become competent team leader or qualified team member who can solve practical scientific and technical challenges

PO3. Graduates will be able to participate in further education or research to pursue their professional development.

9. Expected learning outcomes

After successful completion the CET Programme, graduates will be able to demonstrate and attain the following ELOs:

ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering Technology by applying principles of engineering, science, and mathematics.

ELO2. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions in field of the Chemical Engineering Technology.

ELO3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

ELO4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

ELO5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

ELO6. an ability to communicate effectively with a range of audiences, and to communicate in English language.

ELO7. an ability to apply engineering design to produce solutions that meet specified needs in field of the Chemical Engineering Technology with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

ELO8. an ability to implement engineering systems in field of the Chemical Engineering Technology.

ELO9. an ability to operate and manage engineering systems in field of the Chemical Engineering Technology.

10. Programme structure

Name	Credit		
	Total	**Compulsory**	**Elective**
General knowledge block	**63**	**59**	**4**
Politics and Law	13	13	0
Science and Maths	28	28	0
Social Sciences	4	0	4
Foreign Languages	12	12	0
Introduction to Chemical Engineering Technology	3	3	0
Informatics	3	3	0
Professional knowledge block	**87**	**75**	**12**
Fundamental courses	49	49	0
Specialized courses	10	0	10
Practical courses	14	12	2
Internship	4	4	0
Graduation thesis	10	10	0

11. Programme content (name and required course structure)

11.1 General knowledge block (63 credits)

11.1.a Compulsory Courses (59 credits)

No.	Course Code	Course name	Credit	Note
I.		**Politics and Law**	**13**	
	LLCT130105	The philosophy of Marxism - Leninism	3	
	LLCT120205	Political Economics of Marxism and Leninism	2	
	LLCT120405	**Science socialist**	2	
	LLCT120314	Ho Chi Minh's Ideology	2	

	LLCT220514	History of Vietnamese communist party	2	
	GELA220405	General Laws	2	
II.		**Science and Maths**	**28**	
	MATH132401	Calculus 1	3	
	MATH132501	Calculus 2	3	
	MATH132601	Calculus 3	3	
	PHYS130902	Physics 1	3	
	PHYS131002	Physics 2	3	
	GCHE130603	General chemistry	3	
	TEDG130120	Technical drawing - Basic course	3	(2+1)
	ELEE220144	Electrical Engineering	2	
	ICHE231003	Inorganic Chemistry	3	
	TSCL120803	Safety and techniques in chemistry lab	2	
III.		**Foreign Language**	**12**	
	ENGL130137	English 1	3	
	ENGL130237	English 2	3	
	ENGL130337	English 3	3	
	ENGL130437	English 4	3	
		Introduction	**3**	
	ICHE130703	Introduction to Chemical Engineering Technology	3	(2+1)
		Informatics	3	
	ADMO138685	Advanced microsoft office	3	(2+1)
		Physical Education	**5**	
	PHED110513	Physical Education 1	1	
	PHED110613	Physical Education 2	1	
	PHED130715	Physical Education 3 *(Student register)*	3	
		National Defense Education		
		National Defense Education	165 hours	*Ministry of Education and Training*
Total *(Physical Education and National Defense Education courses are not included)*			59	

11.1.b Elective Courses (4 credits)

No.	Course Code	Course name	Credit	Note
I.		**Social Sciences**	**4**	
	GEFC220105	General Economics	2	
	IQMA220205	Quality Management	2	*Choose 4 credits*
	INMA220305	Introduction to Management	2	
	WOPS120390	Workplace Skills	2	
		Total	**4**	

11.2 Professional knowledge block

11.2.a Compulsory Courses (75 credits)

No.	Course Code	Course name	Credit	Note
I.		**Fundamental courses**	**49**	
	FLUI220132	Fluid mechanics	2	
	APME221021	Applied mechanics	2	
	OCHE231403	Organic chemistry	3	
	ACHE231203	Analytical chemistry	3	
	IANM323303	Instrumental analytical methods	2	
	PCHE221603	Physical Chemistry 1	2	
	PCHE221703	Physical Chemistry 2	2	
	THER222932	Thermal Engineering	2	
	HTPE231903	Heat Transfer Operations	3	
	MTPE232003	Mass transfer Operations	3	
	MPRO232103	Mechanical process and equipment	3	
	POCH323103	Polymer Chemistry	2	
	SEPC232503	Statistics and experimental planning in chemical technology	3	
	PWPD322703	*Design project of Chemical engineering*	*2*	
	ENCO326503	Enterprise collaboration	*2*	
	TINO322903	Technology of inorganic substances	2	
	FMSE222803	Fundamentals of materials science and engineering	2	
	CREN222203	Chemical reaction engineering	2	
	FDMF232603	Fundamentals of Chemical Engineering Design	3	
	ELET323203	Electrochemical technology	2	

88

	TORS323003	Technology of organic substances	2	
II.		**Practical courses**	**12**	
	EGCH110903	*Experiment in general chemistry*	1	
	EICH221103	*Experiments in inorganic chemistry*	2	
	EACH221303	*Experiment in analytical chemistry*	2	
	EOCH221503	*Experiment in organic chemistry*	2	
	EPCH221803	*Experiments in physical chemistry*	2	
	ERPD222303	*Experiment on processes and equipment*	2	
	EAAM416903	*Experiments For Modern Analysis Methods*	1	
III.		**Internship**	**4**	
	GRAP446703	*Internship*	*4*	
IV.		**Graduation thesis**	**10**	
	GRAS436603	Seminar for graduation	3	
	GRAT476803	Graduation Thesis	7	
		Total	75	

11.2.a Elective Courses (12 credits)

No.	Course Code	Course name	Credit	Note
I		**Specialized courses** **(Choose 1 groups)**	**10**	
I.1.		**Group of Organic Chemical Engineering Technology**	**10**	
	TDET423503	Technology of detergents	2	
	IORP423603	Industrial organic pigments	2	
	FSTE423703	Fragrance science & technology	2	
	TECP423803	Technology of cosmetic products	2	
	SIOC423903	Spectroscopic identification of organic compounds	2	*Choose 10 credits*
	PSTE424003	Papermaking science and technology	2	
	TAGP424103	Technology of agrochemical products	2	
	TEDY424203	Dyeing and finishing technologies	2	
	MCHE424803	Medicinal chemistry	2	
I.2.		**Group of Inorganic Chemical Engineering Technology**	**10**	*Choose 10 credits*
	TFER424403	Technology of fertilizer	2	

	TCER424503	Ceramic Technology	2	
	TCEM424603	Technology of cement	2	
	PCSI424703	Physical chemistry of the silicate	2	
	SCIM424903	Structural characterization of inorganic materials	2	
	TMIP425003	Technology of mineral processing	2	
	TPIG425103	Technology of pigment	2	
	AIMA425203	Advanced inorganic materials	2	
I.3.		**Group of Polymer Chemical Engineering Technology**	**10**	
	TPCM425403	Polymer composite materials	2	
	TPLA425503	Technology of plastics manufacture	2	
	FRUT25603	Rubber technology	2	
	MAEP425703	The methods of analysis and evaluation polymer materials	2	
	TPOP425803	Techniques of polymer processing	2	*Choose 10 credits*
	TAPO425903	Technology of Adhesive Polymer	2	
	TTFP426003	Technology of plastic film	2	
	ADPO426103	Polymers with special features	2	
	TFIB426203	Technology of the manufacturing polymer fibers	2	
	TPAI426303	Technology of paint and vecni	2	
II.		**Practical courses**	**2**	
	ESOC424303	Lab experiments for applied organic chemistry	2	
	EICT425303	Specific Experiments in Inorganic Chemical Technology	2	*Choose 2 credits*
	ESPO426403	Lab experiments for polymers technology	2	
Total			**12**	

12. Curriculum planning *(anticipated and applied for the main semesters: from 1st semester to 8ᵗʰ semester).*

Courses that are not included in the curriculum plan, the AAO will open classes in every semesters for students to make their own study plans:

No.	Course Code	Course name	Credit	Prerequisite Course Code
1.	LLCT120205	Political Economics of Marxism and Leninism	2	HT_LLCT130105

2.	LLCT120405	Science socialism	2	HT_LLCT130105
3.	LLCT120314	Ho Chi Minh's ideology	2	HT_LLCT130105
4.	LLCT220514	History of Vietnamese communist party	2	HT_LLCT130105, HT_LLCT120205, HT_LLCT120405 HT_LLCT120314
5.	GELA220405	General law	2	
6.	PHED110613	Physical Education 2	1	
7.	PHED130715	Physical Education 3	3	
8.		National Defense Education	165 hours	
Total *(Physical Education and National Defense Education courses are not included)*			**10**	

1st Semester

No.	Course Code	Course Name	Credit	Prerequisite Course Code
1.	LLCT130105	The philosophy of Marxism - Leninism	3	HT_LLCT120205
2.	MATH132401	Calculus1	3	
3.	ICHE130703	Introduction to Chemical Engineering Technology	3 (2+1)	
4.	TSCL120803	Safety and techniques in chemistry lab	2	
5.	ADMO138685	Advanced Microsoft Office	3 (2+1)	
6.	GCHE130603	General Chemistry	3	
7.	PHYS130902	Physics 1	3	
8.	PHED110513	Physical Education 1	1	
Total *(Physical Education 1 is not included)*			**20**	

2nd Semester

No.	Course Code	Course Name	Credit	Prerequisite Course Code
1.	MATH132501	Calculus 2	3	HT_MATH132401
2.	EGCH110903	Experiment on general chemistry	*1*	HT_GCHE130603 HT_TSCL120803
3.	ICHE231003	Inorganic chemistry	3	HT_GCHE130603
4.	PHYS131002	Physics 2	3	HT_PHYS130902

5.	PCHE221603	Physical Chemistry 1	2	HT_GCHE 130603 HT_MATH132401 HT_PHYS130902
6.	OCHE231403	Organic chemistry	3	HT_GCHE130603
7.	GEFC220105 IQMA220205 INMA220305 WOPS120390	*Social Sciences (choose 4 credits)* General economics Quality management Introduction to management Workplace skills	2 2 2 2	
	Total		**19**	

3rd Semester

No.	Course Code	Course Name	Credit	Prerequisite Course Code
1.	MATH132601	Calculus 3	3	HT_MATH132501
2.	FLUI220132	Fluid mechanics	2	HT_MATH132401 HT_MATH132501 HT_PHYS130902 HT_PHYS131002
3.	ACHE231203	Analytical chemistry	3	HT_GCHE130603
4.	EOCH221503	Experiment in organic chemistry	*2*	HT_OCHE231403 HT_TSCL120803
5.	PCHE221703	Physical Chemistry 2	2	HT_GCHE 130603 HT_MATH132401 HT_PHYS130902
6.	APME221021	Applied Mechanics	2	HT_MATH132401 HT_MATH132501 HT_PHYS130902 HT_PHYS131002
7.	EICH221103	Experiments in inorganic chemistry	*2*	HT_ICHE231003 HT_TSCL120803
8.	MPRO232103	Mechanical process and equipment	3	HT_MATH132401 HT_MATH132501 HT_MATH132601 HT_PHYS130902 HT_PHYS131002
9.	THER222932	Thermal Engineering	2	HT_MATH132401 HT_MATH132501 HT_PHYS130902 HT_PHYS131002

				HT_GCHE130603
		Total	**21**	

4ᵗʰ Semester

No.	Course Code	Course Name	Credit	Prerequisite Course Code
1.	EACH221303	Experiment in analytical chemistry	*2*	HT_ACHE231203 HT_TSCL120803
2.	EPCH221803	Experiments in physical chemistry	*2*	HT_PCHE221603 HT_PCHE221703 HT_TSCL120803
3.	POCH323103	Polymer Chemistry	2	HT_OCHE231403
4.	MTPE232003	Mass transfer Operations	3	HT_MPRO232103
5.	HTPE231903	Heat Transfer Operations	3	HT_THER222932 HT_FLUI220132 HT_MATH132601
6.	ELEE220144	Electrical Engineering	2	
7.	IANM323303	Instrumental analytical methods	2	HT_ACHE231203
8.	TEDG130120	Technical drawing - Basic course	3	
		Total	**19**	

5ᵗʰ Semester

No.	Course Code	Course Name	Credit	Prerequisite Course Code
1.	TINO322903	Technology of inorganic substances	2	HT_ICHE231003
2.	FMSE222803	Fundamentals of materials science and engineering	2	HT_GCHE130603 HT_ICHE231003
3.	CREN222203	Chemical reaction engineering	2	HT_MTPE232003 HT_HTPE231903
4.	FDMF232603	Fundamentals of Chemical Engineering Design	3	HT_MTPE232003 HT_HTPE231903 HT_FLUI220132 HT_APME221021 HT_MPRO232103
5.	ELET323203	Electrochemical technology	2	HT_PCHE221603 HT_PCHE221703
6.	TORS323003	Technology of organic substances	2	HT_OCHE231403
7.	SEPC232503	Statistics and experimental planning in chemical technology	3	HT_MATH132401 HT_MATH132501
		Total	**16**	

6th Semester

No.	Course Code	Course Name	Credit	Prerequisite Course Code
6A. Compulsory Courses				
1.	ERPD222303	Experiment on processes and equipment	*2*	HT_DOHT231903 HT_TSEP232003 HT_MPRO232103 HT_TREA222203
2.	PWPD322703	Design project of Chemical engineering	2	HT_DOHT231903 HT_TSEP232003 HT_MPRO232103 HT_TREA222203 HT_FDMF232603 HT_TEDG130120
6B. Elective courses				
6B1. Group of Organic Chemical Engineering technology: (choose 10 credits)			**(10)**	
3.	TDET423503	Technology of detergents	2	HT_OCHE231403
4.	IORP423603	Industrial organic pigments	2	HT_OCHE231403
5.	FSTE423703	Fragrance science & technology	2	HT_OCHE231403
6.	TECP423803	Technology of cosmetic products	2	HT_OCHE231403
7.	SIOC423903	Spectroscopic identification of organic compounds	2	HT_OCHE231403
8.	PSTE424003	Papermaking science and technology	2	HT_OCHE231403
9.	TAGP424103	Technology of agrochemical products	2	HT_OCHE231403
10.	TEDY424203	Dyeing and finishing technologies	2	HT_OCHE231403
11.	MCHE424803	Medicinal chemistry	2	HT_OCHE231403
6B2. Group of Inorganic Chemical Engineering technology: (choose 10 credits)			**(10)**	
12.	TFER424403	Technology of fertilizer	2	HT_ICHE231003 HT_TINO322903
13.	TCER424503	Ceramic Technology	2	HT_ICHE231003 HT_TINO322903
14.	TCEM424603	Technology of cement	2	HT_ICHE231003 HT_TINO322903
15.	PCSI424703	Physical chemistry of the silicate	2	HT_PCHE221603 HT_PCHE221703

No.	Course Code	Course Name	Credit	Prerequisite Course Code
16.	SCIM424903	Structural characterization of inorganic materials	2	HT_FMSE222803 HT_ICHE231003
17.	TMIP425003	Technology of mineral processing	2	HT_ICHE231003 HT_TINO322903
18.	TPIG425103	Technology of pigment	2	HT_ICHE231003 HT_TINO322903
19.	AIMA425203	Advanced inorganic materials	2	HT_ICHE231003 HT_FMSE222803
6B3. Group of Polymer Chemical Engineering technology: (choose 10 credits)			**(10)**	
20.	TPCM425403	Polymer composite materials	2	HT_POCH323103
21.	TPLA425503	Technology of plastics manufacture	2	HT_POCH323103
22.	FRUT425603	Rubber technology	2	HT_POCH323103
23.	MAEP425703	The methods of analysis and evaluation polymer materials	2	HT_POCH323103
24.	TPOP425803	Techniques of polymer processing	2	HT_POCH323103
25.	TAPO425903	Technology of Adhesive Polymer	2	HT_POCH323103
26.	TTFP426003	Technology of plastic film	2	HT_POCH323103
27.	ADPO426103	Polymers with special features	2	HT_POCH323103
28.	TFIB426203	Technology of the manufacturing polymer fibers	2	HT_POCH323103
29.	TPAI426303	Technology of paint and vecni	2	HT_POCH323103
Total			**14**	

7th Semester

No.	Course Code	Course Name	Credit	Prerequisite Course Code
7A. Compulsory Courses				
1.	EAAM416903	Experiments For Modern Analysis Methods	1	HT_IANM323303
2.	GRAP426703	Internship	4	HT_PWPD312703
3.	ENCO326503	Enterprise collaboration	2	HT_ICHE130703
7B. Elective Courses				
4.	ESOC424303	Lab experiments for applied organic chemistry	2	10 credits of 6B1 group
5.	EICT425303	Specific Experiments in Inorganic Chemical Technology	2	10 credits of 6B2 group
6.	ESPO426403	Lab experiments for polymers technology	2	10 credits of 6B3 group

No.	Course Code	Course Name	Credit	Prerequisite Course Code
		Total	**9**	

8th Semester

No.	Course Code	Course Name	Credit	Prerequisite Course Code
1.	GRAT476803	Graduation Thesis	7	HT_EAAM416903 HT_GRAP426703
2.	GRAS436603	Seminar for graduation	3	HT_GRAP426703
		Total	**10**	

13. Progression points

Students must obtain a mark of 5.0 out of 10.0 for all courses (for class of 2021 is 4.0)

In case where a student fails to accumulate a GPA (scales of 10) of 3.0 for the first year, or 3.5 for the second year, or 4.0 for the third year or 4.5 from the fourth year or over allowable study time, he or she will be required to withdraw from the programme.

14. Special features

A five-day introduction programme in the first week of the first year

A eight-week internship at companies in some companies related to chemical engineering technology.

The last semester for a capstone project that is orally defended

One course's projects

Many courses related to experiments and practices.

15. Job Opportunities

The CET programme equips graduates with competences to meet various of requirement of different labor market, especially in some main sectors including: operate production system, production management, quality assurance, quality control, R&D, technical sale, technical service… Job opportunities are listed as below:

(i) Factories in the field of Inorganic, Organic and Polymer Chemical Engineering.

- Design, supervise and operate the production system.

- Quality Assurance: evaluate and assure the quality of the production system.

- Quality Control: inspect and evaluate quality of final products.

- R & D: research and develop new product to meet customer's requirements.

- Sale Technical: technical advice

- Technical service: solve technical problems for customers

(ii) Universities: Teach on Chemical Engineering Technology fields.

(iii) Research Institutions: Research in the field of Chemistry.

16. Facilities and infrastructure

16.1. Laboratory: organic chemistry laboratory, analytical chemistry laboratory, inorganic chemistry laboratory, polymer chemistry laboratory, machine and equipment laboratory.

16.2. Library, website

The library of HCMUTE includes various types of reference books in Vietnamese, reference books in foreign languages mainly in English, textbooks, various types of dictionaries, technical standards, scientific research reports, theses and projects of undergraduate students. 374,695 Textbooks; 122,129 Vietnamese Literature Books; 10,158 foreign language books; 7801 graduation projects, 7205 master thesis - scientific research reports; and more than 35 newspaper and magazine titles and 50 externally linked electronic libraries for all disciplines.

Websites:
- Sciencedirect.com
- Spigerlink.com
- Wiley.com
- http://vinacel.hcmute.edu.vn
- http://thuvien.hcmute.edu.vn

17. Date of issue: 1st June 2015

18. Date of last revision: 1st June 2020

Rector of HCMUTE	**Dean of FCFT**
Assoc. Prof. DO VAN DUNG	**Assoc. Prof. NGUYEN TAN DUNG**

Appendix 2. Self-rating for AUN-QA Assessment at Programme Level

1	**Expected Learning Outcomes**	1	2	3	4	5	6	7
1.1	The programme to show that the expected learning outcomes are appropriately formulated in accordance with an established learning taxonomy, are aligned to the vision and mission of the university, and are known to all stakeholders.						x	
1.2	The programme to show that the expected learning outcomes for all courses are appropriately formulated and are aligned to the expected learning outcomes of the programme.						x	
1.3	The programme to show that the expected learning outcomes consist of both generic outcomes (related to written and oral communication, problem-solving, information technology, teambuilding skills, etc) and subject specific outcomes (related to knowledge and skills of the study discipline).						x	
1.4	The programme to show that the requirements of the stakeholders, especially the external stakeholders, are gathered, and that these are reflected in the expected learning outcomes.					x		
1.5	The programme to show that the expected learning outcomes are achieved by the students by the time they graduate.					x		
	Overall Opinion	5.60						
2	**Programme Structure and Content**	1	2	3	4	5	6	7
2.1	The specifications of the programme and all its courses are shown to be comprehensive, up-to-date, and made available and communicated to all stakeholders.					x		
2.2	The design of the curriculum is shown to be constructively aligned with achieving the expected learning outcomes.						x	
2.3	The design of the curriculum is shown to include feedback from stakeholders, especially external stakeholders.					x		
2.4	The contribution made by each course in achieving the expected learning outcomes is shown to be clear.						x	
2.5	The curriculum to show that all its courses are logically structured, properly sequenced (progression from basic to intermediate to specialised courses), and are integrated.						x	
2.6	The curriculum to have option(s) for students to pursue major and/or minor specialisations.						x	

2.7	The programme to show that its curriculum is reviewed periodically following an established procedure and that it remains up-to-date and relevant to industry.						x	
	Overall Opinion				**5.57**			
3	**Teaching and Learning Approach**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3.1	The educational philosophy is shown to be articulated and communicated to all stakeholders. It is also shown to be reflected in the teaching and learning activities.					x		
3.2	The teaching and learning activities are shown to allow students to participate responsibly in the learning process.						x	
3.3	The teaching and learning activities are shown to involve active learning by the students.						x	
3.4	The teaching and learning activities are shown to promote learning, learning how to learn, and instilling in students a commitment for life-long learning (e.g., commitment to critical inquiry, information-processing skills, and a willingness to experiment with new ideas and practices).					x		
3.5	The teaching and learning activities are shown to inculcate in students, new ideas, creative thought, innovation, and entrepreneurship.					x		
3.6	The teaching and learning processes are shown to be continuously improved to ensure their relevance to the needs of industry and are aligned to the expected learning outcomes.						x	
	Overall Opinion				**5.50**			
4	**Student Assessment**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4.1	A variety of assessment methods are shown to be used and are shown to be constructively aligned to achieving the expected learning outcomes and the teaching and learning objectives.					x		
4.2	The assessment and assessment-appeal policies are shown to be explicit, communicated to students, and applied consistently.						x	
4.3	The assessment standards and procedures for student progression and degree completion, are shown to be explicit, communicated to students, and applied consistently.						x	
4.4	The assessments methods are shown to include rubrics, marking schemes, timelines, and regulations, and these are shown to ensure validity, reliability, and fairness in assessment.					x		

		1	2	3	4	5	6	7
4.5	The assessment methods are shown to measure the achievement of the expected learning outcomes of the programme and its courses.						x	
4.6	Feedback of student assessment is shown to be provided in a timely manner.						x	
4.7	The student assessment and its processes are shown to be continuously reviewed and improved to ensure their relevance to the needs of industry and alignment to the expected learning outcomes.					x		
	Overall Opinion				**5.57**			
5	**Academic Staff**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5.1	The programme to show that academic staff planning (including succession, promotion, re-deployment, termination, and retirement plans) is carried out to ensure that the quality and quantity of the academic staff fulfil the needs for education, research, and service.					x		
5.2	The programme to show that staff workload is measured and monitored to improve the quality of education, research, and service.					x		
5.3	The programme to show that the competences of the academic staff are determined, evaluated, and communicated.						x	
5.4	The programme to show that the duties allocated to the academic staff are appropriate to qualifications, experience, and aptitude.						x	
5.5	The programme to show that promotion of the academic staff is based on a merit system which accounts for teaching, research, and service.					x		
5.6	The programme to show that the rights and privileges, benefits, roles and relationships, and accountability of the academic staff, taking into account professional ethics and their academic freedom, are well defined and understood.					x		
5.7	The programme to show that the training and developmental needs of the academic staff are systematically identified, and that appropriate training and development activities are implemented to fulfil the identified needs.					x		
5.8	The programme to show that performance management including reward and recognition is implemented to assess academic staff teaching and research quality.						x	
	Overall Opinion				**5.38**			
6	**Student Support Services**	**1**	**2**	**3**	**4**	**5**	**6**	**7**

		1	2	3	4	5	6	7
6.1	The student intake policy, admission criteria, and admission procedures to the programme are shown to be clearly defined, communicated, published, and up-to-date.						x	
6.2	Both short-term and long-term planning of academic and non-academic support services are shown to be carried out to ensure sufficiency and quality of support services for teaching, research, and community service.						x	
6.3	An adequate system is shown to exist for student progress, academic performance, and workload monitoring. Student progress, academic performance, and workload are shown to be systematically recorded and monitored. Feedback to students and corrective actions are made where necessary.					x		
6.4	Co-curricular activities, student competition, and other student support services are shown to be available to improve learning experience and employability.						x	
6.5	The competences of the support staff rendering student services are shown to be identified for recruitment and deployment. These competences are shown to be evaluated to ensure their continued relevance to stakeholders needs. Roles and relationships are shown to be well defined to ensure smooth delivery of the services.					x		
6.6	Student support services are shown to be subjected to evaluation, benchmarking, and enhancement.						x	
	Overall Opinion				**5.67**			
7	**Facilities and Infrastructure**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7.1	The physical resources to deliver the curriculum, including equipment, material, and information technology, are shown to be sufficient.					x		
7.2	The laboratories and equipment are shown to be up-to-date, readily available, and effectively deployed.						x	
7.3	A digital library is shown to be set-up, in keeping with progress in information and communication technology.					x		
7.4	The information technology systems are shown to be set up to meet the needs of staff and students.						x	
7.5	The university is shown to provide a highly accessible computer and network infrastructure that enables the campus community to fully exploit information technology for teaching, research, service, and administration.					x		

7.6	The environmental, health, and safety standards and access for people with special needs are shown to be defined and implemented.						x	
7.7	The university is shown to provide a physical, social, and psychological environment that is conducive for education, research, and personal well-being.						x	
7.8	The competences of the support staff rendering services related to facilities are shown to be identified and evaluated to ensure that their skills remain relevant to stakeholder needs.					x		
7.9	The quality of the facilities (library, laboratory, IT, and student services) are shown to be subjected to evaluation and enhancement.					x		
	Overall Opinion				**5.44**			
8	**Output and Outcomes**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8.1	The pass rate, dropout rate, and average time to graduate are shown to be established, monitored, and benchmarked for improvement.					x		
8.2	Employability as well as self-employment, entrepreneurship, and advancement to further studies, are shown to be established, monitored, and benchmarked for improvement.						x	
8.3	Research and creative work output and activities carried out by the academic staff and students, are shown to be established, monitored, and benchmarked for improvement.					x		
8.4	Data are provided to show directly the achievement of the programme outcomes, which are established and monitored.					x		
8.5	Satisfaction level of the various stakeholders are shown to be established, monitored, and benchmarked for improvement.					x		
	Overall Opinion				**5.20**			

Appendix 3. Mapping of ELOs and CLOs at the CET programme

Legend: Remember (light grey), Understand (grey), Apply (black), Analyze (vertical hatch), Evaluate (dotted)

No	Course	ELO 1	2	3	4	5	6	7	8	9
1	Introduction to Chemical Engineering Technology			Understand	Understand	Understand	Understand			
2	Safety and techniques in chemistry lab	Understand		Understand		Understand				
3	General Chemistry	Understand			Understand					
4	Experiment on general chemistry		Understand	Understand		Understand				
5	Inorganic chemistry	Apply			Apply	Apply	Apply	Apply		
6	Physical Chemistry 1	Apply			Apply			Apply		
7	Organic chemistry	Apply			Apply			Apply		
8	Fluid mechanics	Apply			Apply			Apply		
9	Analytical chemistry	Apply			Apply			Apply		
10	Experiment in organic chemistry		Understand	Apply			Apply			
11	Physical Chemistry 2	Apply				Apply		Apply		
12	Applied Mechanics	Apply			Apply		Understand			
13	Experiments in inorganic chemistry		Understand	Apply			Apply			
14	Mechanical process and equipment	Apply			Apply			Apply		
15	Thermal Engineering	Understand			Understand					
16	Experiment in analytical chemistry		Analyze	Apply	Apply	Apply				
17	Experiments in physical chemistry		Apply	Apply		Apply				
18	Polymer Chemistry	Apply			Apply			Analyze		
19	Mass transfer Operations	Apply			Apply			Analyze		
20	Heat Transfer Operations	Apply						Analyze	Analyze	
21	Electrical Engineering	Apply			Remember					
22	Instrumental analytical methods	Analyze			Apply				Apply	
23	Technical drawing - Basic course			Remember	Apply	Apply	Apply			
24	Technology of inorganic substances	Analyze					Apply	Analyze	Analyze	
25	Fundamentals of materials science and engineering	Analyze					Apply	Analyze		
26	Chemical reaction engineering	Analyze						Analyze	Analyze	
27	Fundamentals of Chemical Engineering Design	Apply				Apply		Analyze		
28	Electrochemical technology							Analyze	Analyze	
29	Technology of organic substances					Apply	Apply	Analyze		

103

Legend: Remember, Understand, Apply, Analyze, Evaluate (shading codes used below: R = Remember, U = Understand, A = Apply, An = Analyze, E = Evaluate)

No	Course	Expected Learning Outcome (ELO)								
		1	2	3	4	5	6	7	8	9
30	Statistics and experimental planning in chemical technology	A		A				A		
31	Experiment on processes and equipment		An			A				An
32	Design project of Chemical engineering		E			A	A	E	E	
33	Technology of detergents	E				A		E		An
34	Industrial organic pigments	E				A		E		An
35	Fragrance science & technology	E					A	E		An
36	Technology of cosmetic products	E				A	A	A		
37	Spectroscopic identification of organic compounds	E	An		A			E		
38	Papermaking science and technology	E				A		E		An
39	Technology of agrochemical products	E				A		E		
40	Dyeing and finishing technologies	E					A	E	E	
41	Medicinal chemistry	E					A	E		
42	Technology of fertilizer	E				A		E		E
43	Ceramic Technology	E					A	E		E
44	Technology of cement	E					A		E	E
45	Physical chemistry of the silicate	E	An				A	E		
46	Structural characterization of inorganic materials	E	An		A			E		
47	Technology of mineral processing	E		E			A	E		
48	Technology of pigment	E					A	E		E
49	Advanced inorganic materials	E					A	E	E	
50	Polymer composite materials	E					A	E	E	
51	Technology of plastics manufacture	E				A		E		An
52	Rubber technology	E					A	E	E	
53	The methods of analysis and evaluation polymer materials	E	An		A			E		
54	Techniques of polymer processing	E					A		E	An
55	Technology of Adhesive Polymer	E				A		E	E	
56	Technology of plastic film	E				A		E	E	
57	Polymers with special features	E					A	E	E	
58	Technology of the manufacturing polymer fibers	E						E		An
59	Technology of paint	E					A	E		An

104

		Remember		Understand		Apply		Analyze		Evaluate	

No	Course	Expected Learning Outcome (ELO)								
		1	2	3	4	5	6	7	8	9
60	Experiments For Modern Analysis Methods		Evaluate	Analyze	Apply			Evaluate		
61	Lab experiments for applied organic chemistry		Evaluate	Analyze					Evaluate	Evaluate
62	Specific Experiments in Inorganic Chemical Technology		Evaluate	Analyze					Evaluate	Evaluate
63	Lab experiments for polymers technology		Evaluate	Analyze					Evaluate	Evaluate
64	Enterprise collaboration			Analyze	Apply			Evaluate		
65	Graduation Practice			Analyze			Apply	Evaluate		Evaluate
66	Seminar for graduation			Analyze	Apply	Apply	Apply	Evaluate		
67	Graduation Thesis	Evaluate	Evaluate	Analyze	Apply		Apply	Evaluate	Evaluate	

Appendix 4. Supporting documents and evidences

No	Exh.	Title of Exhibition	Category
INTRODUCTION			
1	**0.1**	**HCMUTE decision on forming the SAR team**	Document
2	**0.2**	**HCMUTE decision on forming FCFT**	Document
CRIRERIA 1. EXPECTED LEARNING OUTCOMES			
3	**1.1**	**Publication of ELOs of programme**	
	1.1a	Minute of Department Meeting for revision of ELOs programme	Document
	1.1b	Minute of Department Meeting for informing of ELOs programme	Document
	1.1c	The curriculum of CET with ELOs on the FCFT website	Link
	1.1d	The report of Orientation day	Document
	1.1e	The syllabus of the course "Introduction to Chemical Engineering Technology"	Document
4	**1.2**	**Meeting minute of stakeholders for ELOs of CET programme and Higher Education Laws, Mission and Vision of HCMUTE.**	
	1.2a	Meeting minute of stakeholders for ELOs of CET programme	Document
	1.2b	Higher Education Laws	Document
	1.2c	Mission and Vision of HCMUTE	Document
5	**1.3**	**Benchmarking between CET programme and other programmes**	Document
6	**1.4**	**Sample of syllabus**	Document
7	**1.5**	**Soft skills and professional ethics of the CET programme**	
	1.5a	Syllabus of the course Introduction of Chemical Engineering Technology	Document
	1.5b	Seminar rubric for some specialized courses	Document
	1.5c	Plan and report of a workshop	Document
	1.5d	Rubric for a graduation internship course	Document
	1.5e	Rubric for graduation thesis	Document
	1.5f	Plan and report of a Green Day activity	Document
	1.5g	Plan and report of a Volunteer activity	Document
	1.5h	Plan, report and some pictures of an Open Day activity	Document
8	**1.6**	**Report of faculty members for updating the curriculum**	Document
9	**1.7**	**Decision No. 1273/QĐ-ĐHSPKT on the implementation of the 132-credits programme**	Document

10	**1.8**	**Minute of conference between faculty and stakeholders for revision of ELOs and curriculum of CET programme**	Document
11	**1.9**	**Minute of semesterly meetings between faculty and students for revision of ELOs and curriculum of CET programme**	Document
12	**1.10**	**Report on the teaching activities of the lecturer**	Document
13	**1.11**	**Sample of E-portfolio**	Link Document
14	**1.12**	**Samples of paper based exam and experimental based Rubric**	Document
15	**1.13**	**List of teaching and learning supported facilities**	
	1.13a	Photos of the CET laboratories and modern analytical instruments	Document
	1.13b	List of references and textbooks serving CET programme	Document
	1.13c	Digital library	Link
	1.13d	Some photos of self-study areas	Document
	1.13e	Example of a LMS supported course	Document
	1.13f	Students'factory visiting tours	Document
	1.13g	Syllabus of graduation internship course	Document
	1.13h	Syllabus of enterprise collaboration course	Document
CRITERIA 2. PROGRAMME STRUCTURE AND CONTENT			
16	**2.1**	**Curriculum mapping**	Document
17	**2.2**	**Sample of syllabus**	Document
18	**2.3**	**Feedback on the revision of course syllabus**	
	2.3a	Meeting minutes of Department of Chemical Technology	Document
	2.3b	Student feedback from QAO	Document
	2.3c	Alumni feedback	Document
	2.3d	Minute of class observation	Document
	2.3e	E-portfolio report	Document
19	**2.4**	**Publish programme specification to stakeholders**	
	2.4a	Link for the publishing of the programme specification	Document
	2.4b	Chemical Engineering Technology Poster with QR code	Document
	2.4c	Chemical Engineering Technology Brochure with QR code	Document
	2.4d	Content of the Orientation Week	Document
	2.4e	Syllabus of Introduction of Chemical Engineering Technology	Document
20	**2.5**	**Sample of E-Learning Course**	Document

21	**2.6**	**ISO procedure of HCMUTE about the development and revision of the curriculum**	
	2.6a	ISO procedure of HCMUTE about the development of the curriculum	Document
	2.6b	ISO procedure of HCMUTE about the revision of the curriculum	Document
22	**2.7**	**The curriculum revision regulations**	Document
23	**2.8**	**Decision to establish the Scientific and Academic Committee of FCFT**	Document
24	**2.9**	**ISO procedure of Examination**	
	2.9a	ISO procedure of HCMUTE about planning and execution of examination	Document
	2.9b	ISO procedure of HCMUTE about issuing exam questions, keeping confidential, duplicate written exam questions and delivering test papers and test scores	Document
	2.9c	ISO procedure of HCMUTE about managing test scores	Document
25	**2.10**	**The minute of Department meeting**	Document
26	**2.11**	**The minute of the meetings and student feedback**	
	2.11a	The minute of the Department for revision of curriculum	Document
	2.11b	Minute of a semesterly meeting between faculty and students for revision of curriculum.	Document
	2.11c	Student feedback at the end of the course	Link
27	**2.12**	**Table of PIs**	Document
28	**2.13**	**Syllabi related to soft skill**	
	2.13a	Syllabus of Experiment on General chemistry course	Document
	2.13b	Syllabus of Lab Experiment for Polymer Technology course	Document
	2.13c	Syllabus of Polymer Composite materials course	Document
29	**2.14**	**Syllabi with high level in Bloom Taxonomy**	
	2.14a	Syllabus of Design Project in Chemical Engineering Technology Course	Document
	2.14b	Syllabus of Graduation Thesis	Document
30	**2.15**	**ISO procedure of HCMUTE about the design of the new curriculum**	Document
31	**2.16**	**Meeting minute of the FCFT Scientific and Academic Committee for CET programme formation**	Document
32	**2.17**	**HCMUTE decision about authority of the curriculum with 132 credits**	Document
33	**2.18**	**Development of CET curriculum**	

	2.18a	Course portfolio and survey report by QAO	Document
	2.18b	Decision on MOOC approval	Document
	2.18c	Internship evaluation of employers	Document
	2.18d	The 2015, 2018 and 2021 Curriculum	Document
34	**2.19**	**Sample of a graduation thesis**	Document
	2.19a	Syllabus and rubrics of graduation thesis	Document
	2.19b	Report of a graduation thesis	Document
35	**2.20**	**Major specialized orientation for students**	
	2.20a	Syllabus of "Introduction to Chemical Engineering Technology" course	Document
	2.20b	Syllabus of "Enterprise collaboration" course	Document
	2.20c	Minutes of a major orientation meeting	Document
	2.20d	Notification on FCFT website	Document
36	**2.21**	**Process for reviewing curriculum**	Document
37	**2.22**	**The data from stakeholders for reviewing the programme**	
	2.22a	Survey form and data of reviewing the programme	Document
	2.22b	Meeting minutes of workshop with stakeholders for reviewing the programme	Document
38	**2.23**	**Notify CET programme to stakeholders**	
	2.23a	ELOs posted on CET website	Website
	2.23b	Letter to Industries	Document
	2.23c	Meeting minute of the FCFT	Document
	2.23d	Content of Introduction to EET course	Document
39	**2.24**	**Benchmark between CET programme and other Programmes**	Document
40	**2.25**	**Decision on establish the Industrial Advisory Committee of FCFT**	Document
CRITERIA 3. TEACHING AND LEARNING APPROACH			
41	**3.1**	**Publishing the educational philosophy of HCMUTE**	
	3.1a	The educational philosophy on the website of HCMUTE	Link
	3.1b	The educational philosophy on the website of FCFT	Link
	3.1c	The educational philosophy on banner	Picture
42	**3.2**	**Activities to articulate HCMUTE's educational philosophy**	
	3.2a	Regulation No 228/QĐ-ĐHSPKT on HCMUTE Educational Philosophy	Document

		3.2b	Notification for Admission Ceremony of Chemical Engineering Technology	Document
		3.2c	Syllabus of Introduction to Chemical Engineering Technology Course	Document
43	**3.3**		**Activities to support students**	
		3.3a	Notification for Admission Ceremony of Chemical Engineering Technology	Document
		3.3b	Notification for student Competitions	Document
		3.3c	Notification for Academic Supports	Document
		3.3d	Notification for Supporting Students in difficulty	Document
44	**3.4**		**Teaching method and Responsibilities of students**	
		3.4a	Syllabus of Experiment in Analytical Chemistry course	Document
		3.4b	Students's report of Experiment in Analytical Chemistry course	Document
		3.4c	Syllabus of Safety and techniques in chemistry lab course	Document
		3.4d	A presentations of student in Inorganic Chemistry course	Document
		3.4e	A video report in Safety and techniques in chemistry lab course	Link
45	**3.5**		**Activities to support teaching and learning processes**	
		3.5a	Supporting exhibitions: self-learning space, projectors, computer lab, experiment lab	Picture
		3.5b	Examples about enterprise collaboration	Document
		3.5c	Notification for recruitment day	Document
		3.5d	Notification for factory visit	Document
46	**3.6**		**Syllabi of practical courses**	
		3.6a	Syllabi Lab Experiments and Graduation Internship	Document
		3.6b	Syllabus of Graduation Internship	Document
		3.6c	Syllabus of Graduation Thesis	Document
47	**3.7**		**Activities of practice/experimental courses**	
		3.7a	Student's report of Graduation Internship	Document
		3.7b	A video in Inorganic Chemistry lab course	Link
		3.7c	Student's report of Enterprise Collaboration	Document
		3.7d	Workshop for organic chemical students	Document
48	**3.8**		**Student research and contests**	
		3.8a	List of student research topics in 2018 - 2022	Document
		3.8b	Prizes of students' competent contests	Document

49	**3.9**		**Activities of enterprise collaboration**	
		3.9a	Plan to implement enterprise collaboration course	Document
		3.9b	Student's report for enterprise collaboration course	Document
50	**3.10**		**Activities to improve interpersonal and social skills**	
		3.10a	Notifications for Covid-19 pandemic	Document
		3.10b	Notifications for "Chemistry and Applications" competition	Document
		3.10c	Notifications for Spring Volunteer Campaign and the Summer Volunteer Campaign	Document
		3.10d	Students attend Admissions Consultant	Document
		3.10e.	Students attend "Open day"	Pictures
		3.10f.	Notifications for "Chemistry battle" and "Proud of blouse" competitions	Document Pictures
51	**3.11**		**Activities of student exchange programmes**	
		3.11a	Invitation letter of Student exchange programmes	Document
		3.11b	List of MOOC courses	Document
52	**3.12**		**Decisions related with English requirements for students**	
		3.12a	Decision 1727/QĐ-ĐHSPKT Regulations on Undergraduate education	Document
		3.12b	Decision 2930/QĐ-ĐHSPKT on Regulations in Converting Foreign Language Grades for Undergraduate Programmes	Document
53	**3.13**		**Activities to enhance digital and leaning-to-learn competence of students**	
		3.13a	Syllabus of Advanced Microsoft Office course	Document
		3.13b	Drawings in Design projects, Essays and Presentation file	Document
		3.13c	Paper model of factory production	Document
		3.13d	Video on lab experiments and presentations	Link
54	**3.14**		**Activities building entrepreneurial mindset**	
		3.14a	Syllabus of courses : Leadership and Entrepreneurship in Engineering, Graduation Internship, Seminar for Graduation and Enterprise collaboration	Document
		3.14b	Organizational plan for the class "Introduction to Innovation and Startup" for 2021-year students	Document
55	**3.15**		**ISO procedures related with teaching and learning**	
		3.15a	Procedure for planning and implementing teaching	Document
		3.15b	Procedure for inspecting and examining the compliance with teaching regulations by lecturers	Document

	3.15c	Classroom observation procedure	Document
	3.15d	Procedure for internal evaluation	Document
56	**3.16**	**Feedbacks from stakeholders**	
	3.16a	Feedbacks from entrepreneurs	Document
	3.16b	Feedbacks from students	Document
	3.16c	Feedbacks from peers	Document
57	**3.17**	**Alignment between syllabus, learning-teaching activities and assessments**	
	3.17a	Syllabus, lectures, and assessment of a theoretical course	Document
	3.17b	Syllabus, material, and assessment of a practical course	Link
58	**3.18**	**Activities facilitating continuous improvement**	
	3.18a	PI results and suggestions for improvement	Document
	3.18c	Feedbacks from peers and students	Document
59	**3.19**	**List of workshops for Pedagogical Methods and Quality Assurance**	Document
CRITERIA 4. STUDENT ASSESSMENT			
60	**4.1**	**Student enrollment scheme**	Document
61	**4.2**	**Activities to assess English ability**	
	4.2a	Regulations of AAO on Entrance English placement	Document
	4.2b	Regulations of converting foreign language course scores	Document
	4.2c	Assessment of English requirement for graduation	Document
62	**4.3**	**Activities to satisfy course learning outcomes**	
	4.3a	An example of a course based on LMS	Document
	4.3b	Examples of formative and summative examinations	Document
	4.3c	Curriculum mapping of CET programme	Document
	4.3d	Results of PIs measurement	Document
63	**4.4**	**Assessment of graduation internship**	
	4.4a	Guideline of graduation internship	Document
	4.4b	Example of graduation internship report	Document
	4.4c	Reviews of Employers on graduation internship	Document
	4.4d	Example of assessment by rubrics	Document
	4.4e	List of students in graduation internship	Document
64	**4.5**	**Assessment of graduation thesis**	
	4.5a	Guidelines of graduation thesis	Document

	4.5b	Reviews of Reviewers	Document
	4.5c	List of students doing graduation theses	Document
	4.5d	Graduation theses conducted in production companies	Document
65	**4.6**	**Assessment of interpersonal and social skills**	
	4.6a	Regulation on assessment of interpersonal and social skills	Document
	4.6b	Report of assessment of interpersonal and social skills	Document
	4.6c	Example of assessment of interpersonal and social skills	Document
66	**4.7**	**Formative and summative assessments**	
	4.7a	Diversity of assessment methods	Document
	4.7b	Regulation of university and college in credit system	Document
	4.7c	Regulation of grading weight distribution	Document
67	**4.8**	**Assessments of practice courses**	
	4.8a	Sample rubrics of assessment	Document
	4.8b	Guidelines for assessing graduation theses and projects	Document
68	**4.9**	**Assessments in the Covid-19 pandemic**	
	4.9a	Online based tests	Document
	4.9b	Registration list for online exam	Document
69	**4.10**	**Notification of student assessment**	
	4.10a	Timetable of teaching and learning	Document
	4.10b	Notification of student assessment in course syllabus on LMS and class	Document
	4.10c	Notification of student assessment on E/M learning system	Document
	4.10d	HCMUTE student handbook	Document
70	**4.11**	**Regulations on Undergraduate education**	Document
71	**4.12**	**Some course syllabi**	Document
72	**4.13**	**Sample of some rubrics**	Document
73	**4.14**	**Paper-based exam questions**	Document
74	**4.15**	**Surveys on students' satisfaction with teaching-learning activities and assessments**	Document
75	**4.16**	**Procedures for incomplete score and regrading**	
	4.16a	Regulations on Undergraduate education	Document
	4.16b	Application form for Incomplete score	Document

	4.16c	Example of regraded exam answer	Document
76	**4.17**	**Alignment between CLOs and assessment techniques**	
	4.17a	Assessing low-level thinking skills	Document
	4.17b	Assessing high-level thinking skills	Document
	4.17c	Assessing experimental skills	Document
	4.17d	Assessing presentation skills	Document
77	**4.18**	**Announcement of exam answers**	
	4.18a	Regulations on Undergraduate education	Document
	4.18b	Exam answer on the website	Link
78	**4.19**	**Procedures for planning and conducting examinations**	
	4.19a	Regulations on Undergraduate education	Document
	4.19b	Procedures for planning and conducting examinations	Document
	4.19c	Regulations on Ethics in scientific research, citation format, and anti-plagiarism for academic products of HCMUTE	Document
	4.19d	Turnitin result of a graduation thesis	Document
79	**4.20**	**Plans and results of PIs measurement**	
	4.20a	Plans of PI measurement	Document
	4.20b	Results of PI measurement	Document
80	**4.21**	**Questions and Feedbacks on UTExLMS**	
	4.21a	Review of a student's work	Document
	4.21b	Grade report of an online exam	Document
	4.21c	Statistics of questions in a quiz	Document
81	**4.22**	**Regulations of online teaching, learning assessments**	
	4.22a	Regulations on Undergraduate education	Document
	4.22b	Regulations on online education	Document
82	**4.23**	**Online assessment techniques**	
	4.23a	Online quizzes	Document
	4.23b	Online defense of graduation theses	Document
83	**4.24**	**Results of student satisfaction on the assessment techniques**	Document
CRITERIA 5. ACADEMIC STAFF			
84	**5.1**	**The development strategic plans of HCMUTE and FCFT**	
	5.1a	HCMUTE development strategic plan in the 2011-2015 period, vision 2020	Document

		5.1b	HCMUTE development strategic plan in the 2017-2022 period, vision 2030	Document
		5.1c	FCFT development strategic plan in the 2013-2018 period, vision 2020	Document
		5.1d	FCFT development strategic plan in the 2020-2025 period, vision 2030	Document
85	**5.2**		**Human resource development planning for academic staff**	
		5.2a	FCFT Quality Targets and Implementation Plan 2020-2021	Document
		5.2b	Procedure for training and developing human resources	Document
		5.2c	Decision on staff appointment to graduate programme and professional improvement	Document
		5.2d	Annual fostering academic qualifications registration list of lecturers in FCFT	Document
		5.2e	FCFT proposal for human resource development planning for academic staff in the 2020-2025	Document
86	**5.3**		**Regulation on competence improvement**	
		5.3a	Regulation No. 274/QĐ-ĐHSPKT-TCCB of 2nd April 2009 on qualification improvement	Document
		5.3b	Procedure for training and developing human resources	Document
		5.3c	HCMUTE announcements of training courses	Document
		5.3d	List of staffs participating training courses	Document
		5.3e	Training evaluation report of academic staff	Document
		5.3f	Internal Cost Norms	Document
87	**5.4**		**Planning of human resources of the Party Committee**	
88	**5.5**		**Regulations on working**	
		5.5a	Regulation No. 1402/QĐ-ĐHSPKT-TCCB of 14th July 2015 on working, rest, and compassionate leave hours	Document
		5.5b	Joint Circular No. 36/2014/TTLT-BGDĐT-BNV on regulations and standard occupational title codes for academic staffs in the university	Document
		5.5c	Circular No. 47/2014/TT-BGDĐT on working regulation for academic staff	Document
		5.5d	Working regulation for the university academic staff	Document
		5.5e	Decision on announcement of Mr. Nguyen Van Suc's retirement	Document
		5.5f	Decision on announcement of Mr. Nguyen Tien Luc's working time extension	Document
89	**5.6**		**Recruitment procedure**	

		5.6a	Procedure QT-PTCHC-TD on 1st August 2020 on HCMUTE recruitment procedure	Document
		5.6b	Regulation No. 42 /QĐ-ĐHSPKT -TCCB on 9th April 2013 on academic staff standard at HCMUTE	Document
		5.6c	Recruitment announcements	Link Document
		5.6d	Summary of recruitment requirement of FCFT	Document
		5.6e	Sample of recruitment profile	Document
90	**5.7**		**Academic staff assessment**	
		5.7a	Report of student survey results about teaching activities of lecturer	Document
		5.7b	Sample of Teaching observation record and DCT's report of Teaching observation activity	Document
		5.7c	HR and KPIs software	Document
		5.7d	E-portfolio portal, http://eportfolio.hcmute.edu.vn/#/login and a sample	Link
		5.7e	The academic staff's self-assessment report on working results	Document
91	**5.8**		**Employee satisfaction with working environment**	
92	**5.9**		**DCT's employee satisfaction**	Document
93	**5.10**		**Decision on functions, tasks, authority definition**	
		5.10a	Decision No. 813/QĐ-ĐHSPKT-TCCB of 23rd March 2015 on defining the school functions, tasks, authorities, and organizational structure	Document
		5.10b	Description of functions and duties of department members	Document
		5.10c	Faculty organization structure	Document
		5.10d	Academic staff Handbook 2018	Document
94	**5.11**		**HCMUTE probation period policies**	
		5.11a	Decisions on allocation of instructing lecturers for probation period	Document
		5.11b	Decisions on recognition of probation period	Document
		5.11c	Regulation No. 318 /QĐ-ĐHSPKT-TCCB of 17th November 2010 on the tasks and conditions of probation expiration review	Document
		5.11d	Sample of probation profile of academic staff	Document
95	**5.12**		**Regulations on appointment statutes, re-appointment, resignation, dismissal of administrators, and duty allocation**	

	5.12a	Decision No. 475/QĐ-DHSPKT-TCCB 2013 on appointment statutes, re-appointment, resignation and dismissal of administrator	Document
	5.12b	Decision on the appointment of associate professor title for Mr. Nguyen Tan Dung, Mr. Trinh Khanh Son, and Mr. Nguyen Vinh Tien.	Document
	5.12c	Decisions on the appointment of faculty dean, faculty vice deans, department head, and department deputy head.	Document
	5.12d	DCT meeting minutes for duty assignment	Document
	5.12e	FCFT meeting for duty assignment	Document
	5.12f	Decisions on the appointment of principal lecturers (rank II), lecturers (rank III) and engineer (rank III) of FCFT	Document
96	**5.13**	**The official statement of guidance for emulation - bonus**	
97	**5.14**	**The announcement of the annual salary increase**	Document
98	**5.15**	**Decision on early raise of salary for lecturers of FCFT**	Document
99	**5.16**	**Plan and minutes of class observation**	
	5.16a	Plans of class observation	Document
	5.16b	Minutes of class observation	Document
100	**5.17**	**Statistics on Scientific publication 2016-2021 of DCT**	Document
101	**5.18**	**The registration process in intellectual property rights for scientific research products**	Document
102	**5.19**	**Certificate list of long/short-term courses for lecturers at the FCFT**	Document
103	**5.20**	**Annual budget at the FCFT for long/short-term training activity for academic staffs**	Document
104	**5.21**	**Decisions on rewards and recognition for lecturers with their outstanding contribution**	Document
CRITERIA 6. STUDENT SUPPORT SERVICES			
105	**6.1**	**Student enrollment scheme**	Document
106	**6.2**	**HCMUTE's enrollment notice and admission procedure**	Document
	6.2a	HCMUTE's enrollment notice	Document
	6.2b	Admission procedure	Document
107	**6.3**	**Approaches to inform the HCMUTE student intake policy and admission criteria**	Document, Image, Website
108	**6.4**	**Quality plan in long and short terms of HCMUTE and FCFT**	
	6.4a	Quality plan in long and short terms of HCMUTE	Document

	6.4b	Quality plan in long and short terms of FCFT	Document
109	**6.5**	**Human resource development planning for support staff**	Document
	6.5a	Procedure for training and developing human resource	Document
	6.5b	Announcement for training course	Document
	6.5c	List of training courses for support staff	Document
	6.5d	Decision on support staff to graduate program and professional improvement	Document
	6.5e	List of certificates of training courses	Document
110	**6.6**	**Survey on students for supporting service quality**	Document
111	**6.7**	**Annual survey of employees on working environment**	Document
112	**6.8**	**E/M learning activities**	Document, Image
113	**6.9**	**FCFT's team of consultants**	Document, image
114	**6.10**	**Activities in Orientation week**	Document, image
115	**6.11**	**Students' clubs in UTE and FCFT**	
	6.11a	Student's clubs in HCMUTE	Image, Website
	6.11b	Student's clubs in FCFT	Image, Website
116	**6.12**	**Creative competition from scientific research funding**	Image Document
117	**6.13**	**Student's competitions and extracurricular activities**	
	6.13a	Student's competitions	Document, Image
	6.13b	Student's extracurricular activities	Image
118	**6.14**	**Job support services and careers guidance**	
	6.14a	Job support services and careers guidance of HCMUTE	Document
	6.14b	Job support services and careers guidance of FCFT	Document
119	**6.15**	**HCMUTE's physical environment**	
	6.15a	Physical environment of HCMUTE	Image
	6.15b	Physical environment of FCFT	Image
120	**6.16**	**Social environment of HCMUTE and FCFT**	
	6.16a	Social environment of HCMUTE	Image
	6.16b	Social environment of FCFT	Image

121	**6.17**	**HCMUTE's Psychological Environment**	Document, Image
122	**6.18**	**List of students awarded scholarships**	Document
123	**6.19**	**Supporting programmes for advanced students**	Document
124	**6.20**	**Procedure of recruitment**	Document
125	**6.21**	**Competences and Job description**	
	6.21a	Function, responsibility of support staff in HCMUTE	Document
	6.21b	Function, responsibility of support staff in FCFT	Document
126	**6.22**	**Probation period policies and procedures**	
	6.22a	Decisions on task and probation expiration conditions	Document
	6.22b	Staff's probation profile	Document, Image
127	**6.23**	**Decision on appointment statues, re-appointment**	Document
128	**6.24**	**Support staff evaluation process**	Document
129	**6.25**	**Survey on service quality of consultants**	Document
130	**6.26**	**KPIs system and Paper self-report**	Document
131	**6.27**	**Emulation and rewards for support staff**	Document
132	**6.28**	**Activities of staff meeting, summer conference**	Document
133	**6.29**	**Student service center activities**	Document, Website, Image
134	**6.30**	**ERO's activities**	Document, Website, Image
135	**6.31**	**Calibration, maintenance and repair equipment**	Document
136	**6.32**	**Renovation, repairs and acquisition**	Document
CRITERIA 7. FACILITIES AND INFRASTRUCTURE			
137	**7.1**	**CET laboratories**	Document
138	**7.2**	**Financial plan for facilities and equipment**	Document
139	**7.3**	**Health Safety Chemical Security management system in LABs – HSCSMS**	Document
140	**7.4**	**Library resources**	Document
141	**7.5**	**Annual events in the Library**	Document, image
142	**7.6**	**Feedbacks from readers**	Document, image

143	**7.7**	**Feedbacks about quality of service**	Document
144	**7.8**	**HCMUTE Information technology system**	Document
145	**7.9**	**Digital Learning Centre**	Document
146	**7.10**	**Online teaching system**	Document
147	**7.11**	**HCMUTE wifi system**	Document
148	**7.12**	**Working environment at HCMUTE**	Document
149	**7.13**	**Health care**	Document
150	**7.14**	**Security and safety at HCMUTE**	Document
151	**7.15**	**FCFT's physical environment**	Document
152	**7.16**	**FCFT's psychological environment**	Document
153	**7.17**	**Competences and Job description**	Document
154	**7.18**	**Training and development plans for support staff**	Document
155	**7.19**	**List of report and certificate of training courses**	Document
156	**7.20**	**Regulation on qualification improvement**	Document
157	**7.21**	**Internal Cost Norms**	Document
158	**7.22**	**Survey on service quality of staff and student**	Document
159	**7.23**	**Library's enhancement**	Document
160	**7.24**	**Student feedback on support services and facilities**	Document
161	**7.25**	**Graduates feedback**	Document
162	**7.26**	**Renovation, repairs and acquisition**	Document
163	**7.27**	**Calibration, maintenance and repair equipment**	Document
CRITERIA 8. OUTPUT AND OUTCOMES			
164	**8.1**	**The faculty quality objective and training plan**	Document
164	**8.2**	**Department meeting minute**	Document
166	**8.3**	**No. 2919-Regulations on management and benchmark of training efficiency indicators of HCMUTE**	Document
167	**8.4**	**Regulation of academic programme lasting**	Document
168	**8.5**	**Decision established on consultant board**	Document
169	**8.6**	**List of students with low studying progress**	Document
170	**8.7**	**Teaching assistant team of FCFT**	
	8.7a	Regulations on Teaching Assistant	Document
	8.7b	List of Teaching Assistant of FCFT	Document
	8.7c	Contract of Teaching Assistant	Document
171	**8.8**	**List of clubs of HCMUTE**	Document

172	**8.9**	**Exam season review programs**	Document
173	**8.10**	**Hardship scholarship support information**	Document
174	**8.11**	**HCMUTE survey report**	Document
175	**8.12**	**List of paper**	Document
176	**8.13**	**Policy to improve research output**	
	8.13a	Recruitment plans	Document
	8.13b	Regulation on working term of lecturers	Document
	8.13c	Decision on allowing lecturers to study for a doctorate	Document
177	**8.14**	**The process of implementing scientific research project for students**	Document
178	**8.15**	**List of student's Research Project/Poster/Certificate of Merit**	Document
179	**8.16**	**Annual measurement plan and report**	Document
180	**8.17**	**Questionnaire and survey report from 2017-2022**	Document
181	**8.18**	**Enterprise survey**	Document

Appendix 5. Summary of the ELOs, assigned PIs and results on the ELOs assessment at the Department of Chemical Technology

The ELOs and corresponding PIs in the CET curriculum	
ELOs	**Corresponding PIs**
ELO1. an ability to identify, formulate, and solve complex engineering problems in field of the Chemical Engineering Technology by applying principles of engineering, science, and mathematics.	**PI1.1**. Clarify problems by applying principles of engineering, science, and mathematics
	PI1.2. Calculate and interpret fundamental technological factors in the field of CET
	PI1.3. Solve and evaluate problem solutions in the field of CET
ELO2. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions in field of the Chemical Engineering Technology.	**PI2.1.** Demonstrate a proper use of lab equipment to conduct experiments
	PI2.2. Use data acquisition systems, hardware and software to collect, analyze and interpret data
	PI2.3. Prepare a professional technical report
ELO3. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	**PI3.1.** Identify the global, economic, environmental, and societal context of an engineering situation
	PI3.2. Describe ethical and professional responsibilities of an engineer
	PI3.3. Explain the impact of engineering decisions in a global, economic, environmental, and societal context
	PI3.4. Demonstrate entrepreneurship mindset in engineering situations
ELO4. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	**PI4.1.** Identify necessary techniques, skills and tools for different situations
	PI4.2. Explain the use of necessary techniques, skills and tools in different situations
	PI4.3. Apply appropriate techniques, skills and tools to the given situation
ELO5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	**PI5.1.** Establish a collaborative and inclusive environment (Teamwork)
	PI5.2. Fulfill individual responsibilities and contribute to the team's success
	PI5.3. Define team goals and deadlines, plan tasks, organize & facilitate effective team meetings
ELO6. an ability to communicate effectively	**PI6.1.** Present comprehensive content of a problem in own words
	PI6.2. Provide data to support claims in responses to audience

ELOs	PIs	Name of course supported the ELOs	Teaching and learning activites	Assessment methods
	PI6.3. Deliver an oral presentation of a given topic			
	PI6.4. Demonstrate the ability to use proper English			

with a range of audiences, and to communicate in English language.	**PI6.3.** Deliver an oral presentation of a given topic
	PI6.4. Demonstrate the ability to use proper English
ELO7. an ability to apply engineering design to produce solutions that meet specified needs in field of the Chemical Engineering Technology with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	**PI7.1.** Define design requirements and necessary resources to achieve design in the field of CET
	PI7.2. Design technological processes or technical solutions in the field of CET
	PI7.3. Verify design against the design specifications and constraints, and improve
ELO8. an ability to implement engineering systems in field of the Chemical Engineering Technology.	**PI8.1.** Develop a plan to implement technical systems in the field of CET
	PI8.2. Implement engineering systems
	PI8.3. Verify and manage implementation of technical systems
ELO9. an ability to operate and manage engineering systems in field of the Chemical Engineering Technology	**PI9.1.** Operate engineering systems
	PI9.2. Maintain and improve engineering systems
	PI9.3. Manage system operations

Results on the asscessment of ELOs' achievement and corresponding PIs in the 2nd semester- academic year 2020-2021

ELOs	PIs	Name of course supported the ELOs	Teaching and learning activites	Assessment methods	Percentage (%) of achievement	Overall ELO's achievement *(Target = 60%)*
ELO1	PI1.1	Inorganic chemistry	Lecture based, problem solving	Paper based test	33	62 %
	PI1.2	Techniques of Polymer Processing	Lecture based, problem solving	Paper based test	96	
	PI1.3	Polymer Composite Materials	Lecture based, group presentation, essay/ group report	Paper based test	83	
ELO2	PI2.1	Experiment on Organic Chemistry	Lecture based, presentation, visualization	Experimental based rubric	100	97 %

	PI2.2	Experiments in Physical Chemistry	Demonstration, essay/ group report	Experimental based rubric	100	
	PI2.3	Experiment on General Chemistry	Lecture based, demonstration	Experimental based rubric	89	
ELO5	PI5.1	Safety and Techniques in Chemistry Lab	Lecture based, group discussion, multimedia presentation, role play, visualization	Presentation based rubric	68	77 %
	PI5.2	Technology of Fertilizer	Lecture based, group discussion	Presentation based rubric	92	
	PI5.3	Safety and Techniques in Chemistry Lab	Lecture based, group discussion, multimedia presentation, role play, visualization	Presentation based rubric	82	
ELO7	PI7.1	Structural Characterization of Inorganic Materials	Lecture based, problem solving	Paper based test	37	70 %
	PI7.2	Polymer Composite Materials	Lecture based, group discussion	Paper based test	92	
	PI7.3	Dyeing and Finishing Technologies	Lecture based, group discussion	Paper based test	87	
ELO9	PI9.1	Ceramic Technology	Lecture based – essay/ group report	Paper based test	16	72 %
	PI9.2	Practice of Processes and Devices	Demonstration, group discussion, group report	Experimental based rubric	100	
	PI9.3	Practice of Processes and Devices	Demonstration, group discussion, group report	Experimental based rubric	100	
Results on the asscessment of ELOs' achievement and corresponding PIs in the 1st semester- academic year 2021-2022						

ELOs	PIs	Name of course supported the ELOs	Teaching and learning activites	Assessment methods	Percentage (%) of achievement	Overall ELO's achievement (*Target = 60%*)
ELO4	PI1.1	Qua trinh thiet bi co hoc	Lecture based, problem solving	Rubric	82	62%
	PI1.2	Analytical chemistry	Lecture based, problem solving	Paper based test	61	
	PI1.3	Analytical chemistry	Lecture based, group presentation, essay/ group report	Paper based test	34	
ELO6	PI6.1	CNSX vo co	Lecture based, problem solving	Paper based test	100	73%
	PI6.2	Design project: chemical engineering	Problem solving	Rubric	86	
	PI6.3	Graduation practice	Onsite demotration	Rubric	100	
	PI6.4	Technology of organic substances	Lecture based, problem solving	Paper based test	30	
ELO7	PI7.1	Electrochemical Technology	Lecture based, group discussion	Paper based test	100	100 %
ELO8	PI8.1	Fundamental of chemical engineering design	Lecture based, problem solving	Paper based test	90	76%
	PI8.2	Chemical reaction engineering	Lecture based, problem solving	Rubric	63	
	PI8.3	Specilized Experiments in inorganic Chemistry	Demonstration, essay/ group report	Experimental based rubric	100	
Results on the asscessment of ELOs' achievement and corresponding PIs in the 2nd semester- academic year 2021-2022						
ELOs	PIs	Name of course supported the ELOs	Teaching and learning activites	Assessment methods	Percentage (%) of achievement	Overall ELO's achievement (*Target = 60%*)

125

ELO1	PI1.1	Physical chemistry 1	Lecture based, problem solving	Paper based test	78	79.5
	PI1.2	Analytical chemistry	Lecture based, problem solving	Paper based test	44	
	PI1.3	Inorganic chemistry	Lecture based, problem solving	Paper based test	61.7	
ELO2	PI2.1	Experiments in analytical Chemistry	Demonstration, essay/ group report	Rubric	96	80.7
	PI2.2	Experiments in Physical Chemistry	Demonstration, essay/ group report	Rubric	100	
	PI2.3	Experiments in Inorganic Chemistry	Demonstration, essay/ group report	Rubric	67	
ELO3	PI3.1	Experiments in analytical Chemistry	Demonstration, essay/ group report	Rubric	100	94.8
	PI3.2	Experiments in Organic Chemistry	Demonstration, essay/ group report	Rubric	85	
	PI3.3	Lab experiemnts for polymer chemistry	Demonstration, essay/ group report	Rubric	100	
ELO4	PI4.1	Analytical chemistry	Lecture based, problem solving	Paper based test	54	51
	PI4.2	Structural characterization of inorganic materials	Lecture based, problem solving	Paper based test	66	
	PI4.3	Spectroscopic identification of organic compounds	Lecture based, problem solving	Paper based test	32	
ELO5	PI5.1	Experiments in general chemistry	Demonstration, essay/ group report	Paper based test	96	98.8
	PI5.2	Experiments in physical chemistry	Demonstration, essay/ group report	Paper based test	100	
	PI5.3	Technology of fertilizer	Lecture based, problem solving	Paper based test	100	

ELO6	PI6.1	Design project: chemical engineering	Problem solving	Rubric	94	90.1
	PI6.2	Polymer composite materials	Lecture based, problem solving	Rubric	80	
	PI6.3	Technology of fertilizer	Lecture based, problem solving	Rubric	84	
	PI6.1	Medicinal chemistry	Lecture based, problem solving	Paper based test	97	
ELO7	PI7.1	Technology of ceramics	Lecture based, problem solving	Paper based test	65	82
	PI7.2	Technology of detergents	Lecture based, problem solving	Paper based test	89	
	PI7.3	Polymer composite materials	Lecture based, problem solving	Paper based test	93	
ELO8	PI8.1	Design project: chemical engineering	Lecture based, problem solving	Rubric	100	86.2
	PI8.2	Lab experiemnts for polymer chemistry	Demonstration, essay/ group report	Rubric	67	
	PI8.3	Specific experiments in inorganic chemistry technology	Demonstration, essay/ group report	Rubric	80	
ELO9	PI9.1	Lap experiemnts for applied organic chemistry	Demonstration, essay/ group report	Rubric	77	93.1
	PI9.2	Practice of processes and devices	Demonstration, essay/ group report	Rubric	100	
	PI9.3	Practice of processes and devices	Demonstration, essay/ group report	Rubric	100	

Appendix 6. Curriculum sequence

1st	Foreign language · Politics · Science and Maths · Informatics · General chemistry · Introduction to chemical engineering technology · Safety and techniques in chemistry lab · Enterprise collaboration		
2nd	Politics · Science and Maths · Physical chemistry 1 · Inorganic chemistry · Experiment on general chemistry · Organic chemistry		
3rd	Mechanical process and equipments · Heat engineering · Physical chemistry 2 · Inorganic chemistry experiments · Analytical chemistry · Experiment on organic chemistry		
4th	Mass transfer Operations · Heat transfer operations · Experiments in physical chemistry · Fundamentals of materials science and engineering · Instrumental analytical methods · Experiment in analytical chemistry		
5th	Fundamentals of Chemical engineering design · Statistics and experimental planning in chemical technology · Chemical reaction engineering · Electrochemical technology · Technology of inorganic substances · Technology of organic substances · Polymer chemistry · Technology of environment		
6th	Design project: chemical engineering · Practice of processes and devices · Specialization in Inorganic chemical technology · Specialization in Organic chemical technology · Specialization in Polymer chemical technology		

Specialization in Inorganic chemical technology
- Technology of fertilizer
- Technology of ceramic
- Technology of cement
- Structural characterization of inorganic materials
- Advanced inorganic materials
- Physical chemistry of the silicate
- Technology of mineral processing
- Technology of pigment

Specialization in Organic chemical technology
- Technology of detergents
- Fragrance science & technology
- Spectroscopic identification of organic compounds
- Dyeing and finishing technologies
- Medicinal chemistry
- Technology of pigment
- Technology of cosmetics
- Papermaking science and technology
- Technology of agrichemical products

Specialization in Polymer chemical technology
- Polymer composite materials
- Technology of plastics manufacture
- The methods of analysis and evaluation polymer materials
- Techniques of polymer processing
- Technology of paint and vecni
- Rubber technology
- Technology of adhesive polymer
- Technology of polymeric film
- Advanced polymer materials
- Technology of polymeric fibber

Legend:
- General course
- Fundamental course
- Specialized course

7th	Foreign language · Graduation practice · Lab experiments on modern analytical techniques · Specific Experiments in Inorganic chemical technology · Lab experiments for Polymer chemistry · Lab experiments for applied organic chemistry
8th	Graduation thesis · Enterprise collaboration

Appendix 7. List of academic staff in major

No	Academic staff	Major	Year of birth	Year of Start at DCT	Year of Leave from DCT
1	Phan Thị Anh Đào	Organic chemistry	1983	2006	
2	Hoàng Minh Hảo		1982	2016	
3	Võ Thị Ngà		1975	2001	
4	Hồ Phương		1989	2019	
5	Nguyễn Thị Bạch Lê		1980	2005	
6	Lê Thị Duy Hạnh	Inorganic chemistry	1981	2017	
7	Võ Thị Thu Như		1979	2004	
8	Huỳnh Minh Ngọc		1962	1985	2017
9	Hồ Thị Yêu Ly		1976	2003	2018
10	Lê Minh Tâm		1980	2021	
11	Nguyễn Tiến Giang		1990	2021	
12	Nguyễn Vinh Tiến		1985	2013	
13	Trần Thị Nhung		1987	2017	
14	Huỳnh Nguyễn Anh Tuấn	Polymer-Machinary-Equiment	1980	2011	
15	Nguyễn Tấn Dũng		1972	2009	
16	Đặng Đình Khôi		1975	2019	
17	Lý Tấn Nhiệm		1992	2021	

Appendix 8. The process for trainings at the HCMUTE

Step 1: GAPAO gives an announcement in the human resource training and development and requests the FCFT to send a summary containing demands to improve personal development skills of lecturers.

Step 2: GAPAO plans for the human resource training and development based on the suggestions of the FCFT.

Step 3: GAPAO determines and implements the plans of the human resource training and development, which are in line with the vision and mission of the HCMCUTE.

Step 4: Lecturers are requested to report the results at the end of the courses.

Step 5: The FCFT and GAPAO revise, conclude and finally offer the optimal solutions for the next year to continuously improve the quality of the academic staffs.