SELF - ASSESSMENT REPORT FOR AUN-QA

BACHELOR OF ENGINEERING
IN MECHANICAL ENGINEERING TECHNOLOGY

AUN-QA
A Touch of Quality

The 127th AUN Quality Assessment at Programme Level

December 10 - 12, 2018

AUN-QA SELF-ASSESSMENT REPORT

of the Bachelor of Engineering in

MECHANICAL ENGINEERING TECHNOLOGY

We hereby confirm to approve this AUN-QA Self-Assessment Report of the Bachelor of Engineering in Mechanical Engineering Technology programme for assessment according to AUN-QA Criteria (V3.0).

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LIST OF ABBREVIATIONS

AAO	Academic Affairs Office
ASAO	Admissions and Student Affairs Office
ASC	Academic and Scientific Committee
ASU	Arizona State University
BUILD-IT	Building University-Industry Learning and Development through Innovation and Technology
CAD	Computer Aided Design
CAE	Computer Aided Engineering
CAM	Computer Aided Manufacturing
CLO	Course Learning Outcome
CNC	Computer Numerical Control
ELO	Expected Learning Outcome
ERC	Emulation and Reward Committee
ERO	Enterprises Relations Office
FME	Faculty of Mechanical Engineering
FTE	Full-time Equivalent
GAPO	Office of General Administration and Personnel Affairs
GPA	Grade Point Average
HEEAP	Higher Engineering Education Alliance Programme
HCMUTE	Ho Chi Minh City University of Technology and Education
GAPO	General Administration and Personnel Office
ISO	International Organization for Standardization
KPIs	Key Performance Indicators
LMS	Learning Management System
ME	Mechanical Engineering
MET	Mechanical Engineering Technology
MMT	Machinery Manufacturing Technology
MoET	Ministry of Education and Training
MoU	Memorandum of Understanding
NHSGE	National High School Graduation Examination
POs	Programme Objectives
QAO	Quality Assurance Office
SAR	Self-Assessment Report
SHTP	Saigon High Tech Park
TA	Teaching Assistant
VEEC	Vietnam Engineering Education Conference
VULII	Vocational and University Leadership and Innovation Institute

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PART 1: INTRODUCTION

1. Executive summary

Self-Assessment Report of Mechanical Engineering Technology (MET) programme provides detailed information on various quality aspects of the programme. This is the third programme, which is selected for AUN-QA accreditation, of the Faculty of Mechanical Engineering (FME), Ho Chi Minh City University of Technology and Education (HCMUTE).

A SAR team including the Dean Board, Department Heads and experienced lecturers was established in June 2017. It has been responsible for analysing how the academic programme complies with the AUN-QA criteria and collecting facts and evidences in support of the criteria justification. The latest version of SAR was completed in July 2018.

The SAR consists of four main parts:

- Part 1: Introduction
- Part 2: AUN-QA criteria
- Part 3: Strengths and weaknesses analysis
- Part 4: Appendices

2. Ho Chi Minh City University of Technology and Education (HCMUTE)

Ho Chi Minh City University of Technology and Education is a distinct one. It is the first university to train technical teachers and the leading university in the national Technical Education system, with a long history of establishment and development.

The predecessor of HCMUTE is the Technical Education College Department subordinate to the Phu Tho School of Technology, established on October 5th, 1962. In 1972 the Department was renamed Nguyen Truong To Technical Education College Center of Thu Duc and the first academic year 1972-1973 commenced on the Thu Duc campus. In 1974 the Center was upgraded to Thu Duc Education University within Thu Duc University Institute of Technology. On October 27th, 1976, the Institute was renamed Thu Duc University of Technical Education. In 1984 the school was renamed Ho Chi Minh City University of Technology and Education after merging with the adjacent Thu Duc Industrial High School and further merging with Technical Teacher Training School No.5 in 1991.

At present HCMUTE has 15 faculties, 17 functional units, and 17 institutes and centers with about 768 full-time staff members in total including 556 academic staff and 212 non-academic staff.

As an experienced and dynamic state-run university, HCMUTE offers qualified technology-oriented programmes at various levels of training including:

- 07 Ph.D.'s programmes.
- 14 Master's programmes.
- 25 Bachelor's programmes and 12 Bachelor's programmes in technical education.
- 05 Associate programmes.
- 03 Joint training programmes.

Key statement of HCMUTE Educational Philosophy: **HUMANITY, INNOVATION, INTEGRATION**

2.1. Vision

HCMUTE will become a leading center for training, research, innovation and entrepreneurship in Vietnam, on a par with reputable universities in the region and all over the world.

2.2. Mission

Being a leading institution for training, research, and technology transfer in Vietnam. Continuously innovating, providing high quality human resources and scientific products in vocational education, science, technology to satisfy the socio-economic development demand of our country and the region.

2.3. Organizational structure of HCMC University of Technology and Education

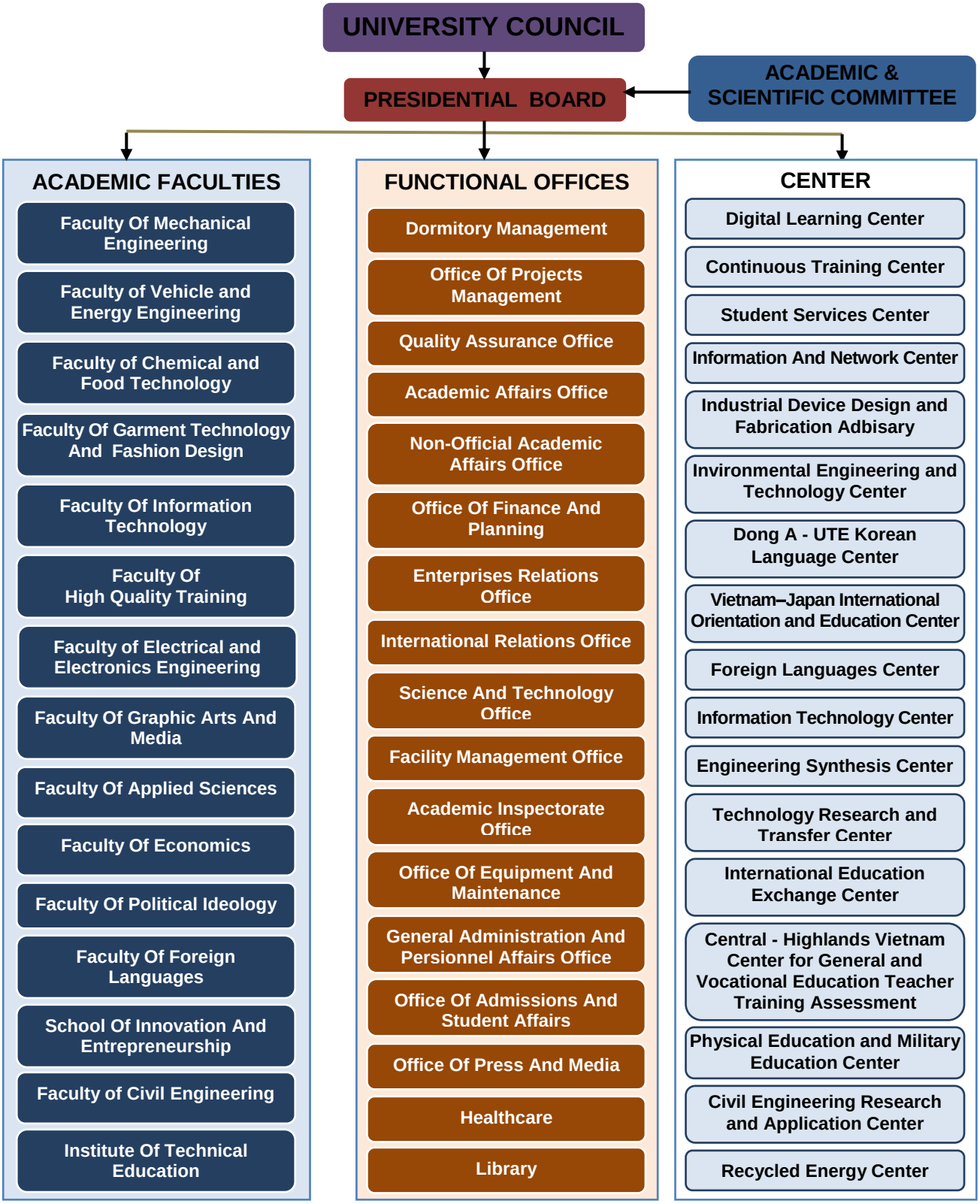


Figure 0. 1: Organizational structure of HCMC University of Technology and Education

2.4. Quality assurance system of HCMUTE

Quality policy of HCMUTE is stated as

"Continuously upgrade quality of teaching, learning and scientific research to provide students with the best conditions to develop comprehensively their professional skills in order to satisfy the demands of society and international integration".

Quality Assurance activities

HCMUTE has been applying ISO 9001:2000 quality management system since 2005 and the system has been maintained until now with 42 quality management processes being issued, revised and added during the operation. Quality Assurance Office (QAO) was established in 2008 with the function as follows:

1. Consulting and directly organizing activities with relations to the management of the University in compliance with ISO 9001:2000

2. Conducting surveys and assessment of the University's education quality.

3. Coordinating the assessment, inspecting training curriculums and educational institutions in compliance with international and the MoET's standards.

Milestones in quality assurance activities of the university from 2005 are stated as below:

- 2005: External assessment by the MoET standards.
- 2007: Achieving ISO 9001:2000 Certification.
- 2014: Becoming an AUN-QA Associate member.
- March 2016: Achieving AUN-QA Certification for three programmes (Mechatronics Engineering Technology, Electrical and Electronic Engineering Technology, Automotive Engineering Technology).
- November 2016: Achieving Quality Accreditation at Institutional level by MoET standards.
- March 2017: Achieving AUN-QA Certification for Construction Engineering Technology programme.
- November 2017: Achieving AUN-QA Certification for four programmes (Electronic and Telecommunication Engineering Technology, Thermal Engineering Technology, Machine Manufacturing Technology and Environmental Engineering Technology).
- By the year 2020, HCMUTE will have had 100% of the academic programmes accredited by the standards of international or regional accreditation organizations.

3. Faculty of Mechanical Engineering (FME)

3.1. Vision of FME

FME will become a top esteemed institution in Southern Vietnam region for training, scientific research and technology transfer in mechanical engineering field; to be the pride of HCMUTE in its process of comprehensive and sustainable development and international integration.

3.2. Mission of FME

- To make the Faculty become the leading unit in education and research in mechanical and automatic fields in Viet Nam.
- To cooperate firmly with the University and the Industry in training, research, technology amelioration and knowledge innovation to serve the industrialization and modernization of the nation.

- To provide learners with an excellent educational environment for comprehensive learning, research and training in theory and practice, skills and ethics development to meet the requirements of the regional and international integration.

3.3. Core values of FME

- **Ethics:** *Respect and follow all the ethic standards*
- **Respect:** *Self-respect and respect for other colleagues, students and partners*
- **Equality:** *Treat other colleagues and students equally*
- **Union and Sincerity:** *Sincerely help and unite together*

3.4. Quality Policy of FME

The slogan that FME has been carrying along during its more than 50 years of development since the establishment in 1965 is "Comprehensiveness, Creativeness and Ambitiousness".

3.5. Organizational structure of FME

FME has 84 academic staff including 8 Assoc. Profs, 16 PhDs, 47 Masters of Science and 04 academic staff studying PhD abroad.

The Faculty has seven departments and one center. It offers graduate and undergraduate study programmes at 03 different levels of training:

- PhD. in Mechanical Engineering
- Master in Mechatronics Engineering Technology
- Master in Mechanical Engineering
- Bachelor in Mechatronics Engineering Technology
- Bachelor in Mechanical Engineering Technology
- Bachelor in Machine Manufacturing Technology
- Bachelor in Industrial Engineering
- Bachelor in Technology of Forest product processing

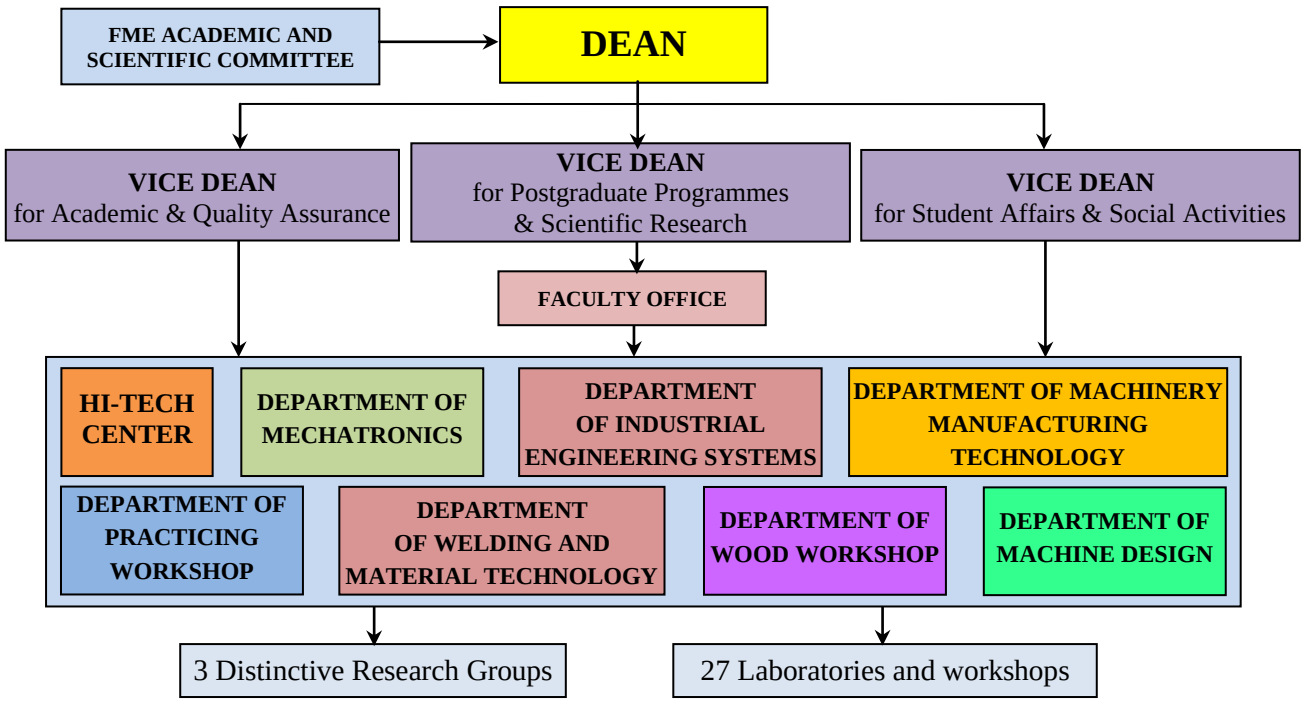


Figure 0.2: Organizational structure of FME

4. Mechanical Engineering Technology programme

The Mechanical Engineering Technology (MET) programme with the first cohort in 2001 is aimed at training the mechanical engineers who have advanced knowledge and skills in the design, manufacturing and management of machinery, production as well as appropriate professional attitudes adapting to the development requirements of the major and society. The programme does not only provide students with an excellent educational background and generic skills, but also encourages students' creativity and assists them in realizing their ideas through practice.

Job and Post-graduate study opportunities:

Graduates from MET programme are able to:

- Work in the mechanical engineering factories and companies, in the fields of engineering services or R&D departments under the role of direct operators, facilitators or managers.
- Continue their higher study at the programme's national and international universities.

Graduates can find good jobs within the first three months after graduating through information about job opportunities on website of FME *[http://fme.hcmute.edu.vn/TopicId/cc5e04d0-2ede-4a90-9c0c-d4b4c4aae783/career-recruitment]*.

PART 2: AUN-QA CRITERIA

CRITERION 1: EXPECTED LEARNING OUTCOMES

1.1. The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university

The aim of MET programme is to graduate the Mechanical Engineers who have advanced knowledge and skills in the design, manufacturing and management of machinery, production as well as appropriate professional attitudes adapting to the development requirements of the major and society.

The MET programme objectives (POs) align with FME and HCMUTE's vision and mission, and Vietnam Law on higher education as shown in the figure 1.1

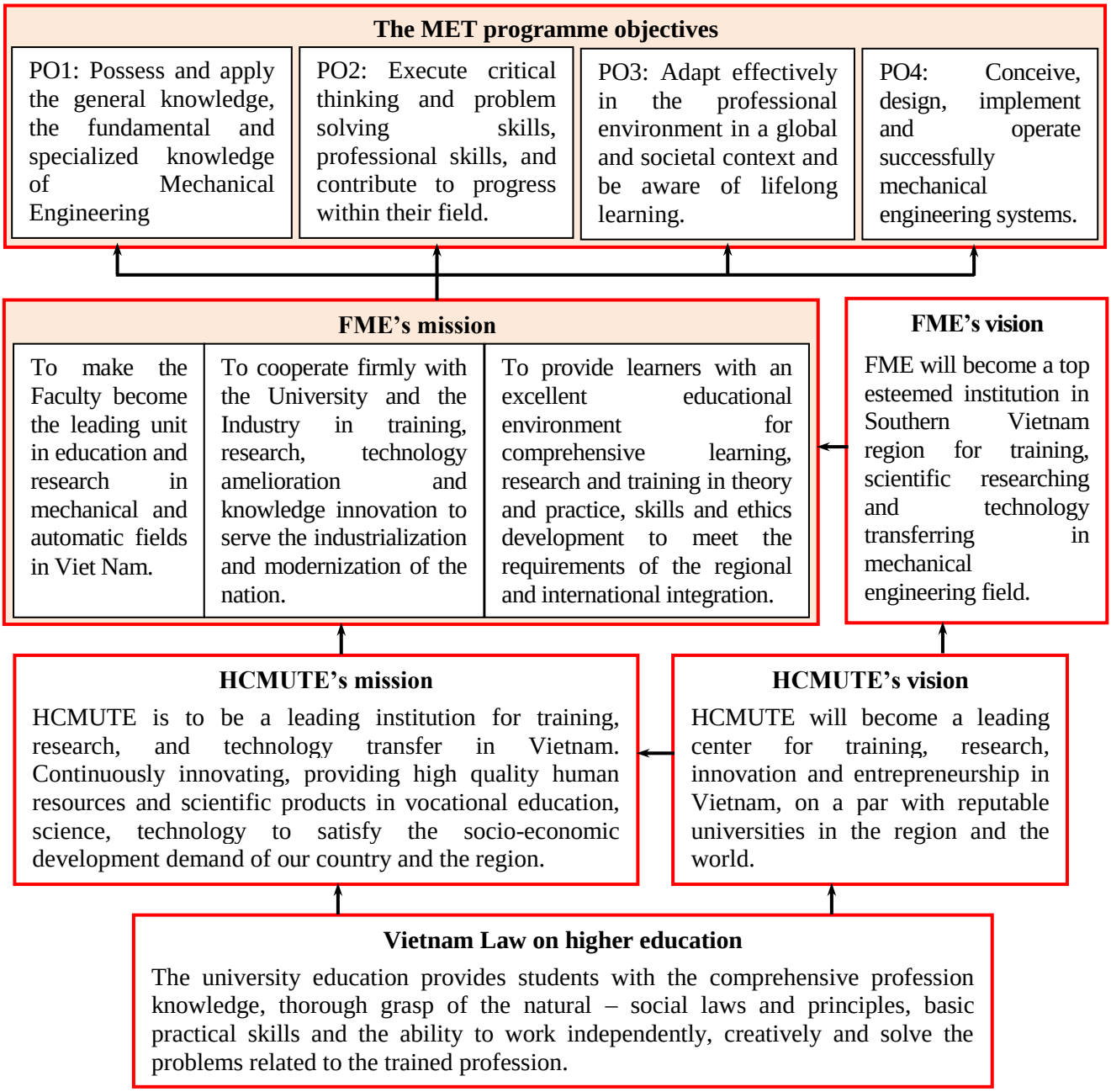


Figure 1.1: Alignment between the POs with FME and HCMUTE's vision and mission, and Vietnam Law on higher education

From the programme objectives of the MET programme, the expected learning outcomes (ELOs) were revised from those of the programme in 2008 as the following procedure *[Exh.1.1: Revision of ELOs of the MET programme in 2012]*:

- Step 1: Make the plan for revising the ELOs.
- Step 2: Draft the ELOs from analyzing the vision and mission of FME and HCMUTE, and requirements from stakeholders as well as referring to the ELOs of the programmes from prestigious universities in Vietnam and in the world.
- Step 3: Organize the seminars to get feedback from stakeholders.
- Step 4: Discuss and decide the drafting ELOs in the meeting of the FME Academic and Scientific Committee (ASC).
- Step 5: Submit the ELOs to the HCMUTE presidential board for approval.

As required from the stakeholders, the ELOs that were revised in the programme 2012 focus more on the learner's life-long learning capacity as well as generic skills, compared to the ELOs in 2008. After that, the ELOs have been stated and published in the programme specification which is available at the FME office as well as on the university and the faculty's websites as follows:

After successful completion of the programme, students will be able to:

ELO 1: Use general knowledge of mathematics, science and information technology to gain professional knowledge and pursue higher education.

ELO 2: Apply the fundamentals of mechanical engineering knowledge in reality.

ELO 3: Analyze and solve mechanical engineering problems.

ELO 4: Measure and interpret experimental data related to mechanical engineering in terms of professional skills.

ELO 5: Lead and work effectively in individual and group-oriented settings.

ELO 6: Communicate effectively in different forms, such as writing, multimedia, graphics, and presentation.

ELO 7: Demonstrate the ability to use English in mechanical engineering, especially reading and writing skills.

ELO 8: Exhibit lifelong learning capacity.

ELO 9: Appreciate different enterprise cultures, demonstrate professional behaviors and work successfully in industrial organizations.

ELO 10: Conceive, plan and manage the projects in accordance with the industrial requirements.

ELO 11: Design and stimulate technological equipment and processes.

ELO 12: Manufacture parts and machinery by CNC machines.

ELO 13: Operate and maintain CNC systems.

Table 1.1: Matrix of Programme objectives vs. Expected learning outcomes

MET Programme Objectives		**Expected Learning Outcomes**												
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1	Possess and apply the general knowledge, the fundamental and specialized knowledge of Mechanical Engineering	✓	✓								✓	✓		
2	Execute critical thinking and problem solving skills, professional skills, and contribute to progress within their field			✓	✓									
3	Adapt effectively in the professional environment in a global and societal context and be aware of lifelong learning	✓				✓	✓	✓	✓	✓				
4	Conceive, design, implement and operate successfully mechanical engineering systems										✓	✓	✓	✓

ELOs are also introduced to freshmen in a-week orientation seminar and in the *Introduction to Mechanical Engineering* course at the first semester *[Exh.1.2: Approaches to ELOs]*.

1.2. The expected learning outcomes cover both subject specific and generic (i.e. transferable) learning outcomes

The MET programme aims to promote active learning, learning how to learn and to become lifelong learners. Therefore, the ELOs consist of specific and generic outcomes. The subject specific outcomes including knowledge, skills, and attitudes in Mechanical Engineering field are translated into the specialized courses and projects. The generic outcomes focusing on general skills in management, communication, problem-solving, critical thinking, teamwork, leadership, etc. are mainly transferred into the teaching-learning activities of courses, particularly the course "*Introduction to Mechanical Engineering*" in the first semester and through extra-curricular activities, and internships during the training time *[Exh.1.3: Extra-curricular activities]*. The ELOs described above are classified according to subject specific, generic and attitude outcomes as shown in the below Table 1.2.

Table 1.2: Classification of the ELOs

Expected Learning Outcomes	Subject specific ELOs	Generic ELOs
ELO 1: Use general knowledge of mathematics, science and information technology to learn professional knowledge and pursue higher education		✓
ELO 2: Apply the fundamentals of mechanical engineering knowledge in reality	✓	
ELO 3: Analyze and solve mechanical engineering problems	✓	
ELO 4: Measure and interpret experimental data related to mechanical engineering in terms of professional skills	✓	
ELO 5: Lead and work effectively in individual and group-oriented settings		✓
ELO 6: Communicate effectively in different forms, such as writing, multimedia, graphics, and presentation		✓
ELO 7: Demonstrate the ability to use English in mechanical engineering, especially reading and writing skills		✓
ELO 8: Exhibit life-long learning capacity		✓
ELO 9: Appreciate different enterprise cultures, demonstrate professional behaviors and work successfully in industrial organizations		✓
ELO 10: Conceive, plan and manage the projects in accordance with the industrial requirements	✓	
ELO 11: Design and stimulate technological equipment and processes	✓	
ELO 12: Manufacture parts and machinery by CNC machines	✓	
ELO 13: Operate and maintain CNC systems	✓	

The ELOs for specific and generic knowledge and skills are then translated into the course learning outcomes (CLOs) which can be achievable through teaching and learning activities. In turn, CLOs are also formulated based on the Bloom's taxonomy, which are fully assessed in the tests and learning activities of the formative assessment as well as the final exam at the end of the course *[Exh.1.4: Some course syllabi, Exh.1.5: Samples of exammination papers]*. The contribution level of the CLOs to the ELOs achievement is demonstrated in Appendix 2. Besides, the ELOs as well as the content of the programme are designed reasonably on the gradually increasing degree of difficulty to ensure students' effective learning. In addition, the university also has the support to help students achieve ELOs such as facilities, teaching assistants, self-study spaces, LMS, Student services, etc.

The ELOs on attitudes, cultures and behaviors could be achieved through extra-curricular activities for students as shown in Table 1.3 *[Exh.1.3: Extra-curricular activities]*.

Table 1.3: Matrix of Extra-curricular activities vs. Expected learning outcomes

No	Extra-curricular activities	ELOs												
		01	02	03	04	05	06	07	08	09	10	11	12	13
1	Field trips					✓	✓		✓	✓				
2	English clubs					✓	✓	✓	✓					
3	Soft skills clubs					✓	✓		✓					
4	Specialized seminars					✓	✓	✓	✓	✓				
5	Social Union activities					✓	✓		✓	✓				

1.3. The expected learning outcomes clearly reflect the requirements of the stakeholders

HCMUTE has promulgated an ISO procedure of revising academic programmes in order to reflect the requirements of the stakeholders. Periodically, FME conducted the investigation, evaluation, comments and getting feedback from alumni, employers through annual workshops on reviewing the ELOs and adjusting the curriculum. In addition, the Faculty also conducted feedback collection from the students who are learning through dialogue meeting between the Faculty and students regularly once every semester *[Exh.1.1: Revision of ELOs of the MET programme in 2012]*.

During the process of revising the MET programme in 2012, feedback from various stakeholders were taken into consideration. Feedback from them were collected by brainstorming, interview and surveys. Of all the gathered feedback, several key suggestions or requests have led to the establishment of clearer and better learning outcomes, compared to that of the 2008 programme. For example, employers and alumni suggested that more emphasis should be put on training soft skills and English proficiency. Such comments gave revising to ELO 5, 6 and 7 of the current curriculum that emphasize their importance *[Exh.1.6: Feedback of stakeholders]*. Table 1.4 summarizes the mapping of stakeholders' requirement level and the ELOs of the MET programme.

Table 1.4: Mapping of stakeholders' requirement levels and the ELOs of the MET programme

Programme ELOs	Academic Staffs	Students	Alumni	Employers
ELO 1	**	*	*	*
ELO 2	**	*	*	*
ELO 3	***	**	***	***
ELO 4	**	**	**	***
ELO 5	**	*	**	***
ELO 6	***	***	***	***
ELO 7	***	*	**	**
ELO 8	***	*	**	*
ELO 9	*	*	**	***
ELO 10	***	**	***	***
ELO 11	***	***	***	***
ELO 12	***	***	***	***
ELO 13	***	***	***	***

Note: *Requirement levels include:* ******* *means* ***requirement in part****,* ******** *means* ***requirement****, and* ********* *means* ***high requirement***

At the same time, the content of the programme has also had many changes to meet the stakeholders' requirements and improve the training quality, namely:

The first is to add the course "*Introduction to Mechanical Engineering*" to the programme in order to improve students' soft skills and their English competence *[Exh.1.7: Syllabus and portfolio of "Introduction to Mechanical Engineering"]*.

The second is to revise assessment rubrics of course projects and capstone project *[Exh.1.8: Assessment rubrics]*.

The third is to organize the specialized seminars with the participation of employers in teaching.

Last but not least, it is to invite employers to attend the capstone project defence board *[Exh.1.9: Activities in Capstone project]*.

Every four years, the ELOs and structure of the MET programme are evaluated and greatly revised based on the stakeholders' feedback *[Exh.1.1: Revision of ELOs of the MET programme in 2012], [Exh.1.6: Feedback of stakeholders]*.

CRITERION 2: PROGRAMME SPECIFICATION

2.1. The information in the programme specification is comprehensive and up-to-date

The English version of the MET programme specification is clearly presented in Appendix 1 together with the necessary information about the programme such as:

1. Awarding institution
2. Name of the final award
3. Programme Title
4. Mode of delivery
5. Training time
6. Admission criteria or requirements to the programme
7. Programme aim
8. Programme objectives
9. Expected learning outcomes of the programme
10. Course workload (Credits)
11. Teaching and learning method
12. Student assessment method
13. Programme structure
14. Job and Post-graduate study opportunities
15. Date on which the programme specification was written or revised
16. Programme contact
17. Brief description of all required courses

The programme specification is communicated to students in the orientation sessions at the beginning of the programme. During training process, information of changes in the MET programme specification is disseminated to students via notice on the bulletin board, FME website, personal mailboxes of students or presented directly in the classroom. For example, the processes to assess students' learning competence, information for selecting students who are allowed to perform capstone project or evaluating students' community services, etc. *[Exh.2.1: Deployment of the programme specification]*

According to the rules regulated by HCMUTE, the programme specification must be periodically revised every 4-6 years of operation. From 2001 to 2012, the MET programme has experienced

several revisions with gradually downsizing the number of credits. Knowledge clusters were integrated to save time for developing self-study competence. The MET programme version 2001 had totally 240 credits (duration of study is 5 years), the 2006 version of 215 credits (4.5 years), the 2008 version of 186 credits (4 years) and the latest 2012 version is shrunk to 150 credits (4 years) *[Exh.2.2: MET programmes in 2004, 2008 and 2012]*.

By the time of this SAR, the Programme Administrative Committees of HCMUTE are preparing for the next round of curriculum revision which will be applied in 2018 cohort *[Exh.2.3: New version of MET programme in 2018]*.

2.2. The information in the course specification is comprehensive and up-to-date

The ELOs of the MET programme are translated into the courses through the course learning outcomes (CLOs) and stated in the course specification. The contribution of each course to achieve some programme ELOs is at different supportive levels such as partly-supportive, supportive and highly-supportive. When students successfully complete all the courses they are expected to achieve all programme ELOs.

The structure of the course specification is standardized as follows:

1. Course title (in Vietnamese and in English)
2. Course code
3. Number of credits
4. Course instructors
5. Conditions to take the course
6. Course Description
7. Course Goals
8. Course learning outcomes and contribution of course to the programme ELOs
9. Structure and content of the course
10. Course materials, including textbooks and references
11. Teaching and learning methods
12. Assessment methods
13. Learning ethics
14. Date on which the course specification was written or revised and leaders who approved it

The group of lecturers who teach the same course is responsible for discussing and writing the course specification, and revising it every year if necessary. Based on the approved course specification, lecturers are requested to prepare the course portfolios including the objectives of the each chapter; textbooks, handouts; assignments and projects; testing and assessment tools and teaching strategies; necessary activities for teachers and students in classes *[Exh.2.4: Some course syllabi]*.

At the end of an academic year, lecturers in the MMT Department conduct the summary meeting to revise the course specifications and portfolios based on faculty and students' feedback as well as from the requirements of employers. Any changes of the course specification in content, course materials, teaching and learning methods, student assessment, etc. must be approved by the Department heads and the FME Dean board *[Exh.2.5: Revising the course specification]*.

2.3. The programme and course specifications are communicated and made available to the stakeholders

The hard copies of both programme and course specifications are always available at the office of the FME and MMT Department to help academic and support staff set up the learning schedules, teaching arrangement and study advice for students. All stakeholders as well as to prospective students can refer the programme specification and brief description of all required courses on the FME website *[http://fme.hcmute.edu.vn/]*. Additionally, the programme and course specification also

are communicated to employers and alumni through annual workshops to get feedback from them *[Exh.2.6: Feedback of employers and alumni for the curriculum development]*.

The programme specification is promulgated for freshmen in an orientation week which is annually organized by the FME in the first week of the first academic year. These seminars provide detailed information about fields, knowledge and skills that students need to obtain, job opportunities and further study *[Exh.2.7: Orientation week for freshmen]*.

Lecturers have to upload the course specification online via the LMS before the course starts and introduce it to students on the first day of the course to help them know well about the CLOs and their contribution of the course to achieving of the ELOs, course contents, textbook, teaching and assessment method *[Exh.2.8: Sample of e-learning course]*.

CRITERION 3: PROGRAMME STRUCTURE AND CONTENT

3.1. The curriculum is designed based on constructive alignment with the expected learning outcomes

The MET curriculum is designed based on the theory of Outcomes-based education. All the courses as well as extra-curricular activities have been designed to contribute to students' achievement of the ELOs. *Appendix 2 (Matrix of courses vs. Expected learning outcomes of MET programme)* illustrates the constructive alignment of the ELOs and the contribution of individual courses with the different cognitive levels of Bloom's taxonomy. By integrating all teaching and learning processes along with extra-curricular activities, all ELOs can be achieved. In other words, what lecturers have to do is to focus on what they want students to do successfully. Thus, when organizing a class, they should focus on helping students develop the knowledge, skills and attitudes that will enable them to achieve the ELOs that have been clearly stated in the course syllabus *[Exh.3.1: Some course syllabi]*. The constructive alignment of the MET curriculum with the ELOs is expressed through choosing courses, learning methods and assessments as shown in the table 3.1.

Table 3.1: Constructive alignment of the MET curriculum with the ELOs

Groups of ELOs	Courses	Learning methods	Assessments
Generic knowledge (ELO 1, 7)	– Mathematics – Physics – Chemistry – General Laws – English	– Lectures – Class discussion – Assignments	– Examination – Student participations – Rubrics of assignments
Specific knowledge (ELO 2, 3, 10, 11, 12)	– Project on Theory of Machine and Machine Design – Project on Machinery Manufacturing Technology – Capstone project	– Team work – Presentation – Writing report	– Defending thesis – Rubrics for presentation – Manuscript publication
	– CAD/CAM-CNC – Mold Design and Manufacturing – Machinery Manufacturing Technology – Pneumatic & Hydraulic Technology	– Lectures – Class discussion – Assignments	– Rubrics of assignments – Examination – Student participations
Generic skills (ELO 5, 6)	– Introduction to Mechanical Engineering – Extra-curricular activities	– Lectures – Class discussion – Presentation	– Rubrics for presentation – Student participations

	– Course Projects – Capstone project	– Hand on practice – Assignments	– Manuscript publication – Defending thesis
Specific skills (ELO 4, 13)	– Experiments on CAD/CAM-CNC – CNC Practice – Practice on Mold Design and Manufacturing – Advanced CAD/CAM-CNC Practice	– Presentation – Assignments – Hand on practice	– Rubrics for presentation – Rubrics for experimental and practice assessment
Attitudes (ELO 8, 9)	– Internships – Ho Chi Minh's Ideology – All courses	– Writing report – Hand on practice – Assignments	– Rubrics of assignments – Rubrics for practice assessment

3.2. The contribution made by each course to achieve the expected learning outcomes is clear

The ELOs are achieved through the courses making up the MET curriculum. Appendix 2 shows that the contribution level of the courses for the ELOs is gradually leveraged from low to high by means of theory lectures, experiments at laboratories, practices at school workshops, course projects, factory visits, specialized seminars, internship and finally capstone project as follows:

- Generic courses provide the broad knowledge and English proficiency, which will be a necessary condition for students to develop their professional career path and lifelong learning ability.
- Fundamental courses such as Descriptive Geometry and Technical Drawing, Fundamentals of Machine Manufacturing Technology, Tolerances and Measuring Techniques, practice courses, etc. provide students with the knowledge and skills on research methods and communication competencies, necessary for further professional development.
- Specific courses with logical arrangement (from Metal Technologies, Machine Manufacturing Technology, Advanced CAD/CAM-CNC, to Mold Design and Manufacturing, etc.) concentrate on providing professional knowledge and skills in mechanical engineering along with appropriate learning methods and working skills as an ME engineer. Students are exposed to different learning methods from traditional one such as lecturing to active learning approach such as problem-based learning (PBL), case studies, exercises, fieldworks and thesis writing.
- The generic skills (teamwork, problem-solving, leadership, management and communication) are embedded in various courses and extracurricular activities *[Exh.3.2: Extra-curricular activities]*.
- And finally, capstone project helps students synthesise their learning across the programme, solve practical problems in mechanical engineering and demonstrate holistically their development of graduate capabilities.

The gradually increasing difficulty of the course content is logically sequenced in the programme structure and this can help ELOs to be achieved effectively. For example, to achieve ELO 11 which is designed to stimulate technological equipment and processes, students have to experience the major design assignment in the *Introduction to ME* at the first semester, then conduct two course projects (*Project on Theory of machine and machine design* of fundamental cluster and *Project on Machinery manufacturing technology* of specialized cluster) in the following semester before completing the capstone project in the last semester.

3.3. The curriculum is logically structured, sequenced, integrated and up-to-date

Based on benchmarking with the Mechanical Engineering curricula of some prestigious universities in Vietnam and in the world *[Exh.3.3: Benchmarking of the MET programme]*, the curriculum is designed to make the subject matter logically structured, sequenced, integrated and up-to-date.

The duration of the programme is 4 years, consisting of 62 courses with 150 credits in total, and is divided into three blocks including general knowledge cluster (57 credits), fundamental knowledge

cluster (39 credits) and specialised knowledge cluster (54 credits including 10 credits of capstone project). The curriculum is logically structured with a good balance of general, fundamental and specialized knowledge clusters as shown on Figure 3.1.

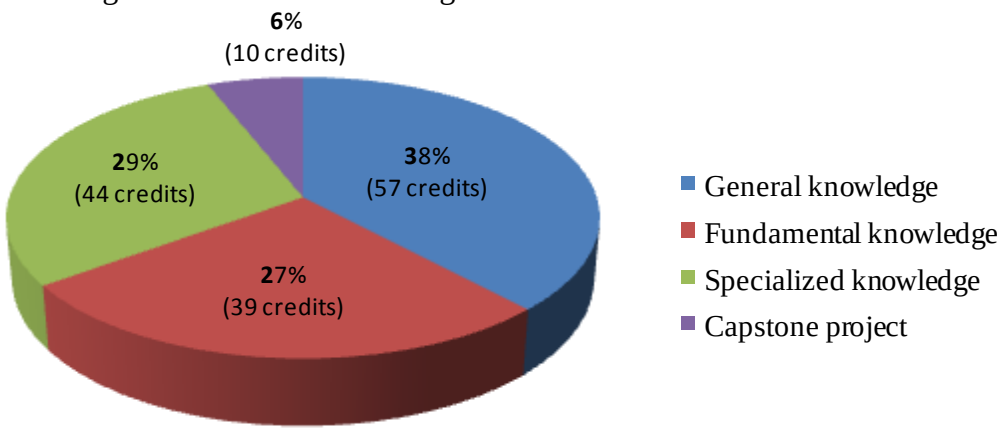


Figure 3.1: The logic structure of the MET programme

The programme structure facilitates content balance between general, fundamental and specialized knowledge. General knowledge helps students achieve self-study capability and promote life-long learning after graduation. Meanwhile, fundamental and specialized knowledge aims to improve their career competences as good practitioners or expert practitioners. Moreover, it is open and flexible, so students have more choices to select subjects and time for their study.

Knowledge clusters are selected to ensure the creation of a T-shaped mechanical engineer (Figure 3.2). The vertical stroke of the T (fundamental and specialised knowledge clusters) illustrates the depth of the curriculum that allows students to conduct the creative processes in ME field; meanwhile, the horizontal stroke of the T (general knowledge cluster) refers to its breadth through collaboration across disciplines.

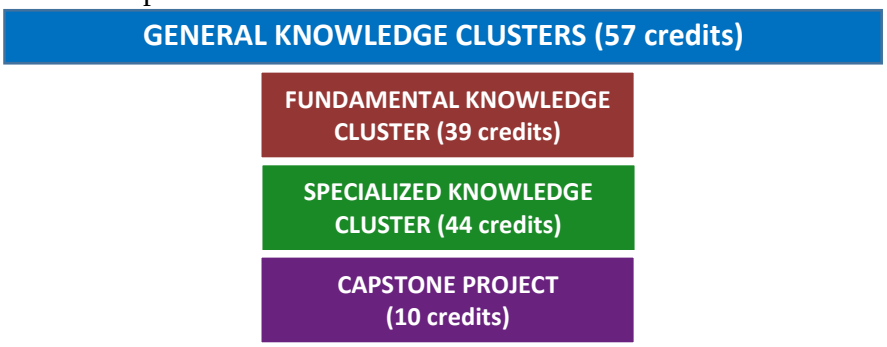


Figure 3.2: T-shaped mechanical engineer

Additionally, the courses are sequentially arranged from basic to advance knowledge to ensure that the previous courses serve as prerequisite knowledge for the following courses. This is reflected in the schedule of specific courses. For example, the courses of *Descriptive Geometry and Engineering Drawing*, *Mechanical Engineering Drawing*, *Theory of Mechanics*, *Strength of Materials* are scheduled in the respective order and become prerequisite courses for studying *Theory of Machine and Machine design* and taking the course project in the fundamental knowledge cluster. These courses let students continue some specialized courses such as *Metal Technology*, *Fundamentals of Machine Manufacturing Technology*, *Machine Manufacturing Technology*, etc. and get the second course project (*Project on Machinery Manufacturing Technology*) in the professional knowledge cluster *(Appendix 3: Curriculum map)*. After that, they will be qualified to complete successfully the capstone project in the last semester.

These two course projects along with the capstone project are great illustration of integration in the curriculum. When taking these courses, students have to apply their knowledge and skills from the previous theoretical and practical courses to solve the technical issues in ME. Soft skills and ethics are also integrated into each course through teaching and learning activities as well as student

assessment. Because of benchmarking with the other programmes in the world, the MET programme is able to promote diversity, student mobility and cross-border education. It allows senior students to participate in a short-term, a semester or a year programme of another national or foreign institution. Some of the elite students of the faculty have been selected to participate student exchange programmes with universities in Thailand. In addition, the faculty invites some visiting lecturers to teach several courses to familiarize students in the international exchange programme *[Exh.3.4: International student exchange programmes with universities]*.

Thanks to the ISO procedure of revising of academic programmes, FME is allowed to adjust annually the curriculum up to 7% of the whole programme. According to the rules regulated by HCMUTE, the programme curriculum must be revised every 4-6 years of operation. From 2001 to 2012, the MET programme has experienced several revisions with gradually downsizing the number of credits. Knowledge clusters were integrated to save time for developing self-study competence of student as well as to adapt to the global evolution and the international integration *[Exh.3.5: Comparing knowledge clusters of MET programmes in 2004, 2008 and 2012]*.

The MET programme version 2001 had totally 240 credits (duration of study is 5 years), the 2006 version had 215 credits (4.5 years), the 2008 version had 186 credits (4 years) and the latest 2012 version is shrunk to 150 credits (4 years). Some small changes in the training programme from 2012 to 2016 are shown in Appendix 4. There may be the slightly increasing modification of the number of selective credits, the adjustment the credits of some courses or revision of course contents, etc. Meanwhile the largest revision occurs after the workshop on curriculum in late 2015. From feedback of stakeholders in 2016, the FME has revised the MET programme by opening another new expertise which is called Industrial Design. Besides knowledge and skills in ME, the new expertise also provides students with the knowledge and skills in the field of aesthetics. Thus, graduates are able to design and create industrial products that ensure their technical functions as well as the aesthetic requirements *[Exh.3.6: Update on the MET programme specification in 2016]*. This makes the curriculum flexible and allows students to choose one of two options depending on their interests and abilities: Mechanical Engineering or Industrial Design.

CRITERION 4: TEACHING AND LEARNING APPROACH

4.1. The educational philosophy is well articulated and communicated to all stakeholders

"Humanity, innovation, integration" is the education philosophy of HCMUTE. This originates from the fact that the school is responsible for providing both engineers and engineering educators for Vietnam. The stakeholders of the HCMUTE community are strongly involved together in educating, inspiring and building high competent, conscientious and responsible graduates. The MMT department's lecturers are to bear in mind that encouraging ambitiousness and creativeness in learners is much more important than just stuffing knowledge. This ideology covers all teaching and learning activities of the programme. Therefore, students are encouraged to build their own understanding of the world by investigating and experiencing on their own under the coaching of instructors. The institution appreciates the core values of lifelong learning by providing students with opportunities for a comprehensive development of cognitive, social and behavioural competence. Through the learning process, individuals are stimulated to explore themselves and take the learning activities as a tool to fulfil their own aspirations and to serve the community. The quality policy of FME – "Comprehensiveness, Creativeness and Ambitiousness" – further strengthens the institutional philosophy and is propagated to all lecturers and students via the Faculty's website as well as through various activities that FME regularly holds. During the building and amending of the MET curriculum, this philosophy is always communicated to the stakeholders and it is the primary concern for the lecturers to choose appropriate teaching and learning methods *[Exh.4.1: The HCMUTE education philosophy and its concretization in the MET programme]*.

The HCMUTE strategic plan with regional and international integration is penetrated to every single department. In the FME, the two programmes including Mechatronics Engineering Technology and Machine Manufacturing Technology that have just been assessed by AUN-QA in the last two years show a solid evidence that the Faculty is preparing their students for the role of global citizenship. Thanks to this integration strategy, more and more FME's students have participated in exchanged programmes among ASEAN universities. Integration is also exploited via the Public Private Partnership (PPP) endeavours during the implementation of the programme. The gap between universities and industries is shorten than ever when they participate in a public-private collaboration system namely the Building University-Industry Learning and Development through Innovation and Technology (BUILD-IT) sponsored by US and Vietnamese government in collaboration with Arizona State University, US Industry and Vietnamese Universities *[https://builditvietnam.org/partners]*, *[Exh.4.2: Integration activities]*.

4.2. Teaching and learning activities are aligned to the achievement of the expected learning outcomes

The ELOs serve as the guideline for outcome-based teaching and learning throughout the MET programme. A clear hierarchy from programme outcomes (POs), ELOs to course learning outcomes (CLOs) ensures the constructive alignment during the implementation of the programme. The curriculum, teaching-learning methods and assessment approaches are designed to adapt to the chronological personal development of students. The MET programme arranges the courses to raise students' cognition levels from low- to higher-order of thinking followed the Bloom's taxonomy. Course syllabi and course portfolios are the tools to manage the teaching and learning activities while semester-end meetings are compulsory for each course groups to discuss on the issues that need to be improved *[Exh.4.3: Alignment mechanism of courses to the ELOs]*.

The MMT department runs specialized courses of the MET programme while other departments govern the general and fundamental knowledge. Interdepartmental meetings are regularly set up to discuss competence requirements for MET's students in order to ensure smooth transition of diverse fields provided by separate departments. Discrete learning stages should use proper teaching strategies to assist students to acquire and use knowledge academically and effectively from simplicity to complexity. Table 4.1 describes the teaching allocation for different departments for the MET programme *[Exh.4.4: Teaching provided by different departments for MET programme]*.

Table 4.1: Teaching and learning allocation of different departments

Semester	Department	Knowledge	Teaching methods
1, 2	– Faculty of Applied Sciences	Mathematics and general sciences	– Lectures – Presentation – Class discussion
3-5	– Dept. of Machine Design; – Dept. of Welding and Metal Technology; – Dept. of Practical Skills; – Dept. of Mechatronics; – Dept. of Industrial Engineering	Fundamental knowledge of Mechanical engineering	– Active teaching methods – Laboratory experiments – Workshop practice – Case studies
6-8	– Dept. of Machinery Manufacturing Technology	Specialized knowledge in mechanical engineering, manufacturing and industrial automation	– Independent study – Course projects, – Factory internship – Capstone project

From low to high-order of thinking, Bloom's taxonomy and Kolb's learning styles direct the teaching contents and learning methods, respectively. The teaching methods will inspire the students' active construction of concepts. Various cooperative teaching methods such as learning duet, think-pair-share, jigsaw, video demonstration, case study, group activities, desktop project, project-based learning, etc. will assist students to gain the most effective learning through various learning styles. Kolb's theory provides a good model to diversify different teaching methods to enhance the learning efficiency *[Exh.4.5: Practices of active teaching methods in the MET programme]*.

Lecturers in FME as well as in MMT department received many extensive pedagogical trainings from either national or international programmes. Some MMT department's lecturers who have earned the Higher Engineering Education Alliance Program (HEEAP) trainings in USA are now engaging to the second phase with the BUILD-IT project. This aims to propagate their teaching and learning experience to not only lecturers in HCMUTE but also the ones from other institutions in the South of Vietnam in STEM field. They also often attend the annual Engineering Education Conference in Vietnam (VEEC) and its descendant Science, Technology, Engineering Mathematics Conference (STEMCON) to collaborate, connect and share best practices with other Southeast Asia's greatest minds and influencers in the STEM fields *[Exh.4.6: Practicing the workshops of teaching and learning]*.

There is no doubt that active teaching methods with more interaction, discussion and sharing will engage students in learning. Flipped classroom with the assistance of digital technology, especially the powerful UTE-Moodle Learning Management System (LMS), is at the cutting edge of alternatives. The innovative LMS of HCMUTE *[http://lms.hcmute.edu.vn]* provides students with instant access to teaching materials and efficient out-of-class interaction with teachers and other students. Proficiency of professional engineering software is another essential competency required by employers. Students are encouraged to use these tools to simulate and analyse complicated engineering prototypes and devices in theory classes before experiencing the practical systems in the laboratory. To catch up with the rapid advance of technology, FME also usually holds trainings for lecturers whenever new technology is available or new facilities are equipped for the Faculty *[Exh.4.7: Technology used to assist the teaching]*.

At Seeing is Believing, the PPP policy of the HCMUTE urges the MMT department to build frequent connection with professional world for students through a number of authentic activities besides the in-class trainings. They mirror industry experiences and highlight applications over memorization, prompting future career success. Authentic trainings including lab experiments, workshop practice, factory visits and internship are designed to prepare students with most work-ready skills for their future career. These activities prepare students for a real world of work. The amount of these compulsory trainings takes 12.7% of the total programme's credits. With all the necessary requirements, textbooks are replaced with a suite of current resources from either lab's equipment or workshops' machines for students to practice and verify the theoretical concepts; exams are replaced with assessments using rubrics that reflect competencies students will need for their careers. Besides the ability of providing fully satisfactory trainings for HCMUTE students, with a sufficient number of modern machines and equipment, FME and particularly MMT department is also a trustworthy institution designated by Ministry of Labour - Invalids and Social Affairs (MOLISA) to provide extensive training courses for teachers of vocational schools. The High Tech Centre, an affiliated unit of the MMT department has a mission of providing short trainings on CNC manufacturing technology for not only the internal students but also external students or technicians from the neighbour industrial zones *[Exh.4.8: Practical trainings and community services]*.

The mission of nurturing and enhancing the creativity and the joy of learning to students can also be obtainable through project-based learning or research projects. For junior students, along with compulsory course projects, they are also encouraged to join research groups or research labs to confront challenges from practical problems with their peers and professors. The school policy also sponsors students to do researches and attend national and international engineering competitions

(Koma-Taisen, ABU Robocon Contests, Yseali Food Innovation) as an aspect of reflective learning *[Exh.4.9: Research activities for students]*.

A flexible, supportive and cooperative learning environment is necessary to promote the learning efficiency. Open learning space is so popular in HCMUTE that students can easily find places for group discussion or doing projects. Open Lab is also a favourite model that could provide supports for any group of students interested in doing researches. Blended learning with different modes of study (face-to-face learning, online learning, project-based learning) provides other alternatives that could suit different types of learners. The HCMUTE's teaching assistant (TA) system which recruits excellent senior students or graduate students as tutors also provides other supportive learning environment to the students. Last but not least, exchange programmes can also give students opportunities to attend short trainings in some sister universities in Korea, Taiwan, Thailand. Foreign students can also come to FME to implement some joint projects or capstone projects during summers. These international exchange programmes are sometimes hold by external partners such as the Saigon High Tech Park (SHTP) which the FME's students are normally their priority invited participants. With well-established relations to some other foreign universities such as Arizona State University (ASU), HCMUTE also encourages students to take their Massive Open Online Courses (MOOC) with equivalent credit transfer to certain designated courses in the programme. These activities are not only enabling students to have the opportunity to approach new methods and knowledge, but also binding relationship between the universities involved *[Exh.4.10: Supportive learning environment]*.

Beyond the implementation of diverse modes of teaching and learning in the MET programme, a consistent management mechanism is the core of the system to close the loop of quality improvement. Syllabi and course portfolios are the first two requirements in the PDCA process to keep track of all teaching and learning activities. Reflective teaching is undertaken by means of teaching peer-review where senior lecturers could give new ones constructive recommendations in terms of teaching approaches as well as specialized experience in their majors. Eventually, the most reliable and available source of teaching evaluation is the students' feedback on teaching quality during the courses. Lecturers can make timely adjustments whenever it is necessary. Any idea for amendment or improvement would be discussed among lecturers in the course groups and revised into the course portfolios. This process is observed and repeated continuously with better teaching efficiency *[Exh.4.11: Activities for the management of the teaching and learning approach]*.

4.3 Teaching and learning activities enhance life-long learning

College life experience is an unforgettable time of students. But life will actually teach them what is essentially suited to each individual. Preparing students the learning methods and inspiring them the desire to learn, critical thinking and self-study skills is much more important than just providing them specific knowledge and technologies. According to the eight competences of the European Referenced Framework, the MET programme has concentrated to develop key competences that could promote life-long learning.

First, communication in either mother tongue or foreign languages is crucial to anybody. English readiness is required in the MET programme where freshmen have to take an English placement test in the beginning of the first year. The subsequent four English courses including the Technical English course will support other specialized courses. English Speaking clubs and international exchange programmes are other extra-curricular activities that students can attend to delight their interest in interacting with others in a foreign language. Since 2016, FME has encouraged senior students to write and defend their capstone projects in English with more incentives by having extra credit in the evaluation process. In the defence committees that use English as the main language, international enterprises are also invited as committee members to evaluate their potential employees *[Exh.4.12: English competency]*.

Mathematics and sciences are indispensable to any engineering major. The MET programme concentrates to not only the depth of specialized courses in mechanical engineering but also the

breadth of sciences and mathematics that will foster the life-long learning of the learners as well. A ratio of 69% of the total credits of the programme is reserved to build the solid background that could facilitate the flexibility for any future careers.

Digital competence is the respiration of the youth in the Industry 4.0. Information-processing skill has been well prepared for students since the very early stage of the programme in the Introduction to Mechanical Engineering course. In the subsequent years, the MET programme integrates a lot of computing courses such as Visual Basic programming, Computer Aided Design (CAD), Computer Aided Engineering (CAE), Computer Aided Manufacturing (CAM), Computer Numerical Control machining (CNC) and Manufacturing process automation with PLC. All these courses as well as the prominent digital LMS resources and media-rich activities connect students to their learning and further strengthen the digital competency for students *[Exh.4.13: Digital competency]*.

Inspiring and motivating students to learn and achieve is the basic feature of the MET teaching and learning experiences. Student-centred, interactive and accessible learning activities would prepare students the necessary self-study skill, critical thinking and design thinking. Reflective learning of students is also triggered by lecturers' early feedback and comments for their performance. Students will receive information so that they can work to improve their progress towards the courses learning outcomes. The feedback can be provided in a variety of forms, for example: self or peer evaluation, verbal or written feedback. Eventually, students establish the habit and reflective analysis competency. It is the independent thinking and experience-based analyzing that will elevate their learning quality in school and intensify practical problem-solving when they go to work as well as support their life-long learning *[Exh.4.14: Feedback mechanism to enhance the self-study skills of students]*.

Besides academic learning, the MET programme also engage students in the learning process via Youth Union related activities and other extracurricular activities. They help students in improving their communication skill, teamwork, social responsibility and leadership and ensure making the most of MET's learning support services. Students are encouraged to participate in social activities, activities of Student Association and Youth Union or volunteer activities such as Green Summer Volunteer Campaign, Spring Volunteer Campaign, University Entrance Exam Supporting Campaign, Blood donation and other charitable activities. There are many art, music and skill clubs where students can join to enjoy or improve their personality. Sport competitions and other professional competitions are frequently organized to make them more active and self-motivated. Admissions and Student Affairs Office will grade their attendance in terms of moral score in each activity in every semester. In order to encourage student to attend more extra-curricular activities, this score is one of the criteria to grant scholarship every semester and for graduation approval *[Exh.4.15: Extra-curricular activities and assessments]*.

Initiative and entrepreneurship is one of the long-term goals that the MET programme wants to bring up for students. Encouraging students to do researches and explore novel concepts is to stimulate their creativeness potential and more important, bringing all those results into production to serve their prospective customers and creating more job opportunities for society. To boost this, HCMUTE reserves the Faculty of Innovation and Entrepreneurship to promote the start-up campaign. Some start-up companies have been founded from this incubation center under the effort of the HCMUTE's lecturers and students *[Exh.4.16: The competence of initiative and entrepreneurship]*.

CRITERION 5: STUDENT ASSESSMENT

5.1 The student assessment is constructively aligned to the achievement of the expected learning outcomes

HCMUTE chooses and assesses students through three main stages, including National High School Graduation Examination (NHSGE), exams during the courses, and capstone projects.

Firstly, based on the results of NHSGE, students can apply to the MET programme using one of the four subject groups (A00, A01, D01, D90). Then, enrolled students have to take an English placement test organized by HCMUTE. After that, they will be arranged to study in classes that is suitable for them *[Exh. 5.1: Assessment of new student admission]*.

It is really important to measure student's progress continuously to ensure that they can achieve all the ELOs of the programme through the contents of each course, teaching and assessment methods. From the ELOs, courses are designed with appropriate CLOs which are systematically mapped to the programme ELOs (see Appendix 2). The constructive alignment between ELOs and course content, teaching method as well as student assessment is clearly shown in all course syllabi *[Exh. 5.2: Some course syllabi]*.

Nowadays, HCMUTE uses three main types of student assessment which are diagnostic, formative and summative. The diagnostic assessment is a form of pre-assessment that allows lecturers to determine students' individual strengths, weaknesses, the levels of knowledge, and skills prior to instruction. These ways of assessment will help lecturers identify the student progress more reliably and fairly *[Exh. 5.3: Different forms of assessment]*. There are many approaches for assessing MET students as shown in Table 5.1.

Table 5.1: Different forms of assessment

No.	Forms of assessment	Applied in
1	Multiple Choice Questions	Diagnostic, Formative and Summative
2	Short Answer Test	Diagnostic
3	Essay	Formative and Summative
4	Performance Test	Diagnostic, Formative
5	Written Test	Formative and Summative
6	Fieldwork/Practicum	Formative and Summative
7	Project	Formative and Summative
8	Thesis	Formative and Summative
9	Presentation	Diagnostic, Formative
10	Portfolios	Formative and Summative
11	Case Study	Formative and Summative
12	Poster	Formative and Summative
13	Laboratory Test	Formative and Summative

Furthermore, according to the ISO procedure of "Composing and keeping confidentially the test, replicating writing test; delivering, receiving the test and grade", Quality Assurance Office (QAO) requires the exam papers to present clearly the CLOs related to each question.

In order to perform the capstone project, students have to finish two obligatory works. Firstly, they must spend their time of about six weeks or more for internship in companies to get experience, practice all professional and necessary skills, and to be familiar with the industrial working environment. Secondly, the FME regulations require them to accumulate enough the number of credits of the programme and then focus all their remained time on doing the capstone project. The capstone projects, therefore, will be able to meet the demand of the ELOs of the programme as well as the requirement of employers.

At the beginning of the last semester, FME will inform officially the plan for doing capstone project and the defence schedule. The list of the theses will also be announced for students to choose as well as the supervisors who will guide them. If students want to suggest their own projects and supervisors, they can send their proposals to the Faculty for approval. Every week, students should meet their

supervisors at least once to report progress and receive advice timely. At the end of the semester, a committee including academic staff and employers will be formed to evaluate the capstone projects using rubrics, particularly presentation and written skills, results and practical application capability *[Exh. 5.4: Regulation and implementation of internship and capstone project]*.

5.2 The student assessments including timelines, methods, regulations, weight distribution, rubrics and grading are explicit and communicated to students

The HCMUTE regulations on teaching activities require every course of the programme to provide a clear syllabus that shows students all the necessary information such as timeline, assessment methods, regulations, weight distribution and the rubrics for assessment.

The course syllabus informs and demonstrates clearly the study plan each week, contents, teaching methods and the assessment methods which can be selected in alignment with the CLOs. The assessment timeline is also announced to students at the beginning of each course. FME and the university control this implementation through activities such as class observation and online surveys for students to evaluate the teaching quality of lecturers *[Exh. 5.5: Evaluation of teaching and learning process]*.

In addition, the weight distribution is divided equally, 50% for formative and 50% for summative assessment. Rubrics are widely used for projects, presentations, laboratory tests, practical tests, and capstone projects. The grading criteria are also explicit according to HCMUTE's regulations *[Exh. 5.6: Grading benchmark]*.

Table 5.2: Grading scale for student evaluation

Classification	**Grade**	
	Decimal scale	**Letter scale**
Excellent	$8.5 \leq GPA \leq 10$	A
Good	$7.0 \leq GPA < 8.4$	B
Average	$5.5 \leq GPA < 6.9$	C
Weak	$4.0 \leq GPA < 5.4$	D
Very weak	$GPA < 4.0$	F

To help students to have an overall and detail understandings about the course, the syllabus will be announced and fully posted on the LMS system *[http://lms.hcmute.edu.vn/]*. HCMUTE also supervises this performance through online survey. One important thing is that lecturers have to provide clear assessment criteria or rubrics before giving students assignment. This is to help students know what to fulfil assessment requirements. Within a week after the final examination, the answers key will be posted to the FME website. Therefore, students can easily check their results *[Exh. 5.7: The assessment and evaluation processes are communicated to students]*.

5.3 Methods including assessment rubrics and marking schemes are used to ensure validity, reliability and fairness of student assessment

Student achievement of ELOs is ensured by using criterion-referenced assessment. In fact, to achieve this, rubrics and marking schemes will help lecturers assess correctly, validly, reliably, and consistently. For the same course, lecturers will use the same rubrics with the minimum resolution of 0.25 *[Exh. 5.8: Tools for student assessment]*.

At the end of each semester, teachers must collect all test papers as well as the portfolios of their courses. Those will be kept in the department office for two years from the test day. Meetings in the group of lecturers of the same subject will also be held to review all the materials, teaching methods and assessment approaches, etc. Then continuous improvement activities will be implemented to prepare well and make the next semester teaching works better and more effective *[Exh. 5.9: ISO Monitoring final examination and appeal procedure]*.

While main study activities take most of the student time, it is important and necessary for them to participate in extra-curricular activities. Through these activities, students will understand more clearly about the outside environment. Especially, they can build a responsibility spirit towards society and community through some voluntary activities they can experience such as Building bridges in countryside, Teaching poor children, Green summers, Full moon festival for poor children, etc. Each time students attend will be graded with the social activities marks from 2 to 5 *[Exh. 5.10: Assessment of students' social responsibility]*.

There are many approaches for assessing students as shown in Table 5.1 above. According to the ISO "the procedure for composing and keeping confidentially the tests, copying writing tests; delivering, receiving the tests and grade," before the final examinations, the group of lecturers of the same subject will discuss the structure as well as the grading of the exam to assure validity. Then the test papers will be checked and approved by the Head of Department. The tests are able to assess student abilities and satisfy all the CLOs. Therefore, to do the examination well, students should review carefully all the contents of the course and catch up them well. To ensure the reliability, the group of lecturers usually decides to use the minimum resolution of 0.25 for grading with a clear rubric to reduce the discrepancy between lecturers *[Exh. 5.11: Procedures for composing, delivering and monitoring the test and grade]*.

HCMUTE applies the ISO procedure of monitoring final examinations to make sure that the test will be fair and objective to all students. To achieve this, the university requires at least two invigilators inside a room over forty students and an inspector outside the room who will observe the examination process. Clearly, students will have the same opportunities and conditions to do the exam. In addition, HCMUTE has a clear appeal procedure for remarking students' test paper in case if they request. Another lecturer will be assigned to do this work to make sure that the result is fair for students.

All lecturers have to document all the portfolios, examination papers, answer keys of formative and summative assessments within two years. This way will assure validity of the assessment. Moreover, in the portfolios, lecturers will self-assess, consider all the online and offline feedback from students and organize meetings with the group of lecturers of the same subject to improve the teaching and learning activities. In fact, with the support of new assessment approaches, it is easier for lecturers to manage the class. Firstly, formative assessment will be 50 percent instead of 20 or 30 percent in the past. Secondly, it is better to use different assessment methods during the semester. Thirdly, it is able to use open tests according to Bloom's Taxonomy to assess students at high level. Then, HCMUTE has an LMS system for students to submit assignments online. Therefore, lecturers can check understandings levels of student throughout activities. One more thing, students can evaluate together, sometimes called student peer evaluation through presentation. Finally, rubrics will be revised regularly to make them more and more valid and efficient.

5.4 Feedback of student assessment is timely and helps to improve learning

The purpose of students diagnostic and formative assessment is to help lecturers adjust appropriately the course contents delivery and to help students change properly their learning attitudes. Because learning is considered as a process, not a product, HCMUTE will assess students throughout the process with formative assessment of 50%. The university also has a tutor or teaching assistant (TA) policy to help students in learning and support lecturers to control big classes as well *[Exh. 5.12: FME teaching assistants]*.

Furthermore, there is a variety of channels to share information and comments about the courses such as LMS forums, Social Network, etc. where students can post questions relating to the course. They can receive the answers from either the lecturers or other students. For experimental and practical courses, results and performances of each lesson will be returned to the students in the next class. For course projects and capstone projects, the plan is so valid with specific timeline. Lecturers will feedback their comments on the presentation paper and design drawings each week so that students can make their own adjustment *[Exh. 5.13: Timely feedback of courses]*.

5.5. Students have ready access to appeal procedure

When receiving the final result, if students are not satisfied with their scores, they can request for remarking the test paper within one week from the day the scores are announced. Particularly, students will come to FME's office and submit their request. The FME secretary will collect their request and transfer to the authorized departments to decide who will be in charge of remarking students' test paper. In case, students still do not satisfy with the remarking, the department will show out the test paper to them *[Exh. 5.14: Appeal procedure]*.

CRITERION 6: ACADEMIC STAFF QUALITY

6.1. Academic staff planning (considering succession, promotion, re-deployment, termination, and retirement) is carried out to fulfil the needs for education, research and service

To adapt with a great change in the education environment, HCMUTE has built the strategies for the short, medium, and long-terms from the period of 2017-2022 (looking forward to 2030) which are continuously developed from the archived version of 2011-2015 (looking forward to 2020). The strategic plan has included the strategies for training, scientific research, facilities, finance, and human resource. Accordingly, the financial strategy is very important and it is mainly made based on the training plan (number of students, field of study, and level of study), research strategy, and faculty's strategic plan. In the faculty's level, FME has effectively developed our own strategic plan, in which the most important part is to improve research capability, technology and world integration. Therefore, the human resources development strategy plays a pivotal role in the continuous and stable development of the faculty. Academic staff planning is an ongoing annual process including the following issues:

✓ Academic staff recruitment covers both capacity and competency. The number of staff required to support the programme as well as their qualifications and experiences are reviewed by HCMUTE based on the proposal of FME.

✓ Professional training for academic staff, especially young lecturers to ensure the quality and the smooth succession in training process.

✓ Training the faculty members for applying the titles of Professor, Associate Professor and Senior Lecturer *[Exh.6.1: Academic staff planning]*.

The Human Resource Development plan is the framework for helping employees develop their personal, professional skills, knowledge, and abilities. Therefore, the requirement of academic staff that must hold Ph.D.'s degree is applied in FME. For recruitment of new academic position, the FME's Dean board firstly checks if candidates meet the enrolment requirements. Then, all application documents will be submitted to the HRO for testing at university's level. Finally, the successful candidate can sign the official labour contract. Nowadays, HCMUTE has attracted PhD lecturers by offering them financial support and promotion.

The policy to promote individuals into key-positions is also applied. Candidates must fulfil all requirements for the positions which are clearly defined in medium-term and long-term strategic plan of HCMUTE. The candidates will be voted by all staff and then the result is submitted to Rector for final decision. The key-individuals will be trained more to improve their ability as well as to ensure the quality of future human resource.

The self-evaluation activity, which is one of the best tools to analyse the individual performance, is annually made by all staff for the teaching, researching and services performance as well. Based on the result, one can be nominated the best award and even the emulation title for his/her outstanding performance. Moreover, the outstanding academic staff can be nominated to higher academic titles (i.e., Associate or Full professor) according to the MoET's regulations *[Exh.6.2: Human resource policy related to academic staff]*.

At the university's level, the pensions and subsidies for retired lecturers are clearly clarified at the regulation of the university. For resignation, the staff has to firstly submit a resignation letter to the General Administration and Personnel Office (GAPO) and the decision procedure is made within 45 days. The university also has the rights to terminate the contract within 45 days in cases of the lecturer's inability or making serious misconduct.

Academic staff of MET programme have been accumulating working experience for the educational career that are satisfying the highest demand for both teaching and research. Based on the HCMUTE's strategic plan, FME has its own strategic plan of academic and support manpower plan that is suitable for the vision and mission of HCMUTE and FME. The FME's manpower plan is annually revised to adjust according to the change of real situations (shown in Table 6.1). The academic and support staff of the faculty are thus planned by setting up the quota of staff recruitment, promotion, retirement, and resignation.

Table 6.1: Academic and support manpower plan

Staff	2017	2018	2019	2020	2021	2022
Academic staff						
+ Assoc. Prof.	6	8	8	9	10	11
+ Dr.	16	16	17	20	25	26
+ Msc.	48	47	47	45	42	42
+ Eng.	13	11	11	9	8	8
Support staff	1	2	2	2	2	2
Total	**84**	**84**	**85**	**85**	**87**	**89**

6.2 Staff-to-student ratio and workload are measured and monitored to improve the quality of education, research and service

FME has totally 84 faculty members with 8 Associate Professors and 16 Ph.D.'s holders. Besides, FME also establishes a wide network of national and international visiting lecturers from prestigious universities and research institutions such as HCMC University of Technology, University of Natural Science, Industrial University of HCMC; professors of international universities such as National Chung-Hsing University, Atma Jaya University, etc. These inviting guests will enrich the teaching content and diversify training fields of the FME *[Exh.6.1: Academic staff planning]*. Table 6.2 shows the number of academic staff supporting the MET programme and their FTEs.

Table 6.2: Number of academic staff and their FTEs (Reference date June 4, 2018)

Title	Male	Female	Total		Percentage of PhDs
			Headcounts	FTEs*	
Assoc. Professor (MMT)	4	0	4	4 x 1 = 4	100%
Assoc. Professor (FME)	4	0	4	4 x 0.37 = 1.48	100%
Full-time lecturers (MMT)	11	1	12	12 x 1 = 12	25%
Full-time lecturers (FME)	41	2	43	43 x 0.37 = 15.91	25.5%
Full-time lecturers (non-FME)	17	3	20	20 x 0.37 = 7.4	35%
Visiting professors/lecturers	14	1	15	15 x 0.2 = 3	33.3%
Total	91	7	98	43.79	

(*) FTE stands for Full-Time Equivalent. This is a unit to calculate the investment of time. 1 FTE equals to 10-12 teaching and consulting hours per week (full-time employment). A staff member with a weekly appointment of 5-6 teaching and consulting hours per week is 0.5 FTE.

The ratio between student to staff is controlled smaller than 25 in accordance with the MoETs regulations to ensure the training quality and is shown in Table 6.3.

Table 6.3: Staff-to-student ratio

Academic year	Total FTEs of Academic Staff	Total FTEs of Students	Student to staff ratio
2017-2018	43.79	677	15.46
2016-2017	44.54	694	15.58
2015-2016	40.41	649	16.06
2014-2015	35.65	578	16.21
2013-2014	30.65	515	16.80
2012-2013	27.00	446	16.52

The lecturer's workload in each semester is decided followed the HCMUTE's regulations, which can be also adjusted based on the demand, qualifications of staff, number of enrolled students for each course, and the readiness of that lecturer. The required workload of teaching staffs is presented in Table 6.4.

Table 6.4: The required workload of teaching staff

Academic titles	Teaching and consultant workload/year	Research workload/year	Service	Community Service (No. Activity/year)
Assoc. Prof.	270h (10-11 teaching and consulting hours/week)	210h	160h	4
PhD./tenure	270h (10-11 teaching and consulting hours/week)	195h	210h	4
Master of Science	270h (9-10 teaching and consulting hours/week)	177h	270h	4
Engineer	270h (9-10 teaching and consulting hours/week)	75h	610h	4

(Research equivalent hours are based on the quality of research output. For example, publishing an SCI journal paper is equivalent to 400 research hours)

Key Performance Indicators (KPIs) system was built to evaluate lecturers in the scientific research, teaching and extra activities.

6.3. Recruitment and selection criteria including ethics and academic freedom for appointment, deployment and promotion are determined and communicated

HCMUTE has the recruitment policy with determined criteria and the annual recruitment follows ISO procedure. FME makes recruitment proposal for each year based on workload, the number of current teachers and the number of staff pursuing higher degrees in accordance with the human resource planning. In recent years, the criteria for recruiting have been adjusted to meet the trend of globalization. Recruitment announcement is posted to the University's website and newspapers. Candidates will be recruited to the lecturer's position at HCMUTE if they pass four rounds of recruitment process. In the first step, the Recruitment Board reviews application documents including academic transcripts, certificates and research achievements. The next step is to check candidates' ability of English, IQ and IT. Then they should demonstrate their pedagogical ability and classroom management in a mock class. Finally, the interview with Recruitment Board is to determine the suitability of applicants with the occupation. Successful candidates will be offered a one-year contract and take probation period to adapt with their future job. Probationary lecturers need to fulfil the requirements of HCMUTE and MoET such as English and pedagogical certificates, etc. to obtain the

lecturer title during this time before signing official contracts. In addition, to promote the qualified staff, HCMUTE has a reward of 15 million VND for men and 20% more for women who hold Ph.D.'s degree *[Exh.6.3: Academic staff recruitment]*.

Rights and duties of the FME lecturers are defined and announced via the FME homepage, email, etc. All academic staff are accountable to the content of courses, complying with intellectual property law, copyright, law of education. FME has the policy that every lecturer must be in charge of at least two courses and every course is taught by at least two lecturers with appropriate professional knowledge to ensure the teaching quality. Lecturers who teach the same course have to discuss consistent teaching contents and select appropriate assessment methods, etc. at the beginning of the semester. Lecturers with Ph.D.'s degree are usually assigned to teach the theoretical courses. The ones who have high vocational skills are responsible for the practical courses. Besides, some other tasks such as taking part in design of curriculum, syllabus and teaching portfolio, publishing the textbook, and guiding students for the internship might be done by the lecturers to meet the workload completion *[Exh.6.4: Academic staff's rights and duties]*.

Promotion and salary increment policies are also set up by HCMUTE and posted to the University's website. At the end of academic year, an annual meeting, which all staff are invited to attend, is organized to evaluate and vote for the best individuals for the title of Emulators according to the performance of professional specific competences, research achievements and management experience, etc. The winner after voting will receive financial subsidy and will be considered for salary promotion *[Exh.6.5: Promotion policy]*.

6.4. Competences of academic staff are identified and evaluated

To identify and evaluate competences of academic staff, HCMUTE sets up competence evaluation system based on teaching activities, scientific research and services. The HCMUTE's academic staffs are able to design the educational syllabus that related to their majors and deliver the coherent teaching. To achieve the expected learning outcomes, they have applied many active learning methods, such as project-based-learning, work-based learning, flipped-classroom, etc. together with the appropriate assessment methods. Besides, they are officially able to upload the teaching materials into the Learning Management System (LMS), as well as Facebook, and Youtube.

To improve teaching efficiency, the FME lecturers must be aware of the professional development through short-term and long-term training courses and must meet the qualification of PhD degree. In addition, lecturers are encouraged to apply variety of teaching and learning methods and student assessment methods to achieve the programme learning outcomes. Teaching competence of staff is evaluated through students' feedback after every course *[Exh.6.6: Teaching activity monitoring]*.

The second task of lecturers is to do scientific research with projects of university and governmental levels as well as national and international publications. Besides teaching and research duties, they are obliged to participate in other activities to support students such as organizing internship, attending Open day, and enrolment consultancy, etc.

Annually, academic staff's self-assessment of task performance is done based on KPIs system and is reviewed and rated by Head of department and Dean board. The assessment activities are always associated with motivational goal for them towards enhancing the teaching quality *[Exh.6.7: Assessment of academic staff performance]*.

6.5. Training and developmental needs of academic staff are identified, and activities are implemented to fulfil them

The annual fund for training of academic staff is decided based on the statistical data and activities in the past year and future plan. The FME lecturers are encouraged and supported to improve their teaching methods and research skills as well as professional and technical skills annually. Typical training activities are carried out as follows:

- Long-term training: selecting and sending lecturers to study Ph.D.'s courses in Vietnam and abroad. Lecturers can apply for either the Vietnamese government scholarships (322 and 911 training programmes) or other sources.

- Short-term training: training courses of pedagogical skills, professional training courses on education management, such as BUILT-IT (Building University – Industry Learning and Development through Innovation and Technology), VULII (Vocational and University Leadership Innovation Institute), and COMET projects from the USAID. In addition, curriculum design course, soft skills training on the education leadership and management, and KPIs courses are selected for the training of academic staff.

- Scientific seminars or workshops on improving research capabilities, industrial maintenance, 3D printing, etc.

- Training courses related to foreign language: English course in the Philippines and India, English training courses in HCMUTE, according to teacher education scheme at ILA 2020, ACET, Training courses for IELTS, advanced Communication in English course.

- Professional training courses on CNC machining, modelling with CREO, SolidWorks, CAE in Mechanical Engineering, Reverse Engineering, etc.

- Training courses related to IT: Digital teaching such as Pearson/LMS courses.

In order to steadily enhance the quality of teaching, the senior lecturers are assigned to guide the young lecturers in terms of the preparation of the teaching materials, portfolio design, and the teaching pedagogy. The young apprentices must attend to the senior lecturers' classes to learn about the classroom management and the teaching methods. Moreover, FME often organizes seminars to share and exchange teaching pedagogies *[Exh.6.8: Training activities for FME academic staff]*.

The training and development needs are identified and fulfilled every year by following procedure:

Step 1: Human Resource Department notifies faculties to send them learning desires of lecturers.

Lecturers propose some courses according to topic of school year. Then their desires will be submitted to Dean of faculty for approving. After that, these training activities are sent to Office of General Administration and Personnel (GAPO).

Step 2: GAPO schedules training programs based on the proposals of faculties.

Step 3: Define and implement the curriculum to meet the missions and visions of the HCMUTE.

Step 4: Lecturers are responsible for the final reports on the result of learning, professional qualifications in accordance with ISO standard of Training and Development of Human Resources.

Step 5: Faculties and GAPO review and innovate for the next school year to improve staff quality.

6.6. Performance management including rewards and recognition is implemented to motivate and support education, research and service

To motivate and enhance the education, research, and service activities, the HCMUTE provides policy on the performance management that is posted on the University's website.

Key Performance Indicators (KPIs) system has been was built to evaluate lecturers to conduct the scientific research, teaching, and extra activities *[Exh.6.9: KPI evaluation system]*. It is also used to evaluate the working capacity and ability of staffs. This tool is also used as the evaluation criterion for voting the awards, nomination, redeployment or even the punishment at the end of each academic year. The HCMUTE built a website *http://kpis.hcmute.edu.vn/login.html* which contains several of options for choosing the workloads. Moreover, the systematic management software Dashboard was built to evaluate the quality of teaching. To ensure the quality of the scientific research, the scientific management software was also applied in the University. Personal report must be submitted at the end of the academic year and it is evaluated by the direct supervisors (i.e.

the Head of Department, Dean of Faculty, and Presidential Board). This evaluation result is a criterion to nominate the annual awards for the academic and support staff. An annual meeting will be organized to vote for the title of Emulators. The best individuals are awarded and considered for a salary increment before schedule *[Exh.6.1: Academic staff planning]*.

6.7. The types and quantity of research activities by academic staff are established, monitored and benchmarked for improvement

In HCMUTE, the research budget allocation is provided based on the level of research project and the evaluation result of specific research project. To promote the young researchers for improving their research skills, the University is also promulgated the HCMUTE's young researcher fund. To enhance both quantity and quality of research, HCMUTE not only made the ISO procedure for the research project registration, implementation, and monitoring but also issued special encouragement and awards for academic staff who have papers published on esteemed international journals. In Faculty's level, FME created many research teams to promote staff's research ability *[Exh.6.10: Research activities and related support policies]*. All research activities have already met the vision and missions of the FME and the HCMUTE as well. The FME lecturers have well performed for various kinds of research projects with the number listed in Table 6.5.

Table 6.5: Number of FME lecturers' scientific research projects (2012-2017)

Level of projects	Number of research projects					Total
	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	
National level	2	3	2	2	2	11
Provincial level	2	2	2	3	4	13
University level	49	60	47	45	29	230
Company level	-	-	-	1	3	4

Accordingly, there are various kinds of research activities that are organized and managed by FME, including research projects from the companies, the University, the Province and Nation. Currently, the research projects offered by the companies are strongly promoted to the FME's lecturers because their research's ability can be significantly updated and improved. Meanwhile the research projects of the Provincial and National level are normally done by the FME's key research groups *[Exh.6.11: FME research projects]*.

To develop research capacity, a number of different seminars, workshops, and symposium are conducted by FME to strengthen and enrich the research skills of the faculty members and postgraduate students in the mechanical engineering fields. As a result, the number of ISI publications given by the FME has already contributed about 41.18% of the total in 2016-2017 for HCMUTE.

Table 6.6: Types and Number of journal publications of FME lecturers (2012-2017)

Academic Year	Types of publication				Total	No. of Publications Per Academic Staff
	National conference	National Journal	International conference	International journal		
2012-2013	20	37	6	10	73	0.86
2013-2014	8	18	6	10	42	0.5
2014-2015	30	28	12	14	84	0.96
2015-2016	33	21	13	8	75	0.88
2016-2017	16	9	20	14	59	0.71

The quantity of journal publications is steadily increasing from 2012 to 2017 and shown in Table 6.6. In order to improve the quality of research, FME has focused on international publications and their number has been increased in comparison with previous years. Therefore, HCMUTE is on the top 20 Vietnamese universities with the ISI publications available in the Web of Science database for the academic year 2016-2017. Particularly in the mechanical engineering field, FME has gained its high rank in the top ISI publication rate in Vietnam, which demonstrates the sustainable development of FME in terms of the scientific research. Publications by the FME lecturers in the period of 2013-2018 are listed in Appendix 7.

CRITERION 7: SUPPORT STAFF QUALITY

7.1. Support staff planning (at the library, laboratory, IT facility and student services) is carried out to fulfil the needs for education, research and service

HCMUTE is one of the most highly ranked public universities in Vietnam and it recently operated by considering the autonomous university model that is really promoted to apply by the MoET. Therefore, the human resources are mainly focused for the sustainable development of the University. Accordingly, the support staff planning is clearly clarified in the HCMUTE strategic plan (i.e., short-term, mid-term, and long-term plans) that is used for the development of human resource policy due to the quality analysis of the human resource challenges. This plan is also one part of the Human Resource Development Plan that must be conformed to both the mid-term strategic plan 2011-2015, the HCMUTE looking forward to 2020 and that of 2017-2022, looking forward to of the Faculty and University. The predictive number of support staffs, the quality of supporting, the English proficiency, and IT skills are also mentioned in the plan. Moreover, the personnel plan of supporting staffs must be included in each faculty strategic plans. In addition, the other Functional Offices of the University are also requested for upgrading their professional qualifications. A number of the support staffs have been trained for improving the professional skills and knowledge with different sources of abroad scholarships. Therefore, the quality of support staffs is sustainably improved throughout the University with the quantity up to 188 members as shown in Table 7.1 *[Exh.7.1: Support staff planning]*.

At FME, there are a number of laboratories to support the teaching and learning of the MET students such as CNC milling and turning Lab, 3D scanning and printing Lab, Automation simulation Lab, Pneumatics – Hydraulics Lab, CAD/CAM-CNC Lab, etc. These labs help students a lot in applying their knowledge in practical situations. The laboratory management staffs are always ready for providing the best services in terms of teaching, learning, and research activities for not only students but also lecturers. They are in charge of laboratory management, maintenance, minor repair, as well as procurement of equipment. The FME's laboratory is always supporting the students in case of borrowing and using laboratory's equipment, especially the students who have the passion on science research and capstone project. The Dean board understands the importance of the laboratories as well as the management staff and always pay much attention in improving the competences of the staff with many training activities which will be discussed in more detail in the next Section. The support from the faculty's secretary is also very important for both students and other faculty members. The faculty's secretary takes the responsibility in many activities of FME, from documentation, management, reception works and also involves in consultant activities in terms of internship, education, research, and the extracurricular activities. Upon the learning activities, HCMUTE students also receive many supports from the staff of the functional offices *[Exh.7.1: Support staff planning]*

Library support staff

It is clear that the University's library is really important for education and research activities. To adapt the sustainable development, the HCMUTE's library is focused to improve the quality of service activities, human resources, and facilitation. Recently, it has 13 staffs, which is included: 2

Master (15.38%), 9 B.A (69.23%), and 2 College Graduate (15.38%). All of them are effectively working and serving for all lecturers and students. In addition, they all meet the national standards for library *[Exh.7.2: Library staff]*. The annual satisfactory surveys of students and alumni are shown that most of them are fully satisfied with the HCMUTE's library *[Exh.7.3: Report on Students and alumni satisfactory survey]*.

Laboratory support staff

To become good engineers in the future, the practice in experimentation and lab experience is greatly helpful in fulfiling the programme learning outcomes. Therefore, in the FME, the laboratories are always managed and operated in a systematic way to help students apply the concepts learned in class into real situations. At each laboratory, it is required to have an expert laboratory staff that has a high level of experimentation and responsibility to provide students with good services. Managers of laboratories and workshops are carefully selected from the faculty members due to the specific, professional fields, and their experiment skills. For safety reason, all laboratories and workshops must have site safety notice board and all students must be trained about the safety before operating the machines and equipment *[Exh.7.4: FME laboratory and workshop managers]*.

IT support staff

To improve the active teaching and learning activities by using technology, HCMUTE has provided sufficient IT facility (i.e., websites, internet system, hardware and software of computer system in the library, labs and offices) and the Information and Network Center has responsibility to hold them in the well working condition. This center has 07 members including 01 Director (PhD.'s holder), 1 Vice Director, 1 website administrator, 1 network management staff and 3 technical staffs. All of members were well trained in the IT maintenance services *[Exh.7.5: IT support staff]*.

Other support services

There are many Centers and Offices which are involved in supporting student affairs, such as Office of Admissions and Student Affairs, Office of Enterprises Relations, Center of Student Services, and Health Department. Moreover, the Ho Chi Minh Communist Youth Union and Student Association of HCMUTE are also in charge of the student's volunteering, extracurricular and cocurricular activities, and community services *[Exh.7.6: Support service activities]*.

Additionally, FME annually organizes consulting activities for new students in the welcome ceremony. The freshmen are introduced about the history, organization structure of the department/faculty/university, as well as facilities. The essential information of the educational programme, and courses are also carefully consulted to the freshmen. The consulting activities have continuously been conducted every academic year through FME's website, email, phone and face-to-face consultation *[Exh.7.7: Consulting activities for students]*.

7.2. Recruitment and selection criteria for appointment, deployment and promotion are determined and communicated

The recruitment plan is annually made based on the ISO procedure, which step-by-step guides the planning, recruiting announcement, receiving applications, reviewing applications, and examining qualifying processes (i.e., foreign languages, computer science, and interviews) as well as the announcement of successful candidates, signing of labor contract, etc. The recruitment information will be informed on the HCMUTE website, and various kinds of social media. Candidates must complete the required assessment given by the University, such as English test, basic informatics skill test, face-to-face interview, etc. The rights and obligations of each support staff are clearly determined and announced according to their abilities, experiences and attitudes. However, before becoming an official support staff, individuals must have at least one year of probationary work. During this time, the support staff will need to complete the requirements of the Office of General Administration and Personnel (GAPO) and the relevant managerial offices. Based on the major

level, the work experience of the employee, the Dean of the faculty/Head of functional offices will assign the suitable positions according to the functions/tasks of the faculty/functional offices and the job description of the recruitment title. To appoint the capable and qualified staffs at the Faculty, Functional Office, Center, and University levels, the GAPO has issued the process of appointing, which is carried out in a democratic, overt and transparent way, through the recommendation letter of all staffs and the credibility surveys of staffs and key staffs in the Faculty/Functional Office/Center. The promulgated regulations for consideration of probationary expiry are applied to administrative officials with clear qualifications, such as having Certificate of Foreign Language (B), Certificate of Information Technology (B), National Administration Management Certificate (experts class) and organize the ranking of promotion examination for the staff *[Exh.7.8: Support staff recruitment]*.

In addition, the planning and appointment of support staffs has actively created in order to have the quality source of management staff who has ability to take the leadership for the University. The appointed staffs must satisfy the requirements of the Regulations of the University, as well as the Law on Higher Education given by MoET *[Exh.7.9: The planning and appointment of support staff]*.

At the end of the academic year, the Title of Emulators is selected by considering the performance results of support staffs and the voting results given by all of staffs in the Faculty/Functional Offices/Centers. The best staffs can be considered for salary promotion one year earlier than the normal case and the emulation title as well. The information are posted to the University's website including the career development procedure for the support staff *[http://hrmo.hcmute.edu.vn/ArticleId/3bec6513-4fd6-48c4-b257-4da0ddb8ee59/quy-trinh-dao-tao-phat-trien-nguon-nhan-luc]*.

Retirement and resignation policy is also clearly introduced to every staff, which is strictly considered the Labor and Social Security *[Exh.7.10: Retirement and resignation policy]*.

7.3. Competences of support staff are identified and evaluated

In HCMUTE, the number of support staff who has Master and PhD. degrees is continuously increasing to meet the demands of labor market in terms of education, research and services. The detailed information at each Functional Office and related duties can be listed in Table 7.1.

The competent requirements are identified clearly for support staff from the recruitment step. Each candidate must satisfy several criteria including English proficiency, Computer skills, Professional skills, etc. As mentioned in the previous section, the successful candidates must complete one year of probationary before being approved as official staff. To do this, they have to prove their competences in the required areas and efforts in improving their weakness to meet the increasing demands of the university and faculty *[Exh.7.8: Support staff recruitment]*.

To evaluate the performance of the staff, the KPIs system is used. This tool is very helpful for the evaluation and also provides a significant basis for the leadership to estimate the need for training of the staffs. The KPIs system will be described in more detail in sub-criterion 7.5. Annually, the Quality Assurance Office (QAO) has responsibility to make the survey for evaluation the quality of service activities and the satisfaction survey of graduated students as well. The results indicate that most of them are very satisfied with the services of the HCMUTE *[Exh.7.12: Satisfaction Survey report from the HCMUTE students]*.

Table 7.1: The number of support staff (Reference date: May 10th, 2018)

Support staff	Highest Educational Attainment						Total
	High School	College Graduate	Bachelor	Master	Doctoral	Assoc. Prof, PhD	
Office of Dormitory	12	2	4	3	0	0	21
Office of Project Management	0	0	2	1	0	0	3
Office of Quality Assurance	0	0	2	4	0	0	6
Office of Academic Affairs	0	0	8	3	0	1	12
Office of Finance and Planning	0	1	10	3	0	0	14
Office of Science and Technology	0	0	3	2	0	2	7
Office of Enterprises Relations	0	0	5	1	0	0	6
Office of International Relations	0	0	1	1	1	0	3
Office of Strategic Management	0	0	1	0	1	0	2
Office of Facility Management	1	2	4	3	0	0	10
Office of Academic Inspectorate	0	0	3	2	0	0	5
Office of Equipment and Maintenance	6	0	5	2	0	0	13
Office of General Administration and Personnel	23	1	8	4	0	0	36
Office of Press and Media	0	0	4	2	0	0	6
Office of Admissions and Student Affairs	0	1	5	4	1	0	11
Library	0	2	9	2	0	0	13
Health Care Center	2	0	1	0	0	0	3
Center of Digital Learning	0	0	3	1	0	0	4
Center of Student Services	0	0	4	2	0	0	6
Center of Information Technology	1	2	2	1	1	0	7
Total	**45**	**11**	**84**	**41**	**4**	**3**	**188**

7.4. Training and developmental needs of support staff are identified and activities are implemented to fulfil them

In accordance with the HCMUTE's policy, the support staff are carefully trained to enrich their professional skills, foreign language proficiency, IT skills, and specialist skill, etc., which are taken their expertise into career beyond and become the effective support staff. There are two ways to determine the needs for training and development of the support staff in the HCMUTE: the needs for training and development of support staffs identified and implemented in systematic way by the University; the employee's aspirations for training and development *[Exh.7.1: Support staff planning]*.

The training and re-training for the staff are always very important for the strategy plan of HCMUTE *[Exh.7.11: Training activities for support staff]*. Short-term, mid-term, and long-term training courses are annually provided for the staff. A percentage of payroll or budget is clearly allocated for training of support staff and it is shown in the internal spending rules of the University *[Exh.7.13: The HCMUTE's budget for training of support staff]*.

As of FME, the support staff recruitment plan is annually made based on its strategy plan. Annually, FME also setups the training plan for the support staffs due to its short-term, mid-term, and long-term development strategy, as well as the plan from the University based on ISO procedures given by the GAPO. Some typical training courses can be seen in Table 7.2 *[Exh.7.14: FME Strategic Plan]*.

Table 7.2: The summary of development training activities for the FME's support staff

No.	Name of training course	Content	Number of participated	Place of training	Time
1	USAID Mekong Comet program	Professional development training program for higher education	5	Vietnam	From 2016 to 2018
2	MoET's training program	Flipped classroom and Critical thinking for adapting the change of education system	1	Da Nang, Vietnam	2017
3	HCMUTE's training course for engineering education	Advance course in engineering education	5	HCMUTE, Vietnam	2017
4	English language training courses	Advance English Course in Engineering Education	4	Philippines and India	From 2014 to 2018
5	5S training	5S-based Lab management	10	FME	2016
6	Senior support staff training	Support service management and policy	1	HCMUTE	2017
7	Advance technical training	CAD/CAM-CNC, 3D printing, Moldex3D, CMM, etc.	10	FME, Taiwan	2015 to now
8	Internal quality assessment training	Internal quality assessment professionals	2	HCMUTE	2017
9	KPIs training	KPI action plan and assessment	All staffs	HCMUTE, FME	2016-2017

In accordance with the results of recruitment and development training, the support staff of the FME fully satisfied the related requirements of the HCMUTE and FME. They have been working effectively to support the students and make the sustainable development of the FME.

At the HCMUTE, support staff have responsibility in helping and supporting students and lecturers in their studying and other activities. Therefore, they have to be trained carefully to meet the requirements of the support services. Training courses have been provided by HCMUTE and FME to improve their competences in the related fields. Some of the training courses can be listed such as: librarian service training, conferences and workshop, software and machine training course, etc. (Table 7.2). To ensure that the best services have been provided, online surveys about the library services, practice classes and other services are conducted every semester. The collected survey data are then reported and utilized to improve the support staff's competences. The improvement can be clearly seen as: a new high quality library had been built; internet-accessed computers had

been provided for the library; new CNC machines and air-conditioners had been equipped for the CAD/CAM-CNC laboratories, etc. *[Exh.7.11: Training activities for support staff]*.

7.5. Performance management including rewards and recognition is implemented to motivate and support education, research and service

To evaluate the performance of the staff, the KPIs tool is effectively used in HCMUTE in comparison with previous tools to ensure that the evaluation must be fair and objective. Accordingly, each staff will make the action plan at the beginning of the month for the supporting staff or at the beginning of the academic year for the lecturer.

The performance of support staff is monthly evaluated by using the KPIs system. Moreover, at the end of academic year, each staff will firstly make the self-assessment report that is absolutely based on the criteria and evidence. The Faculties/Functional Offices/Centers will then organize the annual meeting to analyse, evaluate, and summarise the overall performances. In this meeting, the Faculties/Functional Offices/Centers management boards will report to all staffs about the results and short-term action plan for the next academic year. The staffs are engaged to give the comments and/or suggestions on the overall evaluation. These feedbacks are strictly considered for improving the activities in terms of education, research and services. On the analysis results from KPIs system and voting results given by all staffs, each Faculty will decide the best individuals for the Title of Emulators *[Exh.7.15: Self-assessment report of the staff]*.

Accordingly, there are three levels of emulative titles, such as the University, the Ministry, and Government levels. The support staffs who achieved the emulative titles at the University or Ministry levels will be rewarded incentive money and possibly considered for increasing the salary in advance. In case of the emulation titles at Government level, the University will encourage with honor reward worthily and increase the salary. In addition, when the support staff achieved the excellent performance in service activities, he/she will be awarded by the certificates of merit from HCMUTE's Rector and incentive money. For the support staffs that have just fulfilled the requirements for their position, they will be taken the full achievement, so-called "*A class of performance"*. In this case, he/she will normally achieve the full salary. Inversely, the support staffs will be taken the partial achievement, so-called "*B class of performance"*. The incentive salary will be revoked for next academic year *[Exh.7.16: Emulation and rewards for support staff]*.

To make quick actions for any uncertainty cases, the conversation between the HCMUTE staff and the Presidential Board is scheduled on the last Thursday of each month. Furthermore, the People's Inspection Boards will officially receive all the complaints and denunciations from the staffs and has responsibility to investigate the problems. The investigation report will be submitted to the Presidential Board for making the right decisions.

To maintain the satisfactory of the staff, the working environment is one of the most important factor because it significantly effects to the overall performance of the University. It is clear that the positive work environment including the organization culture, relationship between lecturers and students, opportunities for personal development, life balance, strong team spirit, etc. is being steadily developed in the HCMUTE. To support this, the work environment survey for the staff is annually conducted by the QAO *[Exh. 7.17: Work environment survey for the HCMUTE's staff]*.

CRITERION 8: STUDENT QUALITY AND SUPPORT

8.1. The student intake policy and the admission criteria are defined, communicated, published, and up-to-date

In recent years, HCMUTE has always considered admission as the most important job and in reality the university has achieved many good results.

The admission criteria

Following the national regulation and the admission criteria of HCMUTE, students qualified by the National High School Graduation Examination (NHSGE) can apply to the HCMUTE. Therefore, they have to participate in the NHSGE and apply to the admission process of the HCMUTE after getting the results. The applications of students are considered for enrolment to the MET programme if the total score of the three targeted subjects in one of the four subject groups (A00, A01, D01, D90) from the NHSGE, qualifies the cut-off score which is decided by HCMUTE's admission council and the base score determined by the MoET *[Exh. 8.1: Admission criteria of HCMUTE]*. The four subject groups for application are listed below:

- A00: Mathematics, Physics, Chemistry
- A01: Mathematics, Physics, English
- D01: Mathematics, Literature, English
- D90: Mathematics, English, Natural science

In addition, students must provide evidence of their English language proficiency or they have to take a qualified English test to be enrolled. In case students fail the test, they have to register for supplementary English classes organized by the University.

Student intake policies

To increase the intake quality, direct admission and scholarships are offered to attract excellent students from Gifted and Talented high schools and students who were awarded with prize in national and international excellent examinations. In addition, the HCMUTE has also policy to praise the top excellent enrolled students. For each programme, two students who own the highest enrolled score with the condition of the total score not less than 25, will receive a financial award that is equal to the total score multiplied by one million VND. In order to motivate learning will in students, scholarships corresponding to 100% tuition fee are awarded to excellent students with good GPA *[Exh. 8.2: Student attraction and motivation policies]*.

Increasing the gender diversity in engineering fields is a desire of all industry partners. Since 2014, HCMUTE has become the first university in Vietnam that offered 50% tuition fee exemption to female students until graduation for some engineering programmes including the MET programme. Thanks to this, the number of MET female students is gradually increasing every year (Table 8.1).

Table 8.1: The number of MET female students in recent years

Year	2014	2015	2016	2017	Total
Enrolled number	147	157	173	139	**616**
Female student	0	1	2	4	**7**

Tuition fee exemption is also offered to disadvantage students, students of low-income families and students from minority regions. This policy shows the humanity in the university's education philosophy. The admission information can be easily found on HCMUTE admission website *[http://tuyensinh.hcmute.edu.vn]*, *[Exh. 8.3: Tuition fee exemption policies]*.

Intake policies and admission criteria are communicated, published and up-to-date

The annual admission is always one of the most important tasks of the year. The university prepares for it all the time, and starts the admission consultation from the beginning of the year with many activities. The consultation can be conducted online by using the private UTE-TV Channel *[http://utetv.hcmute.edu.vn/]*. It can also be directly delivered to the students and their families through offline consultation activities (face-to-face coffee talk and consultation) or through the Admission Consultation Days in cooperation with press and media. The admission is also widely propagated and announced online broadcasting of both local and national channels. In addition, to help potential students know more about the university and orient them to prepare for their future

studying and careers, the HCMUTE has annually organized the Open Days event since 2007. In this event, students in some high schools in Ho Chi Minh City and other provinces are invited to visit the university and experience one college students' day with lots of activities that have been prepared by all faculties *[Exh. 8.4: Admission consultation activities]*.

Recently, the HCMUTE has been implemented Dashboard software, a tool to analyse and monitor the intake's quantity and quality *[http://tuyensinhdss.hcmute.edu.vn]*. The intake data of the last five years is processed through statistical analysis software to provide an insight to the admission variation and recommend better enrolment strategy for the following years. The admission consultation strategy will be adjusted based on the regional number of the intake.

8.2. The methods and criteria for the selection of students are determined and evaluated

The admission plan at HCMUTE is established based on the admission regulation and statute of Vietnam MoET. There are two enrolment methods as follows:

- Direct enrolment method: Annually, the university offers 10% of the cohort intake for excellent students from Gifted high schools and 5% from the top 200 high quality schools and the ones that signed the agreement in admission and career orientation with HCMUTE. In case of the English related education programmes, the university additionally offers up to 10% of the cohort intake for students who have international English certificates such as IELTS or TOEFL with good and excellent records.

- NHSGE score-based admission method: students will be enrolled based on their results of the NHSGE which is annually hold in June or July.

The cut-off score will be decided by the admission council based on the number of applications and the base score decided by the MoET. The cut-off score of HCMUTE and all the other universities in Vietnam will be publically and widely announced through different media channels. Table 8.2 shows the cut-off score of the MET programme in compared with other mechanical engineering programmes of several top universities in Ho Chi Minh City in the last six years. The increase of the cut-off score shows the effectiveness of the attraction policies provided by the university and FME *[Exh. 8.5: HCMUTE admission process]*.

Table 8.2: Cut-off score of MET programmes and benchmark

MET programme of	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
HCMUT – VNU[1]	18.5	22	21	24.5	23.75	25.75
HCMUTE	**15.5**	**20**	**19.5**	**22.5**	**22.5**	**24.75**
IUH[2]	14	15	16.5	20.25	20.5	21.5
HCMUT[3]	13	17	18	21.5	19.25	21.75
HUTECH[4]	13	13	13	15	15	16
National cut-off score	13	13	14	15	15	15.5

[1] *Ho Chi Minh City University of Technology-Vietnam National University (http://www.hcmut.edu.vn/)*

[2] *Industrial University of Ho Chi Minh City (http://www.hui.edu.vn/)*

[3] *Ho Chi Minh City University of Transport (https://ut.edu.vn/)*

[4] *HUTECH University of Technology (https://www.hutech.edu.vn/)*

Table 8.3 shows the intake size of the last nine academic years. From 2009 to 2016, the intake size was increased to meet the need of students in pursuing higher education and the demand of the industry. Recently, the intake size is managed to be stable around 140, which is suitable for the training capacity of the faculty. The statistical data of MET students in the last nine academic years is shown in Table 8.4.

Table 8.3: Intake of First-Year Students (last nine academic years)

Academic year	Cohort	Graduation	Applicants		
			No. Applied	No. Offered	No. Admitted/Enrolled
2017-2018	2017	2021	-	147	139
2016-2017	2016	2020	-	182	173
2015-2016	2015	2019	-	163	157
2014-2015	2014	2018	1122	157	147
2013-2014	2013	2017	1970	164	157
2012-2013	2012	2016	1881	136	125
2011-2012	2011	2015	385	123	92
2010-2011	2010	2014	369	135	101
2009-2010	2009	2013	402	111	80

Table 8.4: The total number of MET students (last nine academic years)

Academic year	Students					
	1st Year	2nd Year	3rd Year	4th Year	> 4th Year *	Total
2017-2018	139	170	151	139	78	677
2016-2017	173	153	141	145	82	694
2015-2016	157	143	148	114	87	649
2014-2015	147	152	118	83	78	578
2013-2014	157	121	85	90	62	515
2012-2013	125	88	93	67	73	446
2011-2012	92	96	71	61	79	399
2010-2011	101	76	63	80	73	393
2009-2010	80	65	82	86	69	382

** Total number of students from many cohorts who have still pursued the programme*

8.3. There is an adequate monitoring system for student progress, academic performance, and workload

Monitoring system

Since 2014, the Dashboard system has been implemented by the AAO for recording all the data of students. So the department can monitor the study progress, dropout and pass rates of students, etc. The Dean board will collect the problems of students who are in critical situations to analyse and consult students. At the end of every semester, the report of students with warning situation will also be analysed for suitable solutions. In terms of the course, the lecturer can supervise student learning and performance through the LMS system *[http://lms.hcmute.edu.vn/]*. The presence of students in classes is also documented and student attendance reports will be used for the assessment of student studying progress. In addition, the monitoring is also conducted through the help of the Youth Union and the class monitoring students in other activities such as social activities, sports and art, cultural-political activities, etc. *[Exh. 8.6: Monitoring system]*.

The student progress and performance are monitored through:

- GPA
- Class attendance

- Training point (the evaluation of students' social activities)
- Social working days (minimum 4 days for the whole programme)

Study load and performance

The credit system was piloted at HCMUTE early in 2001 and continuously implemented and improved afterward. Since 2012, the new 150-credit-based higher education system is implemented. Each credit consists of fifteen class hours and at least forty-five hours of self-studying. The programme occupies eight major semesters (or four academic years). In each semester, a student can take 18-22 credits so that at the final semester, student will have time for doing their graduation project (ten credits). Student can arrange their study and finish the programme in a reasonable time by registering extra-courses or re-doing dismissed courses *[Exh. 8.7: Credit-based higher education system implementation]*.

The four-year studying time of the MET programme is designed for any average student to graduate. The rate of on-time graduation of the MET students has fluctuated from 50 to 60 % in recent years and there is a tendency for this rate to increase. There are a number of reasons for late graduation of students such as financial problem, wrong orientation to pursue the programme, difficult projects, or English output qualification, etc. Among listed reasons, the most significant is English competence that is increasingly required. Solutions for improving the rate of graduation are shown more details in the Criterion 11.

8.4. Academic advice, co-curricular activities, student competition, and other student support services are available to improve learning and employability

Academic advice, co-curricular activities and student competition

At HCMUTE, students are educated carefully to lay the foundation stone of future society, especially advanced students. There are many coaching activities to enhance their expertise. Outstanding students could be offered to be teaching assistants, members of the Olympic team, taking part in Scientific Research Groups, joining many creative competitions such as Eureka, Koma Taisen, Holcim's prize, Talented Youth Scientists, National Mechanics Olympics, Solar Car, National Robot and Practice Competency, ABU Robocon Contest. Thanks to the supportive funds from the university, organizations and enterprises, students have the chance to experience new things in new fields, create their own products such as machines, robots, cars, etc. Not only that, after graduation, advance students are encouraged to become candidates of the graduate programme at HCMUTE or HCMUTE's sister universities in the world *[Exh. 8.8: Coaching activities for advance students]*.

Every lecturer at HCMUTE takes a very important role in teaching and coaching students who is the bridge that leads students to knowledge, skills and developing attitude. Lecturers are also advisors for students in the progress of projects and scientific researches. Some lecturers are members of the consultant team who give advice and answers students' questions about their learning problems. Students can also find advice and consultation from lecturers on their capstone projects as well as career and major selection. Besides, lecturers frequently organize a great deal of visits to factories, companies, workshops so that students could learn from practical working conditions *[Exh. 8.9: Academic advice]*.

In order to help students improve their academic work, social knowledge and soft skills, HCMUTE and FME established many clubs such as Skill Club, English Speaking Club, Guitar Club, Martial Art Club, Scientific Research Club and organized a wide range of seminars, workshops, job fairs, soft skill courses, factory visits, etc. Many professional engineers, experts, lecturers, scientists and alumni were invited to share their valued experience to students. Thanks to these, students' competences are enhanced *[Exh. 8.10: Co-curricular activities]*.

Student support services

Starting the new college life will never be an easy task for freshmen. In order to help them break

this ice, HCMUTE and FME hold the Orientation Days during the first week of every academic year. This event gives them chance to meet and know their new future classmates, advisors, campus services, and student clubs and gives them a comprehensive explanation of everything they need to get ready for their journey as a college student. Many activities are set up, for instance, a campus tour to introduce faculties, offices, departments and institutes; student fair and camping to provide good opportunities in order to build new friendships; exhibition to show scientific research models. In addition, there will be many activities at the first week for all students, including both first year and senior students, to learn about the regulations, policies, health care consultation and career orientation, etc. Freshmen who have difficulties with accommodation issues can get helps from the FME Youth Union as well *[Exh. 8.11: Student orientation activities]*.

Other activities to support the students' learning include training courses, seminars to make them familiar with the library system, digital Learning Management System and to share effective leaning methods at university. The FME Youth Union plays an important role in supporting first year students to make the transition from high school to university environment and contribute to their academic as well as social development. Especially, those who do not meet the English proficiency requirement can register to supplementary English classes organized by the university every semester with reasonable fee *[Exh. 8.12: Supplementary English classes]*. In addition, since 2012, the *Introduction to Mechanical Engineering* course has been added into the programme to help students have a general view of the programme and to provide students with learning and working skills in the field of mechanical engineering technology *[Exh. 8.13: Syllabus of Introduction to Mechanical Engineering Course]*.

There are many open spaces inside the campus to assist group discussions as well as self-study of students. Popular areas include the 5th floor Open Space and the basement of the Central Building, areas around the library, the FME's Green Park and the Esuhai Open Space. If students need assistance they can come to the Student Services Center to receive support in finding part-time jobs; opening short-term soft skills training; creating a learning environment and improve student living skills in collaboration with other units in the university; supporting facilities, learning environment, extra-curricular activities, social activities; helping students in solving financial and psychological issues, etc. In order to help students rising their opportunities to get a job after graduation, Job-Fairs are organized annually by the ERO *[Exh. 8.14: Student support services]*.

To help student in keeping up with their study route, the study plans are informed to students at the orientation days and at the beginning of every semester through the online system *[http://online.hcmute.edu.vn]*. Announcement for course registration will be sent to students by the AAO for online registering before each semester starts. On the online system, students can also check their progress and final mark of each course. In addition, they can track their GPA through statistical charts, receive other study alerts, and more *[Exh. 8.15: Course registration]*.

The FME consultant team, including a Vice Dean, the faculty secretary and lecturers, is willing to answer all the questions from students about their studies, researches, difficulties via emails, the FME website, telephone or face-to-face meetings. In addition, students can get support from the consultant team of other functional offices in HCMUTE, as well. Talks between students and the HCMUTE Presidential Board, FME Dean Board, Department Heads are also organized every semester, at both university and faculty level, where students can give their feedback and express their feelings, difficulties, problems and expectations. Many solutions are proposed to increase student services and university's support and training quality. All the question and answer will be posted on the HCMUTE's website *[Exh. 8.16: Talks between HCMUTE/FME administration boards and students]*.

For all students, the capstone project is one of the most important studying activities that need a great help from the advisors. In their capstone projects, students will have chance to apply their derived knowledge in designing, analysing and manufacturing real products or systems. Not only that, they will have chance to learn new technologies and concepts. The capstone project will be the

time students learning about real life issues and they will have an opportunity to empower their creativity. To avoid unexpected failure and keep up with the deadline, every week, students will report and get instruction from advisors by directly meeting or by email or online chatting whenever they need.

Support services to improve learning and employability

Under the help of the Enterprises Relation Office (ERO), many training courses for students are frequently organized such as Effective communication skills, Time management skills, Job interview skills, 5S skills, Effective learning skills, etc. The schedule of the courses can be easily found on the ERO website at *http://pr.hcmute.edu.vn*.

To help students understand more about the labour market and get ready to conquer the real world challenges after graduation, opportunities or career prospects are introduced to students through admissions counselling programmes, in the *Introduction to Mechanical Engineering* course, or at many Job Fairs which are regularly organized. In addition, FME and MMT department frequently organize a great deal of visits to factories, companies, workshops, etc. Students will also have the chance to become interns of enterprises, which helps them comprehend their future jobs.

8.5. The physical, social and psychological environment is conductive for education and research as well as personal well-being

HCMUTE students have a lot of advantages from the infrastructure and facilities. The libraries, self-study areas with free Wi-Fi, dormitories, cafeterias, sport playing grounds are aimed to create and maintain a safe, healthy, creative, self-conscious campus environment for students. They can take part in many sport activities such as football, volleyball, badminton, basketball, martial arts. There are variety of chances for students to practice with their team and compete in annual sport, art, musical and dancing competitions, between faculties, clubs and universities (Referring to Criterion 9).

Apart from physical development, social development is also paid close attention. Art and music have become the irreplaceable part in a student life. Many art performances, concerts, music festival, talk shows, screening days are frequently organized at HCMUTE for students to enjoy happily and relax moments after hard working days. There are plenty of clubs, unions that students could try and share the same interest. For example, The Guitar Club, Dancing Club, UTE Young Volleyball Club, English Speaking Club, MC Club, Youth Union, Students' Association, etc. Every year, FME Tradition Camp is also held to welcome Teachers' Day, which gathers all FME students and builds the solidarity FME spirit. In addition, taking part in social volunteer activities would turn students into mature, confident and active citizens for community. For instance, Green Summer Volunteer Campaign, Spring Volunteer Campaign, University Entrance Exam Supporting Campaign, Blood donation, etc. *[Exh. 8.17: Extra-curricular activities]*.

A healthy body paves the way for a healthy mind. All HCMUTE's students have the National Health Insurance. They will have health examinations and screenings right after they enrol to the school. The campus health care service is always available whenever they need. More than that, psychological development does play a vital role in student's life. Therefore, HCMUTE has a psychological consultant team, established at the Student Service Centre, to help students overcome their difficulties by optimistic ways *[Exh. 8.18: Insurance and health care for students]*.

CRITERION 9: FACILITIES AND INFRASTRUCTURE

9.1. The teaching and learning facilities and equipment (lecture halls, classrooms, project rooms, etc.) are adequate and updated to support education and research

At present, HCMUTE has two campuses at 01 Vo Van Ngan, Thu Duc District and 484 Le Van Viet, District 9, HCMC with total area of over 21 hectares. In particular, the construction floor area

of 144,332.5 square meters includes 5 conference halls, 183 large and small classrooms, 58 laboratories, 98 workshops and 18 computer rooms fully equipped with sound and light system, two dormitories and a stadium. Particularly at the FME, there are 20 laboratories and practice workshops, 8 research laboratories, 1 meeting room and 2 department rooms for meeting MET students. The classrooms are the most convenient ones in the university with many updated equipment. With the current number of students, the average area of study room (including theoretical and practical classes) per student is 3.95 square meters, meeting the requirements and regulations *[Exh.9.1: HCMUTE Campus Information]*.

Since 2007, HCMUTE has completed four new construction projects with a total of 54,000 square meters of construction floor including a High-Tech Center, a central building, multi-purpose rooms, the second dormitory and the under-constructed 8-floor building and practice factory F1 (2017). Especially, CNC/CAD-CAM equipment costing 3.7 million EUR was funded by Austrian Government ODA. The High-Tech Center was successfully constructed and have been operating since November 2009. Thus, the university's facilities have well responded to the academic research activities of the university. In 2015, an Open Technical Space was built and sponsored by Esuhai corporation on an area of 500 square meters for FME's research, innovation, library as well as an interesting self-study place. This is a space where students develop and implement innovative ideas, research projects, and exchange academic activities in the fields of Mechanical Engineering.

Besides, HCMUTE has also many self-study areas around the library, the faculties, and at the 5th floor of the central building…Many classrooms with multimedia and modern facilities, which are fully equipped for teaching and research, were built. Moreover, modern teaching systems such as E-learning, Mobile-learning and Blended-learning have been efficiently deployed and operated for teaching and learning activities, especially, the Digital Learning Center, a 300,000 USD co-investment between HCMUTE and the HEEAP sponsors, ASU (Arizona State University), Intel and Pearson to support the E/M learning via *http://dlc.hcmute.edu.vn/ [Exh.9.2: Application of IoT in education and management]*.

For sustainable development, HCMUTE has developed a 5-year medium-term strategic plan of 2011-2015 looking forward to 2020 and 2017-2022 period looking forward to 2030. Based on the HCMUTE strategic plan, FME has created its own one. With the strategic plans, the facilities of the university and FME are improving in both quantity and quality to meet the growing demands of students and staff's learning, teaching and research *[Exh.9.3: Strategic plans]*.

9.2. The library and its resources are adequate and updated to support education and research

The library is located in the centre of the main campus and convenient for both staffs and students. The library operates from Monday to Friday from 7 AM to 5 PM every week. In addition, on exam season the library opens at noon and evening (around 9 PM) to serve students.

The library owns both electronic and print materials. Its total area of more than 1,430 square meters stores about 483,193 books including textbooks and reference books in Vietnamese and foreign languages, mainly in English, with 911 books in the field of Mechanical Engineering Technology.

Library materials include all types of reference books in Vietnamese, books of foreign reference, textbooks, reference dictionaries, technical standards, scientific reports, theses and graduation dissertation. Most recently, the basement renovation of Central building is used as a student service place according to the creative idea of HCMUTE Rector. The high quality library with the area of 1,500 square meters has been put into operation since September 2017, equipped 100% with air conditioning and free Wi-Fi provided. In addition to foreign language document with more than 7,843 on-the-spot reading materials, the High-Quality Library also attracts the attention to the media by putting into use many service areas for relaxation of students such as lounge, hammock, massage chair, etc. with capacity of 500 seats. Group classrooms are also the regular activity location for clubs and groups. In the future, Youth Union is planning to organize the English Club YOLO (You Only Live One) for the purpose of exchanging - making friends, sharing experiences,

practicing English communication for those who love and desire to enrich English skill and knowledge in a natural and exciting way *[Exh.9.4: HCMUTE's library resources]*.

Not only that, the library annually updates new sources of materials to enhance the diversity of the library data. According to the supplementary material policy, each semester the library coordinates with the faculties to make a list of additional materials and the library will purchase required books as suggested by the lecturers. Besides, there are thousands of electronic materials, including textbooks, reference books, scientific papers, project reports, and thesis of the Mechanical Engineering Technology, which are published online at *http://lib.hcmute.edu.vn/* or *http://thuvien.hcmute.edu.vn/* and all faculty and students are easily accessible for self-study and research purposes *[Exh.9.5: HCMUTE's library E-resources]*.

To improve the quality of the librarian reading resources, the replacement of used books with new books and book fair activities have been conducted regularly. Since 2002, the library has been equipped with library management software for borrowing and retrieval of documents via a networked computer system. By 2015, the library has upgraded its management software with a new foundation, in line with the trend of mobile technology adoption and the strong demand for E-document, mobile devices. This helps the university in providing the best services to our readers in the exploitation of electronic documents and grasps the needs of readers quickly through the weekly, monthly and yearly statistics *[Exh.9.6: E-document data is exclusive for the MTE program]*.

Free Wi-Fi systems are fully provided to all library areas. In the university, Wi-Fi plays a very important role for lecturers and students in looking up information, quickly updating learning situations, group activities, class activities, updating information and faculty alerts from the club, etc. Students will be able to connect to internet to access to the digital library database and free international scientific journals through the provided online website. Furthermore, the Wi-Fi system also help lecturers in sending documents to students quickly, and students in submitting assignments on time. Additionally, it also helps library in effectively performing the operation.

In addition, the HCMUTE library has purchased 20 accounts from the National Center for Communication, Science and Technology to support lecturers and students in searching scientific and technical information for research activities. The library has a computer lab with 63 desktop computers and 30 tablets equipped with internet access for studying and researching. The library is also equipped with a computer system to look for and borrow reference books *[Exh.9.7: Library infrastructure]*.

The library offers self-study space for teamwork activities of lecturers and students. In order to improve the quality of the library's services, the user's satisfaction surveys are regularly conducted every semester. Based on the results of the survey, the library will continue to improve the service quality *[Exh.9.8: Results of students' satisfaction survey on library]*.

9.3. The laboratories and equipment are adequate and updated to support education and research

There are many workshops and labs for students of the MET programme listed in Table 9.1. Especially, the FME's High Tech Center, which has a wide range of modern CNC machines and equipment, was commissioned by a ODA project from the Austrian government. The quality of laboratories at FME has been continuously updating with equipment and software, etc. Besides, the university provides sufficient materials for practice and experiment every semester. At FME, the laboratory staff are capable of providing appropriate services for students as well as lecturers to study and research. The laboratory heads are selected from experienced staff of practical and experimental skills. FME has also strong relationships with industry such as Intel, Samsung, Nike, Takako, Doosan, etc. in finding many scholarships and organizing internship programmes for students to update their specialized knowledge and skills of modern science and technology. In addition, the faculty has also received many funding sources of equipment for teaching and learning from businesses, such as Testing Equipment of Automation sponsored by SIEMENS, pneumatic and hydraulics controlled equipment of SMC company, equipment for technical design of OneCAD company, or devices for the

research and programming of industrial robot from AB company, etc. *[Exh.9.9: The facilities and equipment of FME]*.

Table 9.1: List of Laboratories and Workshops for learning and practicing

No	Laboratory/Workshop title	Room	Courses
1	CNC Milling Lab	E1-307	Advanced CAD/CAM-CNC Practice
2	CNC Turning Lab	E1-305	Advanced CAD/CAM-CNC Practice
3	Computer Base Training System Lab	E1-303	Application of CAE in Design, Practice of CAE
4	Smart CMM Machine Lab	E1-304	Experiments on Mechanical Measurement
5	Rapid Prototype Machine	E1-308	Practice of rapid prototyping and reverse engineering technology
6	Practise workshop	Section E	Mechanical Works Practice, Basic Turning Practice, Basic Milling Practice
7	Manufacturing Process Automation Lab	Section E	Experiments on Automation of Manufacturing Process
8	Industrial Robots Lab	02CNC1	Industrial Robots
9	Electrical & Electronics Engineering Lab	Section E	Electrical and Electronics Engineering
10	Digital Techniques & Microcontroller Lab	02CNC1	Experiments on Digital Techniques and Microcontroller
11	Pneumatics - Hydraulics Lab	02BTBD	Pneumatic & Hydraulic Technology
12	Engineering Materials Lab	02TKM	Experiments on Materials Science
13	Metal Technology Lab	Section E	Metal Technologies
14	Welding Lab	Section E	Welding Practice
15	Mechanical Measuring Lab	Section E	Experiments on Mechanical Measurement
16	Plastic Technology Practice	Section E	Practice of Technology Plastic Application
17	CAD/CAM-CNC Lab	Section E	Experiments on CAD/CAM-CNC Practice on Mold Design and Manufacturing
18	Electrical Discharge Machining Lab	Section E	Electrical Discharge Machining Technology, Experiment of EDM
19	CNC Lab	Section E	CNC Practice,

In order to utilize the equipment, the university places instruction manuals next to the equipment in every laboratory. The Equipment and Maintenance Office also coordinates with the technical staff of the faculties to carry out maintenance and repair the equipment in accordance with the school's maintenance and repair procedures every semester. When any equipment is damaged, staffs may request maintenance service by filling in the equipment maintenance request form with the confirmation of the head of unit and send it to the EMO. If any equipment is not able to be repaired, then the replacement will be considered. In addition, a budget of 300,000 USD a year is spent to equip more devices and equipment, fix machines or repair the buildings excluding what is for new construction and research projects. Furthermore, the university evaluates the effectiveness of using

equipment every semester and asset inventory at the end of each year re-evaluate the depreciation level of equipment according to regulations. Since 2014, the university has conducted satisfaction survey on the service quality and working environment of the school, particularly the satisfaction of students about the equipment for teaching and learning. As a result, more than 94% of them are very satisfied with the laboratories and workshops *[Exh.9.10: Students' satisfaction survey on laboratories and equipment]*.

9.4. The IT facilities including e-learning infrastructure are adequate and updated to support education and research

So far, the university has applied information technology and IT equipment effectively in improving the teaching and learning activities, research and management works of the university. All faculties and departments in HCMUTE are internet accessible working places. Free Wi-Fi access is also provided in related areas such as laboratories, specific classroom areas, halls, libraries, etc. to enhance and extend the learning activities outside the classroom. At present, the total number of computers in the school is 2069, of which the number of computers for learners is 1512. The number of computers for staff in functional offices is 577 computers. Most of the University's computers are connected to the internet, via leased lines of over 320 Mbps and twelve lines of 12 Mbps FTTH *[Exh.9.11: IT facilities]*.

The commercial PSC system (powered and designed by PSC Vietnam) for management of training, assets, library, human resource, and satisfaction surveys of students and employee on the working and learning conditions of the university is also implemented and improved every semester. Besides, the school also provides Gmail foundation's official email accounts for lecturers and students. This system is the place to store and manage the general database of a huge number of activities in a convenient and effective way. The school's Finance and Planning Office is also equipped with the specialized Misa software to support the office staffs to be able to perform the financial works correctly and much easier.

Furthermore, FME as well as functional offices have their own websites to provide helpful information. The faculty website has a friendly and easy-to-use interface for searching information on education, scientific research, academic issues such as exam questions and answers, scholarships, internships, activities of Youth Union and Alumni. In addition, HCMUTE has a large investment in Digital Learning Center which actively supports lecturers and students in E/M learning and implementation of online courses. There are more than 1,000 lectures uploaded to the Internet by HCMUTE lecturers through *www.lms.hcmute.edu.vn*. This system is also used for online exams and conducting surveys. Support websites for faculty, staff and students in lecturing, learning and management are available at *www.lms.hcmute.edu.vn*; *www.online.hcmute.edu.vn*; *www.dkmh.hcmute.edu.vn*; *http://eoffice.hcmute.edu.vn* ; *[Exh.9.12: Digital Learning Center]*.

9.5. The standards for environment, health and safety; and access for people with special needs are defined and implemented

In a clean and green environment, health and safety are always respected throughout the 56 years of development of HCMUTE. Since 2000, to have a clean and green environment, the campus has banned smoking to keep the atmosphere clean and fresh. The neat and clean landscapes of the university campus are maintained and taken care by a professional cleaning service company. Additionally, wheelchair access is available at almost all parts of the campus. On November 20th, 2017 the university inaugurated football court and a multi-purpose sport hall with arches for students to participate in different sport activities.

Health and safety are top priorities at HCMUTE. The laboratories and facilities at FME are fully equipped with standard equipment. Fire extinguishers with valid expired dates and first aid kits for all laboratories and workshops are in place. Fire protection system is regularly inspected for maintenance or replacement. All students are required to observe strictly the safety regulations at every laboratory and at the end of each practice shift, they must clean the entire workshop area. In

case of emergency, students should follow emergency procedures, report to the head of the laboratory and call emergency number. Above and beyond, in order to have a safe campus, the security team must be 24/7 on duty *[Exh.9.13: Regulation, pre-test, emergency protocol]*.

In addition, the Medical Center supports periodic health check, medical insurance, accident insurance for both staff and students, food safety inspection at the canteen and two dormitories, and spraying pesticide to kill harmful insects to prevent diseases *[Exh.9.14: Health care]*. Besides, the Student Services Center has functions of supporting students in study, part time jobs, entertainment, physical activities and life skills training as well as providing the facilities, learning environment, extra activities, and social activities for them to experience and practise their skills *[Exh.9.15: Student services center]*.

In summary, the infrastructure of HCMUTE and FME sufficiently meet the requirements of the MET programme and others. Classrooms, labs, workshops, libraries, computer labs and a well-equipped and updated learning space will effectively assist students in study and research. The clean and fresh campus is such an ideal and impressive working and studying environment for staff and students that only a few universities in Vietnam possess.

CRITERION 10: QUALITY ENHANCEMENT

10.1. Stakeholders' needs and feedback serve as input to curriculum design and development

The MET programme was first established in 2000 and it has evolved through four versions. Governing the reviewing and revising procedures of curriculums are the ISO procedures that define an explicit PDCA process for planning, making surveys, analysing the results and proposing improvement actions for the satisfaction of stakeholders. There is one procedure evaluating the satisfaction of stakeholders including students, alumni, and employers related to the training curriculums. The other assesses the students' satisfaction toward the in-campus services. Every one or two years, the FME also holds workshops to meet and collect feedback of their stakeholders related to the training programmes. Whenever a new curriculum is initiated, MET academic staff play a key role in formulating the new ELOs of the programme that would take into consideration of all stakeholders' feedbacks *[Exh.10.1: ISO procedures for the curriculum design and development]*.

The feedback from different groups of stakeholders motivates the MET curriculum reform. The MoET gave strategic instructions to their educational systems - "Fundamental and comprehensive innovation in education". Professional associations rank essential working competencies in higher priority than knowledge and content. Consequently, by carefully considering the requirements of labour market via annual meetings and workshops with employers and alumni, the 2012 and later the 2018 curriculum versions has changed noticeably compared to the last 2008 version. The ISO procedures further require annual meetings and contribution of teaching faculties and the Academic and Scientific Committee (ASC) of the FME to the development of each programme. Eventually, students – the direct internal verifiers – must experience and assess all the transformation of the programme and give valuable feedbacks by means of surveys on teaching quality of lecturers, service quality of functional offices. Every year, they also have two scheduled meetings with Dean Board and Department Heads, and then with Presidential Boards to provide direct feedbacks to any need-to-improved issues during the semester. The employment survey of newly graduated alumni after 3 months and after 1 year also forms valuable inputs for the MET curriculum development. Amelioration from the feedback of stakeholders has been taken and tabulated in Appendix 4 *[Exh.10.2: Inputs & feedback of stakeholders for the curriculum development]*.

10.2. The curriculum design and development process is established and subjected to evaluation and enhancement

In HCMUTE, the curriculum design and development are implemented under the management of a standardized ISO procedure. This procedure was established in 2005 and it has just been revised in

2015. According to this procedure, major review period for every curriculum based on stakeholders' needs and feedback is at least once in every two years. Annually every programme is also allowed to have minor revision from 5 to 7% of the specialized courses *[Exh.10.1: ISO procedures for the curriculum design and development]*.

At the beginning of every new designing cycle of the curriculum, the Head of MMT Department and his academic staff are responsible for designing the curriculum. The consentaneous ELOs will be sent to the ASC of the FME for preliminary approval before it is officially submitted to the AAO. During this process, feedback from all stakeholders (employers, students, alumni, academic staffs) are carefully taken into consideration. For the last 10 years, the MET programmes has undergone 3 major revisions streaming to the contemporary feedbacks of both internal and external stakeholders. The current active curriculum in 2012 has been revised from the last programme in 2008 by integrating 186 credits down to 150 credits. The latest major evaluation episode of the current programme regarding to the curriculum framework was in December 2015. Since then, it has been continuing to revise to the new 2018 curriculum with 132 credits *[Exh.10.3: Evaluation report for the curriculum implementation in Dec 2015]*.

The MET programme in HCMUTE was designed based on the results from several workshops that benchmarked the current programme against the Mechanical Engineering curriculums of the two most prestigious universities, including one in Vietnam (Hanoi University of Science and Technology *[https://www.hust.edu.vn/]*) and one abroad (Arizona State University *https://www.asu.edu/*) *[Exh.10.4: Curriculum benchmark]*.

The MET programme in HCMUTE is targeted to fulfil the human resource in the South of Vietnam. Recently, in order to comply with important milestones of the country such as the participation of Vietnam into the ASEAN Economic Community (AEC), Trans-Pacific Partnership (TPP) as well as the integration of the school to other international associations, a new curriculum with 132 credits in total has been developed and will be implemented from the next cohort 2018. Due to the feedback from alumni and employers, several important amendments to this curriculum including:

- Courses are integrated to streamline the curriculum;
- Six credits are reserved for students to study interdisciplinary courses;
- Internship is reallocated to start from semester 7 compared to the last semester of the current curriculum. The duration of internship is also lengthened 15 weeks, equivalent to three credits instead of two credits.

10.3. The teaching and learning processes and student assessment are continuously reviewed and evaluated to ensure their relevance and alignment

The teaching and learning processes and student assessment are the core activities during the implementation of a programme. A consistent quality control and continuous improvement of the programme are managed by series of the HCMUTE's ISO procedures. During the teaching implementation, the Inspection Office helps to track the compliance to the teaching statute of lecturers. The department board makes schedule for random classroom observation to check the appropriate teaching plan and to assist lecturers in their teaching quality and methods. At the assessment stage, they are also in charge of planning and securing the alignment of assessment to the ELOs of the courses *[Exh.10.5: ISO procedures of assuring teaching and learning quality]*.

Teaching, learning and assessment processes are collected, analysed and evaluated from various channels for continuous improvement. Classroom observation is one of the regular activities that are well planned before every semester. Senior lecturers will visit younger teachers' classrooms that teach the same group of courses to give timely support regarding teaching approaches and professional knowledge. Mutual classroom visits are also encouraged within the FME for the purpose of academic exchange. Enhancement of teaching practices is further exchanged at the end-semester meetings of the department or through the FME's seminars. During their learning, students

are also encouraged to fill out the online teaching evaluation surveys for the courses they attend *[Exh.10.6: Review and evaluation of teaching quality]*.

Quality teaching involves active engagement with students and allows them to develop and apply their knowledge and skills to real-world problems. Teaching and learning processes in the programme level also show innovation when previous curriculum mainly focused on teaching engineering skills, the current curriculum has interpersonal skills and self-study skill reinforced. In this programme, active learning, cooperative learning, and project-based learning methods are popularly used. Blended learning and flipped teaching make good use of the HCMUTE's LMS to promote the self-study ability of students at home whereas the face-to-face time in class is reserved for discussion and team-work to increase their engagement. Several courses use English teaching materials whereas some specialized courses are also partly taught in English to enhance the students' competency in foreign language *[Exh.10.7: Improvement in the teaching and learning activities]*.

Quality assessment supports quality of learning. Innovation in students' assessment was brought to this programme as well as to the whole university when HCMUTE has designed the theme of assessment innovation to develop learners' competence as the annual academic campaign goal since 2014-2015 school year. The key concepts of this campaign are to raise the contribution of formative assessment to 50% instead of 20-30% compared to previous years. The number of the assessment is increased and the approaches are also varied throughout the semester to give students earlier feedback for their study instead of only two assessments in the past (one midterm test and one final test). The purpose of the assessment is to build students' capacity and motivation to do the task. They are called as student-friendly assessments. The characteristics of effective assessments are purposeful, actionable, coherent and explicit. Assessment also needs to ensure validity, reliability and consistency. Criterion-referenced assessment based on rubrics and marking schemes will assure the objectiveness. Rubrics are intensively used for the assessment of presentations, course projects, experimental and practice courses and especially capstone projects *[Exh.10.8: Improvement in assessment activities]*.

10.4. Research output is used to enhance teaching and learning

The two key missions of HCMUTE are to develop technology and education in engineering. Lecturers besides teaching are also required to do researches and to make public services. These are three tasks assigned in the KPIs system to evaluate the performance of each staff. This KPIs system is also quite flexible with alternatives of different percentage for each task. Teachers are encouraged to do researches to reinforce their majors as well as to bring the soul into their lectures. Many research products have been used to demonstrate and assist the theoretical teaching. Besides engineering and technology researches, MET's lecturers and particularly the HEEAP alumni apply their education and training experience from Arizona State University into the programme and they also usually share their results by participating in the annual VEEC (Vietnamese Engineering Education Conference) and STEMCON (The Science, Technology, Engineering, & Math Conference) *[Exh.10.9: Research outputs of teachers support teaching]*.

Figure 10.1: Prototype of an injection-molding machine to support teaching in the classroom

Undergraduate students are encouraged to discover novel ideas or creative concepts by doing researches. They can receive essential supports from either supervising from supervisors or finance from the school. MET students have also attended national and international competitions and won a number of awards *[Exh.10.10: Students' research outputs]*.

10.5. Quality of support services and facilities (at the library, laboratory, IT facility and student services) is subjected to evaluation and enhancement

The curriculum, the teaching-learning methods and student assessments are the unity and inseparable of a programme. However, it is the support services and facilities make it distinct. The quality of support services and facilities at HCMUTE from the library, laboratory, IT facility, dormitory to student services is frequently evaluated. The survey of several activities with annual cycle includes students' satisfaction on the quality of the services, staff's satisfaction on the working environment, alumni's satisfaction of the programme and the facilities usage evaluation. Other services collect the customers' evaluation more regularly. The library carries out surveys of students and lecturers for their services. The dormitory surveys boarding students for the living and studying conditions, sports and cultural activities. The student services centre appraises their activities and services from attended students to serve them better *[Exh.10.11: Support services and facilities evaluation]*.

From all the above evaluations, many actions have been taken recently. To support teaching and learning activities, smart LED TVs replace projectors that are hard to facilitate multimedia resources as well as to connect to the internet. The laboratory equipment are replaced and renewed every year to keep up with the advancement of new technology. With the inauguration of the digital learning centre, lecturers have another effective tool to build their courses on the LMS that could help to enhance the self-study of their students *(https://lms.hcmute.edu.vn/)*. In 2016, the HCMUTE is deploying an infrastructure project to build a new 8-floor building that is especially reserved for classrooms and experiment and practice laboratories. Wi-Fi system is strengthened in the Administration Hall, around the library and in many other learning open spaces in the campus. Less network congestion occurs while students simultaneously enrol for courses thanks to the solution of AAO. Two more new self-study areas in the basement and on the 5th floor of the Centre Building were inaugurated in October 2016 and September 2017, respectively. Finally, the library - the heart of a university - has established their modern electronic information gate since 2012 to provide valuable and instant electronic resources to readers. International journal access accounts have been bought and provided to key research groups.

10.6. The stakeholders' feedback mechanisms are systematic and subjected to evaluation and enhancement

The quality assurance activities of the HCMUTE are managed by a consistent ISO system that defines in detail the feedback gathering mechanisms and their scheduled occurrence. All sorts of stakeholders' feedback are collected regularly throughout the school year with various collected alternatives from online to direct contact. A summarized table for these surveys is presented in Table 10.1.

Table 10.1: Types of survey

No	Survey's name	Object	Times/ year	Time	Implementation methods
1	Teaching quality survey	All students	2	In the late of each semester	Online (PSC) *online.hcmute.edu.vn*
2	New graduates survey	Students graduating within 3 months	2	May and November	*http://danhgia.hcmute.edu.vn/*
3	Alumni survey	Students graduating more than one year	1	October	*http://danhgia.hcmute.edu.vn/*
4	Students' satisfaction on service quality survey	All students	1	January	*http://danhgia.hcmute.edu.vn/*
5	Staff satisfaction on workplace survey	All current staff at HCMUTE	1	November	*http://danhgia.hcmute.edu.vn/*
6	Employers survey	Companies	1	October	Paper/Online

Feedback from stakeholders are well structured and implemented following the PDCA process. This process focuses on improvement activities after gathering all feedbacks from stakeholders. The cycle that the MET programme is taking is clearly illustrated by the feedback gathering mechanism in Figure 10.1. It shows a hierarchy system which categorizes different sorts of surveys as well as the specific departments in charge. How the data is analysed and processed and who are in charge of taking improvement actions are also defined in this cycle.

For the internal feedback collection of students and academic staff, the period is twice a year. Students are surveyed for the quality of teaching activities starting from the second half of every semester. With these early feedback, lecturers can make instant changes to enhance the learning process. Their feedback for the support services is collected annually and taken online. The QAO is mainly responsible for the feedback, of which reports are sent to each department involved. On the other hand, academic staff can have their feedback provided via the meetings of the department, seminars of the FME in every semester and through the year-end summation of the school *[Exh. 10.12: Systematic feedback mechanisms for stakeholders]*.

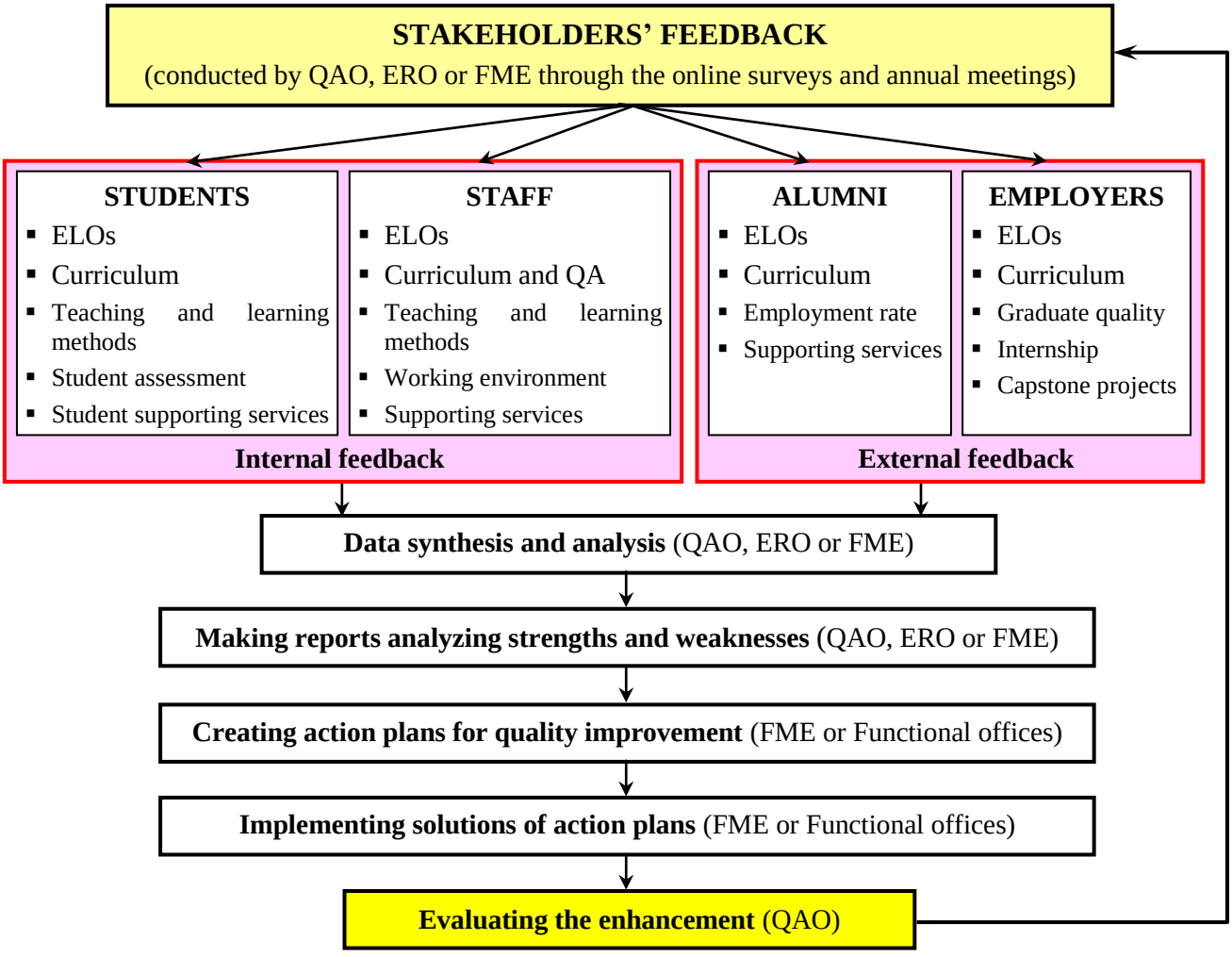


Figure 10.2: Stakeholders' feedback gathering and analyzing mechanism

The external feedback from employers and alumni are collected once a year. In the school level, the ERO collects general feedback of all employers and partners who recruit the HCMUTE's students when they hold the Career Day and job fair. However, each Faculty also have their own contact with employers to collect the recommendations for their specialties. Graduates are requested to have their feedback 3 months after graduating to collect the employment rate.

During the last five years, the feedback mechanism of HCMUTE has made considerable enhancement:

– Surveys are regularly revised after every semester to meet the requirements of stakeholders.

– The feedback system has been improved since 2013. With the advance of online education management system, all surveys are well organized and structured.

– New procedures require all departments have to make plan for their QA activities and make report for any improvement evidence followed the PDCA plan they have made.

– New sorts of survey are implemented such as survey on students' satisfaction for service quality, survey on workplace satisfaction of HCMUTE staff.

CRITERION 11: OUTPUT

11.1. The pass rates and dropout rates are established, monitored and benchmarked for improvement

Before 2014, the pass rates and dropout rates data are collected and reported to the President board by the AAO and the ASAO. Using the education management software, the Dean board can monitor this data and giving solutions to improve the pass rates as well as the dropout rates. Since 2014, the AUN-QA-based quality assurance model has been implemented at HCMUTE, starting with the development of the student data monitoring system, Dashboard *[http://dashboard.hcmute.edu.vn/]*. The monitoring and managing procedure can be described as follows:

✓ At the beginning of an academic year, the faculties have to establish the strategic plan according to the ISO corrective and preventive action procedure *[Exh.11.1: FME strategic plan]*.

✓ Dean board and Head of Departments can access to the Dashboard system to monitor the course's pass rate at the end of each semester and the programme's dropout rate and pass rates at the end of each academic year.

✓ Faculties report the analysis results and action plan as well as solutions to improve the pass rates and dropout rates at the end of the academic year. Large-scale affairs should be listed in the Quality objectives of the faculties. For even higher scale works, it should be proposed to be put in the Quality objectives of the university so it can be done in cooperation with other units in the university such as to increase the employability rates for students right after graduation.

Using the analysis data, the faculty and department have addressed the reasons that caused students difficulties in completing the programme on time as well as the causes of student dropout and many solutions have been issued and implemented to improve the situation. The system helps the faculty and department be able to monitor the study progress of every student, analyse and make solutions to help students keeping up with their study plan and graduate on time. Table 11.1 shows the pass and dropout rates of MET students in the last ten years. The average on-time pass rate (within four years) is 40%, which is relatively low compared to the expectation of the faculty. The main reasons that led to this fact can be listed as: many students couldn't qualify the output English requirement for graduation; student failed the course projects; students paused their study due to personal reasons, etc. The department has worked on many solutions to help students improve their studying.

As can be seen in Fig. 11.1, the pass rate tended to increase. In 2012, due to the implementation of the new regulation on English output qualification many students could not complete the programme in four years. This new regulation is one of the efforts of HCMUTE in improving the quality of graduates to meet the industrial needs and international integration. In order to maintain and improve the pass rate of the HCMUTE students, English classes have been frequently organized to help students improve their English proficiency.

Table 11.1: Pass rates and dropout rates of MET students in last nine cohorts

Academic years	Cohort Size	% completed first degree in			% dropout during			
		3 year	4 year	> 4 year	1st year	2nd year	3rd year	> 4th year
2017-2018	139	-	-	-	-	-	-	-
2016-2017	173	-	-	-	1.73	-	-	-
2015-2016	157	-	-	-	2.54	1.27	-	-
2014-2015	147	1.36	59.90	27.21	2.72	1.36	1.36	2.04
2013-2014	157	0	52.29	31.21	3.18	2.54	1.91	1.91
2012-2013	125	0	38.40	43.20	3.20	2.40	3.20	2.40
2011-2010	92	0	46.74	38.04	4.34	3.26	3.26	2.17
2010-2011	101	0	40.59	45.55	4.95	2.97	2.97	2.97
2009-2010	80	0	26.25	51.25	5.00	6.25	5.00	6.25

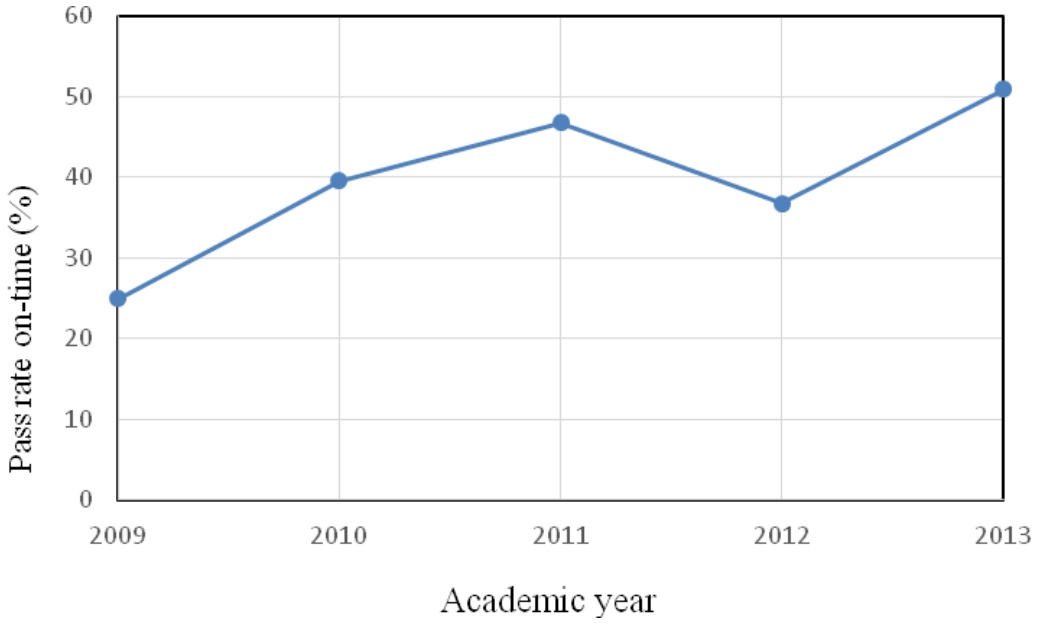


Fig. 11.1: Pass rate of MET students

Table 11.2 shows the statistics of the pass rates within 4 years and dropout rates of the MET students in recent years. It proves that the dropout rate had been decreased significantly over the years. This is because the faculty was successful in giving solutions to help students overcoming their personal difficulties, especially the financial issues and to improve the programme curriculum. The list of solutions for the major issues proposed by the FME to improve the pass rate and dropout rates as shown in Table 11.3.

Table 11.2: Programme pass rates (on-time graduation) and dropout rates

Cohort	2010	2011	2012	2013	2014
On-time pass rate (%)	40.59	46.74	38.40	52.29	61.26
Dropout rate (%)	13.86	12.28	11.20	9.54	7.48

Table 11.3: List of solutions for continuous improvement

No	Issues	Solutions
1	Certain number of students cannot obtain the English language qualifications to graduate and cannot be recruited by foreign companies	Organize frequently supplementary English classes Organize free English class with invited foreign volunteers Establish Skills and English Club to help students increase their skills and knowledge
2	Students have struggled to finish some hard subjects and the course projects due to its specialized content	Open extra classes related to the hard subjects and course projects Organize course review before the final examination (one week) in order to support students in solving difficult problems Encourage lecturers to use TAs to support students in solving exercises and explain concepts
3	Conditions and procedure for registration of retraining	Enhance the procedure for course registration for students who cannot register the courses using the online system
4	Students have problems with their personal life, exam, extra-activities, lab work, financial difficulties, and psychological problems, etc.	Establish the FME consulting team who may meet and talk to students as well as answer their questions via emails, messages on FME website and social networks
5	The ability and knowledge of student do not meet the requirements of the training programme	Transfer students who do not achieve enough 150 credits within a given time frame to lower training levels
6	Decreasing dropout rate is one of the main missions of FME	Organize periodical meetings to find the root causes and suitable solutions in order to stay interested and inspire in the major
7	Student must be both knowledgeable and skilful in technical fields in order to impress the recruiters or to be fully employed	Combine internship and capstone project to do practical project to prepare work-ready skills Encourage students to join Technical Skills Club and Machinery exhibitions, etc. Organize workshop and factory visits to connect students and employers

11.2. The average time to graduate is established, monitored and benchmarked for improvement

Table 11.4 shows the graduation rate of the MET students for cohorts of 2009-2013. Due to the specifics of the engineering programmes, the graduation rate is acceptable. Due to the maximum training time is 8 years, students from cohorts 2011-2013 have been pursuing the programme and graduation rate must be increased. FME have made many efforts to enhance the rate of on-time graduation and the graduate quality with many solutions as shown in Table 11.5. Beside the consultation activities and efforts in improving the support services, the curriculum has been revised and improved to reduce the studying stress of students but still ensure the ELOs.

Table 11.4: Graduation rate of MET cohorts from 2009 to 2013

Cohort	2009	2010	2011*	2012*	2013*
Within 4 years	26.25	40.59	46.74	38.40	52.29
More than 4 years	51.25	45.55	38.04	43.02	31.21
Total	77.50	86.14	84.78*	81.60*	83.58*

** Students of cohort 2011, 2012, 2013 are still pursuing the programme*

Table 11.5: List of solutions to ensure graduation within 4 years

No	Issues	Solutions
1	Students loose their interest in some subjects because they cannot find the applications in real life.	Add more elective courses so that students can select and learn with interest.
2	Students use their self-study time for part-time jobs, instead of reading material or doing homework.	Emphasize how shallow understanding of specialized content affects their future career in the orientation meetings and regular talks.
3	Financial problems related to tuition fees and living costs have distracted several students.	+ Raise funds to award faculty's scholarships for good students having financial difficulties. + Call for sponsorships from alumni and stakeholders.
4	High failure rates in demanding subjects.	+ Make a course review before the final exam. + Encourage lecturers to make best use of teaching assistants to help students with classroom activities.
5	It is not emotionally easy for students to retake the course if they failed in their first time.	+ Have talks with them to reduce their stress + Train these students more learning strategies + Organize some tutorials to help them with academic problems
6	Some students find it hard to hold the English language qualifications as a requirement for graduation	+ Ask students to take the mock tests organized on school campus + Encourage students to take part in the existing English speaking clubs + Cooperate with the Youth Union to organize free TOEIC, listening and speaking classes
7	Personal matters such as conflicts, unpleasant experiences or social life have brought difficulties to students.	+ Encourage peer support so that students can share their difficulties with their friends first + In case they need help, the consultants are always available to listen and give them useful advice
8	Several students are not interested in doing scientific research.	+ Make the academic competitions more lively and interesting + Financially support students' own research
9	Some students cannot accumulate minimum credits per semester due to unexpected errors in course registration.	+ Cooperate with AAO to help students who fail to register in their first time + Publicly announce the registration plan via FME Faculty's websites, emails and social networks.

11.3. Employability of graduates is established, monitored and benchmarked for improvement

Recently, the online survey of the graduate after three months of graduation, instead of paper surveys which were conducted before 2014, is conducted by the Quality Assurance Office using an ISO-based procedure. The survey is sent to students before they come back for the graduation ceremony *[Exh. 11.2: Graduates feedback]*.

Table 11.6 and figure 11.2 show the employability of FME graduates in recent year. In general, the survey data shows that the employment rate of the FME graduates tends to increase which proves the effort of the FME in improving student work ready skills and industry cooperation with many job fairs, training seminars, etc. (Criterion 8). As can be seen in the survey results, an average rate of 36% students found a job immediately after graduation. This shows the efficiency of the job fair activities and career orientation provided by HCMUTE. After three months, the number increase to

68.3% which is also a very high rate compared to the common rate in Vietnam. The remaining graduates want a better job or study higher, and some of them are trying to be self-employed, but most of them have got a job after six month to one year.

Table 11.6: Employment rate of MET graduates 2014-2018

Graduation time	**9/2014**	**9/2015**	**9/2016**	**9/2017**
Survey time	**12/2014**	**12/2015**	**12/2016**	**12/2017**
Immediately after graduation (%)	34.3	32.9	34.5	44.2
Within 1 month after graduation (%)	21.3	24.7	31.5	20.0
Within 3 months after graduation (%)	7.9	7.9	6.4	7.6
Accumulation for duration of 3 months (%)	63.5	65.5	72.4	71.8
Still looking for a better job (%)	29.8	27.7	13.6	13.5
Pursuing another plan in future (%)	6.7	6.8	14.0	14.7
Average rate of employment after 3 months (%)	**68.3**			

After one year, more than 95% of the students from MET and FME get a job and most of them find the job that satisfy their expectation. Among many programmes, the employability situation of the MET students is seen to be very bright with growing need from the industry. The development of the manufacturing industry in recent years brought to Vietnam a huge number of job opportunities in the area of the CAD/CAM-CNC and mold industry. Many MET students have got job right after graduation or even during their last semester in private and FDI companies in their studied fields. Among that, many students have got desired jobs with high paid salary (500-1000 USD/month).

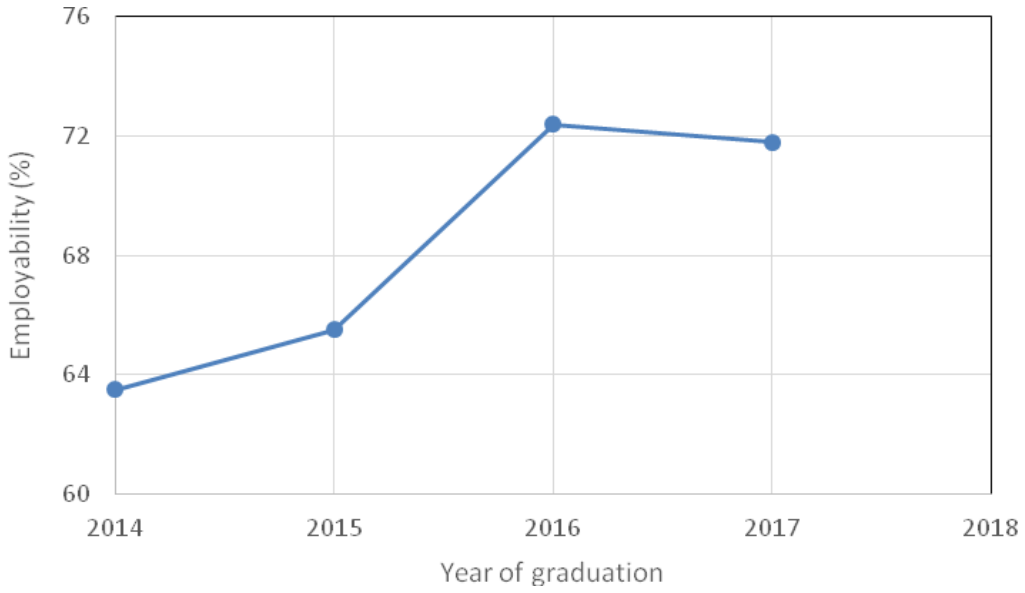


Figure 11.2: Employability rate of FME graduates in recent years

HCMUTE students are always the top selection for head-hunters and employers based on the survey conducted by the FME and ERO on the satisfaction of stakeholders about the quality of graduates. Many students were found to be employed before graduation and right after graduation. This is due to the continuous improvement model running at HCMUTE. Through many admission consultation and orientation activities, HCMUTE attracts a huge number of high quality intakes, facilitate and guide them to success. Students are encouraged to improve their skills and knowledge to engage in real life issues through many courses and research projects as well as co-curricular and extra-curricular activities, as shown in Table 11.7 *[Exh. 11.3: Employer survey sample and results]*.

Table 11.7: Co-curricular activities

Events	Date	Note
Job fairs	1-4 August 2018	45 companies attended
	22-23 May 2018	42 companies attended
	20 March 2018	ESUHAI recruits 50 employees working in Japan in 2019
	15-20 January 2018	39 companies attended
	24 September 2017	45 companies attended
Seminars	9 March 2018	Topic: Nestlé career talk show (Nestlé company)
	19 October 2017	Topic: Green building design of energy saving (Aurecon company)
	16 October 2017	Topic: CNC control technology on the computer (Beckhoff company)
Scientific competitions	12 April 2018	Topic: "Go green in the city 2018" of Schneider electric company
	29 September 2017	Topic: Design and manufacture Koma Taisen

11.4. The types and quantity of research activities by students are established, monitored and benchmarked for improvement

HCMUTE students are always encouraged to participate in research projects during school years. The research activities can be a student project, a scientific competition, a student science club or supporting research projects of the school academic staffs, etc. The research activities help students improving not only their knowledge but also the team work skill which are strongly aligned to the expected learning outcomes, vision and mission of the university and FME. Any student can be registered for participating in a research project. They can join with others to form a research group of maximum four students supervised by a lecturer or researcher. A project should be finished after one year and will be evaluated. Financial support will be given so that students can focus on research and improving the outcomes of the project. Instruction can be found in the ISO procedure of implementation and management instruction for student scientific research project *[Exh. 11.4: Student scientific research implementation guideline and management]*.

The number of HCMUTE student research projects in five recent years is shown in Table 11.8. It can be seen that even though the number of FME student research projects is about the average level, the number is still very modest. To improve the research activities of FME students, every year, the FME makes quality objectives including the number of researches, of the faculty and assigns to each department. The aim of these researches must encourage students and motivate them in both studying and researching. In April, the research project applications are collected to the faculty for reviewing. After approval, the applied project will be send to the Science and Technology Management Office to register for next year research project. High quality project will be recommended for appropriate awards. Table 11.9 shows the list of FME student research awards from 2013 to 2018 *[Exh. 11.5: FME student research projects and awards]*.

Table 11.8:** The n**umber of HCMUTE student research projects 2013-2017

Faculty	Number of research projects					Average Number/year
	2014	2015	2016	2017	2018	
FME	3	11	11	9	11	**9.0**
FCE	6	5	10	8	9	**7.6**
FVEE	0	10	8	6	5	**5.8**
FEEE	0	23	29	8	19	**15.8**
Mean	2.3	12.3	14.5	7.8	11	**9.5**

Note: Faculty of Civil Engineering (FCE), Faculty of Vehicle and Energy Engineering (FVEE), and Faculty of Electrical and Electronics Engineering (FEEE)

Table 11.9: List of FME student research awards

Year	Award	Prize
2018	National Mechanics Olympic contest	3rd
2017	National Robot contest	3rd
2016	Holcim	4th
2015	Holcim	4th
2014	Shell Eco Marathon	1st
	Holcim	4th
	MoET	3rd
2013	Eureka	3rd

11.5. The satisfaction levels of stakeholders are established, monitored and benchmarked for improvement

So far, the university have implemented the PCDA based management system with clear instruction and criteria for monitoring and continuously improving the satisfaction of stakeholders including students, alumni, staffs and employers. To improve the satisfaction of the staffs, meeting with the administration boards (at both university and faculty level) is annually organized for all the staffs to give feedback on different aspects of their working condition in the university. The university administrators will receive the feedback and respond to all the feedback directly at the meeting or through documents after the meeting with solutions. From 2016, the academic staff also have another chance to ask for their right at a special meeting between the University President and staffs which has been conducted once a year.

In addition, online survey on the working condition is conducted every year by the QAO. The collected feedback is then reported to the university administrators for solutions to the criteria at which the satisfaction do not meet the required target. According to the survey reports, most of the staffs are satisfy with the service provided by the functional offices and the working condition. However, there are also aspects that need to be improved as suggested in the reports. In addition, the ratio of the staff conducted the survey is still very limited. Based on the survey reports, many improvement have been made *[Exh. 11.6: Staff survey reports]*.

Some improvements can be listed as follows:

– The teaching and learning facilities have been repaired and renewed.

– The income is increasing.

– Some policies have been released to motivate lecturers in improving the teaching and research activities.

– The Labor-Union canteen was built.

– Abroad travel tours were organized more frequently.

– More training courses were provided.

– Etc.

The Key Performance Indicators (KPIs) system has been implemented at HCMUTE to increase the fairness and equality to every staff *[http://kpis.hcmute.edu.vn/]*. The system will help the administrators in evaluating the performances of their staffs much easier and also help to reduce the suspicion among the staff about the unfairness and inequality. At the beginning of each semester, each staff will make individual targets for the coming semester. The plan will be approved by dean of the FME and head of departments. At the end of every semester, the targets will be evaluated based on the working performances during the last semester.

For students, many feedback channels were established to investigate their satisfaction. The feedback of students about the courses, programme, teaching and examinations can be reported through online survey, conversation between students and the administration boards at university and faculty level or through many other feedback tools such as suggestion boxes, hotline number, Q&A session on FME website, etc. The feedback will be reported to the department and faculty after every semester for analysing and improving *[Exh. 11.7: Student feedback]*.

Students can also give feedback through the conversations between students and the administration boards of faculties and university every semester. They can give their feedback directly to the president at the meeting every Thursday of the final week every month, as well *[Exh 11.8: Talks between HCMUTE/FME administration boards and students]*. Student can also give their feedback at the suggestion boxes or online through university website, email, social networks and also the hotline numbers. Then the collected feedback will be reported to the HCMUTE president. Quick and appropriate decisions and solutions will be implemented timely to help students having the best studying condition and environment. During each course students also have chance to give feedback through online surveys on the quality of the teaching activities before they can see their final exam schedule. The survey result will be then collected, analysed and transferred to each faculty to work out the solution if the evaluation is below the targeted satisfaction. Table 11.10 shows the rate of student satisfaction at different faculties. High rate of student satisfaction can be seen at all the faculty showing the efficiency of the education and service system at HCMUTE.

Another important stakeholder, which is the graduated students (alumni), is also surveyed twice a year to collect feedback about the education programme. On the graduation day (three months after officially graduated), the graduates will be asked to take survey about their status of employment, assessment on suitability of the training programme and course satisfaction. Based on the survey data from graduates, the education curriculum can be considered to be changed 5 to 7 % annually. In addition, every year in November, the annual home coming day (alumni meeting day) is organized at the FME. The evaluation of the alumni on the training programme will be surveyed and collected *[Exh. 11.9: The annual home coming day at FME]*.

Table 11.10: Comparison of student satisfaction among Faculties

Year	Faculty			
	FME	**FCE**	**FVEE**	**FEEE**
2015	84.8%	84.3%	85.2%	85.8%
2016	86.6%	86.8%	87.1%	88.4%
2017	88.1%	88.4%	86.9%	87.8%

Note: Faculty of Civil Engineering (FCE), Faculty of Vehicle and Energy Engineering (FVEE), and Faculty of Electrical and Electronics Engineering (FEEE)

Since 2010, the HCMUTE organizes annual meeting with the surround industry and conducts survey on the satisfaction of the employers to the quality of the HCMUTE graduates. In addition, during many job fairs hold at the HCMUTE, feedbacks from employers about the number of courses in training programme, time needed for the courses, important knowledge and skills, level of satisfaction with the graduates, etc., were collected *[Exh. 11.10: Surveys about satisfaction of employers]*.

Many solutions have been proposed to improve the quality of graduates as well as the satisfaction level of the stakeholders such as application of E/M Learning System which helps lecturers and staff interact easier with students, releasing regulation on teaching assistance which uses teaching assistants (TAs) to help lecturers with active learning and teaching activities in class; or policies of promotion and award for lecturers and staff who have excellent performance at work; and policy for encouraging lecturers to do research, etc.

PART 3: STRENGTHS AND WEAKNESSES ANALYSIS

1. Criterion 1: Expected learning outcomes

Strengths

- The ELOs of the MET programme have been aligned with the programme objectives, mission and vision of the FME and the university.
- The objectives and ELOs of the programme have been reflected the requirements of stakeholders.
- The ELOs cover both skills and academic knowledge. They are achieved based on the contribution of all courses and transmitted to the students thanks to active learning methods, scientific research activities.

Areas and plans for improvement

- The number of feedback from alumni and employers is limited, especially feedback from foreign companies.

2. Criterion 2: Programme specification

Strengths

- The programme uses both of the Programme specification and Course specifications that consist of elements required by the AUN- QA.
- The course specification is informative and shows the alignment of the CLOs to teaching approach, the assessment plan and methods as well as the teaching schedule.
- The programme specification has been communicating to the students via the faculty website while course specifications to them by LMS system.

Areas and plans for improvement

- There should be more elective courses in order to make the programme more adaptive to the rapid development of science and technology and the increasing demands of labor markets.

3. Criterion 3: Programme structure and content

Strengths

- The structure of the programme is aligned to the ELOs as shown by the contribution of the courses to achieve general, fundamental and specialized knowledge, hard and soft skills as well as attitudes.
- The programme has a proper balance between general and specific knowledge, between theoretical and practical training which helps students adapt easily to the real working environment.
- The programme has been up-to-date and met the requirements of the stakeholders.

Areas and plans for improvement

- FME will add some elective courses such as *Innovation and Start up*, *Leadership*, *Public relationship* into the curriculum to help students learn and attain more soft skills.
- The curriculum should give much more global experiences to the students and staff through exchange programmes or through visiting professors.

4. Criterion 4: Teaching and Learning Approach

Strengths

- The HCMUTE's educational philosophy of "Humanity, creativity, integration" is well articulated and translated to the quality policy of the FME and to the teaching and learning spirit of the MET's programme.
- Due to the advantage of being a university of technical education as well as an official member of some international programme (HEEAP, VULII, USAID-COMET, BUILD-IT) for education innovation, the MMT department's lecturers have applied lots of modern learning and teaching methods to deliver professional knowledge as well as to promote interpersonal skills of students.
- The availability of modern industrial manufacturing machines and facilities of the FME, the use of technology-based and e-learning with digital learning center have largely supported the teaching and learning strategies of the programme.
- Infrastructure and open learning spaces are available to support self-learning and promote life-long learning competency.

Areas and plans for improvement

- The English competency of students is still limited. More engineering courses should be taught in English and the recruitment of foreign teachers can also be considered to provide better environment for students to practice.

5. Criterion 5: Student Assessment

Strengths

- Through clear rubrics and marking detailed schemes, the student assessments will surely achieve validity, reliability and consistency.
- Apart from the assessment of specialized knowledge, extracurricular activities are also obligated and cared seriously to build engineering ethics.
- Employers take part in assessing process during the internships and capstone projects in order to minimize the gap between the university and industry.

Areas and plans for improvement

- Applying much more widely the LMS system in online formative assessments to help teaching staff save time and effort. However, to do this the internet should be invested properly.

6. Criterion 6: Academic staff quality

Strengths

- The number of lecturers in FME who graduated from developed countries such as Germany, Japan, Czech, Korea and Taiwan is large enough to ensure the quality of education as well as quality of research with high international publication.
- All staff of HCMUTE and FME master specific technology and are equipped with active teaching methods to conduct the curriculum.
- The policy of HCMUTE is to encourage lecturers to study abroad to improve the educational quality and the quality of the programme.

Areas and plans for improvement

- FME has planned to recruit more qualified staff that have PhD degree annually to improve the quality of staff.

7. Criterion 7: Support staff quality

Strengths

- The working performance of support staff is assessed in accordance with their KPIs score to ensure the equity. Furthermore, the quality of supporting activities is also considered by the periodic surveys from the students to improve the performance of support staff.
- The academic, social, and physical activities for students are hold by the FME support staff. Moreover, they have also given appropriate services in terms of the psychological career, finance and service for students.

Areas and plans for improvement

- In accordance with the sustainable development of the HCMUTE, more quality support staff need to be recruited and trained in the systematic way.

8. Criterion 8: Student quality and support

Strengths

- The orientation and consultation day for high school students, freshmen and the student support services are held frequently and effectively to help students solve several problems in studying, researching and future career selection.

Areas and plans for improvement

- Wi-Fi connection is good enough to support E-learning. The classrooms are not comfortable for students in active learning and teaching and all needs to have air conditioners.

9. Criterion 9: Facilities and infrastructures

Strengths

- Laboratories, libraries and computer rooms are appropriately equipped and frequently updated for supporting the learning, teaching and research activities of both the students and lecturers.
- Environmental health and safety standards meet the requirements.

Areas and plans for improvement

- Modern equipment and systems for laboratories and workshops should be fully developed.

10. Criterion 10: Quality Enhancement

Strengths

- The MET programme has a long history and large networks of alumni and employers that could help to provide a variety of perspectives for the curriculum design and development.
- Well-defined QA procedures established by QAO ensure for the validity, reliability and sufficient of feedback from stakeholders.
- Teaching staff have new mind-set for education innovation thanks to the efforts of international cooperation programs such as HEEAP, BUID-IT, COMET and VULII.

Areas and plans for improvement

- International publications of MMT staff that are still limited should be improved to enhance the teaching.

11. Criterion 11: Output

Strengths

- Graduates from MET strongly satisfy the requirement of the industry as the result of the strong bond of the quality between the university and companies.

- Many feedback channels were established for students and other stakeholders to help improve the quality of university services.
- Graduates have good jobs and can apply to graduate programmes from abroad universities.

Areas and plans for improvement

- More solutions should be adapted to improve student English proficiency and communication skills.
- The connection between faculty and alumni should be strengthened.

PART 4: APPENDICES

Appendix 1: MET programme specification

Training major: MECHANICAL ENGINEERING TECHNOLOGY

1. **Awarding institution:** HCMC University of Technology and Education
2. **Name of the final award:** Bachelor of Engineering (Mechanical Engineering Technology)
3. **Programme Title:** Mechanical Engineering Technology
4. **Mode of delivery:** Full time
5. **Training time:** the normal period of study is 4 years and the maximum period is 8 years.
6. **Admission criteria or requirements to the programme:**

   In order to get admission to the MET programme, high school candidates have to take the National High School Graduation Examination that is held annually on June by MoET. The MET programme enrols students in one of four groups: Group "A00" with 3 subjects (Mathematics, Physics, and Chemistry), Group "A01" with 3 subjects (Mathematics, Physics, and English), Group "D01" with 3 subjects (Mathematics, Literature, and English) and Group "D90" with 3 subjects (Mathematics, English, and Natural Science). The cumulative testing grade of candidates must be higher than the cut-off score set by the university based on the student admission quota from MoET. Additionally, FME reserves the maximum 25% of the annual admission quota for candidates who have graduated from specialized high school or won the prizes in the National Academic Examination, and for those who have international English certificates such as IELTS or TOEFL with good and excellent records.

7. **Programme aim:**

   The aim of MET programme is to graduate the Mechanical Engineers who have advanced knowledge and skills in the design, manufacturing and management of machinery, production as well as appropriate professional attitudes adapted to the development requirements of the major and society.

8. **Programme objectives:**

   The objectives of the MET programme are to prepare students to:

   1. Possess and apply the general knowledge, the fundamental and specialized knowledge of Mechanical Engineering Technology.

   2. Execute critical thinking and problem solving skills and professional skills and contribute to progress within their field.

   3. Adapt effectively in the professional environment in a global and societal context and be aware of lifelong learning.

   4. Conceive, design, implement and operate successfully mechanical engineering systems.

9. **Expected learning outcomes (ELO) of the programme**

   After successful completion of the programme, students will be able to:

ELO 1: Use general knowledge of mathematics, science and information technology to learn professional knowledge and pursue higher education.

ELO 2: Apply the fundamentals of mechanical engineering knowledge in reality.

ELO 3: Analyze and solve mechanical engineering problems.

ELO 4: Measure and interpret experimental data related to mechanical engineering in terms of professional skills.

ELO 5: Lead and work effectively in individual and group-oriented settings.

ELO 6: Communicate effectively in different forms, such as writing, multimedia, graphics, and presentation.

ELO 7: Demonstrate the ability to use English in mechanical engineering, emphasizing on reading and writing skills.

ELO 8: Exhibit life-long learning capacity.

ELO 9: Appreciate different enterprise cultures, demonstrate professional behaviors and work successfully in industrial organizations.

ELO 10: Conceive, plan and manage the projects in accordance with the industrial requirements.

ELO 11: Design and stimulate technological equipment and processes.

ELO 12: Manufacture parts and machinery by CNC machines.

ELO 13: Operate and maintain CNC systems.

10. **Course workload (Credits): 150** credits *(excluding Physical Education and Military training courses)*

11. **Teaching and learning method:** Students are encouraged to build their own understanding of the world by investigating and experiencing on their own under the coaching of instructors. The institution appreciates the core values of life-long learning by providing students with opportunities for a comprehensive development of cognitive, social and behavioural competencies. Through the learning process, individuals are stimulated to explore themselves and take the learning activities as a tool to fulfil their own aspirations and to serve the community.

12. **Student assessment method:** Student assessment in each course includes formative assessment and summative assessment with the weight distribution is divided equally, 50% for formative and 50% for summative assessment. The formative assessment is done in many times during the course and with many different methods. The summative assessment normally occurs at the end of course and measures the extent to which students have achieved the expected learning outcomes. Various types of assessment such as oral presentations, homeworks, exercises, multiple-choice questions, online questions and quizzes, written tests, laboratory tests, group work, course projects, etc. have been applied.

13. **Programme structure:**

Semester	Course Code	Course Name	Number of Credits		
			Total	Practice	Theory
1	MATH130101	Advanced Mathematics A1	3	0	3
	MATH130201	Advanced Mathematics A2	3	0	3
	ENGL130137	English 1	3	0	3
	GCHE130103	General Chemistry A1	3	0	3
	INME130125	Introduction to Mechanical Engineering	3	1	2
	VBPR131085	Visual Basic Programming	3	1	2
	GELA220405	General Laws	2	0	2

	PHYS130102	Fundamental Physics A1	3	0	3
	PHED110513	Physical Education 1	1	0	1
2	MATH130301	Advanced Mathematics A3	3	0	3
	DGED121023	Descriptive Geometry and Technical Drawing	2	0	2
	MATH130401	Probabilities & Statistics	3	0	3
	LLCT150105	Basic principles of Marxism & Leninism	5	0	5
	ENGL230237	English 2	3	0	3
	PHYS120202	Fundamental Physics A2	2	0	2
	(Elective)	General knowledge course 1	2	0	2
	MHAP120227	Mechanical Works Practice	2	2	0
	PHED110613	Physical Education 2	1	1	0
3	LLCT120314	Ho Chi Minh's Ideology	2	0	2
	PHYS110302	Experiment of General Physics	1	0	1
	ENGL330337	English 3	3	0	3
	THME230721	Mechanics in Engineering	3	0	3
	MEED241320	Mechanical Engineering Drawing	4	1	3
	ENMA220126	Materials Science	2	0	2
	TOMT220225	Tolerances and Measuring Techniques	2	0	2
	EXMM210325	Experiments on Mechanical Measurement	1	1	0
	(Elective)	General knowledge course 2	2	0	2
	(Elective)	General knowledge course 3	2	0	2
	(Elective)	Physical Education 3	3	3	0
4	FMMT330825	Fundamentals of Machinery Manufacturing Technology	3	0	3
	MATE211126	Experiments on Materials Science	1	1	0
	TMMP230220	Theory of Machine and Machine design	3	0	3
	BATP230327	Basic Turning Practice	3	3	0
	STMA230521	Strength of Materials	3	0	3
	METE210321	Experiments of Mechanics	1	1	
	LLCT230214	Vietnamese Communist Party’s revolutionary policies	3	0	3
	METE330126	Metal Technologies	3	0	3
	WEPR220425	Welding Practice	2	2	0
5	CACC320224	CAD/CAM-CNC	2	0	2
	ECCC310324	Experiments on CAD/CAM-CNC	1	1	0
	NUMC330424	Numerical Control Systems	3	0	3

	MATH131501	Applied Mathematics in Engineering	3	0	3
	BAMP220427	Basic Milling Practice	2	2	0
	PMMD310423	Project on Theory of Machine and Machine Design	1	1	0
	MMAT431525	Machinery Manufacturing Technology	3	0	3
	(Elective)	Fundamental knowledge course 1	3	0	3
6	ACCC330524	Advanced CAD/CAM-CNC	3	0	3
	PACC320624	Advanced CAD/CAM-CNC Practice	2	2	0
	PMMT411625	Project on Machinery Manufacturing Technology	1	1	0
	AUMP323525	Automation of Manufacturing Process	2	0	2
	EMPA313625	Experiments on Automation of Manufacturing Process	1	1	0
	ENME320124	English for Mechanical Engineering	2	0	2
	(Elective)	Fundamental knowledge course 2	2	0	2
	(Elective)	Specialized knowledge course 1	3	0	3
7	MOLD431224	Mold Design and Manufacturing	3	0	3
	PMDM421324	Practice of Mold Design and Manufacturing	2	2	0
	PTPA422224	Practice of Technology Plastic Application	2	2	0
	PNHY330529	Pneumatic & Hydraulic Technology	3	0	3
	PCNC422124	CNC Practice	2	2	0
	(Elective)	Specialized knowledge course 2	3	0	3
8	FAIN422324	Internship	2	2	0
	GRAT402424	Capstone project	10	10	0

Elective General knowledge courses: Students take at least 6 credits from the list below

- General economy (GEEC220105) (2 credits)
- Introduction to management (INMA220305) (2 credits)
- Introduction to logic (INLO220405) (2 credits)
- System thinking (SYTH220505) (2 credits)
- Plan skill (PLSK320605) (2 credits)
- Presentation skill (PRSK320705) (2 credits)
- Introduction to Vietnam culture (IVNC320905) (2 credits)
- Introduction to sociology (INSO321005) (2 credits)
- University learning technique (ULTE121105) (2 credits)

Elective Fundamental knowledge courses: Students take at least 5 credits from the list below

- Thermal Engineering (THER222932) (2 credits)
- Electrical and Electronics Engineering (EEEN230129) (3 credits)
- Digital Techniques and Microcontroller (DTMC240929) (4 credits)

- Experiments on Digital Techniques and Microcontroller (PDTM311029) (1 credit)
- Energy Source and Energy Management (ERMA321025) (2 credits)

Elective Specialized knowledge courses: Students take at least 6 credits from the list below

- Sheet Metal Forming Process (SHET331524) (3 credits)
- Application of CAE in Design (CAED321024) (2 credits)
- Practice of CAE (ECAE311124) (1 credits)
- Automatic Control (AUCO330329) (3 credits)
- Electrical Discharge Machining Technology (EDMT320824) (2 credits)
- Experiment of EDM (EEDM310924) (1 credit)
- Product design for sheet metal (PDSM431724) (3 credits)

14. **Job and Post-graduate study opportunities:**

Graduates from MET programme are able to:

- Work in the mechanical engineering factories and companies, in the fields of engineering services or R&D departments under the role of direct operators, facilitators or managers.
- Continue their higher study at the programme's national and international universities.

15. **Date on which the programme specification was written or revised:** written in February 2012 and reviewed in November 2015.

16. **Programme contact:**

Assoc. Prof. Dr. Truong Nguyen Luan Vu - Vice Dean

Email: luanvutn@hcmute.edu.vn

Phone number: 848-0909011136

Mailing address: 01 Vo Van Ngan, Thu Duc District, HCMC, VN

17. **Brief description of all required courses**

17.1. General education courses

1. Advanced Mathematics 1 **Credits: 3**

- *Distribution of learning time: 3 (3/0/6)*
- *Prerequisites: None*
- *Former subjects of condition: None*
- *Course description*: This course helps students review the general and advanced mathematical knowledge: Cardinality of a set: rational numbers, real numbers, complex numbers. Limit: function, limit of a function, continuous function. Differential calculus: derivative, differential, Taylor-Maclaurin expansion, the survey on function, curve in polar coordinates. Calculus of single variable: volume fraction uncertainty, definite integrals, generalized integrals. Chain: Chain number, string functions, power series, Taylor-Maclaurin sequence, Fourier series, Fourier expansion, trigonometric series.
- *Textbook:* K. Smith, M. Strauss and M. Toda – *Calculus* - 6th National Edition–Kendall Hunt.

2. Advanced Mathematics 2 **Credits: 3**

- *Distribution of learning time: 3 (3/0/6)*
- *Prerequisites: None*

- *Former subjects of condition:* Calculus I
- *Course description*: This course provides the learner with contents: Matrix-determinant: the matrix, the form of matrix, inverse matrix, determinants, matrix classes. System of Linear Equations: linear systems, Cramer rule, Gauss method, homogeneous system. Space Vector: Space Vector, subspace, linear independence, linear dependence, basis, dimension, Euclidean space. Diagonal matrix-quadratic form: eigenvalues, eigenvectors, private space, diagonal matrix, quadratic form, canonical form, the surface level 2. Differential calculus of function of several variables: function of several variables, derivative, differential, extreme of function of several variables, calculus applications in geometry in space.
- *Textbook:* K. Smith, M. Strauss and M. Toda – *Calculus* - 6th National Edition–Kendall Hunt.

3. Advanced Mathematics 3 **Credits: 3**

- *Distribution of learning time: 3 (3/0/6)*
- *Prerequisites: None*
- *Former subjects of condition:* Calculus II
- *Course description*: This course provides the learner with contents: multiple integral: double integral, application for calculated area of flat domain, calculate the surface area, object volume, triple integrals, and applications for the object volume. Line integral: line integral type one and applications, line integral type one and applications, Green formula, condition of line integral does not depend on integrating line. Surface integral: Integral surface type one, type two, the Ostrogratski formula, vector field, flux and divergence, vector format of Ostrogratski formula, Stokes formula, circulation and vortex vector, vector format of Stokes formula.
- *Textbook:* K. Smith, M. Strauss and M. Toda – *Calculus* - 6th National Edition–Kendall Hunt.

4. Probabilities & Statistics **Credits: 3**

- *Distribution of learning time: 3 (3/0/6)*
- *Prerequisites: None*
- *Former subjects of condition:* Advanced Mathematics 1
- *Course Description*: This module consists of descriptive statistics, fundamental probability, random variables and probability distribution laws, characteristics of random variables, parameter estimation, hypothesis testing, regression and analysis of variance.
- *Textbook:* Probability and Statistics for Engineering and Science by Devore, 8th Edition (published by Cengage Learning), 8th edition with Enhanced Web Assign, regular edition ISBN 1111655499

5. Principles of Physics 1 **Credits: 3**

- *Distribution of learning time: 3(2/1/4)*
- *Prerequisites: None*
- *Former subjects of condition: None*
- *Course description:* This course provides the learner with contents: the mechanics: point dynamics, the law of conservation, solid motion. Thermodynamics: kinetic molecular theory, principles of Thermodynamics I, principles of Thermodynamics II. Electricity and magnetism: electric field, magnetic, variability of electrical magnetic field.
- *Text book*: R.A. Serway và J.W. Jewett. Physics for Scientists and Engineers with Modern Physics, 8th Edition

6. General Chemistry for Engineers **Credits: 3**

- *Distribution of learning time: 3(2/1/4)*
- *Prerequisites: None*
- *Former subjects of condition: None*
- *Course description:* This course provides general chemistry necessary for engineering and science. This course covers fundamentals of electronic structures of atoms, relationship of electron and atomic properties, geometric configuration of the molecule, the polarity of the molecules, link of the physical molecules, a preliminary study on the physical and chemical properties of inorganic substances and their structures.
- *Text book:* Lawrence S. Brown, Chemistry for Engineering Students, Brooks/Cole, Cengage Learning, 2nd edition, 2011, 608 papers

7. Introduction to Mechanical Engineering **Credits: 3 (2+1)**

- *Distribution of learning time: 3 (2, 1, 6)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* The goal of this course is to provide first-year students with a broad outline of engineering, the skills needed to explore different disciplines of engineering and help them decide on a career in engineering.
- *Textbook:*

  [1] Engineering Fundamentals: An Introduction to Engineering, Saaed Moaveni, 3rd edition, CL engineering (2007).

  [2] An introduction to mechanical engineering, Wickert J. and Lewis K., 3rd edition, CL engineering (2012).

8. General Law **Credits: 2**

- *Distribution of learning time: 2 (2, 0, 4)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides students with general theories of the state and law including nature of the state and law, organizing apparatus of the state, Vietnam law system and criminal and civil laws. This knowledge helps student to correctly understand and apply the laws in practice.
- *Textbook:* Le Minh Toan. General Law, National Political Publishing, 2010.

17.2. Fundamental courses

1. Descriptive Geometry and Engineering Drawing **Credits: 4 (3+1)**

- *Distribution of learning time: 4 (3, 1, 8)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides students with fundamental theory of engineering drawing, including engineering drawing standards, basic drawing skills and drawing principles, methods of representation, orthographic projection; and cultivates the abilities of writing and reading engineering drawing.

- *Textbook:*

  [1] David A. Madsen, David P. Madsen, Engineering Drawing and Design, 6rd edition, Cengage Learning, 2016

  [2] K.L. Narayana, P. Kannaiah, K. Venkata Reddy, Machine drawing, 3rd edition, New Age International Publishers

2. Theoretical Mechanics **Credits: 3**

- *Distribution of learning time:* *3 (3, 0, 6)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides students with fundamental knowledge of mechanical engineering. In this course, following topics will be covered:
  + ***Statics***: statics axioms, force, connection, reaction, system analysis.
  + ***Kinematics***: study the motion of points, objects, translation and rotation, kinematic analysis.
  + ***Dynamics***: physical laws, theorems of dynamics, D'Alambert principles, Lagrange equations.
- *Textbook:* Hibbeler. Engineering Mechanics, 13th Edition, Prentice Hall

3. Strength of Materials **Credits: 3**

- *Distribution of learning time:* *3 (3, 0, 6)*
- *Prerequisite: None*
- *Former subjects of condition:* Theoretical Mechanics
- *Course description:* This course introduces students to fundamental knowledge of strength of materials; methods of calculating the stress, strain in mechanical components, structural members under loading, its load capacity and deformations.
- Text book: Hibbeler. Mechanics of Materials, 9th Edition, Prentice Hall, 2013.

4. Theory of machine and machine design **Credits: 3**

- *Distribution of learning time:* *3 (3, 0, 6)*
- *Prerequisite: None*
- *Former subjects of condition:* Strength of Materials
- *Course description:* This course studies structures, working principles and calculating methods of kinematic, dynamic designs of machine and mechanism, standard mechanical joints and components. At the end of the course, students can independently solve calculating problems and machine design problems.
- *Text book:*

  [1] Machine Design: Theory and Practice, W. J. Michels & Ch. E. Wilson & A. D. Deutschman, Macmillan; 1st edition (1975).

  [2] Machine Elements in Mechanical Design (5th Edition), Robert L. Mott, Pearson; 5 edition (March 29, 2013).

5. Project on Theory of machine and machine design **Credits: 1**

- *Distribution of learning time:* *1 (0, 1, 2)*
- *Prerequisite: None*

- *Former subjects of condition:* Theory of machine and machine design
- *Course description:* In this course, student will apply the knowledge in course "Theory of machine and machine design" for designing a machine or a module of machine. The application knowledge includes: kinematic, dynamic designs of machine and mechanism, standard mechanical joints and components. At the end of the course, students can independently solve calculating problems and machine design problems.
- *Text book:*

  [1] Machine Design: Theory and Practice, W. J. Michels & Ch. E. Wilson & A. D. Deutschman, Macmillan; 1st edition (1975)

  [2] Machine Elements in Mechanical Design (5th Edition), Robert L. Mott, Pearson; 5 edition (March 29, 2013).

6. Tolerances and Measuring Techniques **Credits: 3 (2+1)**

- *Distribution of learning time:* *3 (2, 1, 6)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides a foundation for
  + Interchangeability in machine manufacturing engineering. Tolerance and common fits in machine manufacturing engineering such as smooth cylindrical fits, keys and spline fits, thread fits, method of solving the dimension chain exercises and basic principles to draw dimension on detail drawings, some measuring equipment and methods to measure the basic parameters of mechanical parts.
  + E*xperiments on Mechanical Measurement Techniques* mentions methods to measure basic parameters of mechanical parts and introduces tools, equipment, precision and manipulation; calculates and processes measuring results.
- *Textbook:*

  [1] Geometrical Dimensioning and Tolerancing for Design, Manufacturing and Inspection, 2nd edition.

  [2] Tran Quoc Hung. Tolerances and Measuring Techniques, HCMC National University Publishing, 2012.

7. Materials Science **Credits: 3 (2+1)**

- *Distribution of learning time:* *3 (2, 1, 6)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* the subject provides students with:
  + General knowledge of properties of metal and metallic alloy, metallic materials in manufacturing, general knowledge of heat treating to manipulate mechanical properties of metallic materials.
  + Fundamentals of structure and properties of polymer, composite materials, rubber…
- *Textbook:* Materials Science and Engineering: An Introduction, 8th Edition, Williams D. Callister, Jr., David G. Rethwisch, John Wiley & Sons, Inc.

8. Basic of Computer Aided Design (CAD) **Credits: 3 (2+1)**

- *Course workload:* *3 (2, 1, 6)*

- *Prerequisite: None*
- *Former subjects of condition:* Descriptive Geometry and Engineering Drawing
- *Course description:* This course equips students with foundations of CAD in mechanical engineering, trains the ability of creating and reading technical drawing, outlines the first step for students to use computer technology for design.
- *Textbook:*

  [1] Onwubolu, Godfrey, Computer-Aided Engineering Design with SolidWorks, 2013.

  [2] Planchard, Engineering Graphics with SOLIDWORKS 2015, SDC Publications, 2014.

  [3] H. Shih, Autodesk Inventor 2015 and Engineering Graphics, SDC Publications, 2014.

9. Fundamentals of Machinery Manufacturing Technology Credits: 3

- *Distribution of learning time: 3 (3, 0, 6)*
- *Prerequisite: None*
- *Former subjects of condition:* Theory of machine and machine design
- *Course description:* This course provides students with the basic knowledge of
  + Metal cutting, fundamentals of machining methods
  + Machining accuracy and quality of machine part surface, effect factors and how to reduce the influence
  + Locations and setup
  + Specification of machining process on machine tools, special machines, etc...
- *Textbook:*

  [1] Winston A. Knight, Fundamentals of Metal Machining and Machine Tools, Third Edition (CRC Mechanical Engineering), Taylor and Fracis, 2016;

  [2] B. L. Juneja, Fundamentals of Metal Cutting and Machine Tools, New Age International, 2003;

  [3] Hassan Abdel-Gawad El-Hofy, Fundamentals of Machining Processes: Conventional and Nonconventional, CRC Press, Aug 6, 2013

10. Thermal Engineering Credits: 2

- *Distribution of learning time: 2 (2, 0, 4)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides students with a fundamental knowledge of thermal dynamics and heat transfer, introduces student to common thermal instruments such as: dryer/dehydrator, steam boiler, heat exchanger.
- *Textbook:* Introduction to Thermal Systems Engineering: Thermodynamics, Fluid Mechanics, and Heat Transfer, Michael J. Moran , Howard N. Shapiro, Bruce R. Munson , David P. DeWitt, Wiley; 8/18/02 edition (September 17, 2002)

11. Electrical and Electronics Engineering Credits: 3

- *Distribution of learning time: 3(3:0:6)*
- *Prerequisite: None*
- *Former subjects of condition: None*

- *Course description:* This course equips students with knowledge of electrical circuit, circuit design, 1-phase and 3-phase AC circuits. Working principles and calculation methods of current regulator, synchronous motor, asynchronous motor, DC motor. Working principles and calculation methods of basic electrical and electronics components such as diode, transitor BJT, MOSFET, SCR, TRIAC, Opamp.
- *Textbook:* Stephen Herman, Industrial Motor Control, Clifton Park, NY : Delmar Cengage Learning, 2014

12. Electrical and Electronics Engineering Laboratory **Credits: 1**

- *Distribution of learning time:* 1*(0:1:2)*
- *Prerequisite: None*
- *Former subjects of condition:* Electrical and Electronics Engineering
- *Course description:* This course equips students with knowledge of electrical devices, electronic components, enhances the ability to use and select electrical devices, ability to install residential and industrial electrical system, ability to assemble a circuit and measure basic electrical parameters.
- *Textbook:* Stephen Herman, Industrial Motor Control, Clifton Park, NY : Delmar Cengage Learning, 2014

13. Computer Fluid Dynamic **Credits: 3**

- *Distribution of learning time:* *3 (3, 0, 6)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides fundamental knowledge of fluid statics, kinematics and dynamics, analysis of ideal fluid motion and its practical application.
- Textbook: Fundamentals of Fluid Mechanics, Bruce R. Munson, Alric P. Rothmayer, Theodore H. Okiishi, Wade W. Huebsch, Wiley; 7 edition (May 15, 2012).

17.3. Specialized courses

1. Machinery Manufacturing Technology **Credits: 3**

- *Distribution of learning time:* *3 (3, 0, 6)*
- *Prerequisite: None*
- *Former subjects of condition:* Fundamentals of Machinery Manufacturing Technology
- *Course description:* This course provides students with the knowledge of procedure of technology process and making fixtures for manufacturing machine parts; introduces about typical manufacturing processes as well as assembly technology.
- *Textbook:* Steve Krar, Machine Tool and Manufacturing Technology, Willey, 1997; [2] Manufacturing Technology: P. N. Rao, Metal Cutting and Machine Tools, Tata McGraw-Hill Education, 2000

2. Project on Machinery Manufacturing Technology **Credits: 1**

- *Distribution of learning time:* *1 (0, 1, 2)*
- *Prerequisite: None*
- *Former subjects of condition:* Machinery Manufacturing Technology

– *Course description:* This course gives students a chance for application studied knowledge to make a manufacturing process with a specific machine part.

– *Textbook:*

[1] Steve Krar, Machine Tool and Manufacturing Technology, Willey, 1997

[2] Manufacturing Technology: P. N. Rao, Metal Cutting and Machine Tools, Tata McGraw-Hill Education, 2000

3. Manufacturing Process Automation **Credits: 2**

- *Distribution of learning time:* *2 (2, 0, 4)*
- *Prerequisite: None*
- *Former subjects of condition:* Machinery Manufacturing Technology
- *Course description:* This course provides knowledge of structure of an automatic control system, shows student how to use sensors, actuators, PLC in building an automated manufacturing process. This course also introduces students to PLC programming and application of PLC in manufacturing process automation.
- *Textbook:* Serope Kalpakjian, Steven Schmid, Manufacturing Engineering and Technology, SI Edition 7 Ed., PEARSON, 2013.

4. Experiments in Manufacturing Process Automation **Credits: 1**

- *Distribution of learning time:* *1 (0, 1, 2)*
- *Prerequisite:* Manufacturing Process Automation
- *Course description*: This course helps students reinforce their knowledge of manufacturing process automation, the use of sensors, motors, pneumatic/hydraulic valves in control system, working principles of elements of automatic control, install and program PLC, connect PLC with peripheral devices.
- *Textbook:*

[1] Winston A. Knight, Fundamentals of Metal Machining and Machine Tools, Third Edition (CRC Mechanical Engineering), Taylor and Fracis, 2016;

[2] B. L. Juneja, Fundamentals of Metal Cutting and Machine Tools, New Age International, 2003;

[3] Hassan Abdel-Gawad El-Hofy, Fundamentals of Machining Processes: Conventional and Nonconventional, CRC Press, Aug 6, 2013

5. Mold Design and Fabrication **Credits: 3**

- *Distribution of learning time:* *3 (3, 0, 6)*
- *Prerequisite: None*
- *Former subjects of condition:* Machinery Manufacturing Technology
- *Course description:* This course introduces to students the mold and its applications, provides knowledge of molding design and fabrication procedures such as: injection molding, hot die, cold die, etc.
- *Textbook:* How to Make Injection Molds, G Menges, Georg Menges, Menges, Walter Michaeli , Paul Mohren, P Mohren, Hanser Gardner Publications; 3rd ed. edition (January 1, 2001).

6. Maintenance in Industry **Credits: 3 (2+1)**

- *Distribution of learning time:* *3 (2, 1, 6)*

- *Prerequisite: None*
- *Former subjects of condition:* Machinery Manufacturing Technology
- *Course description:* This course provides students with a foundation of:

✓ Organization and management of industrial maintenance
✓ Scheduling maintenance for a specific industrial equipment
✓ Planning removable machine parts
✓ Adjusting the system of industrial equipment
✓ Maintenance equipment clusters as planned
✓ Practice maintenance of industrial machinery and equipment to equip students with the knowledge and skills to be able to carry out maintenance activities , maintenance of structures , machine parts in accordance with procedures and safety ...

- Textbook: Maintenance in Transition, Paul Tomlingson, Independent Publisher Services (February 28, 2014)

7. Nano technology **Credits: 2**

- *Distribution of learning time:* *2 (2, 0, 4)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* this course provides students with fundamental knowledge on the science of making material and functional structures in nano scale; present the contemporary and future applications of nano technology. Students are equipped with baic knowledge for the structure of nano material as well as their processing procedure. Understand the physical, biochemical and other characteristics of nano structures when they are investigated in different scale.
- *Textbook:* Nanostructures and Nanotechnology, Douglas Natelson, Cambridge University Press; 1 edition (August 3, 2015)

8. CAD/CAM-CNC **Credits: 3 (2+1)**

- *Distribution of learning time:* *2 (2, 0, 4)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* the subject provides students with

✓ Fundamentals of CAD/CAM solutions.
✓ Basic skills: selection of machining processes order, cutting tool selection and CNC programming.
✓ Approaching methods for the utilization of CAD/CAM software.

- *Textbook:*

[1] EMCO WinNC GE Series Fanuc 21 TB

[2] EMCO Win Tutorials - Modular Instructor Guide for Industry and Training -PC Turn/Mill 55 GE Fanuc Series 21

9. Advanced CAD/CAM_CNC **Credits: 3**

- *Distribution of learning time:* *3 (3, 0, 6)*
- *Prerequisite: None*

- *Former subjects of condition:* CAD/CAM-CNC
- *Course description:* This course provides the fundamentals of:
  - CAD/CAM and CNC technology
  - Coordinate systems in CNC machine
  - ISO G, M codes in CNC programming
  - 3D objects design
  - 3D models assembly
  - CAM (design, simulation, modification, G-code generation)
  - Relationship between CAD-CAM and CNC.
- *Textbook:* CNC Programming Handbook: A Comprehensive Guide to Practical CNC Programming - Industrial Press Inc., 2003

10. Numerical Control Systems **Credits: 3**

- *Distribution of learning time:* *3 (3, 0, 6)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides students with basic knowledge of:
  - Basic and special configuration;
  - Structural and kinetic schemes, general equations;
  - Adjusting and control.
  - Concepts and knowledge about NC and CNC machines according Numerical Control, Computer Numerical Control, interpolation, motion systems, special devices.
- *Textbook:* Computer Numerical Control: Concepts & Programming, Warren Seames, Cengage Learning; 4 edition (August 1, 2001)

11. Pneumatic - Hydraulic Technology **Credits: 3**

- *Distribution of learning time:* *3 (3,0,6)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides students with basic knowledge of operating principles of a pneumatic control system, electropneumatics, hydraulics, electrohydraulics; advantages and disadvantages of a pneumatic/hydraulic control system compared to electrical control system ; introduces components, basic principles in design pneumatic/hydraulic control system, fault detection and maintenance for pneumatic/hydraulic system.
- *Textbook:* Jagadeesha T, Hydraulics and Pneumatics, I K International Publishing House (November 16, 2015)

12. Industrial Robots **Credits: 2**

- *Distribution of learning time:* *2 (2, 0, 4)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides students with knowledge of robots and its applications in automated manufacturing, services, and daily life. Based on this

knowledge, students can quickly approach and efficiently exploit the advantages of robot in different areas.

- Text book: Saeed B. Niku, Introduction to Robotics: Analysis, Systems, Applications, Wiley; 3th edition (September 22, 2011).

17.4. Workshop

1. Practice of Metalworking **Credits: 2**

- *Distribution of learning time: 2 (0, 2, 4)*
- *Prerequisite: None*
- *Former subjects of condition: None*
- *Course description:* This course provides students with basic knowledge and skills in metalworking with hand tools and basic equipments such as punchers, chisels, files, drills, measuring equipment;
- *Textbook:* Winston A. Knight, Fundamentals of Metal Machining and Machine Tools, Third Edition (CRC Mechanical Engineering), Taylor and Fracis, 2016;

2. Welding Practice **Credits: 2**

- *Distribution of learning time: 2 (0, 2, 4)*
- *Prerequisite: None*
- *Former subjects of condition:* Practice of Metalworking
- *Course description:* This course introduces students to the definition, operating principles of arc welding, electric welding, welding sticks, operating principles of TIG, MIG system. This practice also helps students to practice electric welding and TIG, MIG welding.
- *Textbook:* Welding: Principles and Applications 7th Edition, Larry Jeffus, Cengage Learning; 7 edition (May 12, 2011).

3. Basic Turning Practice **Credits: 3**

- *Distribution of learning time: 3 (0, 3, 6)*
- *Prerequisite: None*
- *Former subjects of condition:* Welding Practice
- *Course description:* This practice helps students:
  - Master construction arrangement and principal units of turning machine.
  - Practice methods of turning and internal cylindrical surfaces, stepped cylindrical surfaces.
  - Practice methods of turning square and profile grooves, external taper surfaces.
  - Practice methods of turning right-hand external V threads.
- *Textbook:*

  [1] Winston A. Knight, Fundamentals of Metal Machining and Machine Tools, Third Edition (CRC Mechanical Engineering), Taylor and Fracis, 2016.

  [2] Hassan Abdel-Gawad El-Hofy, Fundamentals of Machining Processes: Conventional and Nonconventional, CRC Press, Aug 6, 2013.

4. Basic Milling Practice **Credits: 2**

- *Distribution of learning time: 2 (0, 2, 4)*
- *Prerequisite: none*

- *Former subjects of condition:* Welding Practice
- *Course description:* This course provides basic knowledge and skills in milling. This practice helps students:
  - Master construction arrangement and principal units of milling machine.
  - Practice methods of milling horizontal, vertical and angular surfaces, V slots, square slots, keyways, spline shafts, spur and helical gears.
- *Textbook:*

  [1] Winston A. Knight, Fundamentals of Metal Machining and Machine Tools, Third Edition (CRC Mechanical Engineering), Taylor and Fracis, 2016.

  [2] Hassan Abdel-Gawad El-Hofy, Fundamentals of Machining Processes: Conventional and Nonconventional, CRC Press, Aug 6, 2013.

5. Advanced CAD/CAM_CNC Practice **Credits: 2**

- *Distribution of learning time:* *2 (0, 2, 4)*
- *Prerequisite:* Advanced CAD/CAM_CNC
- *Course description:* This course provides student with*:*
  - CNC manually programming
  - CNC machines operating
  - 3D Modeling
  - Assembly and Drawing
  - CAM
  - CNC machining
- *Textbook:* CNC Programming Handbook: A Comprehensive Guide to Practical CNC Programming - Industrial Press Inc., 2003

6. CNC Practice **Credits: 2**

- *Distribution of learning time:* *2 (0, 2, 4)*
- *Prerequisite:* Advanced CAD/CAM_CNC Practice
- *Course description:* This course equips learners with skills in CNC programming, operating and machining. Learners are able to use equipments on CNC, solve common problems on CNC operations.
- *Textbook:* CNC Programming Handbook: A Comprehensive Guide to Practical CNC Programming - Industrial Press Inc., 2003

7. Practice of Mold Design and Manufacturing **Credits: 2**

- *Distribution of learning time:* *2 (0, 2, 4)*
- *Prerequisite: None*
- *Former subjects of condition:* Mold Design and Fabrication
- *Course description*: This course introduces How to design a mold by CAD software, How the plastic flows inside mold and predict defects of product by CAE software ; moreover, provides learners with knowledge and skills in manufacturing mold and operate CNC machine for machining.
- *Textbook:* Lecture of Practice of Mold Design and Manufacturing.

8. Practice of Technology Plastic Application **Credits: 2**

- *Distribution of learning time:* *1 (0, 1, 2)*

- *Prerequisite: None*
- *Former subjects of condition:* Mold Design and Fabrication
- *Course description*: This course provides students with knowledge of industrial plastics machines, professional CAD\CAE software for flow analysis, defects in plastic products, direct generation and handling of defects of plastic products by injection molding technology.
- *Textbook:* TS. Phạm Sơn Minh, ThS. Trần Minh Thế Uyên – Thực tập công nghệ nhựa – Đại học Sư Phạm Kỹ Thuật Tp.Hồ Chí Minh – 2015

9. Internship **Credits: 2**

- *Distribution of learning time:* *2 (0, 2, 4)*
- *Prerequisite: None*
- *Course description:* By participating as a official member of a mechanical plant, students are able to make the acquaintance of organizing the manufacturing process in the plant and understand its management structure. This is the opportunity for students to acquire new and profound information in mechanical engineering to serve for the graduation thesis which can be from the fact-finding trip in mechanical factories.

17.5. Capstone project **Credits: 10**

- *Distribution of learning time:* *10 (0, 0, 30)*
- *Prerequisite:* Project on Theory of machine and machine design, Project on Machinery Manufacturing Technology
- *Course description:* Capstone project consists mainly of an industrial or research-based project carried out under the supervision of one or more faculty members. It introduces students to the basic methodology of research in the context of a problem of current research interest.

18. Campus Infrastructure

Follow the Ministry of education and training's regulations

18.1 Workshops and Laboratories:

- Mechanical Measurement Technology Laboratory
- Mechanical Engineering Workshop
- Gas Welding Workshop
- Electroslag Welding Workshop
- Computer cluster
- Simulation and Automation Laboratory
- PLC Laboratory
- Pneumatic - Hydraulic Laboratory
- Robotics Laboratory
- Process Control Laboratory

18.2 Library, Website

- University's Library and Website
- Faculty's Library and Website

19. Programme guide

Credit hour is calculated as follows:

1 credit = 15 lecture hours
= 30 laboratory hours
= 45 hours practice
= 45 hours self-study
= 90 workshop hours
= 45 hours for project, thesis.

RECTOR **DEAN OF FACULT**

Appendix 2: Matrix of courses vs. Expected learning outcomes of MET programme

No	Course Code	Course	Credits	Semester	ELOs/Contribution level												
					ELO 01	ELO 02	ELO 03	ELO 04	ELO 05	ELO 06	ELO 07	ELO 08	ELO 09	ELO 10	ELO 11	ELO 12	ELO 13
1	MATH130101	Advanced Mathematics A1	3	1	P							P					
2	ENGL130137	English 1	3		P						P	P					
3	GCHE130103	General Chemistry A1	3		P							P					
4	INME130125	Introduction to Mechanical Engineering	3			P			P	P	P	P	P	P			
5	VBPR131085	Visual Basic Programming	3			P			P			P					
6	MATH130201	Advanced Mathematics A2	3		S							S					
7	GELA220405	General Laws	2									P	P				
8	PHYS130102	Fundamental Physics A1	3		S							S					
9	PHED110513	Physical Education 1	1						P			P					
10	MATH130301	Advanced Mathematics A3	3	2													
11	MATH130401	Applied Probability and Statistics	3														
12	LLCT150105	Basic principles of Marxism & Leninism	5									S	S				
13	ENGL230237	English 2	3		S						S	S					
14	PHYS120202	Fundamental Physics A2	2														
15	DGED121023	Descriptive Geometry and Technical Drawing	2			P	P		S	S	S						
16	MHAP120227	Mechanical Works Practice	2			P	P	P	S	S							
17	PHED110613	Physical Education 2	1						S			S					
18	***Choose elective General knowledge course 1***		2														
19	LLCT120314	Ho Chi Minh's Ideology	2	3								S	S				
20	ENGL330337	English 3	3														
21	TOMT220225	Tolerances and Measuring Techniques	2			S	S		S	P	P	S					

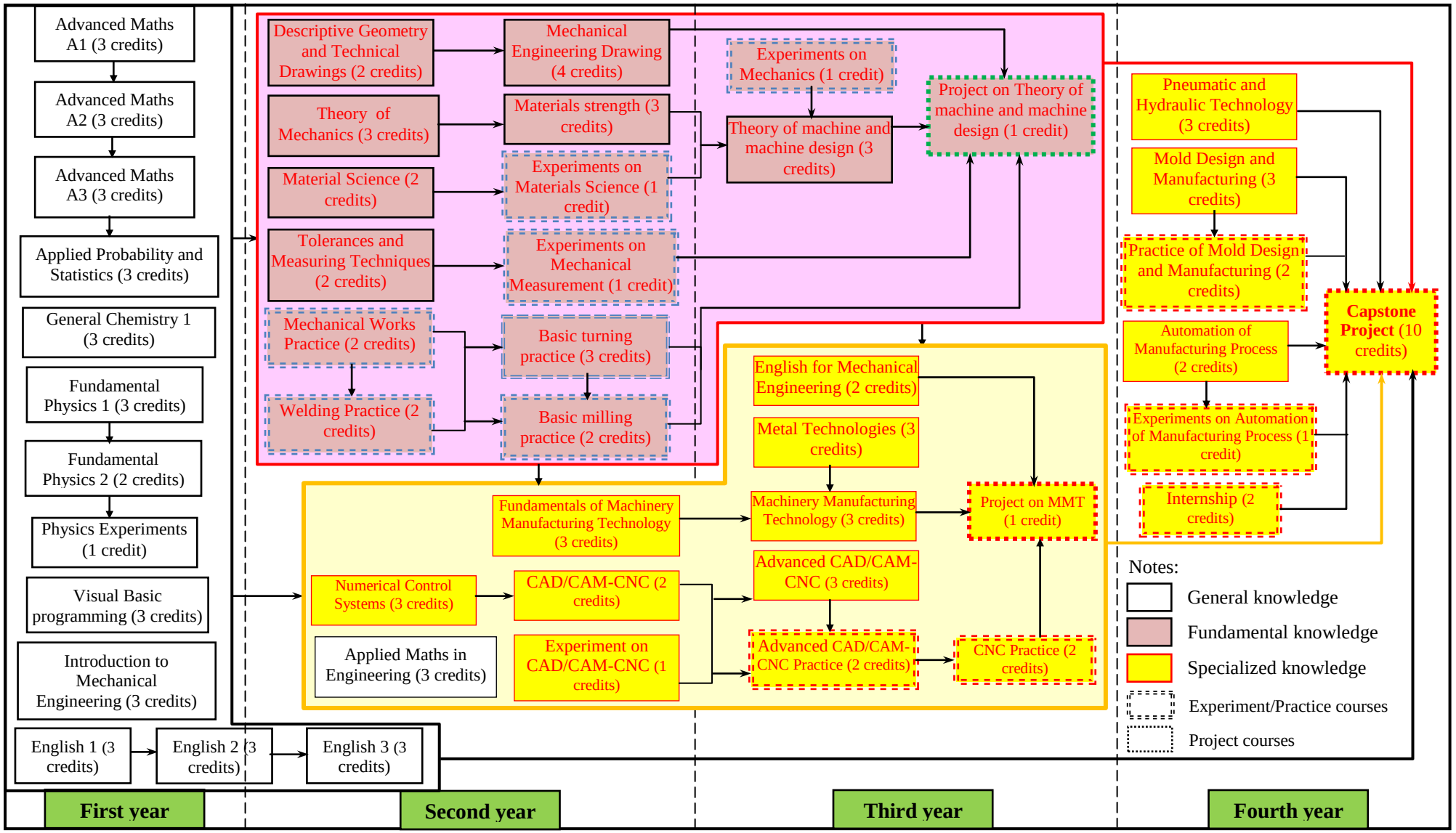
No	Course Code	Course	Credits	Semester	ELOs/Contribution level												
					ELO 01	ELO 02	ELO 03	ELO 04	ELO 05	ELO 06	ELO 07	ELO 08	ELO 09	ELO 10	ELO 11	ELO 12	ELO 13
22	EXMM210325	Experiment of Mechanical Measurement	**1**			**P**	S	**P**	S		**P**	S					
23	PHYS110302	Experiment of Physics	**1**														
24	THME230721	Theory of Mechanics	**3**			**P**	**P**		S	S	S						
25	MEED241320	Mechanical Engineering Drawing	**4**			S	S		S	S	S						
26	ENMA220126	Materials Science	**2**			**P**	**P**		S	S	S						
27	PHED130715	Physical Education 3 (Elective)	**3**						S			S					
28	***Choose elective General knowledge course 2***		**2**														
29	***Choose elective General knowledge course 3***		**2**														
30	LLCT230214	Vietnamese Communist Party's revolutionary policies	**3**	**4**								S	S				
31	METE210321	Experiment of Mechanics	**1**			S	S	S									
32	TMMP230220	Theory of Machine and Machine design	**3**			S	S		S	S	S				**P**		
33	STMA230521	Strength of Materials	**3**			S	S		S	S	S						
34	FMMT330825	Fundamentals of Machinery Manufacturing Technology	**3**						S	S	S			**P**	**P**		
35	MATE211126	Experiment on Materials Science	**1**			**P**	S	**P**	S		**P**		**P**				
36	METE330126	Metal Technology	**3**			S	S		S	S	S			**P**	**P**		
37	PEPR220426	Welding Practice	**2**			**P**	S	**P**	S		**P**		**P**				
38	BATP230227	Basic Turning Practice	**3**			S	S	S	S	S				**P**	**P**	**P**	
39	CACC320224	CAD/CAM-CNC	**2**	**5**		S	S		S	S				**P**	**P**	**P**	**P**
40	ECCC310324	Experiments on CAD/CAM-CNC	**1**			S	S	S						**P**	**P**	**P**	**P**
41	NUMC330424	Numerical Control Systems	**3**						S	S	S			S	S		
42	MMAT431525	Machinery Manufacturing Technology	**3**						S	S	S				S		

No	Course Code	Course	Credits	Semester	ELOs/Contribution level												
					ELO 01	ELO 02	ELO 03	ELO 04	ELO 05	ELO 06	ELO 07	ELO 08	ELO 09	ELO 10	ELO 11	ELO 12	ELO 13
43	MATH131501	Applied Mathematics in Engineering	3		I	S						I					
44	PMMT310423	Project on Theory of Machine and Machine design	1			S	S		S	S	S				P		
45	BAMP220327	Basic Milling Practice	2			S	S	S	S	S				P	P		
46	***Choose elective fundamental knowledge course 1***		3														
47	ACCC330524	Advanced CAD/CAM-CNC	3	6		S	S		S	S				S	S	S	S
48	PACC320624	Advanced CAD/CAM-CNC Practice	2			S	S	I						S	S	S	S
49	PMMT411625	Project on Machinery Manufacturing Technology	1			I	I	I	I	I		I		I	I		
50	AUMP323525	Automation of Manufacturing Process	2			I	I		I	I	I			I	I		I
51	EMPA313625	Experiments on Automation of Manufacturing Process	1			I	I	I	I						I		
52	ENME320124	English for Mechanical Engineering	2			S	S		S	S	I	S					
53	***Choose elective fundamental knowledge course 2***		2														
54	***Choose elective specialized knowledge course 1***		3														
55	FAIN422324	Internship	2					I					I	I	I	I	I
56	PNHY330529	Pneumatic and Hydraulic Technology	3	7			I		I	I	I			S	S		
57	MOLD431224	Mold Design and Manufacturing	3				I		I	I	I			S	S		
58	PMDM421324	Practice of Mold Design and Manufacturing	2				I	I	I	I	I						I
59	PTPA422224	Practice of Technology Plastic Application	2				I	I						I	I		
60	PCNC422124	CNC Practice	2				I	I						I	I	I	I

No	Course Code	Course	Credits	Semester	ELOs/Contribution level												
					ELO 01	ELO 02	ELO 03	ELO 04	ELO 05	ELO 06	ELO 07	ELO 08	ELO 09	ELO 10	ELO 11	ELO 12	ELO 13
61	***Choose elective specialized knowledge course 2***		**3**														
62	GRAT403125	Capstone project	**10**	**8**			H	H	H	H	H			H	H	H	H
		Graduation Examination Courses															
	STOG443225	- Special Graduation Subject 1	**4**	**8**			H	H	H	H	H			H	H	H	H
	STOG433325	- Special Graduation Subject 2	**3**	**8**			H	H	H	H	H			H	H	H	H
	STOG433425	- Special Graduation Subject 3	**3**	**8**			H	H	H	H	H			H	H	H	H

Note: H - Highly Supportive; S - Supportive; P - Partly Supportive

Appendix 3: Curriculum map



Appendix 4: Update on the MET programme from 2012 to 2018

No	Course code	Course title	Credit	Feature	Course code	Course title	Credit	Feature	Time
1	ECNC320724	Equipment on CNC machine	2	Compulsory	MMAT431525	Machine Manufacturing Technology	3	Compulsory	2015
2	EENC313424	Experiments of Equipment on CNC machine	1	Compulsory					
3	PRAU431424	Project on Automatic Production System	1	Compulsory	PMMT411625	Project on Machine Manufacturing Technology	1	Compulsory	
4	EDDG130120	Descriptive Geometry and Engineering Drawing	3	Compulsory	DGED121020	Descriptive Geometry and Engineering Drawing	2	Compulsory	2016
5	CADM230320	Computer Graphic Techniques	3	Elective	MEED241320	Mechanical Engineering Drawing	3+1	Compulsory	
6	FAIN423024	Internship	2	Compulsory	FAIN432324	Internship	3	Compulsory	2018
7						Interdisciplinary courses	6	Elective	2018

Appendix 5: Rubrics for course assessment

Evaluation criteria of Project on Theory of machine and machine design (PMMT310423)

(Supervisors :_____)*

Student name: Student ID: Group:

Content	Failed	Ordinary	Good	Excellent	Mark
Project report (8/20)	**1. Electric motor selection guide – Transmission-ratio Distribution**				
	0.5	**1**	**1,5**	**2**	
	The calculated results of power, velocity and the data table are not correct according to initial conditions.	One of the mistakes in transmission-ratio distribution and the data table.	There are some minor mistakes in calculated results.	Calculated results are correct according to initial conditions.	
	2. Design of the transmission system outside the speed reducer				
	0	**0,5**	**0,75**	**1**	
	The calculated results are not correct according to input parameters or not match with the kind of the transmission system.	The sequence of calculations is correct, but there are some mistakes in calculating main parameters of the transmission system.	The sequence of calculations is correct, but the parameter table of the transmission system is missing.	The calculated results are correct according to input parameters.	
	3. Design of two transmissions systems inside the speed reducer				
	0	**1**	**1,5**	**2**	
	The calculated results are not correct according to input parameters or not match with the kind of the transmission system.	The sequence of calculations is correct, but there are some mistakes in calculating main parameters of the transmission system.	The sequence of calculations is correct, but the parameter table of the transmission system is missing.	The calculated results are correct according to input parameters.	
	4. Design of shafts				
	0	**1**	**1,5**	**2**	
	The diagram of forces is not	The diagram of forces is	The sequence of the design	The sequence of the design	

	correct according to initial conditions.	correct, but there is a mistake in the diagram of internal forces.	of shafts is correct, but the layout does not follow criteria.	of shafts is correct, and the layout follows criteria.	
	5. Design of other machine components (bearings, fasteners, tribology and the cast housing)				
	0,25	**0,5**	**0,75**	**1**	
	The sequence of calculation is incomplete, the tolerant table and the assembly of the speed reducer are missing.	The calculation of bearings, fasteners and the cast housing is correct, but the lubrication and tolerances are missing.	The calculation and the layout are correct, but other components of the speed reducer are missing.	The calculation and the layout are correct.	
Assembly Drawing (8/20)	**1. The size of the assembly drawing is correct according to the calculated results**				
	0.5	**1**	**1,5**	**2**	
	The layout of the assembly drawing (draft) is correct, but the size of the assembly drawing does not follow calculated results.	The layout of the assembly drawing (draft) is correct, but a half of the size of the assembly drawing does not follow calculated results.	The layout of the assembly drawing (draft) is correct, but there are some minor errors in the assembly drawing.	The layout of the assembly drawing (draft) is correct according to TCVN criteria.	
	2. The reasonable size (guarantee for manufacturing and assembly)				
	0.5	**1**	**1,5**	**2**	
	Gear neither fixed nor assembled axially.	The structure of the assembly drawing is not correct, when machine components, e.g. sleeve bearings, bearings, and gears are assembled.	The structure of the assembly drawing is correct, but there are some minor errors in the assembly drawing.	The structure of the assemble drawing is correct according to calculated results.	
	3. Write the size of the assembly drawing (exactly and enough)				
	0.5	**1**	**1,5**	**2**	
	There are some wrong sizes in writing the size of the assembly drawing or missing about 50% in writing the size of the assembly drawing (draft and revision).	There are some wrong sizes in writing the size of the assembly drawing or missing about 30% in writing the size of the assembly drawing (draft and revision).	The size of the assembly drawing is correct, but there are some minor errors. e.g. fonts, dimensions in writing the size of the assembly drawing.	The size of the assembly drawing is correct according to requirements of the project.	

	4. Criteria for drawing the gear, bearing, threaded joint, and the symbol of materials				
	0,25	**0,5**	**0,75**	**1**	
	There are five mistakes in writing criteria of machine components in this section.	There are three or four mistakes in writing criteria of machine components in this section.	The drawing is correct, but there are some mistakes in dimensions.	The drawing is correct according to criteria.	
	5. Describe the drawing according to TCVN criteria				
	0	**0,5**	**0,75**	**1**	
	There are some mistakes in drawing the left-side view and the relationship of the size of projections.	The drawing is exactly described according to TCVN criteria, but requirements and parameters of engineering are missing.	The drawing is exactly described according to TCVN criteria, but there are some mistakes in the heading and the parts list.	The drawing is exactly described according to TCVN criteria.	
Evaluation of the progress (4/20)	**1**	**2**	**3**	**4**	
	Students do not carry out the progress of the project: 0 The progress of carrying out the project for the electric motor selection and the transmission system outside the speed reducer is approved by supervisors	The progress of carrying out the project for transmission systems inside the speed reducer and lubrication of the speed reducer is approved by supervisors.	The progress of carrying out the project for shafts, bearing, fasteners and the cast housing is approved by supervisors.	The progress of carrying out the project for the assembly drawing (draft and revision) is approved by supervisors.	
Evaluation :		**□ Approval**	**□ Disapproval**	**Overall**	**/20**

(*) Evaluation criteria are based on the proposal of the project of theory of machine and machine design

Signature of supervisors

Evaluation criteria of Project on Theory of machine and machine design (PMMT310423)

(REVIEWERS :_____)*

Student name: Student ID: Group:

Content	Failed	Ordinary	Good	Excellent	Mark
Project report (4/20)	**1. Electric motor selection guide – Transmission-ratio Distribution**				
	0.5	**1**	**1,5**	**2**	
	The calculated results of power, velocity and the data table are not correct according to initial conditions.	One of the mistakes in transmission-ratio distribution and the data table.	There are some minor mistakes in calculated results.	Calculated results are correct according to initial conditions.	
	2. Design of the transmission system outside the speed reducer				
	0	**0,5**	**0,75**	**1**	
	The calculated results are not correct according to input parameters or not match with the kind of the transmission system.	The sequence of calculations is correct, but there are some mistakes in calculating main parameters of the transmission system.	The sequence of calculations is correct, but the parameter table of the transmission system is missing.	The calculated results are correct according to input parameters.	
	3. Design of two transmissions systems inside the speed reducer				
	0	**1**	**1,5**	**2**	
	The calculated results are not correct according to input parameters or not match with the kind of the transmission system.	The sequence of calculations is correct, but there are some mistakes in calculating main parameters of the transmission system.	The sequence of calculations is correct, but the parameter table of the transmission system is missing.	The calculated results are correct according to input parameters.	
	4. Design of shafts				
	0	**1**	**1,5**	**2**	
	The diagram of forces is not correct according to initial conditions.	The diagram of forces is correct, but there is a mistake in the diagram of internal forces.	The sequence of the design of shafts is correct, but the layout does not follow criteria.	The sequence of the design of shafts is correct, and the layout follows criteria.	

	5. Design of other machine components (bearings, fasteners, tribology and the cast housing)				
	0,25	**0,5**	**0,75**	**1**	
	The sequence of calculation is incomplete, the tolerant table and the assembly of the speed reducer are missing.	The calculation of bearings, fasteners and the cast housing is correct, but the lubrication and tolerances are missing.	The calculation and the layout are correct, but other components of the speed reducer are missing.	The calculation and the layout are correct.	
Assembly Drawing (8/20)	**1. The size of the assembly drawing is correct according to the calculated results**				
	0.5	**1**	**1,5**	**2**	
	The layout of the assembly drawing (draft) is correct, but the size of the assembly drawing does not follow calculated results.	The layout of the assembly drawing (draft) is correct, but a half of the size of the assembly drawing does not follow calculated results.	The layout of the assembly drawing (draft) is correct, but there are some minor errors in the assembly drawing.	The layout of the assembly drawing (draft) is correct according to TCVN criteria.	
	2. The reasonable size (guarantee for manufacturing and assembly)				
	0.5	**1**	**1,5**	**2**	
	Gear neither fixed nor assembled axially.	The structure of the assembly drawing is not correct, when machine components, e.g. sleeve bearings, bearings, and gears are assembled.	The structure of the assembly drawing is correct, but there are some minor errors in the assembly drawing.	The structure of the assemble drawing is correct according to calculated results.	
	3. Write the size of the assembly drawing (exactly and enough)				
	0.5	**1**	**1,5**	**2**	
	There are some wrong sizes in writing the size of the assembly drawing or missing about 50% in writing the size of the assembly drawing (draft and revision)	There are some wrong sizes in writing the size of the assembly drawing or missing about 30% in writing the size of the assembly drawing (draft and revision)	The size of the assembly drawing is correct, but there are some minor errors. e.g. fonts, dimensions in writing the size of the assembly drawing	The size of the assembly drawing is correct according to requirements of the project.	

	4. Criteria for drawing the gear, bearing, threaded joint, and the symbol of materials				
	0,25	**0,5**	**0,75**	**1**	
	There are five mistakes in writing criteria of machine components in this section.	There are three or four mistakes in writing criteria of machine components in this section.	The drawing is correct, but there are some mistakes in dimensions	The drawing is correct according to criteria.	
	5. Describe the drawing according to TCVN criteria				
	0	**0,5**	**0,75**	**1**	
	There are some mistakes in drawing the left-side view and the relationship of the size of projections.	The drawing is exactly described according to TCVN criteria, but requirements and parameters of engineering are missing.	The drawing is exactly described according to TCVN criteria, but there are some mistakes in the heading and the parts list.	The drawing is exactly described according to TCVN criteria.	
Oral (8/20)	**1**	**2**	**3**	**4**	
	Students cannot answer questions from reviewers: 0 Students answer 1/3 of questions from reviews.	Students answer 2/3 of questions from reviewers.	Students answer correctly questions from reviewers, but cannot explain clearly.	Students answer correctly questions from reviewers, and explain clearly.	
Evaluation :		**□ Approval**	**□ Disapproval**	**Overall**	**/20**

(*) Evaluation criteria are based on the proposal of the project of theory of machine and machine design

Signature of reviewers

FME - HCMUTE

HCMC UNIVERSITY OF TECHNOLOGY AND EDUCATION

FACULTY OF MECHANICAL ENGINEERING

Department of Machinery Manufacturing Technology

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Year: ..... Semester: ……

Class: .....

Date: .....

COURSE ASSESSMENT RUBRIC

Course: CNC Practise (PCNC422124)

Task 3: Programing for a turning product (10 points)

Student 1: ..... Student 1's ID:.....

Student 2: ..... Student 2's ID:.....

Contents	Excellent	Good	Average	Poor/Weak	Points
1. Choose the Dimensions, Material and Coordinate System of workpiece and tools for a turning product (1 point)	**1,0**	**0,8**	**0,5**	**0**	
	Draw a turning product which has at least 3 different diameters, round, chamfer and thread. Define the workpiece dimensions, W and M coordinate system.	Draw a turning product which has some mistake such as under 3 different diameters or no round or no chamfer or no thread. Define the workpiece dimensions, W and M coordinate system.	Draw a turning product which has some mistake such as under 3 different diameters or no round or no chamfer or no thread and workpiece without enough dimensions. Define the workpiece dimensions, no W or M coordinate system.	Draw a turning product which has some mistake such as under 3 different diameters or no round or no chamfer or no thread and workpiece without enough dimensions. Not defining the workpiece dimensions, W and M coordinate system.	
2. Write the sheet of Manufacturing Process (1 point)	**1,0**	**0,8**	**0,5**	**0**	
	Completely set up all machining steps with cutting data (S, F and t) for all cutting tools.	Set up all machining steps with cutting data (S, F and t) for all cutting tools but only the t value is wrong.	Set up all machining steps with cutting data (S, F and t) for all cutting tools but the S and F value is too height or low.	Set up some machining steps with cutting data (S, F and t) for all cutting tools but the S, F or t value is wrong.	

3. **Facing Machining (1 point)**	**1,0**	**0,5**	**0,5**	**0**	
	After facing, the workpiece has right dimension with the shortest time.	Facing is good, but the tool is far the workpiece at the initial position.	Facing with a wrong tool movement.	The workpiece is not faced.	
4. Roughing machining (3 points)	**3,0**	**2,5**	**2,0**	**0**	
	Use G73 for roughing machining and correctly write the P, Q parameters and cutter radius compensation.	Use G73 for roughing machining and correctly write the P, Q parameters but there is no cutter radius compensation.	Use G73 for roughing machining but the shape of product is not correct.	A turning machine can not run with this G code.	
5. Finishing machining (1 point)	**1,0**	**0.7**	**0,5**	**0**	
	Use G72 for finishing machining and correctly write the P, Q parameters and cutter radius compensation.	Use G72 for finishing machining and correctly write the P, Q parameters but there is no cutter radius compensation.	Use G72 for finishing machining but P or Q is wrong.	A turning machine can not run with this G code.	
6. Groove machining (1 point)	**1,0**	**0,5**	**0,5**	**0**	
	Use G77 for groove and correctly write the X, Z, R, P and Q parameters.	Use G77 for groove and correctly write the X, Z, P and R parameters, but the Q value is too high or low.	Use G77 for groove but the width of groove is not correct.	A turning machine can not run with this G code.	
7. Thread machining (1 point)	**1,0**	**0,7**	**0,5**	**0**	
	Use G78 for thread and correctly write the X, Z, P, Q and F parameters.	Use G78 for thread and correctly write the X, Z, P and F parameters, but the Q value is too high or low.	The thread program is good, but the pitch value is wrong.	A turning machine can not run with this G code.	
8. Cut off machining (1 point)	**1,0**	**0.5**	**0,5**	**0**	
	After cut off, the workpiece has right dimension with the shortest time.	Facing is good, but the tool is far the workpiece at the initial position.	Cut off with a wrong tool movement.	A turning machine can not run with this G code.	
				Total	**/10**

Note: The task is based on the syllabus of CNC Practise (PCNC422124)

Lecturer

HCMC UNIVERSITY OF TECHNOLOGY AND EDUCATION
Faculty of Mechanical Engineering
Department of Machinery Manufacturing Technology

ASSESSMENT RUBRIC

Course: Internship (FAIN422324)

Student name: Student ID:

Project's name:

	Weak	Average	Fair	Good	Score
Attendance	**0 – 0.5**	**0.6 – 1**	**1.1 – 1.5**	**1.6 – 2**	
	Participate less than 1/4 required time	Participate from 1/4 to 2/4 required time	Participate from 2/4 to 3/4 required time	Participate at least 3/4 required time	
Report writing	**0 – 0.5**	**0.6 – 1**	**1.1 – 1.5**	**1.6 – 2**	
	Report is not written in standard format and not unification between parts	Report is written in standard format but there are many typing errors	Report is written in standard format but there are some minor typing errors	Report is written in standard format and logical outlines	
Response	**0 – 1.5**	**1.6 – 3**	**3.1 – 4.5**	**4.6 – 6**	
	Answer less than 1/3 number of questions correctly	Answer more than 1/3 and less than 2/3 number of questions correctly	Answer at least 2/3 number of questions correctly	Answer all questions correctly	
				Total	**/10**

Comments: ……

Assessor
(Signature and Name)

HCMC UNIVERSITY OF TECHNOLOGY AND EDUCATION
FACULTY OF MECHANICAL ENGINEERING

FME - HCMUTE

COURSE ASSESSMENT RUBRIC

Course: English for Mechanical Engineering

Speaking Performance Levels

Purpose: Evaluate a student's ability to communicate in technical English

Student name: *Student ID:*

Evaluator:

Ranking: On a scale from 1 (lowest performance) to 10 (highest performance), assign points to each dimension based on the criteria below:

Writing Dimensions/ Weight	Does Not Meet Expectations (1-3 points)	Meets Expectations (4-7 points)	Exceeds Expectations (8-10 points)	Points
Pronunciation 20%	The student is inconsistent in their pronunciation. Some words are pronounced correctly, and others are not correct.	The student's pronunciation is clear, with few errors.	The student's pronunciation is exceptional and mirrors a native speaker.	
Fluency 20%	The student has great difficulty putting words together in a sentence.	The student is able to respond to prompt with few errors and relative ease.	The student speaks clearly and articulately with no hesitation.	
Comprehension 20%	The student's speech reflects basic comprehension, but with frequent errors.	The student's speech reflects comprehension of the topic or prompt.	The student's speech reflects a clear understanding of the topic or prompt and includes details.	
Content 20%	The student's content has some relevance to the topic, but incorrect words are used.	The student's content is relevant to the topic, with few errors	The student's content reflects deep understanding of the topic.	
Vocabulary 20%	The student's vocabulary relates to the topic, is very basic, with a few errors.	The student's vocabulary enhances his/her response to the topic/prompt	The student's vocabulary reflects a sophistication in speaking, similar to a native speaker	
Total 100%	Speaking Criteria			

Assessor name

HCMC UNIVERSITY OF TECHNOLOGY AND EDUCATION

FACULTY OF MECHANICAL ENGINEERING

FME - HCMUTE

CAPSTONE PROJECT EVALUATION FORM

(FOR ADVISOR USE ONLY)

Title of thesis:	
Major:	
Student' s name 01:	Student's ID:
Student' s name 02:	Student's ID:
Student' s name 03:	Student's ID:
Advisor:	Academic Position:
Name of Institute:	

COMMENTS

1. COMMENTS ON ATTITUDE AND BEHAVIOR OF STUDENTS

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2. COMMENTS ON RESULTS OF CAPSTONE PROJECT

2.1. Structure of the capstone project

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2.2. Main contents

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2.3. Results of capstone project

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2.4. Capstone strengths and weaknesses

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3. EVALUATION

No.	CONTENT	MAX POINT	ACHIEVED POINT		
			St 1	St 2	St 3
1.	**Structure of the capstone project**	**30**			
	Student follows exactly the format for capstone project given by FME	*10*			
	The motivation of the project is clearly provided in the thesis	*10*			
	The need of project is clearly showed in the thesis	*10*			
2.	**Main contents (demonstration that students have ability to):**	**50**			
	Apply knowledge of math, engineering, and science	*5*			
	Analyze and interpret data	*10*			
	Design and manufacturing the system, component or process to meet needs	*15*			
	Improvement and development in future	*15*			
	Use the softwares and technical tools to solve the problem	*5*			
3.	***Real-life applications of capstone project***	**10**			
4.	***Products of capstone project***	**10**			
	Total	**100**			

4. CONCLUSIONS

☐ Accept
☐ Reject

HCMC, dd/mm/yy

Advisor

(*Signature and Name*)

HCMC UNIVERSITY OF TECHNOLOGY AND EDUCATION

FACULTY OF MECHANICAL ENGINEERING

FME - HCMUTE

CAPSTONE PROJECT EVALUATION FORM

(FOR REVIEWER USE ONLY)

Title of thesis:	
Major:	
Student' s name 01:	Student's ID:
Student' s name 02:	Student's ID:
Student' s name 03:	Student's ID:
Advisor:	Academic Position:
Name of Institute:	

COMMENTS

1. Structure of the capstone project

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2. Main contents

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3. Results of capstone project

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4. Capstone strengths and weaknesses

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5. Questions and Suggestions

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6. EVALUATION

No.	CONTENT	MAX POINT	ACHIEVED POINT		
			St 1	St 2	St 3
1.	**Structure of the capstone project**	**30**			
	Student follows exactly the format for capstone project given by FME	*10*			
	The motivation of the project is clearly provided in the thesis	*10*			
	The need of project is clearly showed in the thesis	*10*			
2.	**Main contents (demonstration that students have ability to):**	**50**			
	Apply knowledge of math, engineering, and science	*5*			
	Analyze and interpret data	*10*			
	Design and manufacturing the system, component or process to meet needs	*15*			
	Improvement and development in future	*15*			
	Use the softwares and technical tools to solve the problem	*5*			
3.	***Real-life applications of capstone project***	**10**			
4.	***Products of capstone project***	**10**			
	Total	**100**			

7. CONCLUSIONS

☐ Accept

☐ Reject

HCMC, dd/mm/yy

Reviewer

(*Signature and Name*)

Appendix 6: Sample of a course syllabus

HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY AND EDUCATION
FACULTY OF MECHANICAL ENGINEERING

Major: Mechanical Engineering Technology
Degree: Bachelor of Engineering
Programme: Mechanical Engineering Technology

COURSE SYLLABUS

1. **Course title: Machinery Manufacturing Technology**
2. **Code:** MMAT431525
3. **Credits: 3** credits (3/0/6) (3 theoretical credits, 0 experimental credit)

Course schedule: 15 weeks (3 theoretical hours + 0 experimental hour + 6 self-study hours/week

4. **Instructors:**

1/ Main instructor: Assoc. Prof. Dr. Truong Nguyen Luan Vu

2/ Co-instructors:

- ✓ M.E. Phan Thanh Vu
- ✓ M.E. Nguyen Hoai Nam
- ✓ M.E. Đang Minh Phung

5. **Requirements for attending this course**

Prerequisite course(s): None

Previous course(s): Fundamentals of Machinery Manufacturing Technology

6. **Course Description**

This course provides students, majoring in Mechanical Engineering Technology, Machinery Manufacturing Technology and Industrial Engineering with basic knowledge about:

- Designing manufacturing technology processes for common mechanical parts as well as typical parts such as shape of box, connecting rod, shaft, bushing and gear.

- Designing the mechanical fixtures including design methods of assembly drawings, standard mechanisms and components of a mechanical fixture.

- Calculating machining errors and clamping force when designing mechanical fixtures.

- Selecting the assembly processes of mechanical components.

7. **Course Goals**

Goals	**(Goal description)** *(After finishing this course, students are able to)*	**ELOs**
G1	Specialized knowledge in machinery manufacturing technology: manufacturing process design methods, specialized fixture design methods and assembly technology.	ELO 2
G2	Analyze, synthesize and apply the basic knowledge and related knowledge to solve technical problems, for example, is to organize the mass production of machine parts to achieve productivity and quality, then, assemble them together into the machine to meet the requirements of technical specifications.	ELO 3

G3	Work in groups, communicate and read English technical documents.	ELO 5, ELO 6, ELO 7
G4	Design and calculate technological equipment in machinery manufacturing technology.	ELO 11

8. Course Learning Outcomes (CLOs)

CLOs		**Description** *(After finishing this course, students are able to)*	**ELOs**
G1	G1.1	Explain how to make a manufacturing technology process for machining a mechanical component as well as select the suitable equipment and cutting parameters.	ELO 2
	G1.2	Analyse and calculate the reasonable machining stock-left, analyse the technology in the structure of the machine components as well as design machine parts with high technology.	ELO 2
	G1.3	Explain the general method for designing specialized fixtures applied to the processing of basic components of fixtures.	ELO 2
	G1.4	Calculate the machining errors of the specialized fixtures and clamping force required by the clamping mechanisms.	ELO 2
	G1.5	Explain the methods of assembling mechanical products.	ELO 2
G2	G2.1	Evaluate the importance of typical technology processes in manufacturing techniques and demonstrate how to create a manufacturing process for components such as boxes, crankshaft, shafts, bushes and gear.	ELO 3
	G2.2	Read the assembly diagrams of mechanical equipment.	ELO 3
G3	G3.1	Work in groups as well as solve issues about a manufacturing technology process of mechanical components.	ELO 5, ELO 6
	G3.2	Searching for documents in Vietnamese and English as well as self-studying and presenting technological process of other machine parts, such as machining of mechanical components in cars, motorcycles, etc.	ELO 7
G4	G4.1	Design the assembly technological process for mechanical parts.	ELO 11

Contribution level of this course to the program outcomes (ELOs)

ELO 1	**ELO 2**	**ELO 3**	**ELO 4**	**ELO 5**	**ELO 6**	**ELO 7**	**ELO 8**	**ELO 9**	**ELO 10**	**ELO 11**	**ELO 12**	**ELO 13**
	H	H		H	H	S				S		

Note: H (Highly Supportive); S (Supportive); P (Partly Supportive).

9. Required Textbook(s)

9.1. Textbooks

[1]. Steve Krar, Machine Tool and Manufacturing Technology, Willey, 1997; [2] Manufacturing Technology: P. N. Rao, Metal Cutting and Machine Tools, Tata McGraw-Hill Education, 2000

[2]. Hồ Viết Bình, Phan Minh Thanh, *Giáo trình Công nghệ chế tạo máy*, NXB Đại học Quốc gia Tp.HCM, 2013.

9.2. References

[3]. GS. TS. Trần Văn Địch, *Đồ gá gia công cơ*, NXB Khoa học và Kỹ thuật, 2002.

[4]. Trần Văn Địch, Nguyễn Trọng Bình và các tác giả khác, *Công nghệ chế tạo máy*, NXB Khoa học Kỹ thuật, 2003.

[5]. E. Paul DeGarmo, et al., *Materials and Processes in Manufacturing*, John Wiley & Sons, 2004.

[6]. V.M.Kovan, et al., *Fundamentals of Manufacturing Engineering*, Mir Publishers Moscow, 1987.

[7]. Hồ Viết Bình, Nguyễn Ngọc Đào, Lê Đăng Hoành, *Đồ gá gia công cơ khí – Tiện, Phay, Bào, Mài*, NXB Đà nẵng, 2000.

10. Assessment(s):

- Grade: **10**
- Assessment plan:

Test	Topics	Date	Assessment approaches	CLO(s)	Percentage (%)
Formative Assessment					**30**
Quiz#1	Review standard and positioning.	Week 1	Mini exercise	G1.1	5
Quiz#2	Give a machining part: analyse and choose fine standard and coarse standard.	Week 3	Mini exercise	G1.2	5
Quiz#3	Make a manufacturing process for a machine part.	Week 4	Mini exercise	G1.3	5
Quiz#4	Work in groups to translate an English material related to a technological process.	Week 7	Mini exercise	G3.2	5
Quiz#5	Calculate standard error	Week 9	Mini exercise	G1.4	5
Quiz#6	Calculate the clamping force needed for clamping mechanism.	Week 11	Mini exercise	G1.4	5
Essay – Reports					**20**
	After a lesson, students are requested to search and read a topic. Next, all groups present to the class about the research information. Topics include: 1. Manufacturing process of a box-shaped part. 2. Manufacturing process of a connecting rod part. 3. Manufacturing process of a bushing-shaped part. 4. Manufacturing process of a shaft-shaped part. 5. Manufacturing process of a gear-shaped part. 6. Design the structure of fixtures	Week 4-15	Essay – Reports	G1.1 G1.2 G1.5 G2.1 G2.2 G3.1 G3.2	

	7. Present the assembly diagrams				
Summative Assessment					**50**
	- Content covers all important knowledge and expected learning outcomes of the course. - Time duration: 60 minutes.			G1.2 G2.1 G2.2 G4.1	

11. Detail Course Outline

Week	Content	CLOs
Chapter 1 **: Design to Manufacturing Component in the Technology**		
1	***A/*** **Contents and teaching method***: (3)* **Contents of teaching:** 1.1 Basic concepts: ✓ *The production process and the technological process* ✓ *Prepare technology* ✓ *Methods of operation and manufacturing planning* 1.2 The methods of technological process design to manufacture machine components ✓ *Initial data* ✓ *Technological process design order* **Teaching approaches**: + Lecturing + Teamwork (Work in group) + Presentation	G1.1
	B/ **Self-study**: *(6)* + Read Chapter 15, document [3] and chapter 1, document [2]	
2	***A/*** **Contents and teaching methods***: (3)* **Content of Teaching:** ✓ Research drawings and check technological properties of structures ✓ Determine the machining appropriate surplus stock **Teaching approaches**: + Lecturing + Teamwork (Work in group) + Presentation	G1.2
	B/ **Self-study**: *(6)* + Read chapter 1, document [2] and chapter 7, document [3] + Do homework about surplus stock	
3	***A/*** **Contents and teaching method***: (3)* **Contents of Teaching:** + Determine reasonable manufacturing process and design operation + Compare alternative technologies 1.3. Design technological process for CNC machines **Teaching approaches**: + Lecturing	G1.2

	+ Give assignments about surplus stock and divide group to discuss	
	***B/* Self Study:** *(6)* **+** Reading chapter 1, document [2] and chapter 6, document [3] + Do homework according to the given drawings (Set up a manufacturing process)	
4	***A/* Contents and teaching method***: (3)* **Content of Teaching:** 1.4 Standardize the technology process ✓ *Concept* ✓ *Typical technology* ✓ *Group technology* ✓ *Combination technology* **Teaching approaches**: ✓ Lecturing ✓ Giving homework about technological process	G1.1
	***B/* Self-study:** *(6)* + Reading chapter 1, document [2] and chapter 13, document [3] + Do homework according to the drawings (Design the technological process in order to fabricate machine parts)	
***Chapter 2*: Manufacturing Technology of Symbolic components**		
5	***A/* Contents and teaching method***: (3)* **Content of Teaching:** 2.1 **Manufacturing Technology of box shape components** ✓ *Technical requirements* ✓ *Technology in box structure* ✓ *Material and stock* ✓ *The technology process manufacture box-shaped parts* ✓ *Solution of machining operation* ✓ *Machining box-shaped part by CNC machine* **The main teaching method:** + Reporting project and division the class into groups, teacher concludes and synthesize	G2.1 G3.1 G3.2
	***B/* Self-study:** *(6)* + Reading chapter 1, document [2] and chapter 16, document [3]	
6	***A/* Contents and teaching method***: (3)* **Content of Teaching:** 2.2 **Manufacturing Technology of pincers shape components** ✓ *Technical requirements* ✓ *Technology in pincers structure* ✓ *Material and surplus stock* ✓ *The technology process manufacture pincers shape components* ✓ *Solution of machining operation* ✓ *Machining pincers shape component* **The main teaching method:** + Reporting project and division the class into groups, teacher concludes and	G2.1 G3.1 G3.2

	synthesize	
	***B/* Self-study:** *(6)* + Reading chapter 1, document [2] and chapter 16, document [3]	
7	***A/* Contents and teaching method***: (3)*** **Content of Teaching:** 2.3 **Manufacturing Technology of axial shape components** ✓ *Technical requirements* ✓ *Technology in axial structure* ✓ *Material and stock* ✓ *The technological process manufacture axial shape components* ✓ *Solution of machining operation* ✓ *Machining axial shape component in the CNC machines* 2.4 **Manufacturing Technology of bush shape components** ✓ *Technical requirements* ✓ *Technology in bush structure* ✓ *Material and surplus stock* ✓ *The technology process manufacture bush shape components* ✓ *Solution of machining operation* ✓ *Machining bush shape component in the CNC machines* **The main teaching method** + The student is presented on English translation and their class together commented	G2.1 G3.1 G3.2
	***B/* Self-study:** *(6)* + Reading chapter 1, document [2] and chapter 16, document [3]	
8	***A/* Contents and teaching method***: (3)*** **Content of Teaching:** 2.5. Machining Gear ✓ *Classify degrees of accuracy* ✓ *Material and surplus stock for gear* ✓ *Technological requirement and gear heat treatment* ✓ *Standard of locating and the technological process before manufacturing gear* ✓ *The method of manufacturing gear* ✓ *Testing gear* ✓ *Manufacturing gear in the CNC machines* **The main teaching method** + Presenting + Lecture + Disputation	G2.1 G3.1 G3.2
	***B/* Self-study:** *(6)* + Reading chapter 1, document [2] and chapter 17, document [3]	
	***Chapter 3* : Design Fixture**	
	A/* Contents and Methods teaching in the class: (3)*** **Content of Teaching:**	

9	3.1 Content general about fixture ✓ *Content about equipped with technology* ✓ *The method equipped for the production process* ✓ *General structure of fixtures* ✓ *Faculty of fixtures* ✓ *Requirement for fixtures* ✓ *Material for manufacturing fixtures* ✓ *Classify fixtures* 3.2 The methods for designing fixtures ✓ *General method* ✓ *Initial documents to design of fixtures* ✓ *Method and sequence design of fixtures.* ✓ *Calculations needed when designing a fixture* 3.3 Details and fixing mechanism ✓ *Concept* ✓ *Main fixing mechanism and fixture manufacturing errors* ✓ *Additional fixing mechanisms* **The main teaching method**: + Lecturing **+** Discussion + Presentation	G1.3 G1.4
	***B/* Self-study:** *(6)* + Reading chapter 2, document [2] and chapters 1, 2, 3, 11 document [4] + Do homework last week.	
10	***A/* Contents and methods teaching main of the classes:** *(3)* **Content teaching theory:** 3.4 Clamping and calculations of clamping ✓ *Concept and requirements for clamping* ✓ *The method of calculating force needed* ✓ *Calculations of clamping errors* **The main teaching method**: + Lecturing **+** Discussion + Presentation	G1.4
	***B/* Contents should be self-taught at home:** *(6)* + Reading chapter 4, document [2] and chapter 3, document [2] + Do homework last week	
11	***A/* Contents and method teaching main of the classes***.: (3)* **Content teaching theory** 3.5 Clamping mechanisms type of mechanically ✓ *Clamping by cleat* ✓ *Clamping by thread* ✓ *Clamping by eccentric cam* ✓ *Clamping by elastic disk* ✓ *Clamping by plastic*	G1.4

	The main teaching method: + Lecturing **+** Discussion + Presentation	
	***B/* Self-study:** *(6)* + Reading chapter 4, document [2] and chapter 3, document [2] + Doing homework by teachers last week.	
12	***A/ Contents and method teaching main of the classes. (3)*** **Content teaching theory** **3.6** Clamping mechanisms type of hydraulic, electromagnetic, electromechanic ✓ *Clamping by air* ✓ *Clamping by hydraulic* ✓ *Clamping by air-hydraulic* ✓ *Clamping by mechanical - hydraulic* ✓ *Clamping by electric - mechanic* ✓ *Clamping by electromagnetic* ✓ *Clamping by air vacuum* **3.7** Auxiliary mechanism and carcass attachment ✓ *Mechanism instructions* ✓ *Gage tare tool – Mechainsm index* ✓ *Carcass attachment* **3.8** Overview attachments of the fast assembly used on CNC machines ✓ *Concept* ✓ *Advantage of attachments of the fast assembly* **The main teaching method**: + Lecturing **+** Discussion + Presentation	G1.4
	***B/* Self-study:** *(6)* + Reading chapter 4,5,6 document [2] and chapter 3, document [2]	
***Chapter 4:* Assembly technology of the mechanical products**		
13	***A/* Contents and teaching method**. *(3)* **Content of Teaching:** 4.1. *The concept of assembly technology* ✓ *Location of assembly technology* ✓ *The task of assembly technology* 4.2 The assembly methods ✓ *Classification of the assemblies* ✓ *The concept of assembly accuracy* ✓ The assembly methods **Teaching approaches**: + Lecturing **+** Discussion + Presentation	G1.5

	***B/* Self-study:** *(6)* + Reading chapter 20 document [3] and chapter 4, document [2]	
14	***A/* Contents and teaching method***: (3)* **Content of Teaching:** 4.3 Assembly forms 4.4 Design assembly technology process ✓ *Contents and documents for* designing assembly technology process ✓ *The sequence of* design assembly technology process ✓ *Make assembly diagram* **Teaching approaches**: + Lecturing + Discussion + Presentation	G1.5 G2.2 G4.1
	***B/* Self-study:** *(6)* + Reading chapter 20 document [3] and chapter 4, document [2] + Doing homework last week.	
5	**REVIEW** According to the review questionnaire	

12. Ethics:

- If students do not finish given assignments, they will not be allowed to attend the final exam.
- Assignments and projects must be done by the student. Plagiarism is not allowed and may result in a failing grade.

13. Approval date: 1st revision **30/03/2012**

14. Approval level:

Dean of faculty	Department Head	Group compilation
Assoc.Prof. Nguyen Truong Thinh	Assoc.Prof. Truong Nguyen Luan Vu.	ME. Phan Thanh Vu ME. Đang Minh Phung

15. The process of updating:

Update 1 (write content and Date updated): July 29, 2016 Re-mapping the CLOs vs. the revised ELOs	**Author** ME. Phan Thanh Vu **Department head** Assoc.Prof. Truong Nguyen Luan Vu

Appendix 7: List of publications published in the period of 2014-2018 by lecturers

1. Nguyen V.K., Pham H.H., **Pham Huy Tuan**. *Multi-objective Optimization of a Linear Flexure-Based Mechanism Using Pseudo Rigid-Body Diagram Analysis and FEA-Based Response Surface Methodology*. Modern Environmental Science and Engineering, 2018 (Accepted).

2. Nguyen V.K., Ngo N.P., Pham H.H., **Pham H.T**. *Optimal design and simulation of compliant mechanism used as amplifier of micro linear actuator*. J. Science & Technology Development, 2018 (Accepted).

3. Duc-Tai Nguyen, **Minh-Ky Nguyen**. *Analysis mixed-mode fracture toughness (mode I/II) of a single-layered graphene sheet by finite element methods simulation*. Journal of Technical Education Science, Vol 46, 06-2018, ISSN 1859-1272.

4. V.K Nguyen, D.L. Tuong, **Pham Huy Tuan**, H.H. Pham. *Design and Optimization of a New Hollow Circular Flexure Hinge for Precision Mechanisms*". The 1st International Conference on Material, Machines and Methods for Sustainable Development (MMMS 2018), Danang, Vietnam, May 18-19, 2018, pp. 243-250.

5. T.T. Nguyen, T.H.M. Nguyen, **Pham Huy Tuan**. *New Approaches in Tool Path Optimization of CNC Punching Machine by Simulated Annealing*. The 1st International Conference on Material, Machines and Methods for Sustainable Development (MMMS 2018), Danang, Vietnam, May 18-19, 2018, pp. 215-223.

6. **Van Huu Thinh**. *Fundamentals of computing and designing a rotary feeder*. Proceedings of The First International Conference on Material Machines and Methods for Sustainable Development MMMS 2018, Danang, Vietnam, May 2018, Bach Khoa Publishing House, Vol 1, pp.619-624.

7. Le Thi My Hoa, **Pham Thi Hong Nga**. *Effect of Ethylene Vinyl Axetate (EVA) on the Mechanical Properties of Low-Density Polyethylene/ EVA Blends*. The first International Conference on Material, Machines and Methods for Sustainable Development, May 2018, (2): 932-939

8. **Phan Thanh Nhan**, Sneha Samal, Bohdana Marvalova, Iva Petrikova. *Thermal Characterization of Metakaolin-Based Geopolymer*. The Journal of The Minerals, Metals & Materials Society (TMS), Springer, December 2017, Volume 69, Issue 12, pp 2480–2484, ISSN 1047-4838.

9. V.K. Nguyen, H.H. Pham, **Huy-Tuan Pham**. *Multi-objective Optimization of a Linear Flexure-Based Mechanism Using Pseudo Rigid-Body Diagram Analysis and FEA-Based Response Surface Methodology*. The 3rd ASEAN Smart Grid Congress and the 5th International Conference on Sustainable Energy (ASGC3-ICSE5), 4 – 6 December 2017, Ho Chi Minh City University of Technology, Vietnam, pp. 142-149.

10. **Pham Son Minh**, Luu Phuong Minh, Nguyen Vinh Du. *The Thixoforming Process with Different Pressing Speed for Aluminum material*. The 4th International Conference on Advanced Engineering – Theory and Applications 2017 (AETA 2017), Dec 2017, pp. 228 – 241, ISBN: 9783319698144 (Web); 9783319698137 (print).

11. **Hieu Giang Le**, Ngoc Le Chau, Van Anh Dang, Thanh-Phong Dao. *Robust parameter design and analysis of a leaf compliant joint for micropositioning systems*. Arabian Journal for Science and Engineering, November 2017, Volume 42, Issue 11, pp 4811–4823, ISSN: 2193-567X.

12. Thanh-Phong Dao, Nhat Linh Ho, Tan Thang Nguyen, **Hieu Giang Le**, Pham Toan Thang**, Huy-Tuan Pham**, Hoang-Thinh Do, Minh-Duc Tran, Trung Thang Nguyen. *Analysis and optimization of a micro-displacement sensor for compliant microgripper*. Microsystem Technologies, December 2017, Volume 23, Issue 12, pp 5375–5395, Print ISSN 0946-7076.

13. Ngoc Le Chau, Thanh-Phong Dao, **Hieu Giang Le**. *Optimal Design of a New Compliant Planar Spring for the Upper Limb Movement Support Device with Free Energy Adjustment*. The 10th National Conference on Mechanics, Ha Noi, 8-9/12/2017 Vol 3, Industrial Fluid Mechanics.

14. Nhat Linh Ho**,** Thanh-PhongDao, **Giang Le Hieu.** *A Hybrid amplifying structure for a compliant microgripper*. The 10th National Conference on Mechanics, HaNoi, 8/12/2017 Vol 3, Industrial Fluid Mechanics.

15. **Minh Phung Dang,** Thanh-Phong Dao, **Giang Le Hieu.** *A hybrid mechanism based on beetle-liked structure and multi-lever amplification for a compliant micropositioning platform*. The 10th National Conference on Mechanics, Ha Noi, 8-9/12/2017 Vol 3, Industrial Fluid Mechanics.

16. **Dai Mai Duc**, T. Nguyen-Quoc, S. Nguyen-Hoai**.** *Static analysis of FG-CNTRC plates using higher-order shear deformation theory*. Lecture Notes in Mechanical Engineering 2018, January, (Proceedings of the International Conference on Advances in Computational Mechanics 2017 ACOME 2017, 2 to 4 August 2017, Phu Quoc Island, Vietnam), Springer Nature Singapore Pte Ltd. 2018, I, pp 357-368, Hardcover ISBN 978-981-10-7148-5, Book series ISSN 2195-4364

17. **Truong Minh Tri**, Bui Van Hong, Vo Thi Xuan. *Self- directed learning in the context of internationalization in TVET in Vietnam*. Journal of TVET@Asia Issue 9, June 2017, ISSN: 2196-838X Issue 9: Enhancement of Work-Integrated Learning (WIL) through cooperation of TVET Institutions, Companies, and Universities.

18. **Do Thanh Trung, Pham Son Minh**, Le Hoang Lam. *Study on A Damping System for the Toolholder in a Turning Process*. International Journal of Engineering Science Invention, International Journal of Engineering Science Invention, Volume 6 Issue 4, PP. 22-26, 2319 – 6734..

19. **Pham Son Minh**, Ho Ngoc Son. *Deformation of T-Connected Pipes Due to Welding Process*. International Journal of Engineering Science Invention, Vol. 6 (11), 11/2017, pp. 17-23, ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726.

20. **Pham Son Minh**, Ho Ngoc Son. *Pipe deformation due to welding*. International Journal of Science and Engineering Investigations, Vol. 6 (70), Nov 2017, pp. 147-152, ISSN: 2251-8843.

21. **Pham Son Minh**, Tran Thanh Phong. *Welding Deformation of a Rectangular Box during Gas Metal Arc Welding*. IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), Vol. 14 (6), 12/2017, pp. 85-91, e-ISSN: 2278-1684,p-ISSN: 2320-334X.

22. **Hieu Giang Le**, Tan Thang Nguyen**,** Thanh-Phong Dao, Shyh-Chour Huang. *Evaluation of structural behavior of a novel compliant prosthetic ankle-foot*. 2017 International Conference on Mechanical, System and Control Engineering (ICMSC 2017) St. Petersburg, Russia, during May 19-21, 2017, Electronic ISBN: 978-1-5090-6530-1.

23. **Nguyen Truong Thinh, Tuong Phuoc Tho**, Nguyen Thanh Tan. *Designing Self-feeding System for Increasing Independence of Elders and Parkinson People*. 2017 17th International Conference on Control, Automation and Systems (ICCAS 2017), Jeju, South Korea, 10/2017, IEEE, pp.691-695, ISBN 978-89-93215-13-7.

24. **Nguyen Truong Thinh, Tuong Phuoc Tho**, Tran Thi Thuy Nga. *Robot Supporting for Deaf and Less Hearing People*. 2017 17th International Conference on Control, Automation and Systems (ICCAS 2017), Jeju, South Korea, 10/2017, IEEE, pp.889-892, ISBN 978-89-93215-13-7.

25. Nhat Linh Ho, Thanh-Phong Dao, **Le Hieu Giang**. *Analysis of sensitivity of a compliant micro-gripper*. Journal of Technical Education Science, Vol 42, 06/2017, ISSN 1859-1272.

26. **Pham Huy Tuan** and Nguyen Ha Ngoc Hieu. *Shape Optimization and Fabrication of a Compliant Constant-Force Mechanism.* J. Science & Technology: Technical Universities, Vol. 115, pp. 63-68, 2017.

27. **Phan Thanh Nhan**. *Steps of using transformation matrixto analyze kinematics of specific planar mechanism*. Journal of Technical Education Science, Vol 42, 06/2017, ISSN 1859-1272.

28. **Truong Nguyen Luan Vu, Le Hieu Giang, Le Linh**, Vo Lam Chuong, Phan Tan Hai. *Pid controller design for second-order delayed unstable process*. Journal of Technical Education Science, Vol 44A, pp 27-32, 10/2017, ISSN 1859-1272.

29. **Vo Lam Chuong, Truong Nguyen Luan Vu.** *Identification method for simplified decoupling control system of multivariable processes*. Journal of Technical Education Science, Vol 44A, pp 76-82, 10/2017, ISSN 1859-1272.

30. Ngoc-Phuong Hoang, **Huy-Tuan Pham**. *Design of a Compliant Bio-Inspired Camera-Positioning Mechanism for Autonomous Mobile Robots*. 2017 IEEE International Conference on System Science and Engineering (ICSSE), July 21-23, Ho Chi Minh City, Vietnam, pp. 345-349. (**ISBN:** 978-1-5386-3422-9).

31. **Xuan Tien Vo**. *The concept of CDIO in Vocational Teacher Education in Vietnam*. Journal of TVET@Asia Issue 9, June 2017, ISSN: 2196-838X Issue 9: Enhancement of Work-Integrated Learning (WIL) through cooperation of TVET Institutions, Companies, and Universities.

32. Van-Khien Nguyen, **Huy-Tuan Pham**, Huy-Hoang Pham . *Optimal Design of High Precision Compliant Guide Mechanism Using Gene Algorithm and Taguchi–Based Sensitivity Analysis*. 2017 IEEE International Conference on System Science and Engineering (ICSSE), July 21-23, Ho Chi Minh City, Vietnam, pp. 432-437. (**ISBN:** 978-1-5386-3422-9)

33. **Thanh-Tan Nguyen, Huy-Tuan Pham**, and Thi Hong-Minh Nguyen. *Tool Path Optimization in CNC Punching Machine for Sheet Metal Manufacturing*. *2017 IEEE International Conference on System Science and Engineering (ICSSE)*, July 21-23, 2017, Ho Chi Minh City, Vietnam, pp. 401-406. (ISBN: 978-1-5386-3422-9).

34. **Pham Huy Tuan**. *Concept Inventory and Adaptive Instructional Strategy to Enhance the Teaching of Science and Engineering Courses*. 2017 STEMCON Science Technology Engineering Math Conference in Vietnam, March 1-2, 2017, Hanoi, Vietnam.

35. **Van Huu Thinh**. *Designing and manufacturing a rotary feeder*. IEEE International conference on system Science and Engineering ICSSE 2017,ISBN 978-1-5386-3421-9, pp. 420-423,July 2017, Ho Chi Minh University of Technology and Education, Vietnam.

36. **Van Huu Thinh,** Nguyen Van Huong. *Improving design and manufacture a machine for packing bags mushroom*. Vietnam Mechanical Engineering Journal, ISSN 0866-7056, No. 10/2017, pp.1-5.

37. **Do Van Hien**, Nguyen Xuan Hung. *Limit and shakedown isogeometric analysis of structures based on Bézier extraction*. European Journal of Mechanics - A/Solids, Elsevier, Volume 63, May–June 2017, Pages 149–164, ISSN: 0997-7538.

38. **Pham Son Minh, Do Thanh Trung, Tran Minh The Uyen**, Phan The Nhan. *A Study on the Welding Line Strength of Composite Parts Pith Various Venting Systems in Injection Molding Process*. Key Engineering Materials, Trans Tech Publications, Switzerland, Vol. 737, pp 70-76, 1662-9795, June 2017.

39. Myungseok Choi, Kilho Eom, Kwanwoong Gwak, **Mai Duc Dai**, Alexander Olshevskiy, Chang-Wan Kim. *Dynamical response of multi-walled carbon nanotube resonators based on continuum mechanics modeling for mass sensing applications*. Journal of Mechanical Science and Technology, May 2017, Volume 31, Issue 5, pp 2385–2391, ISSN: 1738-494X (Print).

40. Hoang Vu Phan, **Truong Quang Tri** and Hoon Cheol Park. *An experimental comparative study of the efficiency of twisted and flat flapping wings during hovering flight*. Bioinspiration & Biomimetics, IOP Publishing (UK), Vol.12, No.3, 4/2017, ISSN 1748-3182 (print); 1748-3190 (web).

41. **Do Thanh Trung, Tran Minh The Uyen, Pham Son Minh**. *Numerical Study on the Flow Length in an Injection Molding Process With an External Air-Heating Step*. Int. Journal of Engineering Research and Application, Int. Journal of Engineering Research and Application, Vol. 7, Issue 4, pp.85-89 (Part -2), 2248-9622, Mar 2017.

42. **Do Thanh Trung, Tran Minh The Uyen, Pham Son Minh**. *Study On The External Gas-Assisted Mold Temperature Control For Thin Pall Injection Molding*. Int. Journal of Engineering Research and Application, Int. Journal of Engineering Research and Application, Vol. 7, Issue 3, pp.15-19 (Part -2), ISSN 2248-9622, Mar 2017.

43. **Pham Huy Tuan**, Minh-Nhat Le, Van-Trinh Mai. *A Novel Multi-axis Compliant Prosthetic Ankle Foot to Support the Rehabilitation of Amputees*. The 3rd International Conference on Green Technology and Sustainable Development, GTSD 2016, 24-25 November 2016, Kaohsiung, Taiwan, ISBN 978-1-5090-3638-7, DOI 10.1109/GTSD.2016.61, pp 238-241.

44. **Phan Cong Binh**, Tri Dung Dang, Hoai Vu Anh Truong, Chau Duy Le, Minh Tri Nguyen, Kyoung KPan Ahn. *A study on modeling of a hybrid Wind Pave energy converter system*. 016 16th International Conference on Control, Automation and Systems (ICCAS 10/2016).

45. **Dang Thien Ngon**, Dat Le Quang, Toan Phan Van, Tuan Tao Anh. *A Welding Temperature Determination Method of LoP Carbon Steel and Stainless Steel Pelded Joint by Rotary Friction Welding Process*. The 3rd International Conference on Green Technology and Sustainable Development, GTSD 2016, 24-25 November 2016, Kaohsiung, Taiwan, ISBN 978-1-5090-3638-7, DOI 10.1109/GTSD.2016.55, pp 206-211.

46. **Dang Thien Ngon**, Giang Nguyen Truong. *An Approach To Design A Globoid CAM Using CREO Parametric 3.0*. The 3rd International Conference on Green Technology and Sustainable Development, GTSD 2016, 24-25 November 2016, Kaohsiung, Taiwan, ISBN 978-1-5090-3638-7, DOI 10.1109/GTSD.2016.54, pp 200-205.

47. **Le Hieu Giang, Mai Duc Dai, Pham Minh Duc**. *Investigation of Effects of Tool Geometry Parameters on Cutting Forces, Temperature and Tool Wear in Turning Using Finite Element Method and Taguchi's Technique*. International Journal of Mechanical Engineering and Applications, Volume 4, Issue 3, June 2016, Pages: 109-114, ISSN Print: 2330-023X.

48. **Le Hieu Giang, Truong Nguyen Luan Vu, Le Linh**. *Analytical Design of IMC-PID Controller for Ideal Decoupling Embedded in Multivariable Smith Predictor Control System*. International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering, Vol. 10, No. 7, 850-854, May 2016.

49. **Tuong Phuoc Tho, Nguyen Truong Thinh**, Nguyen Huy Bich. *Design and development of the vision sorting system*. The 3rd International Conference on Green Technology and Sustainable Development, GTSD 2016, 24-25 November 2016, Kaohsiung, Taiwan, ISBN 978-1-5090-3638-7, DOI 10.1109/GTSD.2016.57, pp 217-223.

50. **Le Linh, Truong Nguyen Luan Vu, Le Hieu Giang**. *Design of IMC-PID Controller Cascaded Filter for Simplified Decoupling Control System*. International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering, Vol. 10, No. 7, 869-884, 05/2016.

51. **Truong Nguyen Luan Vu, Le Linh, Le Hieu Giang**. *Fractional-Order PI Controller Tuning Rules for Cascade Control System*. International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering, Vol. 10, No. 7, 854-858, May 2016.

52. **Le Minh Tai**, Shyh-Chour Huang. *Effect of Nano-fillers on the Strength Reinforcement of Novel Hybrid Polymer Nanocomposites*. Materials and Manufacturing Processes, Volume 31, Issue 8, 8/2016, online 5/2015.

53. Nguyen Tan Viet Tuyen, **Nguyen Truong Thinh**, Dang Thai Son. *Gait of Quadruped Robot and Interaction Based on Gesture Recognition*. Journal of Automation and Control Engineering Vol. 4. No. 1. February 2016, ISSN: 2301-3702, pp 53-58.

54. Le Phan Hung, **Nguyen Truong Thinh, Tuong Phuoc Tho**. *Kinematic Analysis and Development Five-axis Milling Machine Based on Parallel Mechanisms*. The 3rd International Conference on Green Technology and Sustainable Development, GTSD 2016, 24-25 November 2016, Kaohsiung, Taiwan, ISBN 978-1-5090-3638-7, DOI 10.1109/GTSD.2016.42, pp 145-154.

55. Shyh-Chour Huang, **Le Minh Tai**. *Optimal design of process parameters, experimental fabrication and characterisation of a novel hybrid polymer nanocomposite*. International Journal of Materials and Product Technology, Vol. 52, Nos. 3/4, pp. 362-380, 4/2016.

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Appendix 8: Checklist for AUN Quality Assessment at Programme Level

1	**Expected Learning Outcomes**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1.1	The expected learning outcomes have been clearly formulated and aligned with the vision and mission of the university						x	
1.2	The expected learning outcomes cover both subject specific and generic (i.e transferable) learning outcomes						x	
1.3	The expected learning outcomes clearly reflect the requirements of the stakeholders					x		
	Overall opinion	**6.0**						
2	**Programme Specification**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2.1	The information in the programme specification is comprehensive and up-to-date						x	
2.2	The information in the course specification is comprehensive and up-to-date						x	
2.3	The programme and course specifications are communicated and made available to the stakeholders						x	
	Overall opinion	**6.0**						
3	**Programme structure and content**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3.1	The curriculum is designed based on constructive alignment with the expected learning outcomes					x		
3.2	The contribution made by each course to achieve the expected learning outcomes is clear						x	
3.3	The curriculum is logically structured, sequenced, integrated and up-to-date					x		
	Overall opinion	**5.0**						
4	**Teaching and Learning Approach**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4.1	The educational philosophy is well articulated and communicated to all stakeholders					x		
4.2	Teaching and learning activities are constructively aligned to the achievement of the expected learning outcomes						x	
4.3	Teaching and learning activities enhance life-long learning					x		
	Overall opinion	**5.0**						
5	**Student Assessment**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5.1	The student assessment is constructively aligned to the achievement of the expected learning outcomes					x		
5.2	The student assessments including timelines, methods, regulations, weight distribution, rubrics and grading are explicit and communicated to students						x	
5.3	Methods including assessment rubrics and marking schemes are used to ensure validity, reliability and fairness of student assessment						x	
5.4	Feedback of student assessment is timely and helps to improve learning					x		

5.5	Students have ready access to appeal procedure						x	
	Overall opinion	**6.0**						
6	**Academic Staff Quality**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6.1	Academic staff planning (considering succession, promotion, re-deployment, termination, and retirement) is carried out to fulfil the needs for education, research and service						x	
6.2	Staff-to-student ratio and workload are measured and monitored to improve the quality of education, research and service					x		
6.3	Recruitment and selection criteria including ethics and academic freedom for appointment, deployment and promotion are determined and communicated					x		
6.4	Competences of academic staff are identified and evaluated					x		
6.5	Training and developmental needs of academic staff are identified and activities are implemented to fulfil them						x	
6.6	Performance management including rewards and recognition is implemented to motivate and support education, research and service						x	
6.7	The types and quantity of research activities by academic staff are established, monitored and benchmarked for improvement					x		
	Overall opinion	**5.0**						
7	**Support Staff Quality**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7.1	Support staff planning (at the library, laboratory, IT facility and student services) is carried out to fulfil the needs for education, research and service					x		
7.2	Recruitment and selection criteria for appointment, deployment and promotion are determined and communicated					x		
7.3	Competences of support staff are identified and evaluated					x		
7.4	Training and developmental needs of support staff are identified and activities are implemented to fulfil them						x	
7.5	Performance management including rewards and recognition is implemented to motivate and support education, research and service						x	
	Overall opinion	**5.0**						
8	**Student quality and support**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8.1	The student intake policy and admission criteria are defined, communicated, published, and up-to-date						x	
8.2	The methods and criteria for the selection of students are determined and evaluated						x	
8.3	There is an adequate monitoring system for student progress, academic performance, and workload						x	
8.4	Academic advice, co-curricular activities, student competition, and other student support services are available to improve learning and employability					x		

8.5	The physical, social and psychological environment is conducive for education and research as well as personal well-being					x		
	Overall opinion	**6.0**						
9	**Facilities and infrastructure**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9.1	The teaching and learning facilities and equipment (lecture halls, classrooms, project rooms, etc.) are adequate and updated to support education and research						x	
9.2	The library and its resources are adequate and updated to support education and research					x		
9.3	The laboratories and equipment are adequate and updated to support education and research						x	
9.4	The IT facilities including e-learning infrastructure are adequate and updated to support education and research					x		
9.5	The standards for environment, health and safety; and access for people with special needs are defined and implemented					x		
	Overall opinion	**5.0**						
10	**Quality enhancement**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10.1	Stakeholders' needs and feedback serve as input to curriculum design and development					x		
10.2	The curriculum design and development process is established and subjected to evaluation and enhancement					x		
10.3	The teaching and learning processes and student assessment are continuously reviewed and evaluated to ensure their relevance and alignment					x		
10.4	Research output is used to enhance teaching and learning				x			
10.5	Quality of support services and facilities (at the library, laboratory, IT facility and student services) is subjected to evaluation and enhancement				x			
10.6	The stakeholder's feedback mechanisms are systematic and subjected to evaluation and enhancement						x	
	Overall opinion	**5.0**						
11	**Output**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
11.1	The pass rates and dropout rates are established, monitored and benchmarked for improvement						x	
11.2	The average time to graduate is established, monitored and benchmarked for improvement						x	
11.3	Employability of graduates is established, monitored and benchmarked for improvement					x		
11.4	The types and quantity of research activities by students are established, monitored and benchmarked for improvement					x		
11.5	The satisfaction levels of stakeholders are established, monitored and benchmarked for improvement					x		
	Overall opinion	**5.0**						
	Overall verdict	**5.4**						

Appendix 9: Supporting documents and evidences

No	Exh.	Title of Exhibition	Category
Criterion 1: Expected Learning Outcomes			
1	1.1	Revision of ELOs of MET programme in 2012	
	1.1a	Plan for revision of MET programme	Document
	1.1b	ISO procedure of revising of academic programmes	Document
	1.1c	Vision and Mission of HCMUTE and FME	Image
	1.1d	Feedback from Alumni and Industry in 2011	Document
	1.1e	Survey reports on satisfaction level of stakeholders for the MET programme	Document
	1.1f	Meeting minutes of the FME Academic and Scientific Committee on the ELOs and curriculum of MET programme	Document
	1.1g	HCMUTE decision on the promulgation of MET's ELOs	Decision
2	1.2	Approaches to ELOs	
	1.2a	ELOs posted on FME website	Image
	1.2b	Meeting minutes of the FME on writing syllabi of MET programme in 2012	Document
	1.2c	Syllabus of *Introduction to Mechanical Engineering*	Document
3	1.3	Extracurricular activities	
	1.3a	Green Summer Volunteer Campaign	Document
	1.3b	Environmental Hygiene	Document
	1.3c	Field trip	Document
	1.3d	English club	Document
	1.3e	Soft skill club	Document
4	1.4	Some course syllabi	
	1.4a	Syllabus of *Introduction to Mechanical Engineering*	Document
	1.4b	Syllabus of *Fundamental of Machinery Manufacturing Technology*	Document
	1.4c	Syllabus of *Machinery Manufacturing Technology*	Document
	1.4d	Syllabus of *Automation of Manufacturing Process*	Document
5	1.5	Samples of examination papers	
	1.5a	Examination paper of *English for Mechanical Engineering*	Document
	1.5b	Examination paper of *Tolerances and Measuring techniques*	Document
	1.5c	Examination paper of *Descriptive Geometry and Engineering Drawing*	Document
6	1.6	Feedback of stakeholders	
	1.6a	Survey reports on satisfaction level of stakeholders for ELOs and curriculum of MET programme in 2011, 2015 and 2016	Document
	1.6b	Feedback from Alumni and Industry in 2011, 2015 and 2016	
	1.6c	Meeting minute of the MMT Department on the ELOs and curriculum of MET programme in 2011, 2015 and 2016	Document
	1.6d	Meeting minute of the FME Academic and Scientific Committee on the ELOs and curriculum of MET programme in 2011, 2015 and 2016	Document
7	1.7	Syllabus and portfolio of "*Introduction to Mechanical Engineering*"	
	1.7a	Syllabus of "*Introduction to Mechanical Engineering*"	Document
	1.7b	Portfolio of "*Introduction to Mechanical Engineering*"	Document
8	1.8	Assessment rubrics	
	1.8a	Rubrics for course project	Document
	1.8b	Rubrics for Capstone project	Document
	1.8c	Rubrics for presentation	Document
	1.8d	Rubrics for Internship	Document
9	1.9	Activities in Capstone project	

	1.9a	List of employers to attend the capstone project defense board	Document
	1.9b	Some pictures of the capstone project defense ceremony	Image
Criterion 2: Programme Specification			
10	2.1	Deployment of the programme specification	
	2.1a	MoET decision on opening new programme	Decision
	2.1b	HCMUTE decision on promulgation of MET programme	Decision
	2.1c	List of teaching schedule and assigned lecturers for each semester	Document
	2.1d	Plan for orientation week	Document
	2.1e	MET programme specification posted on FME website	Image
11	2.2	MET programmes in 2004, 2008 and 2012	
	2.2a	MET programme in 2004	Document
	2.2b	MET programme in 2008	Document
	2.2c	MET programme in 2012	Document
12	2.3	New version of MET programme in 2018	Document
13	2.4	Some course syllabi	
	2.4a	Syllabus of *Introduction to Mechanical Engineering*	Document
	2.4b	Syllabus of *Fundamental of Machinery Manufacturing Technology*	Document
	2.4c	Syllabus of *Machinery Manufacturing Technology*	Document
	2.4d	Syllabus of *Automation of Manufacturing Process*	Document
14	2.5	Revising the course specification	
	2.5a	Syllabus of *Advanced CAD/CAM-CNC* and *Advanced CAD/CAM-CNC Practice*	Document
	2.5b	Meeting minute of the MMT Department on the course specification	Document
	2.5c	Meeting minute of the FME Academic and Scientific Committee on the course specification	Document
15	2.6	Feedback of employers and alumni for the curriculum development	
	2.6a	Plan of organizing workshops with employers and alumni	Document
	2.6b	Reports of annual meetings and workshops with employers and alumni	Document
	2.6c	Meeting reports of the FME Academic and Scientific Committee on revising the MET programme	Document
16	2.7	Orientation week for freshmen	
	2.7a	Plan for orientation week	Document
	2.7b	Images of orientation week	Image
17	2.8	Sample of e-learning course	
	2.8a	E-learning of *Tolerances and Measuring techniques* course	Document
	2.8b	E-learning of *CAD/CAM-CNC* course	Document
	2.8c	E-learning of *Experiments on CAD/CAM-CNC* course	Document
Criterion 3: Programme Structure and Content			
15	3.1	Some course syllabi	
	3.1a	Syllabus of *Introduction to Mechanical Engineering*	Document
	3.1b	Syllabus of *Fundamental of Machinery Manufacturing Technology*	Document
	3.1c	Syllabus of *Machinery Manufacturing Technology*	Document
	3.1d	Syllabus of *Automation of Manufacturing Process*	Document
16	3.2	Extra-curricular activities	
	3.2a	English club	Document
	3.2b	Field trip	Document
	3.2c	Soft skill club	Document
	3.2d	Environmental Hygiene	Document
	3.2e	Green Summer Volunteer Campaign	Document

17	3.3	Benchmarking of the MET programme	
	3.3a	MET programmes of some prominent national and foreign universities	Document
	3.3b	Analysing and benchmarking MET programme of HCMUTE and the others	Document
18	3.4	International student exchange programmes with universities	
	3.4a	HCMUTE and FME policy to promote exchange programmes	Document
	3.4b	Exchange programmes with Korea, Taiwan, Thailand universities	Document
	3.4c	International exchange programme of SHTP	Document
	3.4d	Decision on nominating students to participate in student exchange programme	Decision
19	3.5	Comparing knowledge clusters of MET programmes in 2004, 2008 and 2012	Document
20	3.6	Update on the MET programme specification in 2016	
	3.6a	ISO procedure for revising academic programme	Document
	3.6b	Plan for revision of MET programme specification in 2016	Document
	3.6c	Feedback from Alumni and Industry	Document
	3.6d	Meeting minutes of FME and MMT Department	Document
	3.6e	MET programme - Industrial Design expertise	Document
Criterion 4: Teaching and Learning Approach			
21	4.1	The HCMUTE education philosophy and its concretization in the MET programme	
	4.1a	HCMUTE Educational Philosophy	Document
	4.1b	Vision and mission of Faculty of Mechanical Engineering (*http://fme.hcmute.edu.vn/ArticleId/18944dd4-d4d0-4915-9a9c-3053fdf045c0/vision-mission*)	Website
	4.1c	Courses use Project-Based Learning as a teaching method	Document
22	4.2	Integration activities	
	4.2a	AUN-QA certificates of FME's programmes	Document
	4.2b	MoU between HCMUTE and BUILD-IT programme	Document
	4.2c	*https://builditvietnam.org/partners*	Website
	4.2d	Industrial partners of FME	Document
	4.2e	Exchange programmes with Korea, Taiwan, Thailand, Indonesia, Philippine universities	Document
23	4.3	Alignment mechanism of courses to the ELOs	
	4.3a	Matrix of courses vs. expected learning outcomes	Document
	4.3b	Sample syllabi and course portfolios of MET programme	Document
	4.3c	Samples of different formative and summative assessment methods	Document
	4.3d	Minutes of semester-end meetings of course groups	Document
24	4.4	Teaching provided by other departments for MET programme	
	4.4a	Minutes on consensus of teaching contents of interdisciplinary courses	Document
	4.4b	Syllabi of general courses provided by Faculty of Applied Science	Document
	4.4c	Sample syllabi of fundamental courses provided by other departments in FME	Document
	4.4d	Sample syllabi of specialized courses provided by MMT Department	Document
25	4.5	Practices of active teaching methods in the MET programme	
	4.5a	Syllabus of Introduction to Mechanical Engineering	Document
	4.5b	Syllabus of Hydraulic and Pneumatic Technology	Document
	4.5c	Syllabus of Automation of Manufacturing Processes	Document
26	4.6	Practicing the workshops of teaching and learning	
	4.6a	Pedagogical trainings for engineering programmes provided by the Institute of Technical Education	Document

	4.6b	Certified Facilitator certificates of MMT lecturers	Document
	4.6c	Master Teachers trainings facilitated by MMT lecturers	Document
	4.6d	The MMT lecturers' papers attended VEEC and STEMCON conferences	Document
18	4.7	Technology used to assist the teaching	
	4.7a	Courses' portfolios using computer simulation	Document
	4.7b	Digital Learning Center, policy and annual reports	Document
	4.7c	List of link of online video lectures	Document
	4.7d	Laboratories with modern industrial facilities	Document
	4.7e	New technology trainings for FME lecturers	Document
19	4.8	Practical trainings and community services	
	4.8a	Factory visiting plans, notices and reports	Document
	4.8b	Training for teachers of vocational schools provided by MMT Department	Document
	4.8c	Short training courses provided by the High Technology Center	Document
	4.8d	Assessment rubrics for practical trainings	Document
27	4.9	Research activities for students	
	4.9a	HCMUTE policy for students doing researches	Document
	4.9b	Research groups and research labs for students	Document
	4.9c	List of students' researches and their awards in the last 5 years	Document
	4.9d	Posters, papers, reports and pictures of students' researches output	Image
	4.9e	Annual FME's competitions	Image
	4.9f	National and international competitions (Koma-Taisen, ABU Robocon Contests, Yseali Food Innovation)	Image
28	4.10	Supportive learning environment	
	4.10a	Open learning space and open Lab	Image
	4.10b	Teaching assistant system	Document
	4.10c	HCMUTE and FME policy to promote exchange programmes	Document
	4.10d	Exchange programmes with Korea, Taiwan, Thailand universities	Document
	4.10e	International exchange programme of SHTP	Document
	4.10f	List of approved credit transferred courses to MOOC	Document
29	4.11	Activities for the management of the teaching and learning approach	
	4.11a	Course portfolios	Document
	4.11b	Teaching peer-review reports of MMT Department	Document
	4.11c	Department meeting on teachers' evaluation	Document
	4.11d	Statistic reports for course evaluation of students	Document
30	4.12	English competency	
	4.12a	English lectures of specialized courses	Document
	4.12b	FME's English Speaking club	Document
	4.12c	Capstone projects Defence committee in English	Document
31	4.13	Digital competency	
	4.13a	Syllabus of "*Introduction to Mechanical Engineering*"	Document
	4.13b	Syllabi of programming courses	Document
32	4.14	Feedback mechanism to enhance the self-study skills of students	
	4.14a	Feedback for course projects	Document
	4.14b	Feedback for formative assessment of some courses	Document
33	4.15	Extra-curricular activities and assessments	
	4.15a	Plans and Reports of extracurricular activities to teach ethics and social responsibilities for students	Document
	4.15b	Plans and final reports of Youth Union and Student Association	Document

	4.15c	Matrix of extra-curricular activities vs. expected learning outcomes	Document
	4.15d	Assessment of social responsibility for students	Document
	4.15e	Regulation for student grants	Document
34	4.16	The competence of initiative and entrepreneurship	
	4.16a	Report of student scientific research activities	Document
	4.16b	Plan and activities of the Faculty of Innovation and Entrepreneurship	Document
	4.16c	Organizing plan for the Week of civil information supplementation	Document
	4.16d	HCMUTE start-up companies	Document
Criterion 5: Student Assessment			
35	5.1	Assessment of new student admission	
	5.1a	Student Enrolment Project	Document
	5.1b	Regulation of AAO on Entrance English tests	
	5.1d	Results of Entrance English placement	Document
36	5.2	Some course syllabi	
	5.2a	Syllabus of *Introduction to Mechanical Engineering*	Document
	5.2b	Syllabus of *Fundamental of Machinery Manufacturing Technology*	Document
	5.2c	Syllabus of *Machinery Manufacturing Technology*	Document
	5.2d	Syllabus of *Automation of Manufacturing Process*	Document
37	5.3	Different forms of assessment	
	5.3a	Samples of quiz test, non-marking test for diagnostic purpose	Document
	5.3b	Samples of students' presentations and reports	Document
	5.3c	Sample rubrics for assessment of presentation	Document
	5.3d	Sample rubrics for course projects	Document
	5.3e	Samples of online tests	Document
	5.3f	Samples of test sheets	Document
38	5.4	Regulation and implementation of internship and capstone project	
	5.4a	Samples of internship reports	Document
	5.4b	Rubric for internship evaluation	Document
	5.4c	Regulations on capstone projects	Document
	5.4d	Rubric for capstone projects evaluation	Document
	5.4e	Samples of advisor, reviewer and committee's comment for capstone project	Document
39	5.5	Evaluation of teaching and learning process	
	5.5a	Class observation	Document
	5.5b	Online surveys for students to evaluate the teaching quality	Document
40	5.6	Grading benchmark	
	5.6a	Regulations of university and college in credits system	Document
	5.6b	Grading sheets and sample of students' work	Document
41	5.7	The assessment and evaluation processes are communicated to students	
	5.7a	Course introduction video clips	Document
	5.7b	Weekly feedback for students' assignment, course projects	Document
	5.7c	Answers for the final test and grading scheme	Document
42	5.8	Tools for student assessment	
	5.8a	Marking schemes for the evaluation of courses	Document
	5.8b	Rubrics for presentation	Document
	5.8c	Rubrics for the evaluation of capstone projects	Document
	5.8d	Rubrics for the evaluation of course projects	Document
43	5.9	ISO monitoring final examination and appeal procedure	

	5.9a	ISO monitoring final examination procedure	Document
	5.9b	ISO appeal procedure	Website
44	5.10	Assessment of students' social responsibility	
	5.10a	Regulation on assessment of students' social responsibility	Document
	5.10b	Online "social mark" of students	Document
45	5.11	Procedures for composing, delivering and monitoring the test and grade	
	5.11a	ISO procedures for composing, delivering and monitoring the test and grade	Document
	5.11b	FME link of answers for the final test	Document
46	5.12	FME teaching assistants	
	5.12a	Regulations on teaching assistants	Document
	5.12b	Decision on teaching assistants	Document
	5.12c	FME teaching assistants	Document
47	5.13	Timely feedback of courses	
	5.13a	The content of final test and the answer keys on the FME website	Document
	5.13b	Feedback online on the LMS	Document
	5.13c	Samples of experimental reports	Document
	5.13d	Samples of weekly course project feedback	Document
48	5.14	Appeal procedure	
	5.14a	ISO appeal procedure	Document
	5.14b	Samples of student appeal cases	Document
Criterion 6: Academic Staff Quality			
49	6.1	Academic staff planning	
	6.1a	HCMUTE human resource planning	Document
	6.1b	FME development strategy	Document
	6.1c	List of FME staff	Document
	6.1d	List of visiting lecturers of FME	Document
	6.1e	Lecturers' title accreditation	Document
50	6.2	Human resource policy related to academic staff	
	6.2a	Professor title registration announcement	Document
	6.2b	Retirement regulations	Document
	6.2c	Education Law execution	Document
	6.2d	Retirement announced on the homepage	Document
	6.2e	Insurance policies	Document
	6.2f	Promotion and designation regulations	Document
	6.2g	Job description for FME academic staff	Document
51	6.3	Academic staff recruitment	
	6.3a	Standards for lecturers	Document
	6.3b	HCMUTE recruitment statistics	Document
	6.3c	FME recruitment proposal	Document
	6.3d	Recruitment announcement on the homepage	Document
	6.3e	Academic staff recruitment process	Document
	6.3f	Criteria checklist for academic staff candidates	Document
	6.3g	Probation guides for academic staff	Document
	6.3h	Probation ending documents of academic staff	Document
	6.3i	HCMUTE adjusted standards for lecturers	Document
	6.3j	HCMUTE recruitment proposal	Document
	6.3k	Decision for probation officers	Document
	6.3l	The required eligibility for academic staff to end the probation period	Document

52	6.4	Academic staff's rights and duties	Document
	6.4a	Standards for lecturers	Document
	6.4b	HCMUTE adjusted standards for lecturers	Document
53	6.5	Promotion policy	Document
	6.5a	Promotion and resignation regulations	
54	6.6	Teaching activity monitoring	
	6.6a	A course outline	Document
	6.6b	Teaching schedule of MMT Department	Document
	6.6c	Tutor policies for academic staff	Document
	6.6d	Teaching profile of a course	Document
	6.6e	Teaching learning activity report	Document
	6.6f	Final test content matching with the course syllabi	Document
	6.6g	Variety of instructional media used to consult students	Document
	6.6h	Teaching observation plan	Document
	6.6i	Teaching observation report	Document
55	6.7	Assessment of academic staff performance	
	6.7a	Personal planning in KPIs system	Decision
	6.7b	Student surveys on teaching quality	Document
	6.7c	Quality assurance report on teaching activities	Document
	6.7d	Self-assessment report	Document
	6.7e	Personal planning report	Document
	6.7f	Supervision of HCMUTE education inspectors to teaching activities	Document
56	6.8	Training activities for FME academic staff	
	6.8a	Lecturer fostering announcement	Document
	6.8b	List of training courses for academic staff	Document
	6.8c	Announcement for performance report submission	Document
	6.8d	Training course announcement	Document
	6.8e	English test results of academic staff	Document
	6.8f	FME training course proposal	Document
	6.8g	LMS training course	Document
	6.8h	HR training and development process	Document
57	6.9	KPI evaluation systems	
	6.9a	KPIs system	Document
58	6.10	Research activities and related support policies	
	6.10a	Research project implementation procedure	Document
	6.10b	Regulation for scientific research norm of teachers	Document
	6.10c	Budget distribution plan for scientific projects	Document
	6.10d	Regulation for Financial support for scientific papers published on international journals	Document
	6.10e	Decision on Featured research teams	Document
59	6.11	FME research projects	
Criterion 7: Support Staff Quality			
60	7.1	Support staff planning	
	7.1a	HCMUTE Human Resource planning	Document
	7.1b	Development and Training Process of Human Resource	Document
61	7.2	Library staffs	
	7.2a	Table of national standard for library staffs	Document
	7.2b	List of library staffs	Document

62	7.3	Report on students and alumni satisfactory survey	
	7.3a	Satisfaction survey of HCMUTE students	Document
	7.3b	Satisfaction survey of alumni	Document
63	7.4	FME laboratory and workshop managers	
	7.4a	List of FME laboratory and workshop managers	Document
	7.4b	Training courses for FME laboratory and workshop managers	Document
64	7.5	IT support staff	
	7.5a	List of Formation and Network Center Staffs of the HCMUTE	Document
	7.5b	Decision on Formation and Network center functions	Decision
	7.5c	Training courses for Formation and Network Center Staffs	Document
65	7.6	Support service activities	
	7.6a	Statute for consultation	Document
	7.6b	Function and responsibility of consultants	Document
	7.6c	Support service activities of functional offices and centers	Document
66	7.7	Consulting activities for students	
	7.7a	Plan of the Freshmen welcome ceremony	Document
	7.7b	Images of Freshmen welcome ceremony	Photos
	7.7c	Decision on consultant staff	Document
	7.7d	Report of activities of consultant staff	Document
67	7.8	Support staff recruitment	
	7.8a	Provisions on the tasks and conditions for expiry of the probationary period	Document
	7.8b	Announcement on examinations, review and results of exams for appointment to lecturers, teachers, experts and librarian	Document
	7.8c	HCMUTE's ISO procedure for the recruitment	Document
	7.8d	http://hrmo.hcmute.edu.vn/TopicId/edb253a3-cfd7-4546-b813-163767bcbc0e/tuyen-dung	Document
	7.8e	Support staff recruitment, emulation and rewards for support staff	Document
	7.8f	Decision on the promulgation of the Regulation on the appointment, re-appointment, resignation and dismissal of subunits leaders of the HCMUTE	Decision
68	7.9	The planning and appointment of support staffs	
	7.9a	Strategy for organizational and human resource development	Document
	7.9b	Evaluation and classification form for staffs	Document
	7.9c	Decision on appointment of support staffs	Decision
69	7.10	Retirement and resignation policy	
	7.10a	Retirement regulations for support staff	Document
	7.10b	Retirement announced on the homepage	Document
	7.10c	Insurance policies for support staff	Document
	7.10d	Promotion and resignation regulations	Document
70	7.11	Training activities for support staff	
	7.11a	Training-fostering plans for support staff	Document
	7.11b	List of training courses for support staff	Document
	7.11c	Announcement for performance report submission	Document
	7.11d	Training course announcement for support staff	Document
	7.11e	English test results for support staff	Document
	7.11f	HR training and development process	Document
71	7.12	Satisfaction survey report from the HCMUTE students	Document
72	7.13	The HCMUTE's budget for training of support staff	Document
73	7.14	FME's Strategic Plan	Document

74	7.15	Self-assessment report of the staff	Document
75	7.16	Emulations and Rewards for support staffs	
	7.16a	Emulation guides for support staff	Document
	7.16b	Emulation titles for support staff	Document
	7.16c	Salary increase decision for support staff	Document
	7.16d	Salary increase announcement for support staff	Document
76	7.17	Work environment survey for the HCMUTE's staff	Document
Criterion 8: Student quality and support			
77	8.1	Admission criteria of HCMUTE	
	8.1a	Admission announcement for university, college and vocational high school levels	Document
	8.1b	HCMUTE admission plan	Document
78	8.2	Student attraction and motivation policies	
	8.2a	Direct admission announcement	Document
	8.2b	Decision on financial award for top two highest score enrolment	Document
	8.2c	Scholarship for student motivation	Document
79	8.3	Tuition fee exemption policies	
	8.3a	Decision on tuition fee exemption for female students	Decision
	8.3b	Decision on tuition fee exemption and reduction for economically disadvantage students	Decision
80	8.4	HCMUTE Admission Consultation Activities	
	8.4a	Plan and photos of the admission consultation activities	Document & photos
	8.4b	Plan and photos of the Open Days	Document & photos
81	8.5	HCMUTE admission process	
	8.5a	MoET statute for student admission for universities and colleges	Document
	8.5b	Plan for organizing the NHSGE	Document
	8.5c	Meeting minutes of the admission council and HCMUTE cut-off score in recent years	Document
82	8.6	Monitoring system	
	8.6a	The Dashboard system	Document
	8.6b	Student caution reports from AAO	Document
83	8.7	Credit-based higher education system	Document
84	8.8	Coaching activities for advance students	
	8.8a	Teaching assistance statute and regulation	Document
	8.8b	Research projects activities and competitions	Document
	8.8c	Olympic team establishment and results	Document
85	8.9	Academic advice	
	8.9a	Consultant teams establishment and activities	Document & photos
	8.9b	Factory visiting activities	Document
86	8.10	Co-curricular activities	
	8.10a	Activities of English club	Document
	8.10b	Job-fair activities	Images
	8.10c	Factory visiting activities	Document
	8.10d	Seminars and Workshops for students	Document
87	8.11	Student orientation activities	
	8.11a	FME plan for student orientation	Document

	8.11b	Activities in the Orientation Days	Images
88	8.12	Supplementary English classes	Document
89	8.13	Syllabus of *Introduction to Mechanical Engineering Course*	Document
90	8.14	Student support services	
	8.14a	Open spaces	Images
	8.14b	Student service center	Document
	8.14c	Student satisfaction survey on support services	Document
91	8.15	Courses registration	
	8.15a	Courses registration statute	Document
	8.15b	Courses registration announcement	Document
	8.15c	Online courses registration	Image
92	8.16	Talks between HCMUTE/FME administration boards and students:	
	8.16a	Plans and reports of Talks between FME administrators and students	Document & photo
	8.16b	Plans and reports of Talks between UTE administrators and students	Document & photo
93	8.17	Extra-curricular activities	
	8.17a	English club	Document
	8.17b	Field trip	Document
	8.17c	Soft skill club	Document
	8.17d	Environmental Hygiene	Document
	8.17e	Green Summer Volunteer Campaign	Document
94	8.18	Insurance and health care for students	
	8.18a	Insurance and health care for students	Document
	8.18b	Psychological consultation to students	Document
Criterion 9: Facilities and infrastructure			
95	9.1	HCMUTE Campus Information	
	9.1a	HCMUTE map in 2030	Image
	9.1b	Construction area	Document
	9.1c	Four construction works and construction plan for F1 building	Image
96	9.2	Application of IoT in education and management	
	9.2a	Digital Learning Center facilities	Document
	9.2b	Online LMS course list	Document
	9.2c	Map of Internet connection	Image
	9.2d	PSC application software of some units	Document
	9.2e	Misa software used in accounting	Document
97	9.3	Strategic plans	
	9.3a	HCMUTE 5-year medium-term strategic plan 2011-2015 looking forward to 2022	Document
	9.3b	HCMUTE 5-year medium-term strategic plan 2016-2020 looking forward to 2030	Document
	9.3c	FME's strategic plans	Document
98	9.4	HCMUTE's library resources	
	9.4a	Regulation of library and website	Document
	9.4b	List of books, journals and reference materials of the curriculum at the school	Document
	9.4c	List of mechanical engineering books of FME's library	Document
99	9.5	HCMUTE's library E-resources	
	9.5a	Sample of e-databases	Image

	9.5b	Link e-library	Image
	9.5c	List of electronic textbooks	Document
100	9.6	Announcement of new books, book exchange and book fair	
	9.6a	Announcement of new books	Document
	9.6b	Exchange new books for old books	Image
	9.6c	Book fair	Image
101	9.7	Library infrastructure	
	9.7a	Library facilities	Image
	9.7b	Interaction of library and readers	Image
	9.7c	Wi-Fi system for the library	Document
102	9.8	Surveying and evaluating the support quality of the library	
	9.8a	Surveying form	Document
	9.8b	Surveying results from 2012-2017	Document
103	9.9	The facilities and equipment of FME	
	9.9a	Device log	Document
	9.9b	Maintenance and repair process of equipment	Document
	9.9c	FME plan for buying new equipment	Document
	9.9d	FME plan for repair and maintenance of offices, workshops and LABs	Document
104	9.10	Results of students' satisfaction survey on laboratories and equipment	Document
105	9.11	IT facilities	
	9.11a	Statistics of the number of computers, TV and projectors	Document
	9.11b	FME's website	Document
	9.11c	Information of marks, schedules, classrooms	Document
	9.11d	Register subject online	Document
	9.11e	Online learning	Document
106	9.12	Digital learning center	
	9.12a	Digital Learning Center facilities	Document
	9.12b	Online LMS course list	Document
	9.12c	Samples of courses applying Moodle system	Document
107	9.13	Regulation, pre-test, emergency protocol	
	9.13a	Laboratory and Workshop regulations	Document
	9.13b	Sample of pre-test on environment, health and safety	Document
	9.13c	Emergency protocol	Document
108	9.14	Health care	
	9.14a	Health insurance and accident insurance for the university staff and students	Document
	9.14b	Inspection of food sanitation	Document
	9.14c	Plans of spraying insecticides	Document
	9.14d	Periodic examination	Document
109	9.15	Student services center	
	9.15a	Functions of Student services center	Document
	9.15b	Activities of Student services center	Document
Criterion 10: Quality enhancement			
110	10.1	ISO procedures for the curriculum design and development	
	10.1a	UTE's ISO procedure for the curriculum design and development version 2015	Document
	10.1b	Statute No. 125/QC-ĐHSPKT-ĐT date 22/12/2008 (Student Handbook 2015 – page 11)	Document
	10.1c	ISO procedure for evaluating the satisfaction of stakeholders on the training curriculums	Document

	10.1d	ISO procedure for evaluating the satisfaction of students during their training	Document
111	10.2	Inputs & feedback of stakeholders for the curriculum development	
	10.2a	MET programmes applied in 2004, 2008, 2012, 2018	Document
	10.2b	Reports of annual meetings and workshops with employers and alumni	Document
	10.2c	Meeting minutes of the FME Academic and Scientific Committee on revising the MET programme	Document
	10.2d	Surveys of FME students on teaching quality of lecturers (2013-2018)	Document
	10.2e	Meeting minutes between students and Dean Board, students and Presidential Board	Document
	10.2f	Survey results of newly graduated students	Document
112	10.3	Evaluation report for the curriculum implementation in Dec 2015	Document
113	10.4	Curriculum benchmark	
	10.4a	MET programmes of some prominent national and foreign universities	Document
	10.4b	Analysing and benchmarking MET programme of HCMUTE and the others	Document
114	10.5	ISO procedures of assuring teaching and learning quality	
	10.5a	Procedure for inspecting and examining the compliance with teaching statute of lecturer	Document
	10.5b	Procedure for classroom observation	Document
	10.5c	Procedure for planning and organizing examination	Document
	10.5d	Procedure for composing and keeping confidentially the test, replicating writing test; delivering, receiving the test and grade	Document
	10.5e	Monitoring final examination procedure	Document
115	10.6	Review and evaluation of teaching quality	
	10.6a	Plan and reports of teaching visits from department board	Document
	10.6b	Student online feedback forms and reports for courses	Document
	10.6c	Action reports for teaching enhancement from MMT Department	Document
116	10.7	Improvement in the teaching and learning activities	
	10.7a	ELOs focuses on soft skills	Document
	10.7b	HCMUTE policy to promote E/M Learning	Document
	10.7c	Annual reports of EM learning implementation	Document
	10.7d	Online LMS course list of MET programme	Document
	10.7e	English or bilingual course list of MET programme	Document
117	10.8	Improvement in assessment activities	
	10.8a	Sample course syllabi with different modes of assessment	Document
	10.8b	Rubrics for the evaluation of course projects and presentation in the course portfolios	Document
118	10.9	Research outputs of teachers support teaching	
	10.9a	Lecturers' KPIs evalauation system	Document
	10.9b	Annual research topics lists of FME lecturers	Document
	10.9c	Samples of MMT lecturers researches	Document
	10.9d	The MMT lecturers' engineering and technology publications (Appendix 7)	Document
	10.9e	The MMT lecturers' papers attended engineering educational conferences (VEEC, STEMCON, and IETEC)	Document
119	10.10	Students' research outputs	
	10.10a	Student research guide and procedure	Document
	10.10b	Annual research topics lists of FME students	Document
	10.10c	Sample researches of MET students (2013-2017)	Document
	10.10d	MET students awards of national and international competitions (Koma-	Document

		Taisen, Robocon 2017)	
120	10.11	Support services and facilities evaluation and enhancement	
	10.11a	The library's enhancement	Document
	10.11b	Equipment and facilities usage procedures	Document
	10.11c	Student services evaluation and enhancement	Document
	10.11d	Students' self-study requirement and open space usage evaluation	Document
	10.11e	Public internet Wi-Fi enhancement	Document
121	10.12	Systematic feedback mechanisms for stakeholders	
	10.12a	Curriculum evaluation feedback in 2015	Document
		i. Plan of FME curriculum revision workshop in 2015	
		ii. FME curriculums workshop presentation	
		iii. Survey form for employer on MET curriculum	
		iv. Meeting minute of revising ELOs and curriculum of MET programme	
		v. Meeting minute of FME Academic Science Committee on revising the ELOs and curriculum of MET programme	
		vi. Survey reports on satisfaction level of stakeholders for ELOs and curriculum of MET programme	
	10.12b	Curriculum evaluation feedback in 2016	Document
		i. HCMUTE plan for the CDIO curriculum implementation evaluation	
		ii. Decision of advisory board for curriculum evaluation	
		iii. HCMUTE plan for curriculum implementation evaluation workshop	
		iv. FME curriculum implementation evaluation workshop plan	
		v. FME curriculum implementation workshop schedule	
		vi. CDIO curriculum implementation workshop presentation	
		vii. Survey form for employer on FME curriculum	
		viii. Comments from alumni for MET programme	
		ix. Curriculum workshop minutes	
		x. Curriculum evaluation report	
	10.12c	Survey results of newly graduated students	Document
Criterion 11: Output			
122	11.1	FME training plan and report	
	11.1a	Quality targets of FME's annual training plan	Document
	11.1b	Report of FME's annual training plan performance	Document
123	11.2	Graduates feedback	
	11.2a	Form of Graduates feedback	Decision
	11.2b	Report of Graduates feedback	Document
124	11.3	Employer survey sample and results	
	11.3a	Instruction of use for student accounts and online reference	Document
	11.3b	Instruction of use for lecturer accounts and online reference	Document
125	11.4	Student scientific research implementation guideline and management	Document
126	11.5	FME student research projects and awards	
	11.5a	List of FME student research projects	Document
	11.5b	Certificates of student research awards	Images
	11.5c	Decide on rewarding students for the achievements of scientific research	Decision
127	11.6	Staff survey and reports	Document
128	11.7	Student feedback	
	11.7a	Student complaint resolution procedure	Document
	11.7b	Procedure for evaluating student's satisfaction in the course	Document
	11.7c	Student feedback report and decision	Document
129	11.8	Talks between HCMUTE/FME administration boards and students	

	11.8a	Plans and reports of Talks between FME administrators and students	Document & photo
	11.8b	Plans and reports of Talks between UTE administrators and students	Document & photo
130	11.9	The annual home coming day at FME	
	11.9a	Plan of the annual home coming day at FME	Document
	11.9b	Photos of the annual home coming day at FME	Photos
131	11.10	Surveys about satisfaction of employers	
	11.10a	Survey about the satisfaction level of industry to graduated students	Document
	11.10b	Survey about the satisfaction level of industry to MET programme	Document

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