

SELF - ASSESSMENT REPORT FOR AUN-QA



HCMUTE

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



BACHELOR OF ENGINEERING **IN MECHATRONICS ENGINEERING TECHNOLOGY**



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AUN-QA SELF-ASSESSMENT REPORT
of the Bachelor of Engineering in
MECHATRONICS ENGINEERING TECHNOLOGY

We hereby confirm to approve this AUN-QA Self-Assessment Report of the Bachelor of Engineering in Mechatronics Engineering Technology programme for assessment according to AUN-QA Criteria (V2.0).

A handwritten signature in blue ink, consisting of a stylized, cursive name.

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Dean

Faculty of Mechanical Engineering

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LIST OF ABBREVIATIONS

CLO	Course Learning Outcome
ELO	Expected Learning Outcome
ERC	Emulation and Reward Committee
FME	Faculty of Mechanical Engineering
FTE	Full-time Equivalent
HEEAP	Higher Engineering Education Alliance Programme
HCMUTE	Ho Chi Minh City University of Technology and Education
KPIs	Key Performance Indicators
MET	Mechatronics Engineering Technology
MoET	Ministry of Education and Training
MOU	Memorandum of Understanding
OAA	Office of Academic Affairs
QAO	Quality Assurance Office
SAR	Self-Assessment Report
TA	Teaching Assistant

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PART 1: INTRODUCTION

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

Founded on October 05th 1962, HCMUTE is one of the leading universities in terms of training and supplying high quality human resources in science and technology, serving the industrialization and modernization of the provinces in the south of Vietnam.

As of 2015, HCMUTE has 15 faculties, 16 functional units, and 14 institutes and centers. There are 577 lecturers, working and teaching at HCMUTE. The university has an area of 21.036 hectares, with 60.333 hectares of construction floors.

1.1. Vision

HCMUTE is to be the national top center for training and applied science research in technology and professional pedagogy, on a par with other major universities in South-East Asia and the world. HCMUTE is to serve as the driving force behind the sustainable development of the nationwide vocational education system.

1.2. Mission

HCMUTE is to:

- To be an organization for training, research, technology transfer, and vocational education science.
- To provide technical manpower and high quality scientific products to construct and develop the country.
- To actively and positively contribute to the fundamental and comprehensive innovation in education and training Vietnam.
- To integrate into the international education community and maintain sustainable development.

1.3. Organizing Structure of HCMC University of Technology and Education

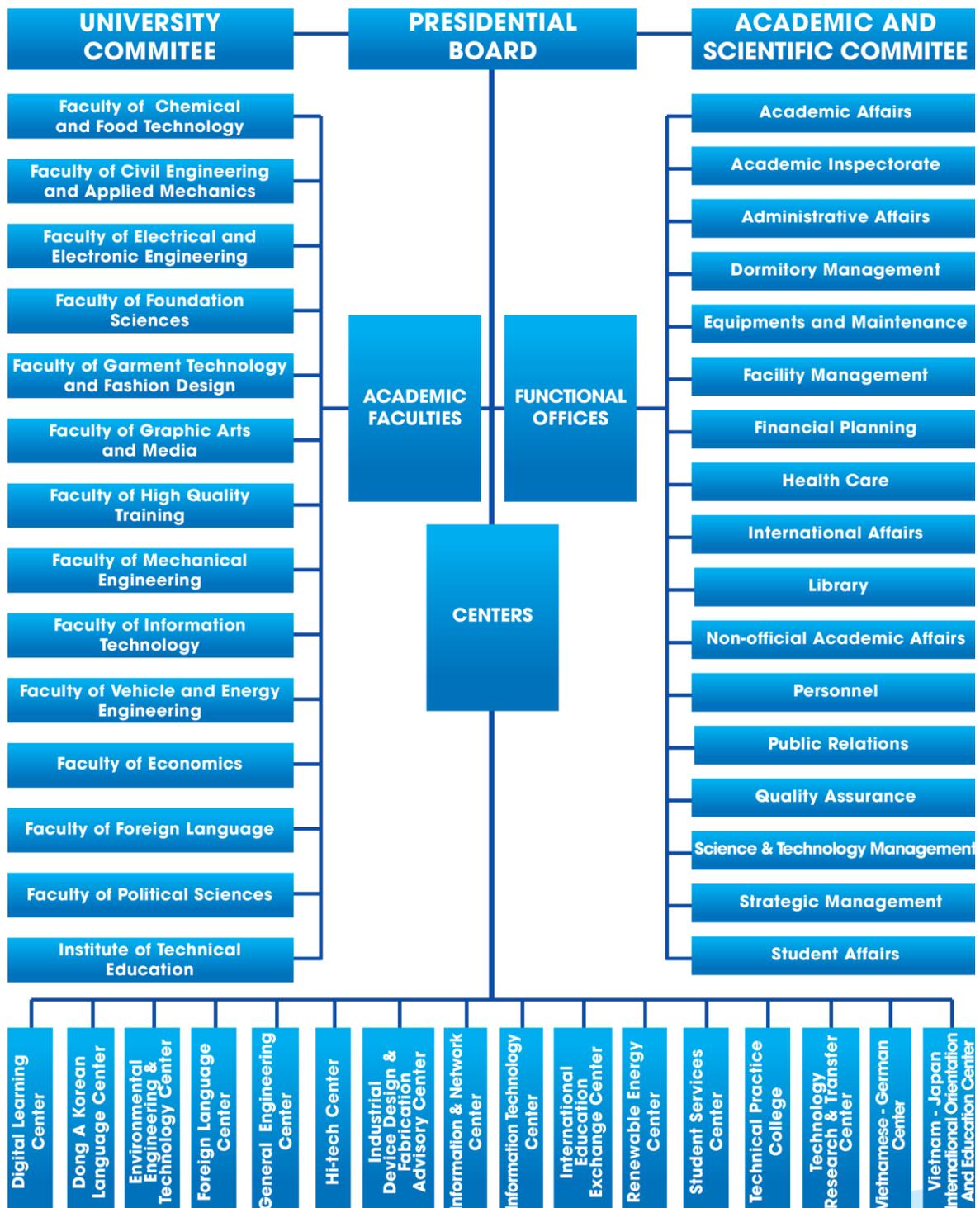


Figure 0-1: Organizing Structure of HCMC University of Technology and Education

2. Faculty of Mechanical Engineering (FME)

2.1. Vision of FME

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

international integration.

2.2. 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.

2.3. 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

2.4. 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".

The consistency between FME's and HCMUTE's missions

HCMUTE missions	FME missions
a. Be an organization for training, technology and professional education scientific research and transfer	a. To make the Faculty become the leading unit in education and research in mechanical and automatic fields in Viet Nam
b. Provide technical manpower and high quality scientific products to construct and develop Vietnam	b. 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

<p>c. Actively contribute to kernel and comprehensive renewals in education and training in the nation. Integrate into international education community and sustainably self-develop</p>	<p>c. 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</p>
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2.5. Organizing structure of FME

FME has 91 academic staff including 17 PhDs (not including 05 PhDs who are leaders and managers of the university), 03 academic staff are studying PhD abroad, and 47 Masters of Science.

The Faculty has 06 departments and 01 center. It offers graduate and undergraduate study programs at 03 different levels:

- PhD in Mechanical Engineering
- Master in Mechatronics Engineering Technology and Mechanical Engineering
- Bachelor in Mechatronics Engineering Technology
- Bachelor in Mechanical Engineering Technology
- Bachelor in Machinery Manufacturing Technology and Industrial Engineering..

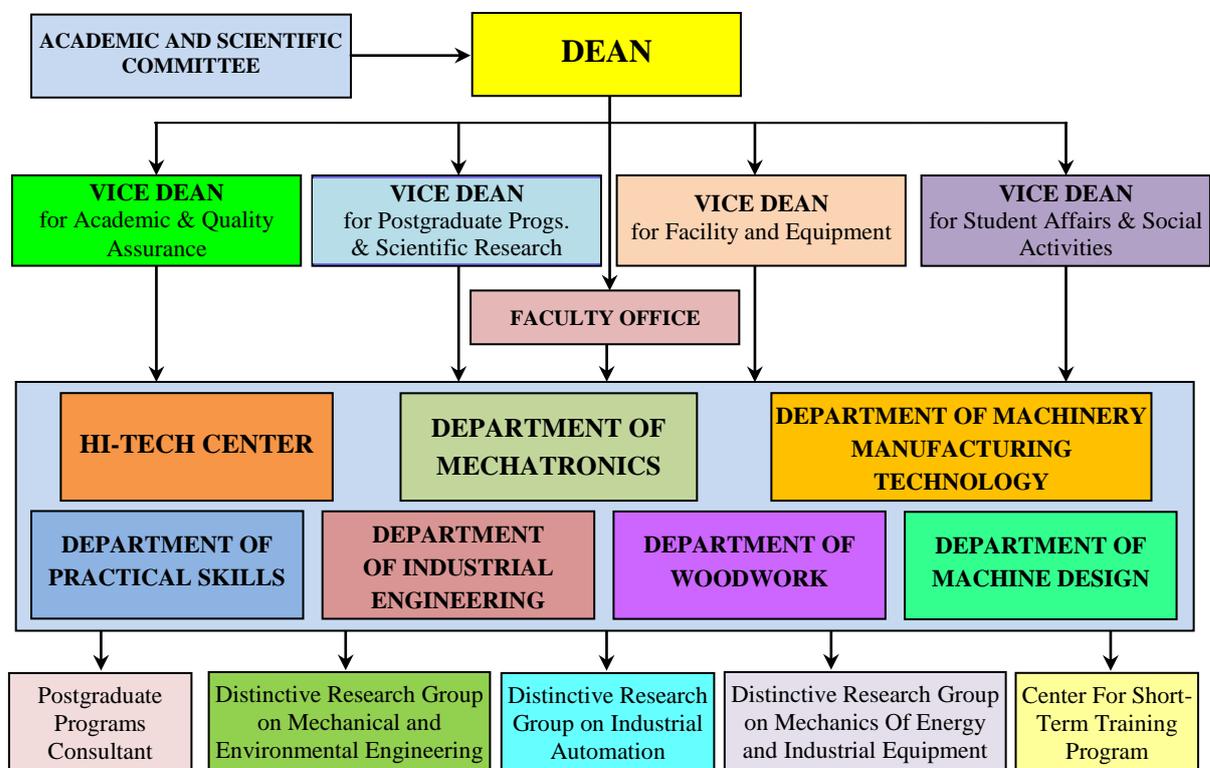


Figure 0-2: Organizing structure of FME

To support teaching, learning and researching work, FME has established 27 laboratories and workshops, 3 distinguished research groups. In addition, FME has 8 laboratories for research purpose [*Appendix 1: List of Laboratories and Research Groups*].

3. The Mechatronics Engineering Technology (MET) programme

The MET programme aims to train good practitioners in an emerging field that combines mechanical engineering, electrical engineering and computer science.

Programme Objectives

The MET program is to prepare students to:

1. Apply general knowledge, fundamental knowledge and specialized knowledge to work effectively and implement lifelong learning in the profession.
2. Analyze thoroughly the production system with problem solving skill and professional skills.
3. Communicate effectively in the professional environment, leadership and team work situations.
4. Conceive, design, implement, operate and maintain Mechatronics systems.
5. Specify requirements of industry to fulfill the needs of customers.

Job Opportunities

After graduation, students could work in mechanical engineering, electrical and electronic engineering, chemical engineering, food processing or technical services companies and factories in the role of engineers or operation managers.

PART 2: AUN-QA CRITERIA REQUIREMENTS

CRITERION 1: EXPECTED LEARNING OUTCOMES

1.1. The expected learning outcomes have been clearly formulated and translated into the programme

The main purpose of the MET programme is to help graduates completely fulfill the requirements from the labor markets, have good jobs and succeed in their careers. Therefore, in order to formulate the expected learning outcomes (ELOs) for the MET programme, FME has consulted the requirements of all stakeholders (employers, advisory board, alumni, students and faculty) via the annual survey [*Exh. 1-01: Survey report on satisfaction level of stakeholders for Programme Objectives of MET programme in 2011*]. Moreover, the FME regularly holds seminars for teaching staffs, employers and industrial advisory board to fully analyze the working environment of the Mechatronics engineers.

The analysis results indicate that the Mechatronics career is always a multi-disciplinary and complex integration of the three different emerging fields related to mechanical engineering, electrical engineering and computer science. In order to be ready for all practical problems, graduates must have professional knowledge and technical skills that blends those three fields. They should also have appropriate soft skills to work effectively in the multidisciplinary teams [*Exh. 1-02: FME meeting reports on the Working Environment Job Analysis of MET engineers in 2011*].

The synthesis of the survey results and working environment analysis show that the labor markets have these requirements for the knowledge, skills and attitudes of the MET graduates: “thoroughly understand specialized knowledge of Mechatronics career”; “efficiently implement problem-solving skill and professional skills”; “effectively cooperate in diverse organizations”; “design and develop products, procedures and systems with added value”; “maintain professional responsibilities in the workplace”; and “participate in lifelong learning”. Other requirements for “appreciating different enterprise cultures” and “recognizing the importance of the social context in the practice of engineering” are also mentioned during the design of the MET curriculum.

The FME has referred to the curriculum from other prestigious universities in Vietnam, in South-East Asia and in the world [*Exh. 1-03: List of prominent national and foreign universities and the curriculum comparison with FME*]. The benchmark of the MET program against these curricula have been done [*Exh. 1-04: Final report on curriculum benchmarking of Mechatronics programme among some prominent national and foreign universities*].

The expected learning outcomes:

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

- ELO 1: Use general knowledge of mathematics and science.
- ELO 2: Apply the principles of fundamental engineering knowledge.
- ELO 3: Apply advanced engineering knowledge in the professional areas of mechanical, electrical and electronic, and automation engineering.
- ELO 4: Identify, formulate, analyze and solve Mechatronics problems.
- ELO 5: Conduct investigations and experiments about Mechatronics engineering problems.
- ELO 6: Demonstrate professional skills that contribute to successful engineering practice.
- ELO 7: Lead and work effectively in individual and group-oriented settings.
- ELO 8: Communicate effectively in different forms: written, multimedia, graphical, and oral communication.
- ELO 9: Communicate effectively in English.
- ELO 10: Recognize the importance of the role and responsibility of engineers and the social context in the practice of engineering.
- ELO 11: Appreciate different enterprise cultures, demonstrate professional behavior and work successfully in organizations.
- ELO 12: Participate in lifelong learning
- ELO 13: Conceive and develop requirements and functions of components in Mechatronics systems.
- ELO 14: Design components for Mechatronics systems.
- ELO 15: Implement processes of hardware and software for Mechatronics systems.
- ELO 16: Operate the automation systems and manage the operation process.

Table 1-1: The relationships between knowledge, skills and ELOs

Group of ELOs	ELOs
General knowledge	<ul style="list-style-type: none"> ▪ ELO 1: Use general knowledge of mathematics and science.
Technological knowledge	<ul style="list-style-type: none"> ▪ ELO 2: Apply the principles of fundamental engineering knowledge. ▪ ELO 3: Apply advanced engineering knowledge in the professional areas of mechanical, electrical and electronic, and automation engineering. ▪ ELO 4: Identify, formulate, analyze and solve Mechatronics problems.
Generic skills	<ul style="list-style-type: none"> ▪ ELO 7: Lead and work effectively in individual and group-oriented settings. ▪ ELO 8: Communicate effectively in different forms: written, multimedia, graphical, and oral communication. ▪ ELO 9: Communicate effectively in English.
Attitude and awareness	<ul style="list-style-type: none"> ▪ ELO 10: Recognize the importance of the role and responsibility of engineers and the social context in the practice of engineering. ▪ ELO 11: Appreciate different enterprise cultures, demonstrate professional behavior and work successfully in organizations. ▪ ELO 12: Participate in lifelong learning.
Professional skills	<ul style="list-style-type: none"> ▪ ELO 5: Conduct investigations and experiments about Mechatronics engineering problems. ▪ ELO 6: Demonstrate professional skills that contribute to successful engineering practice.
	<ul style="list-style-type: none"> ▪ ELO 13: Conceive and develop requirements and functions of components in Mechatronics systems. ▪ ELO 14: Design components for Mechatronics systems. ▪ ELO 15: Implement processes of hardware and software for Mechatronics systems. ▪ ELO 16: Operate the automation systems and manage the operation process.

All ELOs of the programme fully satisfy the requirements of the stakeholders and are highly evaluated [*Exh. 1-05: Survey report on satisfaction level of stakeholders for ELOs of MET*]

programme in 2011]. Matrix of programme objectives versus expected learning outcomes is illustrated in Table 1-2.

Table 1-2: Matrix programme objectives vs. expected learning outcomes

Programme Objectives	Expected Learning Outcomes															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	X	X	X													
2				X	X	X										
3							X	X	X							
4													X	X	X	X
5										X	X	X				

The expected learning outcomes of the MET programme have been clearly announced and officially promulgated in 2012 with the HCMUTE Decision for issuing ELOs [*Exh. 1-06: Decision of HCMUTE for the promulgation of Mechatronics' ELOs in 2012*]. These ELOs have been highly supported by the stakeholders by means of annual surveys in 2014 and 2015. Therefore they are still maintained and applied for the current curriculum [*Exh. 1-07: Survey report on satisfaction level of stakeholders for ELOs of MET programme in 2014, 2015*]. The publicity of the ELOs to lecturers, students, employers and society is done via the university and the faculty's websites [<https://hcmute.edu.vn/>], students' handbook [*Exh. 1-08: Students' Handbook*] and the Programme Teachers' Manual [*Exh. 1-09: MET Programme Specification*].

The formulated ELOs of the MET curriculum have been fully translated into the programme.

To transfer the ELOs into the programme, FME analyzed the requirements of ELOs and identified the knowledge (general and technical knowledge), skills (generic and professional skills) and attitudes-awareness (ethics and life-long learning) that should be educated to students along the programme (Table 1-3).

According to the ELOs, the course learning outcomes, teaching content, teaching activities and assessment methods of all courses in the MET programme were reviewed and revised to ensure completeness and consistency [*Exh. 1-10: Samples of courses' portfolios*]. Each course has to contribute to the attainment of certain ELOs for students [*Appendix 2: Matrix of courses vs. expected learning outcomes*]. The integration of overlapping courses, elimination of courses with less contributions or adding new courses were also implemented [*Exh. 1-11: MET curricula before 2012 and the 2012 version*]. The programme is reviewed annually and then revised if necessary according to the policy of the FME faculty for reviewing and updating the curriculum. The ELOs for soft skills and attitudes are also transferred to the programme via extracurricular activities such as seminars, union activities,

social activities [Appendix 3: Matrix of extracurricular activities vs. expected learning outcomes]. All the curricular and extracurricular activities are held throughout the programme and collaborate with each other to give students opportunities to experience various learning environments (in class, factory, society, etc). This assures a complete attainment of all ELOs in the programme.

Table 1-3: The translation of ELOs into the programme

Knowledge clusters	The number of credits					ELOs
	Total	Lecture	Lab	Compulsory	Elective	
1. General knowledge	57			51	6	
Policies	12			12		ELO 10, 11
Social science and Humanities	6				6	ELO 10, 11
Foreign language	9			9		ELO 9, 12
Mathematics	15			15		ELO 1, 12
Natural sciences	9	8	1	9		ELO 1, 12
Computer science	3			3		ELO 2, 8, 12
Introduction to MET	3	2	1	3		ELO 2, 7, 8
2. Professional knowledge	83			70	13	
Fundamental courses	38			32	6	ELO 2 ELO 4, 5, 6
Specialized courses	28			21	7	ELO 3
						ELO 4, 5, 6
						ELO 7
Laboratory, workshop-practices	15			15		ELO 4, 5, 6 ELO 7
Factory practices	2			2		ELO 4, 5, 6
						ELO 7
						ELO 10, 11
3. Capstone project	10			10		ELO 13, 14, 15, 16

ELO 1 is translated into the programme by means of mathematics and science courses in the first year. ELO 2 and ELO 3 are conveyed to the professional knowledge with fundamental

background courses in the first 2 years. From the third year, the programme offers specialized courses which provide students with the know-how to apply in-depth understanding of mechanical, electronics, industrial automation. It also stretches students with higher requirements of systems thinking competence including analyzing and evaluating a Mechatronics system. The programming skills are also upgraded from course to course.

ELOs 4, 5 and 6 call for professional skills which are trained through practice activities in fundamental courses, specialized courses, course projects and experiment courses.

ELOs 7 and 8 necessitate essential soft skills for future work which are rationally integrated in learning activities such as oral presentation and project-based teamwork. Some course projects are implemented in teams will strengthen communication skill, critical thinking, teamwork skills or project management. In order to create more opportunities for senior students to present and propagate their study results for junior students (reinforce ELO 8), results of capstone projects are usually shared in poster exhibitions at FME or at university ceremonies [*Exh. 1-12: Graduation thesis posters*]. Moreover, the FME has also founded a local Mechatronics journal which is an annual collection of all student researches and capstone projects [*Exh. 1-13: Local Mechatronics Journal*].



Figure 1-1: Open lab for MET students

Students also achieve the ELOs from extracurricular activities. English ability (ELO 9) is prepared through 4 English courses in their first year. Students are required to read English materials to serve for their study, course projects and create engineering innovative products for competitions. ELOs 10 and 11 mentioning on attitude, cultures and behavior are transferred to students within seminars, practices in factories and other union activities such as the Green Summer Volunteer Campaign, blood donation, charitable activities, etc [*Exh. 1-14: Plans and Reports of extracurricular activities to teach ethics and social responsibilities for*

students; Exh. 1-15: Plans and final reports of Youth Union and Student Association; Appendix 3: Matrix of extracurricular activities vs. expected learning outcomes].

The MET programme ensures students for the procurement of ELOs 13, 14, 15 and 16 with a thorough study from the first year to the fourth year. Freshman students start with the Introduction to engineering course. Their levels of cognition are upgraded through each course projects in the second and third year. Finally, the capstone project is provided in the fourth year. Apart from the analyzing and evaluating capability of the existent Mechatronics systems, course projects and capstone project also test the students their problem solving skills for new ideas to improve old systems. Sometime it also challenges students with innovative concepts for absolutely new problems.

1.2. The programme promotes life-long learning

The curriculum includes 150 credits and is structured as follow:

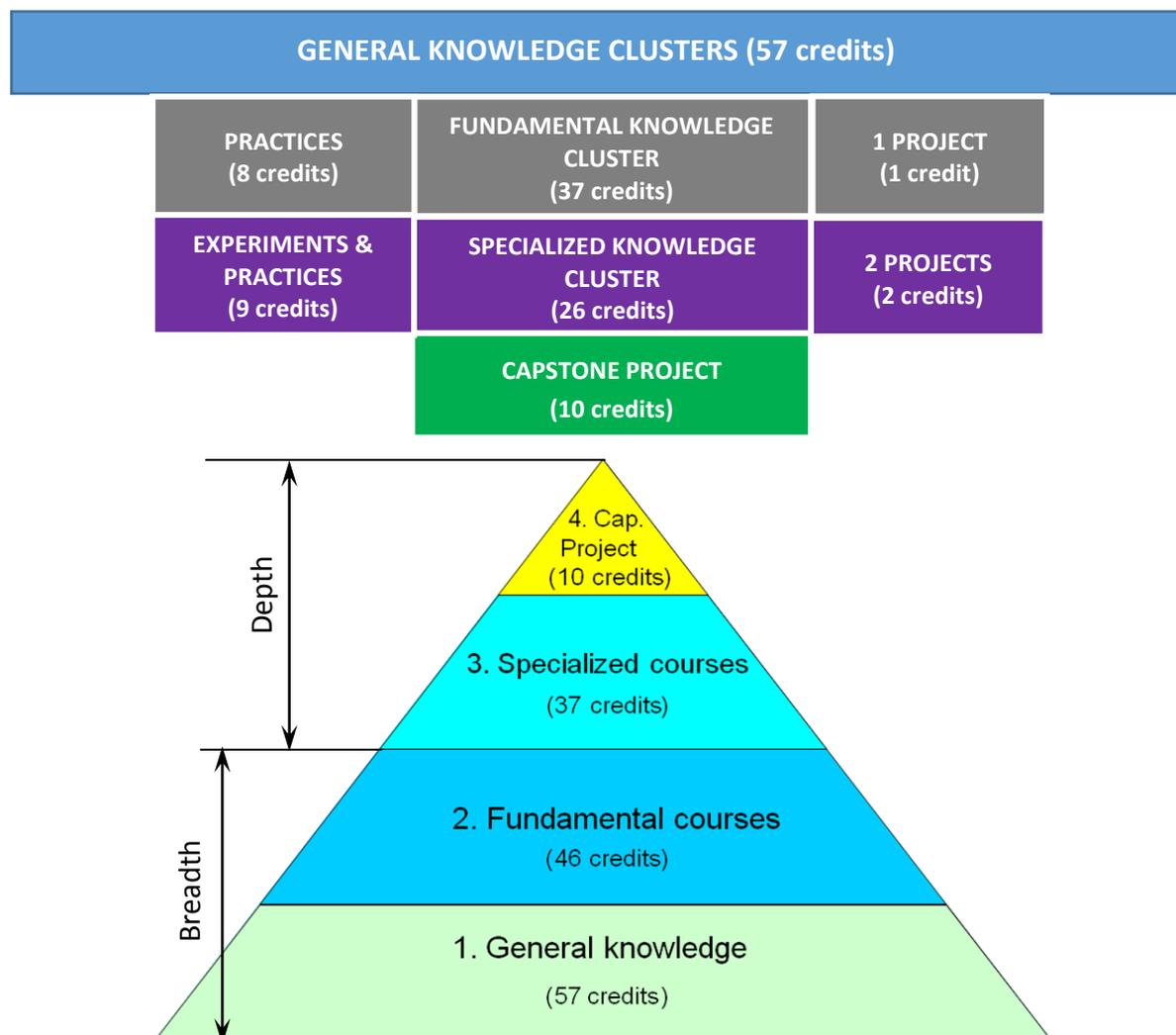


Figure 1-2: Diagram of programme knowledge

The MET programme aims to develop 8 competences of students which could promote life-long learning according to the European Referenced Framework:

1. Communication in the mother tongue: students practice listening, speaking, reading and writing skills in Vietnamese through oral presentations in classroom; group work and others communication in such as writing thesis. Other extracurricular activities which are organized by the university and FME for them to joint also facilitate interaction between students and society in their mother language.
2. Communication in foreign languages: students train their listening, speaking, reading and writing skills in English in 4 English courses of the programme and others communication situations such as international seminar, conferences and contests.
3. Mathematical competence and basic competences in science and technology: the programme teaches Mathematics and Science courses in the first year. Then, students use mathematics and scientific knowledge to solve the problems of engineering in the fundermental and specialization majors. The programme prepare students for continued learning for their professional or academic development after graduation
4. Digital competence: the programme consists of computing courses. Along with the programme, students are trained to use Internet, computer softwares and electronic resources to do assignments and projects. They use computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.
5. Learning to learn: there is an orientation for new students about how to learn. After that, in the programme, students' active learning are facilitated.
6. Social and civic competences: Physical training courses and environment education are taught in the programme. These help students know how to improve their health and know how to protect themselves. The political courses teach students about social issues such as gender equality and how to develop their democratic participation.
7. Sense of initiative and entrepreneurship: students are helped to develop their ideas of entrepreneurship; ethnic and social responsibility in Introduction course at the first year and then, in course projects and practicum at companies in other years of the programme.
8. Cultural awareness and expression: students are given opportunities to attempt social and cultural activities organized by the university and school.

The life-long learning can be only fostered based on the desire to learn, critical thinking and self-study skills of students. Therefore, the programme always concerns itself with nourishing the learning desire for students. The MET programme provides students competence in mathematics, sciences and core engineering in the mechatronic field. Hence, after graduation students can continue studying to meet their personal favorite, social

demand or career development. Specifically, they can pursue higher training to improve their career competences as good practitioners or expert practitioners. They can also conduct higher education (Master degree, PhD. degree) or change to other engineering-related fields such as Electrical and Electronics engineering, Mechanical engineering (Figure 1-3).

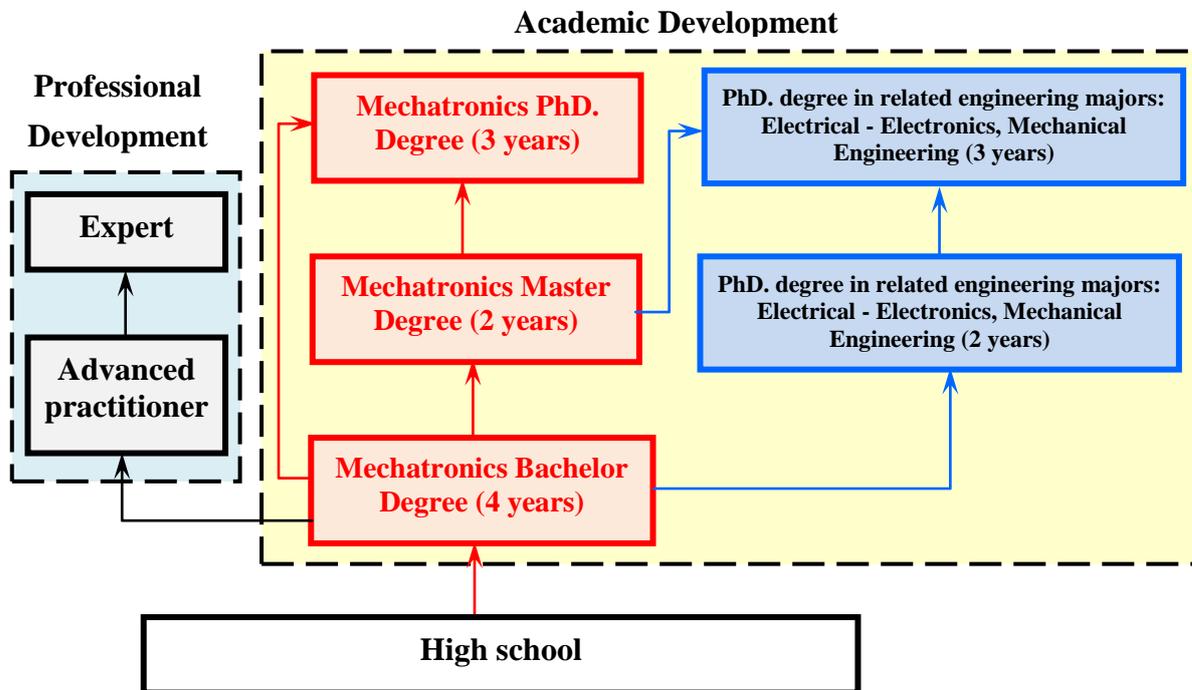


Figure 1-3: Higher education possibility for MET students chart

1.3. The expected learning outcomes cover both generic and specialized skills and knowledge

Applying Bloom Taxonomy, the ELOs of the programme cover both generic and specialized knowledge and skills and are clearly demonstrated in Table 1-1.

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

The construction of the ELOs follows the below procedure:

1. Analyze the Government Standards for undergraduate education stated in Chapter VI, Education Law version 2005.
2. Specify the requirements mentioned in the Regulations of Education of MOET.
3. Analyze the meeting minutes with employers, industrial advisory board, faculties, alumni and students. Through meeting with employers, industrial consulting experts, lecturers, alumni and the representatives of current students showed their requirements and expectation of graduates competences [Exh. 1-16: Meeting minutes between FME and stakeholders]. These are analyzed and transferred into ELOs [Exh. 1-17: Meeting minutes of FME Academic and Scientific Committee].

4. Reference and benchmark to the curricula of the same major from prestigious national universities (Hanoi University of Technology, HCMC University of Technology, Le Qui Don Technocal University) and foreign universities (Dresden University of Technology, Aachen University of Applied Sciences, University of Hannover ...) [*Exh. 1-04: Final report on curriculum benchmarking of Mechatronics programme among some prominent national and foreign universities*].
5. Transfer the stakeholders' requirements into the ELOs draft of the programme.
6. Collect feedback of the stakeholders for the ELOs draft of the programme [*Exh. 1-01: Survey report on satisfaction level of stakeholders for Programme Objectives of MET programme in 2011; Exh. 1-05: Survey report on satisfaction level of stakeholders for ELOs of MET programme in 2011; Exh. 1-07: Survey report on satisfaction level of stakeholders for ELOs of MET programme in 2014, 2015*].

CRITERION 2: PROGRAMME SPECIFICATION

2.1. The university uses programme specification

When opening the Mechatronics Engineering Technology programme, Faculty of Mechanical Engineering has prepared “the documents for opening a program” and submitted to the Science and Training Committee of UTE and to the Ministry of Education and Training (MoET). The structure of the documents is regulated by MoET with the following information:

MECHATRONICS ENGINEERING TECHNOLOGY PROGRAMME SPECIFICATION

1. **Awarding institution:** HCMC University of Technology and Education
2. **Name of the final award:** Bachelor of Engineering (Mechatronics Engineering)
3. **Programme Title:** Mechatronic Engineering Technology
4. **Learning outcomes of the programme:**

Group of ELOs	ELOs After successful completion of the programme, students will be able to:
A. General knowledge, core engineering fundamental knowledge and specialized knowledge in Mechatronics:	<ol style="list-style-type: none">1. Use general knowledge of mathematics and science.2. Apply the principles of fundamental engineering knowledge.3. Apply advanced engineering knowledge in the professional areas of mechanical, electrical and electronic, and automation engineering.
B. Professional skills in Mechatronics:	<ol style="list-style-type: none">4. Identify, formulate, analyze and solve mechatronic problems.5. Conduct investigations and experiments about mechatronic engineering problems.6. Demonstrate professional skills that contribute to successful engineering practice.
C. Interpersonal skills: communication, teamwork and attitudes	<ol style="list-style-type: none">7. Lead and work effectively in individual and group-oriented settings.8. Communicate effectively in different forms: written, multimedia, graphical, and oral communication.9. Communicate effectively in English.10. Recognize the importance of the role and responsibility

	<p>of engineers and the social context in the practice of engineering.</p> <p>11. Appreciate different enterprise cultures, demonstrate professional behavior and work successfully in organizations.</p> <p>12. Participate in lifelong learning</p>
D. Conceiving, designing, implementing and operating mechatronic systems in the enterprise context	<p>13. Conceive and develop requirements and functions of components in mechatronic systems.</p> <p>14. Design components for mechatronic systems.</p> <p>15. Implement processes of hardware and software for mechatronic systems.</p> <p>16. Operate the automation systems and manage the operation process.</p>

5. Admission criteria or requirements to the programme:

In order to get admission to the MET programme, high school candidates have to take a National Entrance Examination which is held annually on July by MoET. The MET programme enrolls students in group “A” with three subjects: Mathematics, Physics, and Chemistry or group “A1” with three subjects: Mathematics, Physics, and English. The cumulative testing grade of candidates must be higher than the cut-off score which is set by the university based on the student admission quota from MoET.

Admitted students also have to take an English placement test in the beginning of the school year. If they don’t meet the preliminary requirement of English, they have to take some preparation courses to improve their language skills in order to fulfill the prerequisite of later specialized courses

6. Programme objectives:

- Apply general knowledge, fundamental knowledge and specialized knowledge to work effectively and implement lifelong learning in the profession.
- Analyze thoroughly the production system with problem solving skill and professional skills.
- Communicate effectively in the professional environment, leadership and team work situations.
- Conceive, design, implement, operate and maintain mechatronic systems.
- Specify requirements of industry to fulfill the needs of customers.

7. Programme structure: *[Appendix 4: Curriculum map]*

8. Teaching, learning and assessment strategies:

The teaching strategy of teachers at MET department is to develop independent learning and reflective learning. In order to promote this competency, the teaching approach is implemented in five strategies:

- Inspire students with passion of experiencing and exploring to motivate them with active learning process.
- Teaching theory and experiment simultaneously would help students not only understand the content but also have the ability to apply their know-how to solve specific problems in MET.
- Create more opportunities for students to deepen and widen their knowledge by using problem-based learning from simplest to more sophisticated practical problems.
- Coach students to go through four stages of engineering career: “Conceive – Design – Implement – Operate”. Eventually, they learn knowledge, professional skills, technical arguments and soft-skills.
- Trigger and nurture independent thinking and the habit of evaluation in action.

9. Date on which the programme specification was written or revised: written on January 2012 and annually reviewed in 2013, 2014, 2015.

After the “opening MET programme documents” has been approved and officially promulgated under the Decision of UTE [*Exh. 2-01: HCMUTE Decision on Opening New Programmes 559/DHSPKT- DT; Exh. 2-02: HCMUTE Decision on Promulgation of MET Programme*], the FME can recruit students, hold teaching activities, approve graduation and issue degrees according to the contents registered in the Opening documents. In order to support the referencing and using of the stakeholders, the FME transferred the necessary information from the Opening Documents into “MET programme specification” [*Exh. 2-03: MET programme specification*]. The Curriculum map [*Appendix 4: Curriculum map*] was also included to describe the appropriateness of the programme structure and learning map. The programme specification with the curriculum map is used by the university, the FME, lecturers and students with the following procedure:

1. Before a new school year, the FME uses the MET programme specification to make the teaching plan for that year and submits it to the Office of Academic Affairs (OAA). Base on the plan, the office will make the cost estimation plan.
2. At the beginning of each semester, based on the “Teaching plan for the whole school year”, the FME confirms the courses teaching in that semester and delegates it to each department.
3. Each department makes a detailed teaching schedule and assigns lecturers for each course based on their capability and time slots [*Exh. 2-04: List of teaching schedule*]

and assigned lecturers for each semester]. Courses belonging to general knowledge (mathematics, sciences, English, physical education, national defense education) are taught by other Faculties in the university. They will be transferred to the appropriate Faculties by the OAA. After the assigned teaching schedules are finished and returned to the OAA, this office will summarize the complete schedule for all the courses that will be taught in the next semester. Finally it will be announced to students.

4. Students refer to the MET programme specification and rely on the teaching schedule from the OAA to make their own learning strategies, check for the appropriateness of this individual plan (which courses should take first, which courses should follow, which courses fit their major, studying time and workload in the current semester, etc). Students are supposed to make the most appropriate tentative schedules for their own and then register courses online.
5. MET lecturers are responsible for the quality of their lectures, which should follow the approved syllabi. Lecturers prepare the course portfolio which should include: the course learning outcomes (CLOs) of each chapter, the objectives of the lectures; textbooks, handouts; testing and assessment tools and teaching strategies. At the beginning of the courses, teachers provide the course description sheets for students which explicitly describe the CLOs; the contribution of the course to the ELOs; structure and content of the course; textbook, teaching materials; teaching strategies and assessment methods [*Exh. 2-05: Samples of courses' portfolios*]. Teachers can discuss and advise students on learning methods to acquire the CLOs and the related ELOs of the programme.
6. The Academic Regulations approved in the Programme specification are the legal bases for the stakeholders during the organizing, managing and teaching of the programme.
7. The time of curriculum design and revision is recorded.

2.2. The programme specification shows the expected learning outcomes and how these can be achieved

At the curriculum design stage, the programme specification clearly describes the ELOs, course descriptions and the curriculum obviously shows the learning map to achieve the ELOs. At the implementation step, the programme specification is translated into the course specification. The contribution of each course to the programme ELOs is screened, and modified annually. When students successfully complete all the courses they are expected to achieve all programme ELOs.

To help students to achieve the ELOs, the teaching and learning activities are designed as following:

At the first semester, freshman is required to take the Introduction to Engineering course. This course introduces general concepts related to MET, basic problems of practical careers, requirements of the program and job opportunities for mechatronic engineers [Exh. 2-06: *Syllabus of “Introduction to MET”*]. Through this course, students will be gradually aware of the characteristics of their study and their future careers. Consequently, they could evaluate the fitness of their expectation and personal ability with the programme.

In order to promote the critical thinking and self-learning skills for students, from the second year, students will do some course projects under teachers’ guidance. Firstly, teachers will initiate students with encouraging them to seek for any problems from different fields related to mechatronics. Next, teachers will supervise the design, fabrication and operation processes of their selected engineering systems. The underline pedagogic philosophy, reflective learning, develops learners from a chain of activities: identify the problems, analyse, testing their own ideas and self-learning from experiences [Exh. 2-07: *Samples of Project on Theory of machine and machine design, Control and Drive Project, Project of Mechatronic systems*]. Course projects, seminars and presentations always require students to search documents in the library and from on the internet, process the information, analyze and summarize their finding both in Vietnamese and in English. Then they have to present their projects and discuss with each other to expand the possible solutions. Along with developing those interpersonal skills, the programming skills are gradually upgraded from course to course [Exh. 2-08: *Syllabi of “Practice in Applied Programming with C++”; “Practice of Digital Techniques and Microcontroller”*].

Beside compulsory course projects, students are also encouraged to do applied scientific researches under teachers’ guidance. These student projects will boost their independent thinking skills and competence in doing research. With these competencies, graduates can pursue higher education or take part in research and innovation groups to create new products.

Students can also learn practical skills from field trips to factories. They can interact with modern machines and technologies and experience practical requirements from manufacturing processes. These problems are always more complicated than those in schools. Consequently, students will realize the importance of continuous update of knowledge from “everyone, everytime and everywhere” [Exh. 2-09: *Factory internship reports*]. The interaction with manufacturing and trading environments in factories and companies can promote entrepreneurship for students.

The extracurricular activities will reinforce students with ELOs connected to attitudes and soft skills. The university, FME and student unions organize these activities throughout the

school time and encourage students to engage after their classes [Exh. 2-10: Students' competitions: Dancing Robot, Contest@Bosch; Exh. 2-11: Students' competitions: Micom Car Rally (MCR); Exh. 2-12: Students' competitions: National Koma-Taisen].



Figure 2-1: Dancing robot contest in 2014

2.3. The programme specification is informative, communicated, and made available to the stakeholders

The MET programme specification covers all the necessary information for the stakeholders: teaching institution, name of the final award, programme title; along with other information about the programme objectives, the expected learning outcomes, job opportunities; education philosophy and teaching strategies; structure and content of the programme; academic staffs and other conditions for quality assurance of the teaching and learning process.

The FME always hold orientation seminars for freshman students to clearly explain the programme specification. Therefore, students can understand and know how to use these sources of information to set up their study plan and make their own amendment when necessary. The learning methods and academic regulations are also mentioned in these orientation sessions [Exh. 2-13: List of assigned teachers for Orientation Seminars for freshmen; Exh. 2-14: Syllabus of "Introduction to MET"].

The hard copy of the programme specification is always available at the office of the FME to serve administrative staffs and faculties while they set up the learning schedules, teaching arrangement and study advising for students. At the course level, each faculty has to prepare "lesson plan" to distribute and explain for students at the first class.

This MET programme specification is widely published on websites, student handbook, printed hard copy and printed posters hung on the academic bulletin board. Any revision for

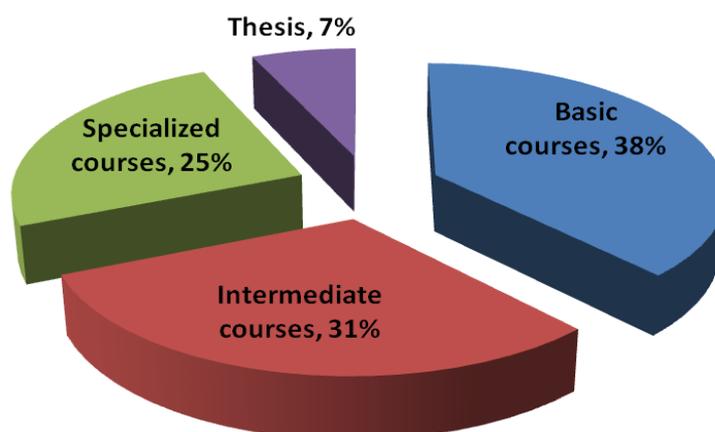
the programme is immediately updated on websites and the academic bulletin board of the FME to inform the stakeholders.

CRITERION 3: PROGRAMME STRUCTURE AND CONTENT

3.1. The programme content shows a good balance between generic and specialized skills and knowledge

The MET programme was designed based on the practical needs of stakeholders [Exh. 3-01: Employers' recruitment needs of mechanical engineers from 2008 to 2014; Exh. 3-02: FME meeting reports on the Working Environment Job Analysis of MET engineers in 2011], as well as referring to the curricula of other national and international institutions [Exh. 3-03: Mechatronics curricula of prominent national and foreign universities]. From 2001 to 2012, the MET programme has experienced several revisions with gradual downsizing of the number of credits. Knowledge clusters were integrated to save time for students' self-study. The programme structure [Exh. 3-04: MET curriculum] facilitates content balance between knowledge and generic and specialized skills (Table 3-1).

Table 3-1: The MET program structure



Knowledge cluster		Subjects	Credits	Total
Basic courses	Orientation	Introduction to MET	3	3
	Mathematics	Advanced Mathematics A1	3	15
		Advanced Mathematics A2	3	
		Advanced Mathematics A3	3	
		Applied Probability & Statistics	3	
		Applied Mathematics in Engineering	3	
	Foreign language	English 1	3	9
		English 2	3	
		English 3	3	

	Sciences	Fundamental Physics 1	3	12
		Fundamental Physics 2	2	
		Physics Experiment	1	
		Fundamental Chemistry A1	3	
		Visual Basic Programming	3	
	Political Education	Principles of Marxism	5	18
		Ho Chi Minh's Thoughts	2	
		Revolutionary of Lines of VCP	3	
		General laws	2	
		Elective courses	6	
<i>Intermediate courses</i>	Theory	Descriptive Geometry & Technical Drawing	3	33
		English in Engineering	2	
		Mechanics in Engineering	3	
		Strength of Materials	3	
		Principles & Parts of Machines	3	
		Measuring Techniques & Tolerances	2	
		Material Science 1	2	
		Fundamentals of Machinery Manufacturing Technology	3	
		Automatic Controls	3	
		Electrical and Electronics Engineering	3	
	Elective courses	6		
	Course project	Project on Theory of machine and machine design	1	1
	Experiment	Experiments on Mechanics	1	4
		Experiments on Mechanical Measurement	1	
Experiments on Material Science		1		
Experiment of Electronic electrical engineering		1		

	Practice	Electric Welding Practice	1	8	
		Mechanical Works Practice	2		
		Basic Turning Practice	3		
		Basic Milling Practice	2		
<i>Specialized courses</i>	Theory	Pneumatic & Hydraulic Systems	3	23	
		PLC Programming Techniques	2		
		Digital Techniques and Microcontroller	4		
		Industrial Robots	2		
		Applied Programming with C++	3		
		Electric drives	3		
		Servo Driving Systems	2		
		Elective courses	4		
	Course project	Control and Drive Project	1	1	
		Project of Mechatronic systems	1	1	
	Experiment and Practice	Experiments on Pneumatic Drive & Hydraulic Drive	1	12	
		Practice in PLC Programming	1		
		Practice of Electrical Drive	1		
		Experiment of Automatic Control	1		
		Practice in Applied Programming with C++	1		
		Practice of Digital Techniques and Microcontroller	1		
		Experiments on Industrial Robots	1		
		Practice of Servo Driving Systems	1		
		Factory Internship	2		
		Elective course	2		
	<i>Thesis</i>		Capstone project	10	10
				Total	150

3.2. The programme reflects the vision and mission of the university

The vision and mission of the university “Ho Chi Minh City University of Technology and Education becomes the national No 1 center of training and applied science research in technology and professional pedagogy, on a par with other major universities in the South-East Asia area and the world. HCMUTE is the motivation of sustainable development of the nationwide vocational education system” [Exh. 3-05: Vision and Mission of UTE].

To support for the mission of HCMUTE as a training institution for high quality human resources, the MET programme is designed to promote students “learning by doing”. Most theory courses are accompanied by their counterpart experiment or practice courses (shown in Table 3-2).

Table 3-2: Ratios between theory and experiment, practice

Knowledge and skills	Theory credit	Experiment, practice credit	Theory percentage	Experiment, practice percentage
General knowledge and skills (57 credits)	47	10	31,3%	6,7%
Fundamental knowledge and skills (46 credits)	26	20	17,3%	13,3%
Specialized knowledge and skills (47 credits)	21	26	14%	17,4%
Total	94	56	62,6%	37,4%
	150 credits		100%	

Besides providing professional knowledge and skills, the programme also attaches great importance to develop research competence with application orientation.

3.3. The contribution made by each course to achieving the learning outcomes is clear

The programme ELOs are transferred into the course learning outcomes and expressed in the course syllabi [Exh. 3-06: Samples of courses’ syllabi] and [Exh. 3-07: Samples of courses’ portfolios]. The contribution level of the courses for the ELOs is steadily elevated from low to high by means of theory lectures, experiments at laboratories, practices at school workshops, course projects, factory visits, seminar, graduation practices and capstone projects [Appendix 2: Matrix of courses vs. expected learning outcomes]. Apart from the normal curriculum, union activities and extracurricular activities are regularly held to help students improve their communication skill, leadership, teamwork and social responsibility.

3.4. The programme is coherent and all subjects and courses have been integrated

The structure of the programme is designed based on the concept that fundamental courses are obligatory to fulfill in-depth courses. Core courses and specialized courses are arranged with increased demand order. *[Appendix 5: Interacting map of core courses]* shows good correlation among all subjects and courses.

The final and the most crucial course in the programme is the capstone project. It is an essential component in the whole training process that could help:

- Assess all level of knowledge through out the MET curriculum.
- Consolidate and enhance the acquired knowledge during students’ study. It is also the preliminary step to apply professional awareness to solve practical problems of manufacturing processes.
- Practice professional skills of an engineer, establish the behavior and working method for a MET engineer in their future professional careers.
- Practice analyzing and integration capability, problem-recognizing and problem-solving skills along with other soft skills.

3.5. The programme shows breadth and depth

The programme shows breadth and depth. This would help students to acquire all knowledge easily. The difficulty level of courses is increasing with studying time.

The MET programme has general courses (57 credits); core and specialized courses (93 credits). The programme facilitates both breadth in general knowledge as well as depth in professional courses in MET.

General knowledge cluster (57 credits): it includes natural science (24 credits), humanity and social science (12 credits), foreign languages (9 credits) and political education and general laws (12 credits). General knowledge facilitates self-study capability and promotes life-long learning after graduation.

Fundamental knowledge cluster (46 credits): this cluster consists of courses that would build solid background for the following specialized subjects. The knowledge provides students general awareness in mechanical engineering as long as the ability to adapt themselves to different working cultures after graduation.

Specialized knowledge cluster (47 credits): all professional courses are carefully chosen to consolidate the expected outcomes that follow the orientation of the MET programme. The ratio among specialized theoretical knowledge, practical courses (experiment and practice), course projects and capstone project shows balanced combination between theoretical and practical training; learning and practicing. This would highly fulfill the needs of actual production.

During the training of the programme, students have to do course projects: Project on Theory of machine and machine design, Control and Drive Project, Project of Mechatronics systems. Each project will serve for a specific subject or a group of subjects. For instance, the Project on Theory of machine and machine design foster Principles & Parts of Machines course; Control and Drive Project consolidates Electric drives; Project of Mechatronics systems strengthens both Automatic Controls and PLC Programming Techniques. These projects help students to reinforce fundamental knowledge on choosing electrical actuators, pneumatic and hydraulic parts, valves, electrical motors, power supply systems, mechanical driving system calculation,... They also facilitate the ability in setting up assembly drawings, drawings of standard mechanical parts, designing electrical control system for the mechanical driving systems, making technical reports. Additionally, learners can also design and choose control equipment for mechanical- electrical systems; simulate and implement mechanical systems, control systems which could enhance the automation of manufacturing processes [*Exh. 3-08: Samples of students' course projects*].

The implementation of a course project is done throughout a semester. With Project on Theory of machine and machine design and Control and Drive Project, each student has his own problem. Meanwhile a group of student is appointed for a specific topic when they do Project of Mechatronics systems. At the end of the semester, students or groups of student will present their project results in front of defense committees which are randomly assigned by the MET department. These projects are official courses in the programme; therefore the average grade decided by the supervisor and the defense committees is the final results for that course.

3.6. The programme clearly shows the basic courses, intermediate courses, specialized courses and the final project, thesis or dissertation

The sequence of courses and the study plan are carefully designed to support for each other. It will ensure that graduates can achieve all the ELOs. Table 3-3 shows the sequence of required courses in each knowledge cluster.

The programme clearly shows the basic courses, intermediate courses, specialized courses and the capstone project. General courses and fundamental courses are selected to fully and practically support for the learning process of the subsequent specialized knowledge. Capstone project is a special course which could help learners to integrate all previous knowledge to solve specific engineering problems. This course distribution strategy is highly rational and appropriate.

3.7. The programme content is up-to-date

The design of the MET programme has been referred to the programme of other prestigious university in Vietnam and in the world. The MET programme was designed based on the combination of both practical experience and excellent models of other universities in USA, Australia, German and Southeast Asia [*Exh. 3-03: Mechatronics curricula of prominent*

national and foreign universities]. All those programmes were analyzed and assessed to extract prominent amendment for the current MET programme of HCMUTE.

The structure and content of the programme have been changing for more than 10 years, with previous versions in 2001, 2005, 2008 and the latest revised version of 2012 [*Exh. 3-09: The MET curricula used in 2001, 2005 and 2008*]. This purpose is to adapt to the the global evolution and the international integration context.

The revised cycle of the programme is 12 months. The HCMUTE has promulgated the Regulation for revising procedure of study program [*Exh. 3-10: Procedures of Reviewing and Revising Curriculum*]. According to the Regulation, dean of the FME has to work with head of MET department to make an annual plan for the updating and revising of the programme. All changes require the approvals of the FME academic and scientific committee [*Exh. 3-11: Meeting reports of the FME Academic and Scientific Committee on revising the MET programme*]. Next, head of the Office of Academic Affairs will verify it and submit to the Rector Board for official approvals.

The Appendix 6 shows considerable updates of the programme from 2008 to 2011 (the 187 credits programme) to the current 2012 programme (the 150 credits programme). Some intermediate courses and specialized courses have been reduced in term of number of credits thanks to the use of active learning methods and to save time to promote self-study. Some courses are also integrated to each other to eliminate the overlapping knowledge and to enhance the efficiency in training (Table 3-3). [*Appendix 6: Comparison between MET programmes applied in 2008 and in 2012*].

Table 3-3: Some integrated courses in MET programme applied in 2012

No	Curriculum (applied from 2008 to 2011)	Credit No.	Curriculum (applied from 2012 till now)	Credit No.	Note
1	Basic AutoCAD	2	Computer aided design (CAD)	3	Merged course
2	Basic AutoCAD practice	1			
3	Electrical engineering	3	Electrical – Electronics Engineering Experiments on Electrical – Electronic Engineering	3	Integrated course
4	Electronics engineering	3		1	
5	Applied digital techniques	3	Digital techniques & Microcontrollers	4	Integrated course
6	Microcontrollers & Microprocessors	3			
7	Applied power electronics	2	Electric Drives	3	Integrated course

8	Electric drives	3			
9	Pneumatic – Hydraulic technology	4	Pneumatic – Hydraulic technology	3	Added experiments
10			Experiments on Pneumatic – Hydraulic technology	1	
11	Working safety and environment	2			Merged with workshop practice
12	Sensor technology	3	Manufacturing Process Automation Experiments on Manufacturing Process Automation	2	Integrated course
13	PLC programming techniques	2		1	
14	Industrial communication network	2	Industrial communication network Experiments on Industrial communication network	2	Integrated course
15	Distribution control system (DCS)	2		1	
16	Graduation dissertation	7	Capstone project	10	Credit increased

CRITERION 4: TEACHING AND LEARNING STRATEGY

4.1. The faculty or department has a clear teaching and learning strategy

The university educational objectives are to make students “*to learn genuinely, to become good practitioner*”. Aligning with these, the educational philosophy of FME’s programmes is constructivism. It includes two principles:

1. Learning process does not really take place unless learners take the initiative.
2. People construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences.

Using these two principles, all teaching staffs have discussed and have been of the same mind with the following two points:

1. The role of teacher in MET programme is not to provide content but instead a facilitator offering opportunities for students to experience new information. Consequently, learners will explore knowledge by themselves.
2. The students’ role is more active during the learning process. They do their independent study through experiencing activities provided by teachers. Students are also encouraged to set up learning models by themselves to explore and construct critical thinking competency.

The teaching strategy of teachers at MET department is to develop independent learning and reflective learning. In order to promote this competency, the teaching approach is implemented in five strategies:

1. Inspire students with passion of experiencing and exploring to motivate them with active learning process.
2. Teaching theory and experiment simultaneously would help students not only understand the content but also have the ability to apply their know-how to solve specific problems in MET.
3. Create more opportunities for students to deepen and widen their knowledge by using problem-based learning from simplest to more sophisticated practical problems.
4. Coach students to go through four stages of engineering career: “Conceive – Design – Implement – Operate”. Eventually, they learn knowledge, professional skills, technical arguments and soft-skills.
5. Trigger and nurture independent thinking and the habit of evaluation in action.

One of the most important parts in this programme is the Introduction to MET course. This course gives students the idea of what engineering is, information related to their majors, career opportunities and foreign languages as well as soft skills, like presenting, working in

groups, problem solving and especially motivation to learn, which leads to self-planning, and self-orientation for the future [*Exh. 4-01: Syllabus of “Introduction to MET”*].



Figure 4-1: Group study and discussion in the Introduction to MET course

4.2. The teaching and learning strategy enables students to acquire and use knowledge academically

The courses of MET program raise students’ cognition levels from low to high [*Appendix 2: Matrix of courses vs. expected learning outcomes*]. The teaching and learning strategy which enables students to acquire and use knowledge academically is undertaken through the following activities:

- Lecturing: mathematics and natural science courses are taught in the first year by using lecturing approach and demonstrating with factual examples. It prepares students with solid background of mathematics and general sciences to learn fundamental and specialized courses in the following years as well as for life-long learning.
- Applying theories into practice: fundamental knowledge is taught in the first two years of the study program. The teaching and learning methods of these subjects are teaching theory combined with laboratory experiments and workshop practice. It would enable students to apply theory to different context under teachers’ guidance.
- Learning by doing: from the third year, specialized knowledge in mechanical engineering, electronics and industrial automation are taught by using “learning by doing” method. Students practice knowledge to solve engineering problems in course projects, capstone project and applied researches.



Figure 4-2: Research orientation for freshmen

4.3. The teaching and learning strategy is student-oriented and stimulates quality learning

Most classrooms are equipped with projectors, teachers usually use PowerPoint lectures, videos. Complicated engineering prototypes and devices are simulated by professional engineering software (Labview, simulation platform for ABB robot). These tools help students to understand their lessons thoroughly [Exh. 4-02: Courses' portfolios using computer simulation].

Additionally, the innovative E/M learning system of UTE [website: <http://lms.hcmute.edu.vn>] provides students with instant access to teaching materials and efficient interaction with teachers and other students [Exh. 4-03: Online video lectures]. Besides adequate laboratories and school workshops with modern facilities, students can also interact with contemporary industrial machines and equipment [Exh. 4-04: Laboratories with modern industrial facilities (Robot Lab, Process Control System)].

Students are guided and sponsored to do researches and attend engineering competitions [Exh. 4-05: Students' awards in the ABU Robocon Contests]. The UTE usually coordinates with big industrial corporations (Siemens, Omron, Texas Instrument, Nestle, Intel,...) to hold technical seminars. These industrial interactions help students to understand the applications of knowledge they are studying and also to gain more working experience for their future jobs [Exh. 4-06: Pictures of Meetings with employers and other Organizations]. In order to further inspire the passion of students in learning and exploring specialized courses (such as microcontroller programming, industrial robot), the FME also hold some student competitions for instant Dancing Robots, Soccerbot, MCR, Sumo Robot, ... [Exh. 4-07: Pictures of some students' competitions: Dancing robot, MCR, SUMO robot].

Research labs (such as Young Scientist Lab, Open Lab, Ames Lab, etc) are favorable destinations for students to study, experience exchange and also to implement research projects as well as their capstone projects. Some outstanding products made by students from these labs [Exh. 4-08: Outstanding products made by students from FME' labs] have

won several prestigious awards [*Exh. 4-09: Awards for students and supervisors from research labs*].

4.4. The teaching and learning strategy stimulates action learning and facilitates learning to learn

The teaching and learning strategy stimulating students' action learning through course projects, capstone projects and research projects.

Learning through these projects is a process of problem-based learning and trial and errors. Reflective learning of students is triggered from teachers' instant feedback and critique for their results. Everytime when students do tasks given by their teachers, they often receive feedback or critique. During that process, students make these action chains "define problems, analyze, evaluate, system thinking and propose possible solutions, estimate results, criticize and apply new solutions". After applying new solutions students get feedback or critique again from teachers. The above action chains repeat continuously with higher and higher demanding problems. 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 successfully solve practical problems when they go to work as well as support their life-long learning.

From teachers' point of view, during their work they also make "reflective teaching" through action chain "teach, analyze, evaluate and improve" and repeat this cycle continuously with better teaching efficiency target. Reflective teaching is undertaken with supports among colleagues by means of teaching visits to observe and share experience with each other [*Exh. 4-10: Teaching visit reports of MET department*]. Other valuable source of information is the Students' Comment Survey results after they finish their courses [*Exh. 4-11: Statistic reports for courses evaluation of students from 2010-2015*].

CRITERION 5: STUDENT ASSESSMENT

5.1. Student assessment covers student entrance, student progress and exit tests

1. Student entrance assessment

Student entrance assessment tests are taken place in July annually according to the regulation of Ministry of Education and Training (MoET). High school candidates have to take a National Entrance Examination with some required subjects depending on their majors. The MET programme enrolls students in group “A” with three subjects: Mathematics, Physics, and Chemistry or group “A1” with three subjects: Mathematics, Physics, and English [Exh. 5-01: Student Enrollment Project]. Each programme has its own cut-off entrance score to get admission based on the approved quota from MoET. Specifically, the number of candidates and number of admissions of MET programme in the last 5 years was listed in Table 5-1.

Table 5-1: The number of candidates and number of admissions of MET programme

Year	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016
Number of candidates	675	930	882	1068	980
Number of admissions	154	172	216	205	179

Admitted students have to take an English placement test in the beginning of the school year. If they don't meet the preliminary requirement of English, they have to take some intermedia English courses [Exh. 5-02: Regulations of AAO on Entrance English placement tests].

2. Student progress assessment

Student progress assessment is essential for quality assurance in each courses as well as throughout the study program. The assessment is undertaken through courses with different methods: examination, report, homework, presentation, etc. The assessment contents have to link to course syllabi and cover every course learning outcomes [Exh. 5-03: Samples of students' presentations and reports]. In addition to that, during the programme, students have to do course projects, experiments and practice. From these assessment tools, teachers can check and evaluate the capability of students to apply learning knowledge to reality [Exh. 5-04: Sample products of students from some course projects].

3. Exit assessment

In order to accomplish the programme, MET students have to earn 140 credits of courses and another 10 credits of capstone project. They also have to do graduation practice in the last year to gain more working experience for their future jobs [Exh. 5-05: Regulations on graduation requirements].

The capstone project can be registered in the last semester when students successfully accumulate at least 132 credits [Exh. 5-06: *Regulations on Capstone Projects*]. Students are supposed to do their graduation thesis in 15 weeks. They are also encouraged to choose topics and supervisors on their own. All the procedure for topic registration, implementation process, progress reports (weekly report to supervisors, intermediate report and final report) is publicly announced to students at the beginning of each semester [Exh. 5-06: *Regulations on Capstone Projects* ; Exh. 5-07: *Capstone Projects implementation processes for MET students*]. The students have to defend their reports in front of the department committee. The committee will evaluate their performance using the structured evaluation form [Exh. 5-08: *Lists of capstone projects and Defense Committees* ; Exh. 5-09: *Rubric for capstone projects evaluation*].

5.2. The assessment is criterion-referenced

Student assessment systems have clear and transparent criteria. Every teacher knows intensively the evaluation and assessment methods for the courses they are in charge. These tools are documented in the official MET programme files promulgated by the FME and in the course portfolio written by teachers. Students can refer these assessment criteria in Students' Handbook. At the first class, teachers introduce the syllabus and examination and assessment methods to students [Exh. 5-10: *Samples of courses' syllabi*]. The grading scale for students' performance is categorized in Table 5-2.

Table 5-2: Grading scale for student evaluation

Classification	Grade	
	Decimal scale	Letter scale
Excellent	$8.5 \leq \text{GPA} \leq 10$	A
Good	$7.0 \leq \text{GPA} < 8.4$	B
Average	$5.0 \leq \text{GPA} < 6.9$	C
No passing		
Weak	$4.0 \leq \text{GPA} < 4.9$	D
Too weak	$\text{GPA} < 4.0$	F

Course projects would require for reports and presentation. Evaluation standard will rely on rubrics which are designed separately according to each course [Exh. 5-11: *Rubrics for the evaluation of course projects and presentation in the course portfolios*]. Some rubrics used for analyzing and evaluating courses - matrix analyzing the correlation between programme ELOs and CLOs, matrix correlates CLOs and assessment tools and methods – are well

prepared in each course portfolio [*Exh. 5-12: Rubrics for course evaluation in the course portfolios*].

5.3. Student assessment uses a variety of methods

Accurate evaluation of students' progress in term of acquired knowledge, skills and other learning activities is essential. The MET department always encourages teachers to use different assessment tools and methods and they should be described clearly in the course syllabi [*Exh. 5-13: Different assessment and testing methods and their corresponding grade ratio (Course portfolios)*]. Possible assessment tools and methods could be [*Exh. 5-14: Samples of assessment and testing question types*]:

- Multiple choice questions
- Writing examinations
- Presentations
- Oral examinations
- Attendance, discussion, assignment
- Homework
- Team-work activities
- Formative and summative assessments

All students have to accomplish three course projects (Project on Theory of machine and machine design, Control and Drive Project, Project of Mechatronics systems) and a capstone project. These course projects assess the ability of applying learning knowledge to practical problems. Students have to defense their projects in front of the department committee. Especially for capstone projects, the evaluation committee may also have other invited stakeholders such as teachers from other related departments and employers as well [*Exh. 5-15: Lists of course projects and Defense Committees*].

In addition to learning activities, students are also assessed through social activities, activities of Student Association and Youth Union or public activities. Office of Student Affairs will grade their attendance in term of moral conduct score in each activity in every semester [*Exh. 5-16: Assessment of social responsibility for students*]. In order to encourage student to attend more extracurricular activities, “social score” is an important criterion to grant scholarship every semester and for graduation approval [*Exh. 5-17: Regulation for student grants*].

5.4 Student assessment reflects the expected learning outcomes and the content of the programme.

All course syllabi have course learning outcomes. Each CLO has to support specific ELOs of the programme. The contents of each chapter, homework, formative and summative

assessment have to cover all the announced CLOs [*Exh. 5-18: Samples of courses' portfolios and lecture notes*].

Beside the requirements for professional knowledge and skills, students are also supposed to achieve other soft skills, English and learning and working attitudes. For instant, students will be rejected for the final exams if their attendance in class is less than a limited percentage. Students have to strictly follow the regulations when they enter any experiment/practice laboratories and workshops for safety reasons [*Exh. 5-19: Lab regulation*]. Soft skills can also be assessed through independent working capability and work in teams in courses that require students to do reports and presentation [*Exh. 5-20: Rubrics for evaluation of presentation, report (soft skills)*].

5.5. The criteria for assessment are explicit and well-known

At the beginning of each course, teachers have to introduce clearly the syllabus and all the assessment methods during the course. It includes the ratio among exams (midterm, final), exercises, homework, reports and so on. Students can also check these information in Students' Handbook, from the Office of Academic Affairs or from the FME's website [<http://online.hcmute.edu.vn>]. The program content highlights the self-study capability and the engagement of students into the learning process. Hence, the program is designed to increase the self-study time at home, raise the percentage of formative assessment from 20-30% to 50% [*Exh. 5-21: HCMUTE regulation for course evaluation*].

For courses that require team reports or presentation, students are grouped in teams of 3-4 members. Every team has to search the information related to the assigned topic, then analyze and study the information. Then they prepare slide presentation to report in front of the class. Assessment criteria for the presentation are well designed in form of rubrics [*Exh. 5-20: Rubrics for evaluation of presentation, report (soft skills)*].

5.6. The assessment methods cover the objectives of the curriculum

Teachers are required to make course portfolios for the subjects they are in charge. The course portfolio has to describe all homework and assignments for each chapter, the evaluation and assessment methods. They have to adapt to course objectives which finally support for certain ELOs of the programme. Teachers can also prepare similar tasks for the midterm and final exams as long as they are suitable for the CLOs [*Exh. 5-18: Samples of courses' portfolios and lecture notes*]. For example in Automation Control module, with delegation from head of MET department, team leader of this module can hold a meeting at the end of the semester to discuss the testing contents, delegate a person to design the exam tasks. The final exam tasks will then be sent to the head of department for approval [*Exh. 5-22: HCMUTE Procedure on making exam questions*].

5.7. The standards applied in the assessment are explicit and consistent

The MET programme is described explicitly in the Students' Handbook and distributed to every student at the first semester. The course syllabus, evaluation and assessment methods

are also introduced to students at the first class of each subject. The testing tasks and their answers have to be publicized to students after the examination on the FME's website [<http://fme.hcmute.edu.vn/>] or on the academic bulletin board of the MET department [*Exh. 5-23: FME regulation on preparing exam questions and answers*].

After the official testing date of a course, teachers have one-week deadline to grade and input the results on the OAA's website [<http://online.hcmute.edu.vn/>]. Students also have the same deadline period to request for re-grading if they do not satisfy with the first result. To ensure for objectiveness and fairness for students, re-grading process will be done by a different teacher who also teaches that course. The final results will be announced to students [*Exh. 5-24: HCMUTE Procedure on grading and re-grading*].

To be approved for graduation, students have to gain enough required credits and have the accumulated GPA above 5.0 (based on the 10.0 grading scale). Moreover, students also have to fulfill required English outcome and social activities, etc [*Exh. 5-25: HCMUTE Regulation on graduation approval*].

The OAA bases on the accumulated GPA to classify students' graduation rank [*Exh. 5-26: OAA Regulation on classifying students' graduation rank*].

CRITERION 6: ACADEMIC STAFF QUALITY

6.1. The staff are competent for their tasks

The FME has a long history of more than 50 years (established in 1965). Its current mission is to become a leading center for teaching and researching in mechanical and automation engineering in Vietnam. It has made a lot of contributions for the development of UTE in training and researching activities [*Exh. 6-01: List of research projects of FME teachers; Appendix 7: List of publications published in the period of 2011-2015 by lecturers*].

The FME has totally 91 faculty members with 17 PhDs (excluding 5 PhDs are in charge of administration duty in UTE); 6 Associate Professors. The academic staff who are involved in teaching the MET programme have high professional quality and great ardor for educational career. The FME always makes Teacher Professional Development Plan not only in quantity but also in quality to fulfill the higher demand for training and researching quality. Teaching staffs of FME are always encouraged and subsidized for higher training in teaching and researching perspective [*Exh. 6-02: Annual training plan; Exh. 6-03: HCMUTE Decisions on delegating teachers for training*]. Lecturers achieving PhDs degree have more incentives in teaching and researching [*Exh. 6-04: HCMUTE Internal Spending Statute*]. The FME Board is always aware of crucial mission to recruit candidates who hold high teaching degree. From 2014, the FME has been recruiting PhD holding candidates only, based on the annual School Recruitment Plan. Teaching staffs recruited for the MET programme are required for both high academic degree and the Teachers' Standards of MET Department and HCMUTE [*Exh. 6-05: Teaching staffs standards*]. Most lecturers of the MET programme have high professional degrees and plentiful teaching and researching experiences [*Exh. 6-06: Feedback survey results from students; Exh. 6-01: List of research projects of FME teachers*].

The FME usually contacts its staffs pursuing PhD study abroad and orient their research plans to meet their future tentative working duty plan. The FME also signed a lot of MOU with some prestigious foreign universities to recommend its staffs for PhD study serving for the future human resource development plan [*Exh. 6-07: Memorandum of Understanding (MOU) signed with National Central University – Taiwan, Chonnam National University, and Otto-von-Guericke University Magdeburg*]. Moreover, in order to further enhance the quality of teaching and researching for faculty members, the FME has made a Strategic Development Plan for two researching centers: upgrade the existing High Technology Center and build a new MET Researching Institute [*Exh. 6-08: High Tech Center upgrading project and MET Research Building project*].

The FME's Teaching Staffs Development Plan is consistent with the following principles:

- + Promoting higher training for young staffs in each department.
- + Recruiting new highly qualified lecturers.

- + Encouraging and recommending excellent students to pursue higher education (PhD study) to build future recruitment resources.
- + Making Annual Training Plan for short-term and degree-seeking training abroad with both national and foreign grants.
- + Expanding teaching and researching co-operation with national and foreign scholars.
- + Encouraging and making more incentives to promote self-training, frequently selecting and screening staffs upon Professional Standards.
- + Making recurrent Scientific Meeting Regulation to assure teaching staffs of accomplishing both teaching and doing research duties.
- + Making plan, organizing and managing training courses to upgrade professional skills, English and information technology for faculty members. Making training administrative procedures for managing faculties. Always making backup plan and regulations of training for descendent staffs.

6.2. The staff are sufficient to deliver the curriculum adequately

The MET department has 19 lecturers to teach specified knowledge and skills of the MET programme. With every course, the FME always assigns at least two lecturers [*Exh. 6-14: Teaching scheduling plan*].

In early 2014, teaching assistant team was established in the whole university and then has been highly contributing to learning process of students [*Exh. 6-11: Decision on establishing teaching assistant team; Exh. 6-12: Function and responsibility of teaching assistant team*].

Beside fulltime academic staffs, the 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 and research institutions. These inviting guests will enrich the teaching content and diversify training fields of FME [*Exh. 6-09: List of inviting lectures*]. Furthermore, the FME usually invites international professors and researchers to hold academic seminars [*Exh. 6-10: Lists of research and science seminars of FME*].

The equivalent to FTE for teaching staffs is showed in Table 6-1 and Table 6-2.

Table 6-1: Academic staffs of MET department (Updated to August 2015)

Academic staffs	Male	Female	Total			PhD degree percentage
			Quantity	FTEs allocated	FTE	
Assoc. Professor (MET)	1	0	1	1	1.0	100%
Assoc. Professor (FME)	5	0	5	0.3	1.5	100%
Full-time lecturer (MET)	17	2	19	1	19.0	31.5%
Full-time lecturer (FME)	15	2	17	0.3	5.1	29.4%
Full-time lecturer (non-FME)	24	8	32	0.2	6.4	28.1%
Visiting Professor/ Lecturer	8	0	8	0.2	1.6	75%
Total	70	12	82		34.6	

Note: FTE – Full-time equivalent

Table 6-2: Student/Academic staff ratio and Graduate/Academic staff ratio

Academic Year	Total FTE of teachers	Number of students	Number of graduate students	Number of students per FTE of teachers	Number of graduates per FTE of teachers
2014-2015	34.6	818	93	23.6	2.6
2013-2014	33.2	749	77	22.2	2.3
2012-2013	32.5	634	81	23.2	3.0
2011-2012	32.2	511	74	22.5	3.3
2010-2011	31.6	425	68	21.7	3.5

6.3. Recruitment and promotion are based on academic merits

Human resources development is essential in any organization. The FME has made Faculties Development Road Map to increase the teaching and researching quality. Raising enrollment requirements is a key condition. In recent years, the qualification benchmark of lecturers must be PhD degree and the HCMUTE would provide financial incentive for lecturers holding Ph.D degree.

Every year, based on the workload, numbers of current teachers and numbers of staffs pursuing higher degree in Vietnam and abroad, the FME makes faculty recruitment proposals for each semester. Job opportunities are regularly announced on the University's website, newspapers and recruiting sites *[Exh. 6-16: Recruitment announcement,*

Recruitment processes, Recruitment documents]. Recruitment process includes three phases (1) document review, (2) direct interview and (3) teaching demonstration. The lecturer candidates' application documents include academic transcripts and research achievements. Teaching demonstration in front of Recruitment Board after interview sections shows the candidate's academic competences, communication skills, mastery of the subject, classroom management, and student-teacher communication. The FME's Recruitment Board checks the documents carefully before recommending candidates to the Rector [*Exh. 6-17: Recruitment and selection procedure*]. The lecture candidates have one year to adapt with their future works. Then HCMUTE will evaluate their performance again before signing official contracts. Besides, they also need to fulfill the requirements of HCMUTE and MOET such as English certificate, pedagogical skills, etc to obtain the lecturer title [*Exh. 6-18: Regulation 06/2011 MoET*].

Staffs with excellent performance in teaching and doing researches will be considered and nominated to higher academic titles based on the MoET's regulations:

- Associate Professor: candidates have to hold PhD degree in the relevant fields. They must have at least 6-years experience in teaching (more than 3 years after they got the PhD degree). Candidates have to show high research competence with some ranking national and international publications. These ranking journals have to be in the lists of The State Council for Professor Title of Vietnam. Candidates have to be the major member in two research projects, the supervisor of at least two graduated Master students and fluency in English (or other foreign languages) [*Exh. 6-19: Meeting reports for nominating Associate Professor candidates*].

- Full Professor: candidates have to hold PhD degree in the relevant fields. They must have at least 9-years experience in teaching (more than 6 years after they got the PhD degree and more than 3 years after they got their Assoc. Prof. position). Candidates have to show their excellent research competence with lots of ranking national and international publications. Candidates have to successfully supervise at least two PhD students and fluency in English (or other foreign languages). Candidates have to submit their applications to The State Council for Professor Title of Vietnam in order to be nominated to Full Professor position [*Exh. 6-20: Guideline of the State Council for Professor Title of Vietnam*].

6.4. The roles and relationship of staff members are well defined and understood

The UTE has promulgated Regulations for defining function, role and responsibility of teaching staffs [*Exh. 6-21: HCMUTE Regulations on function and responsibility of teaching staffs*] based on the companion regulations of MOET [*Exh. 6-22: MoET Regulations on function and responsibility of teaching staffs*]. As a big faculty, the FME has a Dean and four vice-Deans. The Dean is responsible for all activities inside the FME and the official representative outside the FME. Each vice-Dean is in charge of different aspects such as Researches; Academic and Training; Facilities and Students – Unions.

Under Faculty Managing Board are Departments led by Heads and Deputy Heads. Each person is in charge of certain responsibilities [Exh. 6-23: *Function and responsibility description tables for Faculty Board members/Department Board members and teaching staffs*]. The Head of Department has to report to the Dean. This position requires a highly experienced PhD-degree staff who is in charge of orienting for all academic activities of that department. The Head of Department term is 5 years.

Beside those key staff members, older teachers with much teaching experience play a crucial role in elevating teaching quality and are highly valuable models for younger lecturers. During probation time of newly recruited lecturers (the first year of the labor contract), senior teachers are assigned to train the newcomers in preparing teaching materials and methods. Young apprentices have to participate in other teachers' classes to learn classroom management and teaching approaches. After the probation time, young lecturers have older ones visit their classes 2 to 3 times per semester to make suggestions for their improvement [Exh. 6-24: *Teaching visiting lists, Reports for teaching recommendation*]. Moreover, experienced teachers usually share a lot of ideas on teaching methods when the FME holds seminars and academic meetings [Exh. 6-25: *Lists of Meetings and Seminars held by FME*]. The lecturers teaching the same course must work together to deliver consistent teaching contents and select appropriate assessment methods. Furthermore, the ELOs and the curricula of MET programme are regularly revised based on the lecturers' opinions and evaluation [Exh. 6-26: *Meeting reports of the FME Committee for Education & Research on revising the MET programme*].

6.5. Duties allocated are appropriate to qualifications, experience and skills

Teaching duties assigned to staff members are based on their qualifications, experience and skills. Heads of department have to hold PhD degree or higher. They are experienced teachers and have the ability to orient for all academic activities of their departments. Each staff has to teach at least 2 courses and each subject has to be assigned to at least 2 teachers with appropriate qualification. Theory courses are designated to Master or PhD degree lecturers. Experiment and practice courses are appointed to experienced teachers with highly technical skills. It is required that Master or higher degree teachers can supervise undergraduate students to do their thesis projects and research projects [Exh. 6-27: *Lists of supervisors for capstone projects and research projects*].

A teaching assistant (TA) is an individual who assists a lecturer with teaching-related responsibilities. TAs include graduate teaching assistants (GTAs), who are graduate students or undergraduate teaching assistants (UTAs), who are undergraduate students. TAs generally have a fixed salary determined by each contract period. TA's responsibilities vary greatly and may include: tutoring; invigilating tests or exams; and assisting a professor with a large lecture class, in laboratory, or discussion sessions [Exh. 6-13: *List of TA and Working plans of TA*]. The FME requests novice lecturers to visit the classes of experienced teachers and learn how to design course syllabus. The experienced

teachers are appointed to supervise the novice lecturers and evaluate their practicum [Exh. 6-15: Probation accomplishment documents].

6.6. Staff workload and incentive systems are designed to support the quality of teaching and learning

Staff workload in each semester is designed followed the UTE Regulations and based on the demand, qualifications and number of enrolled students for each course and the readiness of the staff [Exh. 6-28: Regulation No. 42/QĐ-ĐHSPKT-TCCB on March 9th 2013 for teacher standards]. Based on the UTE Regulation [Exh. 6-04: HCMUTE Internal Spending Statute], the required workload of teaching staffs is shown in Table 6-3.

Table 6-3: The required workload of teaching staffs

Academic titles	Teaching and consultant workload/year	Research workload/year	Community Service (No. Activity/year)
Assoc. Prof.	320h (10-11 teaching and consulting hours/week)	110h	4
PhD./ tenure	320h (10-11 teaching and consulting hours/week)	110h	4
Master of Science	280h (9-10 teaching and consulting hours/week)	90h	4
Engineer	280h (9-10 teaching and consulting hours/week)	90h	4

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

Working capacity and contribution ability of staffs are evaluated based on the Key Performance Indicators (KPIs) system. The evaluation result is a criterion to vote for awards, nomination, redeployment or punishment at the end of every school year [Exh. 6-29: KPIs evaluation system].

6.7. Accountability of the staff members is well regulated

Responsibility of each staff member is clearly guided in UTE and MoET's documents. In every school year, accountability of staffs is well regulated in the Internal Expenditure Regulation based on each working position, academic titles and capacity of staffs. The implementation of these processes is checked by different levels of management. Each staff has to do personal report for their works at the end of every school year and they are evaluated by their direct manager. This evaluation result is a criterion to nominate for personal and department anual awards [Exh. 6-30: Teaching staffs' KPIs evaluation results].

6.8. There are provisions for review, consultation, and redeployment

The review, consultation and redeployment of staffs are done based on the university's requirements and statistic data for their performance: students' feedback, KPIs results, evaluation of direct manager and colleagues [*Exh. 6-31: Students' feedback, KPIs results and meeting reports for teachers evaluation*].

Moreover the redeployment can also be done depending on staffs' wishes. The FME always creates as much opportunities as possible for ex-staffs working in functioning offices to teach courses that they are expertise.

6.9. Termination and retirement are planned and well implemented

Retirement of staff members are well defined in the Decision of MoET on working regulation and Government Decree [*Exh. 6-32: Civil servant Law, Decree No. 29/2012/NĐ-CP on April 12 2012 of Government related to recruitment, allocation and management of civil servants*]. The retirement age for female and male employees are 55 and 60 years old, respectively. If the university has the demand and the staffs are willing to contribute, they are invited to extend their contracts up to 5 years for PhD degree staffs and 7 years for Assoc. Prof. and Full Prof. After retirement, besides the pension and other allowances following the Labor Law and Social Insurance Law, UTE's ex-staffs can also receive other retirement incentives from the university [*Exh. 6-33: Regulation of the Human Resources Management Office, Evaluation table results of retired teachers*].

In case of termination, staffs have to submit their applications to the Human Resources Management Office and with clear reasons of termination at least 3 months in advance. On the other hand, UTE also has the right to terminate the contract with staffs who do not fulfill the requirement of the jobs or make serious mistakes. UTE has the responsibility to inform the employees 3 months prior to terminating the employees' contract.

6.10. There is an efficient appraisal system

At the end of every school year, all lecturers have to make self evaluation reports based on their teaching and researching performance according to the regulation of HCMUTE and MoET. They are also nominated for some awards and emulation titles [*Exh. 6-34: HCMUTE Decisions on recognition for personal and faculties' annual awards*]. Increasing of the staffs' salary grade is revised every 2 to 3 years [*Exh. 6-35: Decision on early upgrading salary grade for FME's staffs ; Exh. 6-36: Upgrading salary grade examination results of FME's staffs*]. Some excellent staffs of the FME have been promoted to higher positions in the university level: the vice-rector Assoc. Prof. Le Hieu Giang, the head of Human Resources Management Office Assoc. Prof. Nguyen Ngoc Phuong, the head of Project Management Office Dr. Nguyen Tien Dung, the deputy head of Research Management & International Relations Office Dr. Nguyen Vu Lan.

The KPIs system has been piloting since the 2nd semester of 2014-2015 school year and it will be a key criterion for the appraisal system. Based on the KPIs results and local nomination from department level, the FME's Emulation and Reward Committee (ERC)

will make the staffs' evaluation and nominate them for awards after every school year. From the FME ERC's nomination, the UTE ERC will check and make the official approval. The annual rewards for staffs include: "Excellent staff" in 3 levels: University, MoET, and Government *[Exh. 6-37: Lists of annual teachers' awards]*. Staffs with excellent performance and contribution can be reviewed to upgrade the salary grade earlier *[Exh. 6-38: List of early upgrading salary grade for FME's staffs]*. This appraisal system has positive impact to the teaching and doing researches efficiency.

CRITERION 7: SUPPORT STAFF QUALITY

7.1. The library staff are competent and adequate in providing a satisfactory level of service

There are currently 19 library staffs in HCMUTE including 02 Masters, 09 Bachelors and the rest are college and tertiary degree holders. Sixteen of them have professional knowledge for librarianship, 01 is Information technology based and 02 are officers [Exh. 7-01: *List of library staffs*]. With 17,000 students accessing library data base, these library staffs are effectively working and satisfying the national standards for library [Exh. 7-02: *Table of national standards for library staffs*]

In order to satisfy even better the ever-increasing needs of students and to develop Electronic Database Library for the university, there is a plan of personnel development by 10% increment per year, thus the staff number will reach to 30 by 2018 [Exh. 7-03: *2013 – 2018 Staff development plan with expectation by 2020*]. The additional staffs are for new units such as learning material publisher (02 persons), electronic library (06 persons) and library information service (01 person).

To encourage the staffs to improve their professional knowledge, each staff is allowed to sketch out his/her own plan for simultaneous working and studying [Exh. 7-04: *Quality objectives of the library every year*]. Moreover, the library frequently organizes professional workshops and seminars to let the staffs approach to newest professional techniques to ameliorate the service quality [Exh. 7-05: *List of organized workshops and seminars*]. Beside the university internal library, HCMUTE students may take Invitation letter issued by the library to access the Vietnam National Library or other libraries that HCMUTE library is linking with [Exh. 7-06: *Invitation letter and list of linked libraries*].

Annually, HCMUTE Quality Assurance Office investigates activities of the library to assess the working performance of the library in general and its staffs in specific. Assessment results of the library have been A-level for many years [Exh. 7-07: *Internal assessment results and Quality objective achievements of the library*] and the library has been granted awards from the university [Exh. 7-08: *List of granted awards of the library*]. In addition, the library also holds a Talk with students every semester and periodically self-evaluates every 02 years [Exh. 7-09: *Plan for Talks with students; Survey form and Investigation results*]. Among student's responses, many have been noted and applied to improve the effectiveness of the library [Exh. 7-10: *Talk and Survey report*]. Moreover, HCMUTE Student Affairs Office does the survey to graduated alumni for their feedback on library service. Results have shown a high rate of satisfaction from most of the alumni [Exh. 7-11: *Survey report from HCMUTE Student Affairs Office*].

7.2. The laboratory staff are competent and adequate in providing a satisfactory level of service

Laboratory and Workshop Practice activities are major ones and also the strength of HCMUTE MET Department in comparison with other universities in the Southern Vietnam region. The Department has 17 laboratories and practice workshops available for students, satisfying the national standard for laboratories and practice workshops [Table 1 of Introduction section].

To assure the excellent working status of the laboratories and workshops, one lecturer is assigned as the Director to take care of each laboratory or workshop. The lecturer is responsible for operating and planning budget for renewing or replacing equipment. Together with the Deputy Chairman of the Department, the Vice Dean of the Faculty, the Facility Management Officers and the Vice President in charge of facilities and equipment, this lecturer will sketch out the Equipment replacement/supplement budget plan every year *[Exh. 7-12: Annual Equipment replacement/supplement budget plan]*.

Holding Master or higher degrees, the lecturers are pre-trained with the equipped devices and then develop further experimental and practical exercises and thus manage very well all activities in the laboratories and workshops.

Additionally, due to the rapid development of MET which leads to the demand of frequent renewals of practice equipment, the lecturers are encouraged to participate in national/international conferences, exhibition shows to update their knowledge and skills and also to propose the most suitable equipment replacement to catch up with modern changes *[Exh. 7-13: List of Department lecturers participated in conferences; Exh. 7-14: List of annually replaced/supplemented equipment]*.

To continuously improve the training quality of practice subjects, the Faculty and University managing board have created connections with students for their feedback on teaching work in general and practice activities in specific. The feedback summary is used as the basis for modifications in teaching and learning activities in the Department. The online feedback survey is done by the end of each semester when the subjects end. Results from 2010 to 2015 have shown that 75-80% of students satisfied with the courses of the MET program *[Exh. 7-15: Annual student survey results regarding to subjects]*.

7.3. The computer facility staffs are competent and adequate in providing a satisfactory level of service

The Information and Network Center of HCMUTE is managing all computer laboratories for student practice. The center has 08 faculty members including 01 Director, 01 Vice Director, 01 Website administrator, 01 Network management staff and 04 technical staffs for computer laboratories, internet networking and telephone network. All of them are good at information technology and assure that all the computer laboratories work properly *[Exh. 7-16: List of Information and Network Center staffs and professional fields]*.

For courses that require practice on computers, students are arranged to practice at computer equipped rooms at the relevant Faculties. In these rooms, all computers are installed with

technical software and controlled by a lecturer to facilitate the teaching/learning activities even during off-work hours. The lecturer is well trained according to the National standards (Ministry of Education and Training) for laboratory lecturer before delivering the subject to students [*Exh. 7-17: List of laboratory lecturers and professional fields*].

Students can also utilize more than 50 internet-accessed computers in the library to search for learning materials even during off-work time. For simplicity of use, the operation of this computer room is done by librarians or the youth union members [*Exh. 7-18: Library computer room registration form for use, Computer room regulation*].

7.4. The student services staffs are competent and adequate in providing a satisfactory level of service

After having fixed the cut-off entrance score, admission offices go through admission process according to the pre-planned procedure. Student enrollment procedure and required documents are publicly announced and clarified through HCMUTE's website <http://tuyensinh.hcmute.edu.vn/>, and the procedure is done in correspondence with the MoET regulation. [*Exh. 7-19: Freshmen Admission Plan, Admitted freshmen enrollment procedure*]. Each year, the university and FME celebrate the Freshmen Admission Ceremony to welcome new members to the whole big family. Within the first week, HCMUTE Presidential board, Faculty/Office deans/vice deans and senior students hold an orientation for freshmen to introduce the university history, organization structure of the university/faculty/department, personnel and facilities. Freshmen are consulted with curricula, objectives and requirements of the whole study program, higher education learning methodologies, etc. The orientation also provides students with essential information about the school offices that they can seek for help. [*Exh. 7-20: Organizing plan for the Week for civil information supplementation at the beginning of every new school year; Exh. 7-21: Time table of the Week for civil information supplementation*].

Functional offices are responsible for both major duties and assistance to students' learning process. To support student affairs, Academic Affairs Office, Student Affairs Office, Student Services Center, Faculty Consultants, Health Center and other offices must join in if needed [*Exh. 7-22: Statute for consultation; Exh. 7-23: Function and Responsibility of consultants; Exh. 7-24: Promotion decision of consultants*].

Students may receive consultation through:

- Direct consultation in Consulting office;
- Consulting website;
- Consulting emails;
- Organized consulting seminar with regarded topics;
- Consultation on phone;

- Consultation on facebook.

Service quality is annually investigated and results are reported to all offices for improvement [Exh. 7-25: *Student service survey results in 2010, 2011, 2012, 2013, 2014 and 2015*].

Table 7-1: The system of student services

No		Students services	Supporting unit and staff
1	Academic support	Consulting students with course registration, time-table adjustment	Office of Academic Affairs
		Granting credit exemption, examination exemption, course withdrawing, academic transcript	Consultants of FME Science and Technology
		Guiding for graduation management, credit shortage, and other issues related to certificate / degree	Management Office Academic staff
		Consulting international students	Library
		Consulting students with scientific research work	
		Supporting learning materials	
		Introducing information capacity of HCMUTE to students	
		Instructing students how to effectively search for and use learning materials and other library information services	
		Instructing students how to make study plan for every semester and the whole programme time	
		Guiding students for course selection and registration	
Orienting students to learning methodologies and dealing with learning difficulties			
2	Financial support and scholarships	Guiding for school fee	Student Affairs Office
		Offering financial aids	Public Relations Office
		Offering scholarship	Management Board of FME
		Consulting students with students affairs,	

		policy for tuition fee waiver or deduction	Financial and Planning Office
		Searching for part-time jobs for students	
		Transferring student abroad	
		Looking for and organizing student exchange activities with foreign students	
3	Career orientation and Employment	Orienting students to career and job market	Public Relations Office Management Board of FME Consultants of FME
4	Students services	Daily receiving students and connecting them with consultants	Student Service Center Student Affairs Office Consultants of FME
		Conducting short-term courses for soft-skills	
		Supporting facilities and environment for learning, social activities, charity activities and other outdoor activities	
		Organizing Student Experiences Club and other clubs to help students develop their skills and experience	
		Guiding students for student recruitment issues	
		Consulting students with social activities and moral conduct score	
5	Accommodation support	Helping student with accommodation registration	Dormitory Management
6	Medical care	Caring students' health	Health Care Center

CRITERION 8: STUDENT QUALITY

8.1. There is a clear student intake policy

MET Department does student recruitment clearly and publically according to Statutes of MoET.

The recruitment process gets along well with the National Higher Education laws 2012 (Statutes of MoET for universities, recruitment quantity, recruitment organization, recruitment and enrollment procedure) [*Exh. 8-01: MoET statute for student recruitment for universities and colleges*]. The annual recruitment quantity is approved and announced by MoET through their official website to all universities and colleges who have formal and/or in-service higher education programmes [*Exh. 8-02: Recruitment announcement for university, college and vocational high school levels*].

In order to improve the quality and quantity of enrolled students, HCMUTE and FME have been regularly conducting career-orienting and consulting activities to high-school students and their parents, such as:

- Exposing banners, posters, leaflets [*Exh. 8-03: Posters and leaflets for MET Department student recruitment*], announcing information in advance on HCMUTE's and FME's website whose addresses are <http://tuyensinh.hcmute.edu.vn> and <http://fme.hcmute.edu.vn/>;
- Organizing Student Recruitment Consulting Days at remote sites to bring information to local pupils [*Exh. 8-04: Plan for remote recruitment consulting days; Exh. 8-05: Images on remote recruitment consulting days at different provinces*];
- Weekly online consulting through websites of newspapers, Youtube, etc during the recruitment time [https://youtu.be/kQ3TfOa_a-Q; <https://youtu.be/IhVmMiKxSBM>];
- On-air consulting through broadcasting channels of HTV, VTV, etc;
- Organizing yearly Open-days to receive career-orienting teachers, parents and high-school students to visit the university. On these days, FME and MET Department introduce to them about MET programme and facilities of the faculty [*Exh. 8-06: Plans for Open-days and related images*], organize Talks and direct Q&A for them about professional knowledge and occupation trends; exhibitions of MET students' products of their research and capstone projects [*Exh. 8-07: Images of students' scientific products*].

Also, to encourage and attract excellent students, the university develops its own scholarship foundation for those with excellent examination results and continuously calls for sponsorships for outstanding undergraduates during their learning periods [*Exh. 8-08: Decision on awarding scholarship for those with excellent NUEE results*]. Especially for female students, the university has a special policy for entrance-grade, waived tuition fee, exam exemption for students awarded with National student excellence examinations and so on [*Exh. 8-09: Decision on waiving tuition fee for MET female students*].

Thanks to these meaningful activities, the quality and quantity of enrolled students of the university have truly increased in the recent years.

Table 8-1: Numbers of MET students enrolled at the first year (6 most recent years)

Academic year	2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015 - 2016
Male	86	152	172	213	202	177
Female	2	2	0	3	3	2
Total	88	154	172	216	205	179

Table 8-2: Total number of MET students (last 5 academic years)

Academic year	2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015
Male	418	504	628	741	788
Female	7	7	6	8	7
Total	425	511	634	749	795



**Cuộc thi Đua xe bằng
năng lượng mặt trời
Dành cho học sinh
Trung học Phổ thông**



Figure 8-1: HCMUTE has annually organized Solar Car Challenge for high school students

To attract prospective students, the FME usually holds competitions like Dancing robots, Soccerbot, Micom Car Rally (MCR), etc which attract a lot of students' concern. The impact of these competitions sometimes goes beyond the UTE's border with participation from other technical universities and even high schools [*Exh. 8-10: Announcement, photos, posters and products of students' competitions*]. The Solar Car Challenge was established in 2014 to help motivate students in science and engineering, and to increase alternative energy awareness. The Challenge teaches high school students how to build roadworthy solar cars. These activities inspire innovative and competitive environment and closed connection among young engineers who will be the key manpower in mechatronics for southern provinces of Vietnam.

8.2. The student admission process is adequate

MoET, in the role of governmental education management organization, annually organizes and supervises the National Graduation Examination (NGE) to acquire students' scores basing on which all universities and colleges in the nation will select students to fill their enrollment quota given by the ministry.

Before 2014, MoET conducted the National University Entrance Examination (NUEE) for all high-school students who had passed the National Graduation Examination. Students were able to select which universities or colleges they desired to apply to. After grading students for NUEE results, the ministry announced the common cut-off entrance score (which guaranteed the minimum acceptable students' input quality) so that all the universities and colleges could estimate their own cut-off entrance score (which had to be higher than the one announced by the ministry) to recruit freshmen.

Since 2015, MoET has been applying only the NGE. From the examination results, the ministry announces the common cut-off entrance score so that all the universities and colleges could estimate and announce their own cut-off entrance score (which had to be higher than the one announced by the ministry). Basing on each university/college's cut-off entrance score, students may choose to apply to the most suitable ones to their capability and desire. The university/college collects and considers application forms to recruit qualified students.

HCMUTE does the processes of student recruitment fully in compliance with the regulations of MoET. The university annually establishes a Student Recruitment Committee to decide the recruitment grade levels for the whole university and for each study program which must be higher than the related levels announced by MoET (Table 8-2) [*Exh. 8-11: Meeting minute of deciding the recruitment grade levels; Exh. 8-12: Decision on cut-off entrance score for A- and A1-categories*]. The grade levels may vary yearly according to the number of application forms and the quality of the applicants. This fact is evidenced by the continuously increasing cut-off entrance score level for MET Department in annual national university entrance examinations.

[http://tuyensinh.hcmute.edu.vn/Resources/Images/SubDomain/tuyensinh/brochue_2015_0002.jpg].

Table 8-3: Cut-off entrance score of MET-HCMUTE and some other universities in HCMC

Academic year \ Cut-off entrance score	2010 - 2011	2011 - 2012	2012 - 2013	2013 - 2014	2014 - 2015	2015 - 2016
Announced by MoET	13	13	13	13	14	15
MET Department, HCMUTE	15	15.5	16.5	20	20.5	23.75
HCMC University of Technology, VN National University - HCMC	17	17	18.5	22	21	24.5
Industrial University of HCMC	13	13	13	15	16	20.25
HUTECH University (HCMC)	13	13	13	13	14	15

Beside the increasing cut-off entrance score, the table 5-1 also shows the stably increasing numbers of enrolled students for MET Department within the last 5 years thanks to the high training quality of the Department as well as the yearly statistic feedback reports showing a high job placement and high, stable incomes for MET students. This fact shows the attractiveness of the MET Programme and the big demand for MET from the society [*Exh. 8-13: Survey data from MET alumni*].

8.3. The actual study load is in line with the prescribed load

Basing on National Higher Education laws 2012, Statutes of MoET for universities, Statutes for Student Recruitment, Statute No.43/2007, Learning outcome statements, HCMUTE has been applying a Credit-based higher education system. [*Exh. 8-14: Decision on issuing Statutes for Credit-based higher education system; Exh. 8-15: Implementation instruction for Credit-based higher education system; Exh. 8-16: Statutes for curricula constructing and course distribution in the 150-credit study program; Exh. 8-17: Decision on issuing Higher education programme curricula*]. Each credit consists of 15 in-class hours and at least 45 self-study hours.

The 150-credit study program is planned to occupy 4 years each of which may have 2 major semesters and 1 summer semester. Courses are distributed evenly for each year with about 15-22 credits per semester, that equivalent to 5-8 courses, including elective courses which students may select according to their capability and FME consultants' suggestions [*Exh. 8-18: Plan for MET Study program*]. In other words, students may also choose pre-planned courses for each semester or they may register for pursuing extra courses or re-doing

dismissed courses. The minimum number of registered credits is 15 and the maximum is 25 per semester. *[Exh. 8-19: Statute for course registration]*. With the advantages of the credit-based system, students may finish their programme within the permitted 4 year period or sooner depending on their capability. Those who have low capability or personal difficulties may still extend their study within the next 4 years. *[Exh. 8-20: Students' Handbook 2012]*.

In order to guarantee the relevance between learning load (of students) and teaching load (of teachers), the university and FME do the following solutions:

- Establish Academic Inspectorate to investigate and guarantee that the teaching and learning process is following well the training plan. *[Exh. 8-21: Functions and responsibilities of Academic Inspectorate Office; Exh. 8-22: Lecturer's refringement report; Exh. 8-23: Lecturer's refringement explanation and treatment report]*;
- Lecturers must assign systematic homework and assignments to students to make sure that students will have 3 hours at home studying/practicing the knowledge they have achieved in one hour in class. *[Exh. 8-24: Detailed curricula of some courses]*;
- Prepare supporting services for academic affairs and psychology *[Exh. 8-25: Statute for consultation to students ; Exh. 8-26: Decision on consultant selection]*.

During the training implementation process, basing on students and lecturers' feedback the university, FME and MET department have made ameliorations for the training process. *[Exh. 8-27: Plan for Talks between University/FME managers and students; Exh. 8-28: Summary of students' feedback in Talks between University/FME managers and students; Exh. 8-29: Conclusions and new tasks from University president; Exh. 8-30: Report of fulfillment results of assigned tasks from University president]*.

CRITERION 9: STUDENT ADVICE AND SUPPORT

TheMET students are studying in a good educational environment supported by an adequate student progress monitoring system, a helpful consulting system and assistance from FME and university functional offices.

9.1. There is an adequate student progress monitoring system

The monitoring system has been developed for every student batch with class monitoring board (monitor, vice monitor, youth union leader, etc) in order to reflect at the earliest and the most effectiveness the progress of every single class member. Should any troubles occur, the monitoring board may ask for suggestions from the consultants, lecturers, department managers or faculty managers. The consultants are required to have frequent appointments with students under their supervision [*Exh. 9-01: Report of consulting work of consultants*]. Besides, every lecturer has to register to be available on at least one day per week at the MET department office to meet students, answer their questions and timely help solve students' learning problems together with his/her teaching assistant [*Exh. 9-02: Time schedule for lecturers' availability at the department office; Exh. 9-03: Working plan of teaching assistants*].

In addition, since 2012 HCMUTE has been building a monitoring system of students' learning process through network [<http://online.hcmute.edu.vn>]. As soon as students enroll, the university grants each student an account to log into the system. The system's database includes the profile of the students; the notices from the university, FME and MET department; semester schedules; scores of subjects (including the formative and summative assessment), chart assessing learning outcomes throughout the course etc. This is a very useful monitoring system to help OAA, Faculty and lecturers to monitor the students' learning progress and they can take measures to help students promptly if necessary.

The system also helps monitor student's moral conduct, extracurricular activities. Students also receive support from groups and centers of the university, such as Student Association, Youth Union, Student Affairs Office, Student Service Center, etc. For example, Student Affairs Office is authorized to offer reward, punishment, scholarships and special policies to students. The office has to investigate carefully students' learning process by means of their database and propose relevant encouraging, supporting or preventing policies [*Exh. 9-04: Working reports of Student Affairs Office and Student Service Center*].

9.2. Students get adequate academic advice, support and feedback on their performance

At the very first year of the program, students may get to know about the training program; department, faculty and university statute that they will take for undergraduate program through Student's handbook. Additionally, the consultant team helps explain timely any problems related to learning subjects and fields such as helping students set up learning plans for the whole program, choose appropriate courses for each semester, use available facilities etc [*Exh. 9-05: Student's handbook; Exh. 9-06: Statute for consultants*].

Students also receive help from TAs in solving homework, laboratory, or discussion sessions to enable them to catch up with the course's content learned [*Exh. 9-07: Statute for TAs*].

With the foundation of Digital Learning Center since 2014, the university offers E/M learning, a better condition for students' study. They can access to online lectures available on <http://lms.hcmute.edu.vn/> to study anywhere and anytime [*Exh. 9-08: List of online courses; Exh. 9-09: Online course video*]. Self-learning spaces being gradually and orderly formed at different faculties do contribute to the convenience of students in learning and knowledge exchanging. [*Exh. 9-10: Images of activities at self-learning spaces*].

Starting from sophomore level, students may join in scientific technology and engineering clubs, such as Youth Scientist Club, Open Lab, Ames led by FME teachers. At these clubs, students have a chance to do peer-learning from their club-mates, senior students and take part in research projects of the teacher. This is believed to be very useful for their current study and future work [*Exh. 9-11: Images of students working at Clubs/Labs*]. FME also does organize meetings, seminars, conferences on scientific topics or alumni meetings. These are excellent opportunities for undergraduates to realize their current status so that they may develop themselves a long term study plan to meet with the real working requirements [*Exh. 9-12: Plans and images of scientific seminars/conferences*].

To stimulate students in learning and training, the university offers scholarships or financial supports to excellent students or poor students [*Exh. 9-13: List of scholarship holders, Scholarship Policy*]. Also, the university reserves a part of the total budget for scientific research stimulation for students. Those who would like to do research may firstly look for a supervisor from FME or its departments and then propose their budget plans for consideration [*Exh. 9-14: List of student research projects*].

9.3. Mentoring for students is adequate

The MET students receive full support from the university, offices, FME and MET department managing board and teachers, consultants, etc. The consultants are acting a key role since students rely on their suggestions from the first years of their study [*Exh. 9-15: Statute for consultants*].

Every semester, students have chances to express their opinions to FME managing board or even to University Presidential board. They can present their difficulties or dilemmas in their study process and thus the managers may reconsider the general policy [*Exh. 9-16: Report of Talks between University/FME managers and students*].

Youth Union and Student Association are also responsible for consulting and orienting students' learning activities and social activities. Students gain advantages, e.g. soft-skills, personal skills, when joining in the union and association as members [*Exh. 9-17: List of activities of Youth Union and Student Association*].

9.4. The physical, social and psychological environment for the student is satisfactory

The university has a complete and firm infrastructure which serves well students' living and study. HCMUTE has 2 dormitories accommodating almost 2,400 students with average standard of 4-6 m²/student. Inside each dormitory have study rooms, sport facilities and canteens [<http://ktx.hcmute.edu.vn/>]. Free Wifi internet is available in the dormitories.

Art performances and sports activities are frequently organized, especially on vacations or holidays. These are the entertaining, enjoying and relaxing moments for students to release their study pressure [*Exh. 9-18: List and images of student art performances and sports activities*]. Also, academic and scientific contests (e.g. Olympic for freshmen, Dancing Robot, Robocon, etc.) are other meaningful aspects in their student life [*Exh. 9-19: List and images of Robocon, Robot dancing contest*].

Career orientation activities, job fairs are also usually co-organized by HCMUTE and off-campus partners. Seminars and talks with psychologic experts, famous people, and so on help contribute more necessary skills to students [*Exh. 9-20: List and images of soft-skills seminars/talks*].

Health Care Center of the university takes good care of students' physical and mental health status. The center signs a contract with Thu Duc General Hospital to do periodic health tests for students [*Exh. 9-21: Plan for periodic health test for students*]. The center is also responsible for applying Health insurance for students according to currently applied Health Laws [*Exh. 9-22: Plan for student health insurance payment*].

CRITERION 10. FACILITIES AND INFRASTRUCTURE

The students are provided with full facilities and infrastructure for study and research.

10.1. The lecture facilities (lecture halls, small course rooms) are adequate

Up to 183 big size and small size classrooms, 58 laboratories, 98 workshops and 16 computer labs are occupying the total area of 127.884m² and equipped sufficiently with sound and light systems [*Exh. 10-01: List of area and equipment in each classroom, laboratory and workshop*]. The rooms, labs or workshops are scheduled in accordance with the number of students and monitored by a supervisor [*Exh. 10-02: Table of supervisor arrangement for classrooms/labs/workshop with contact information*].

The MET classrooms are the most convenient ones in the university with very modern equipment. Beside the sound, light and ventilation systems, 100% of the rooms are equipped with projectors and cameras to supervise teaching-learning-examining process [*Exh. 10-03: Images of classrooms and seminar rooms*].

At the beginning of each semester, Academic Affairs Office will create a schedule for theoretical classes and arrange suitable classrooms. During teaching process, if a lecturer would like to temporarily use another room, he/she may register for it through online system (<http://online.hcmute.edu.vn>)

The FME has 06 departments including: MET Department, Machinery Building Technology Department, Machinery Design Department, Professional Practical Skills Department, Woodwork Technology Department and Industrial Engineering Department. Thus the office system has 01 Faculty office and 06 Department offices. Being responsible for the Faculty office is the Secretary and consultants who alternatively are available to consult students with FME related issues. Meanwhile, at Department offices there are also regular staff members and students may make appointment with their lecturers for course contents, project reports, project designs, etc [*Exh. 10-04: Department offices of FME*].

The laboratories are supervised directly by related Department [*Exh. 10-05: Inventory of laboratory equipment*]. MET students are encouraged to take part in extracurricular academic activities to further practice with professional knowledge and skills through clubs and laboratories (such as Youth Scientist Club, Open Lab, and Ames). [*Exh. 10-06: List of area and equipment of each laboratory used by scientific clubs*].

In addition to the Library, FME students are provided with self-learning classrooms and open self-learning spaces outside [*Exh. 10-07: Images of self-learning spaces*].

10.2. The library is adequate and up-to date

The Library possesses both electronics and paper materials. Its total area is more than 1,430m² storing tens of thousands of hard-copy books. The number of specialized books serving for MET field students is about 2,000 which are in Vietnamese or English. The Library annually updates new resources for students of the whole university [*Exh. 10-08:*

List of MET reference materials; Exh. 10-09: Annual list of new books added to the library].

Lecturers can recommend new/useful materials relevant to the teaching and research disciplines of the University so that the library can consider to purchase.

To support student self-study, there are quite many study rooms or spaces allowing students to read on site instantly. The lecturer and student can book study carrel or discussion room to study, work or discuss their project. Besides, the library periodically holds many activities such as book fairs, book exchange, seminars, book discussion to support and introduce new materials to the staff and students [*Exh. 10-10: Plans for annual book fairs and seminars to introduce new materials*].

In order to figure out the needs of students, the Library usually conducts surveys on students' satisfaction and types of most frequently borrowed thus supplement the books accordingly. [*Exh. 10-11: Feedback form on Library service quality*]. Students can do remote access to the Library digital database and free esteemed international scientific journals [*Exh. 10-12: Digital Database for journals/publications access*]. The electronic library has 124 e-textbooks [*Exh. 10-13: Set of e-textbooks*] which are very useful for active learning and research work.

Moreover, FME stills establishes its own library, which has MET professional field books and graduated students' dissertations to typically serve for teachers and students of the faculty [*Exh. 10-14: List of FME professional textbooks and students' dissertations*].

10.3. The laboratories are adequate and up-to date

Workshops and laboratories for MET students, including Material Science Lab, CAD/CAM/CNC Lab, Electrical – Electronics Lab, Sensor and Micro processor Lab, Pneumatic and Hydraulic Lab, Process control Lab, PLC Lab, MPS Labs, Servo drive Lab, Automatic Control Lab and Robotics Lab, are also specially treated with modern and sufficient equipment [*Exh. 10-15: List of Laboratories and Workshops for MET students*].

Within the most recent years, FME has been sponsored with many famous companies' equipment, such as 635 million VND worth equipment and simulation software of INTEL Vietnam; 203 million VND worth air compressor of Thang Uy Co.Ltd [*Exh. 10-16: Sponsored equipment handing-over plan and contract*].

Lab directors assigned to take care of the laboratories will have the responsibility to monitor the equipment condition and its uses [*Exh. 10-17: Laboratory diary*]. They are encouraged to attend conferences, exhibition shows to update their knowledge and skills, and also to propose the most suitable equipment replacement to catch up with modern changes.

The university compensates fully consumed materials for practice and experiments every semester [*Exh. 10-18: Plan for experiment material supply; Exh. 10-19: Budget plan for retail equipment*].

10.4. The computer facilities are adequate and up-to date

To satisfy the increasing need of computer usage of faculty members and students, the university has established Information and Computer Center with information technology staffs [*Exh. 10-20: Functions and Responsibilities of Information and Computer Center*]. Currently, there are 16 computer clusters, with appropriate software to support the teaching and learning process such as AutoCAD, Matlab, OrCAD, Visual C, Flexsim, etc [*Exh. 10-21: List of computer clusters and software installed at Information and Computer Center*]. In 2013, HCMUTE invested over 20 billion VND to update information technology system of the university [*Exh. 10-22: Decision on the approval of Project updating HCMUTE network and server systems*]. Especially in March 2015, the University inaugurated a new distance learning (DL) classroom equipped with the latest technology in videoconferencing and collaboration software and hardware [*Exh. 10-23: Decision on establishing Digital learning room; <https://youtu.be/6II8JfaAfo4>*]. This facility will allow UTE to connect with Arizona State University (ASU) and other institutions of higher education around the world to create an interactive channel between faculty and students. These type of global interactions are aimed at increasing the competitiveness of HCMUTE graduates by preparing them with crucial skills needed in today's workforce, such as: team work, problem solving, project planning, presentation skills and English language training. The DL classroom is a US \$300,000 co-investment between UTE and the HEEAP Alliance partners, specifically ASU, Intel and Pearson. The classroom has a capacity for 50 people arranged in 7 workstations, each one equipped with tools that support virtual collaboration [<https://dhs.hcmute.edu.vn>].



Figure 10-1: Online class held at Digital learning room of HCMUTE by University of Sunderland

Computers in laboratories are frequently maintained and updated. The laboratory supervisors and supporters double check every semester to make sure that all computers are ready for use in the successive semester. These staffs are always available on site to solve technical problems (if any) [*Exh. 10-24: Equipment maintenance report; Exh. 10-25: Equipment utilization efficiency report*].

To enhance out-of-class learning activities, free high-speed internet Wifi is also offered at relevant areas such as laboratories, classrooms, university hall, library, etc [*Exh. 10-26: Project for full campus Wifi access and Wifi distribution lay-out*].

10.5. Environmental health and safety standards meet requirements in all aspects

Health and Safety are at the highest priority. Regulation and safety restriction at every laboratory/workshop must be strictly followed [*Exh. 10-27: Laboratory/Workshop Regulation and Safety Restriction*]. Although supervised by supervisors, students must follow well all items of workshop regulation. At the end of each practice shift, all students are required to do cleaning for the whole workshop area. In case of emergency, the student should follow the emergency protocol, report to the lab director and call emergency number [*Exh. 10-28: Emergency protocol and emergency number*].

FME laboratories and workshops are equipped quite sufficiently with standard equipment. Extinguishers are available in 100% of the laboratories and workshops. The fire prevention and extinguishment equipment is frequently tested for maintenance or replacement [*Exh. 10-29: Periodic maintenance schedule of fire prevention and extinguishment equipment*].

The university does emphasize the health and safety of teachers and students. HCMUTE Health Care Center offers free medical services to all faculty members and students. The center has been accredited and approved by Ho Chi Minh City Department of Health. It is equipped with necessary medical equipment and medicines for simple cases or first-aid for serious ones [*Exh. 10-30: Functions and Responsibilities of Health Care Center*]. Besides, the center helps lecturers and students to apply for health insurance which is compulsory to every individual [*Exh. 10-31: Commitment of health insurance registration for 100% lecturers and students*].

The center periodically collaborates with local units to spray pesticide liquid [*Exh. 10-32: Contract and Plan for pesticide liquid spraying*].

Students and lecturers are surveyed for their satisfaction on service quality of the Health Care Center [*Exh. 10-33: Survey form for students and lecturers' satisfaction on service quality of the Health Care Center*].

The campus area is completely smoking prohibited to keep the atmosphere fresh and clean.

The tidy and clean landscape of the university campus is maintained and taken care by a hired professional company [*Exh. 10-34: Cleaning work contract*]. Facility Management

Office supervises the cleaning process and contract fulfilment [*Exh. 10-35: Functions and Responsibilities of Facility Management Office*].

In summary, the infrastructure of HCMUTE in general and FME in specific truly well satisfies the demands of the MET study program. The fully equipped and updated classrooms, laboratories, workshops, libraries, computer rooms and learning spaces effectively support students' learning activities. The fresh and clean university campus is a healthy educational environment for students. Lecturers' and students' health are carefully cared.

CRITERION 11: QUALITY ASSURANCE OF TEACHING AND LEARNING PROCESS

11.1. The curriculum is developed by all teaching staff members

MET Department has been established since 2001. After 14 years of development, MET curriculum has also been gradually modified to suit with the modern trends and demands of the society. The programme has had more than 240 credits originally, then 180 credits, and now it contains of only 150 credits [*Exh. 11-01: MET curricula at different historical periods*], which emphasizes self-learning capability of students and the meaning of skills derived from practice courses [*Exh. 11-02: Detailed syllabi of some courses in 150-credit programme structure*]. The change has been suggested by department lecturers who have directly joined in teaching in the programme, and then approved by the Scientific Committees of FME and HCMUTE to put into application. All department members, with support from FME managers and staff, have contributed significantly into this big step of changing [*Exh. 11-03: Meeting reports of MET Department on revising the MET programme; Exh. 11-04: Meeting reports of the FME Academic and Scientific Committee on revising the MET programme*].

11.2. The curriculum development involves and students

Students do have contributions into the changing of the programme structure. During their study time, students frequently take part in the Talks with FME and HCMUTE representatives to reflect their dilemmas in course contents, study program and others [*Exh. 11-05: Reports of Talks*].

Besides, newly graduated students after having been employed may come back to university to receive their bachelor degrees or join in annual alumni meeting. On such occasions, they are invited to share the newest requirements to be added into course contents and programme structure [*Exh. 11-06: Survey results of newly graduated students; Exh. 11-07: Contributing opinions of alumni in course contents and study program structure*].

For course development, students can give comments/ feedback about the contents, structure of the study programs by direct participation in the committee of course design and development, or via the class meeting with faculty members/study consultants, or via discussion panels. In addition, students are invited to give feedback on course quality, teaching methods, practice guidance, internship, and development of research capacities.

For students in the 1st academic years, the faculty pays attention to the “catch up” with basic knowledge of foundation courses in order to adjust content and teaching methods in a timely manner in accordance with the Bloom Taxonomy so that they can have effective learning methods.

For students from the 2nd year to 4th year, they can provide feedback about blocks of professional knowledge and teaching methods, practice, internship, research orientation, dissertation and others. The Faculty also collects feedback from students via direct

communication between the representatives of the faculty and students each semester [Exh. 11-08: Questionnaire for students, for graduates], [Exh. 11-09: Announcement for meeting between Board of Dean, Board of President with students], [Exh. 11-10: Direction ideas from university leaders].

For graduates, they can provide feedback about quality of the whole study program in different levels of their satisfaction. Their feedback is taken into consideration and analyzed by the university and the faculty to improve the program [Exh. 11-11: Questionnaire for graduates], [Exh. 11-12: Reports of survey results on graduates over the years].

Year by year, these results from feedback of students have been considered to improve the quality of the program, teaching methods, facilities and infrastructures towards achievement of regional and international standards.

11.3. The curriculum development involves the labor market

The curriculum is implemented in CDIO orientation. This is an approach in which teachers may help construct in learners a 4-systematically-linked-step procedure: Conceive (idea forming), Design, Implement and Operate.

In addition to feedback of undergraduates and alumni, opinions from employers, companies are also very valuable for FME faculty members to ameliorate the curriculum in order to provide qualified and skilled engineers to the labor market [Exh. 11-13: Opinions of employers to MET study program]. These feedbacks are used to improve the MET curricula applied in 2012, 2013 and from 2014 onwards [Exh. 11-14: Meeting reports of MET Department on revising MET curricula; Exh. 11-15: Meeting reports of the FME Academic and Scientific Committee on revising the MET programme; Exh. 11-16: MET curricula applied in 2012, 2013 and from 2014 onwards]

11.4. The curriculum is regularly evaluated at reasonable time periods

The MET curriculum has been modified several times in different periods. Since the establishment of the department (2001), the contents has been developed basing on the standard technology programme platform announced by MoET. It has gotten through many times of evaluation and periodical content modification. From a 180-credit frame, it has become a 150-credit frame since 2012 after being reviewed and accepted by the FME academic and scientific committee and improved by the feedback from stakeholders. The revised cycle of the programme is 12 months. The HCMUTE has promulgated the Regulation for revising procedure of study program [Exh. 11-17: Procedures of Reviewing and Revising Curriculum]. Annually, it may be modified by up to 7% to update with new knowledge [Exh. 11-18: MET curricula applied in 2012, 2013 and from 2014 onwards].

11.5. Courses and curriculum are subject to structured student evaluation

Through Quality Assurance Office and the website <http://online.hcmute.edu.vn>, students can easily reflect quality performance of lecturers [Exh. 11-19: Summary of students' feedback

on teaching contents and methodologies of lecturers]. Besides, they can also directly do this in the Talks with HCMUTE and FME managers for the timeliest correction [*Exh. 11-20: Reports of Talks; Exh. 11-21: Conclusions and new tasks to fulfill students' requests from University president*].

Exit survey and alumni survey are conducted annually to collect feedback from graduates.

11.6. Feedback from various stakeholders is used for improvement

At the end of every semester, students are required to evaluate lecturers' performance through the website <http://online.hcmute.edu.vn> [*Exh. 11-22: Survey form for students' evaluation on lecturers' performance*]. Survey results are summarized and processed by Quality Assurance Office and then sent back to FME [*Exh. 11-23: Report of students' evaluation on lecturers' teaching performance*]. The lecturers receiving low satisfaction (less than 72%) will have to explain and propose the solutions to FME managing board to improve their teaching quality. [*Exh. 11-24: Regulation for lecturers' teaching quality improvement*].

Additionally, through meetings with alumni, companies, employers, department and faculty members, FME always asks for their opinions on the current study program and course contents to know if it still works well with students' future work. Any necessary modification will be made with the approval of FME academic and scientific committee every year [*Exh. 11-25: Course contents and study program structure modification basing on stakeholders' feedback*].

11.7. The teaching and learning process, assessment schemes, the assessment methods and the assessment itself are always subject to quality assurance and continuous improvement.

Quality Assurance Office advises the university Presidential board of tasks to ensure the education quality of the university which must follow tightly the MoET regulation; to establish and implement the self-evaluation process for quality assurance with a pre-planned schedule. For example:

- Assigning and implementing needed tasks, collecting and analyzing data to be used for quality self-evaluation and accreditation programmes.

- Together with other related units proposing to the university Presidential board the necessary modification in teaching methods, assessing curricula and constructing outcomes of study programs [*Exh. 11-26: Functions and Responsibilities of Quality Assurance Office*].

In order to ensure the learning and teaching quality, improvement of teaching methodology is very much necessary. Lecturers have to register for online teaching courses and apply hybrid learning [*Exh. 11-27: Lecturers' registration for online teaching*], information and media technology into lectures with Powerpoint slides, videos, etc, and deliver courses in

English or bilingual courses to simultaneously enhance students' English proficiency [*Exh. 11-28: Lecturers' registration for delivering courses in English or biligual courses*]. Young lecturers have to take one probationary year for teaching experience before being allowed to officially deliver lectures for the department [*Exh. 11-29: Regulation for Young lecturer probation*].

Assessment methods do contribute to the fairness and output quality of teaching and learning activities. Since 2012, formative assessment results have been increased from 20% or 30% to 50% in all the courses to evaluate more precisely the whole learning process of students and their self-learning activeness. In order to find out the most suitable assessment methods for every course to affect positively on students' learning capability, MET department and FME do assessment experience sharing among lecturers in MET department or FME; take opinions, proposes from colleagues and students on formative and summative assessments to improve the process. FME has held conferences on Investigation & Assessment Amelioration [*Exh. 11-30: Plan for Conference on Investigation & Assessment Amelioration; Exh. 11-31: Images and presented reports in the Conference on Investigation & Assessment Amelioration*]. From that conference time on, FME and all of its departments intend to encourage their lecturers to use open-examination (material usage allowed), which is a method to stimulate students' innovation and avoid students' self-limited review or simple learn-by-heart [*Exh. 11-32: List of courses ameliorated in Investigation & Assessment*].

The teaching quality is controlled by FME, Academic Inspectorate Office and OAA [*Exh. 11-33: Functions and Responsibilities of Academic Inspectorate Office*]. FME appointed a vice dean to be responsible for the teaching operation and quality assurance. He or she as well as departments make plans of participating in teachers' classes every semester to recommend their teaching improvement [*Exh. 11-34: Teaching visiting lists, Reports for teaching recommendation*]. Additionally, students' online feedback at the end of each course through <http://online.hcmute.edu.vn> do help these units to make timely improvement for the teaching quality [*Exh. 11-35: Report of changes according to students' online feedback*].

CRITERION 12. STAFF DEVELOPMENT ACTIVITIES

12.1. There is a clear plan on the needs for training and development of both academic and support staff

The HCMUTE has been applying ISO management system for recruitment and staffs development procedures [*Exh. 12-01: ISO procedure for staff recruitment (2012- Human Resource Management Office); Exh. 12-02: ISO procedure for training and developing staffs – 2006*].

The university Presidential board and Deans of faculties are always focusing on the staff development by short-term and long-term fostering trainings. Beside the obligatory professional training courses, the FME also collects the opinion of faculty staffs for additional trainings every year. Base on this demand, the FME sketches out the annual training plan and long-term plan for the development of its staffs [*Exh. 12-03: Registered list for additional trainings*].

To improve staff quality, the university has selected prospective managers for the 05 coming years; and Regulation for yearly professional development [*Exh. 12-04: Midterm plan 2011-2015 with expectation by 2020*]. The fostering trainings include long-term ones (> 2 years) for degree improvement (Master/PhD) [*Exh. 12-05: Nominations for Master/PhD pursuance*] and short-term ones for skill/language development [*Exh. 12-06: Nominations for English development in The Phillipines, Exh. 12-07: Nominations for English development in ITEC programme*]. Moreover, the university always keeps updating the nominated staffs' progression by requiring their annual progression report [*Exh. 12-08: Requests from Personnel Office for progression report*].

Plans for fostering and developing staffs has been set up in many ways and through many activities including looking for courses which help to achieve international standards. Each department develops its own plan for fostering learning or researching capabilities of department members basing on internal discussion [*Exh. 12.09: Plan for fostering learning or researching capabilities of department members*]. Learning activities of the members are recorded and considered for their performance (by Key performance indexes – KPIs), compliments, transfers or new responsibility arrangements [*Exh. 12-10: Compliments and awards for staffs' performance*]. This helps create an active and competitive working environment which leads to the increment of Full professor/Associate Professor number and the rate of PhD holders in the university faculty by yearly recruitment or training courses. [*Exh. 12-11: Plan for staff recruitment; Exh. 12-12: Training activities for staff development*].

To stimulate research development, the university encourages all lecturers to do research sponsored by the university, MoET and the government [*Exh. 12-13: Regulation for doing research; Exh. 12-14: List of research projects every year*]. Also, the university has a special policy to honor valuable national and international research publications [*Exh. 12-*

15: Policy for valuable national and international research projects/publications; Exh. 12-16: List of staffs' awarded research projects].

To improve foreign language proficiency of faculty members, the university also has plans for nominating staffs to join in language improvement projects [*Exh. 12-17: National foreign language project 2020; Exh. 12-06: Nomination for English development in The Phillipines; Exh. 12-18: Nomination for English development in ACET*]. Besides, the university regularly organizes English proficiency tests for faculty members to separate them into different levels for suitable fostering programmes [*Exh. 12-19: Requests for English proficiency test participation; Exh. 12-20: IELTS, TOIEC and TOEFL score announcement*]. Furthermore, HCMUTE also has a special policy to honor staffs exceeding their required English levels [*Exh. 12-21: Policy for staffs achieving/exceeding the required English levels*].

Pedagogical skills training courses are also frequently offered for Higher education didactic pedagogy, Higher education instruction technology, Learner activating teaching method [*Exh. 12-22: Announcement for Pedagogy Certificate course enrolment; Exh. 12-23: Announcement for Pedagogy improvement course enrolment; Exh. 12-24: List of Pedagogy improvement course attendants*].

Beside the strategic development plans for academic staffs, the HCMUTE usually holds training courses for supporting staffs to improve their document management skills, holding event, etc. [*Exh. 12-25: Training courses for supporting staffs from the Human Resource Management Office*]

12.2. The training and development activities for both academic and support staff are adequate to the identified needs

Many methods to train and develop faculty members have been applied, which are:

1. Recruit new qualified members and train them to obtain the expected requirements

To support faculty members with their new duties, a one-year probation programme is applied to them within the very first year [*Exh. 12-26: Regulation for probation faculty members*]. The new members will be supervised and supported by experienced senior members [*Exh. 12-27: List of probation members and supervisors*]. During the probation, the new members may take part in and observe the supervisors in-class teaching, exchange experience and teaching materials with other colleagues.

2. Further train and develop professional knowledge and skills, foreign language proficiency and pedagogical skills of available permanent faculty members

The permanent members are assigned to participate in short-term courses every year to update their professional knowledge, foreign language and teaching methods. The university regularly organizes English proficiency tests for faculty members to classify them into different levels for suitable and free fostering courses. Although the faculty members satisfy

well the national standards, HCMUTE still frequently updating newest teaching methodologies through international scientific conferences with foreign experts or courses organized by HCMUTE Technical Education Institute. *[Exh. 12-28: Conference on Finland education; Exh. 12-29: List of participants in Conference on Finland education; Exh. 12-30: E/M Learning training course for faculty members]*.

3. Organize scientific conferences/seminars

Scientific conferences/seminars are considered as a very important channel for faculty members to improve and update their knowledge. They are placed in the annual strategic plan of FME and the university. At the university level, seminars on management improvement are conducted for supporting staffs *[Exh. 12-31: Announcement for management improvement seminar for supporting staffs, and list of attendants; Exh. 12-32: Announcement for E-Office instruction seminar for supporting staffs, and list of attendants]*. At FME are internal conferences to enhance experience sharing among members *[Exh. 12-33: Plans and images of FME conferences]*.

In addition to the internal conferences, the university also organizes international conferences in-country or sends staffs to those abroad *[Exh. 12-34: Nomination for staff member to attend in abroad international conferences]* with supporting fees *[Exh. 12-35: Regulation for supporting fees for staff members attending in abroad international conferences]*.

4. Pursue post-graduate education

Young lecturers are encouraged to apply for PhD scholarships to study abroad basing on special treatments *[Exh. 12-36: Regulation for PhD degree submission and list of successful staffs]*. For the staffs that are doing PhD programme at HCMUTE, their teaching load is exempt and their tuition fees are waived. *[Exh. 12-37: Regulation for tuition fee waived and teaching load exemption for PHD pursuing faculty members]*.

The efficiency of all staff development efforts is shown through the increasing number of PhD holders and research projects every year *[Exh. 12-38: International publications of FME faculty members]*.

To investigate the effectiveness of the training and development activities for staffs on both quantity and quality, the QAO conducts the annual survey for the satisfaction of the need fulfillment from the academic and support staffs. Results show high satisfactory level *[Exh. 12-39: Satisfaction feedback form for the training and development activities for staffs; Exh. 12-40: Satisfaction feedback summary for the training and development activities for staffs]*.

CRITERION 13. STAKEHOLDERS FEEDBACK

Stakeholders' feedback including that from lecturers, undergraduates, newly graduated students, alumni, employers, industrial consultants is very meaningful for the university and FME to modify and improve the study program the most correctly and properly.

13.1. There is adequate structured feedback from the labor market

Public Relations Office conducts a survey for industry's feedback on students' quality biennially meanwhile FME does annually [Exh. 13-01: Procedure for Customers' satisfaction on study program]. The survey form is sent directly by post to employers, including private, foreign and governmental companies for evaluating the capacity of graduated students in applications and fulfillment of requirement of industry [Exh. 13-02: Survey form on students' job handling capability]. The responded forms are then collected and summarized by Public Relations Office [Exh. 13-03: Industry survey results on students' job handling capability]. Next, the summarized results are sent to FME, basing on which the faculty propose a plan to review and modify the study program contents according to real demands from industry (Table 13-1) [Exh. 13-04: Announcement on study program contents review and modification; Exh. 13-05: Meeting report of study program contents modification].

Table 13-1: Feedback from companies

Survey time (year)	Number of companies	Total feedbacks	
		Feedbacks	Ratio
2010	16	16	100%
2011	25	20	80%
2012	26	22	84,6%
2013	40	35	87.5%
2014	58	48	82.7%
2015	57	46	80.7%

13.2. There is adequate structured feedback from the students and alumni

1. From alumni

The university and FME have established Alumni associations at university and faculty levels. [Exh. 13-06: Decision on consolidating alumni liaison committee]. The FME alumni association is usually updating personal information of alumni of different generations and holds a annual meeting in every November. [Exh. 13-07: Alumni Meeting Invitation Letter;

Exh. 13-08: Images of FME Alumni Meeting]. Through the meetings, FME conducts questionnaire survey for alumni's feedback [*Exh. 13-09: FME alumni survey form*]. Survey data are then summarized and reported to the Faculty managing board [*Exh. 13-10: Alumni survey results*]. According to the reports of FME Alumni Association, most of alumni are satisfied with the current training programme contents.

Table 13-2: Quantity and timeline of MET graduates employed in Nov 2014

Job Status	No. of response (95 samples)	%	Accumulation (%)
Having a job right after graduation	34	35.8	35.8
Having a job 3 months after graduation	31	32.6	68.4
Pursuit of another degree	5	5.3	73.7
Having a job 6 months after graduation	25	26.3	100

Table 13-3: Quantity and timeline of MET graduates employed in Nov 2015

Job Status	No. of response (127 Samples)	%	Accumulation (%)
Having a job right after graduation	37	29.1	29.1
Having a job 3 months after graduation	51	40.2	69.3
Pursuit of another degree	8	6.2	75.5
Having a job 6 months after graduation	31	24.5	100

2. From newly graduated students

FME and Quality Assurance Office periodically investigate newly graduated students by the graduation time. Survey can be done in 2 ways: Survey form direct distribution or online survey [<http://danhgia.hcmute.edu.vn>].

After receiving the report from Quality Assurance Office, FME works out problems with lecturers who have low evaluation results (less than 72 points). The lecturers are requested to explain and propose suitable solutions to improve teaching quality of FME in general [*Exh. 13-11: Lecturer explanation report*]. At the same time, FME also organizes Faculty general meeting to consider case by case and figure out the necessary solutions. The

meeting report is sent back to Quality Assurance Office *[Exh. 13-12: Report of teaching quality of lecturers from students' evaluation results]*.

Besides, at the end of every month, FME and the university hold monthly Talks among Presidential board, Faculty managing board and students. During the Talks, students may express their wonderings, requests as well as contributing ideas for the university or faculty. *[Exh. 13-13: Summary of students' requests]*. Accordingly, FME and the university propose suitable solutions to improve teaching, learning quality to serve students' study better *[Exh. 13-14: Conclusions and new tasks to fulfill students' requests from University president]*.

13.3. There is adequate structured feedback from the staff

The university and FME frequently collect feedback from faculty members and staff.

For the whole university staffs, HCMUTE annually conducts the University General Meeting in which any staffs can give their comments on working condition, learning environment and study programs; ideas for improving study program, teaching activities and other activities on the university campus *[Exh. 13-15: Report of University General Meeting]*. In addition, the university has organized Summer Conference for heads of offices and departments every year to summary the previous year's activities, collect feedbacks from the staff and decide on key tasks for the next year *[Exh. 13-16: Report of Summer Conference]*.

At FME level, the faculty also conducts annual General Summary Meeting at the end of every school year. Faculty staffs are stimulated to propose ideas or solutions of improvement for environment and teaching quality *[Exh. 13-17: FME general summary meeting report]*.

Furthermore, the university and FME also do survey on staffs' feedback on service quality of functional offices *[Exh. 13-18: Survey form for staffs' feedback on service quality of functional offices; Exh. 13-19: Survey results of staffs' feedback on service quality of functional offices]*. The results act as the basis of further improvement of service quality and education support.

CRITERION 14. OUTPUT

The output is the final achievement of the training process. Therefore, the consideration on the rate of successful and dismissed undergraduates, training duration, job placement and ability of doing research are important measurands for the university and FME to accurately evaluate the current study program curricula and timely conduct necessary modifications.

Results have shown that the rate of on-time and successfully graduated students is stable and the average programme duration from starting to finishing is proper. In addition, the rate of job placement of MET students is always high. This fact reveals that the study program fits well with the on-site working requirements. Within the recent years, many significant research projects and papers of FME teachers and students have been published on journals and conference proceedings. These are great evidence for the strongly developing research capability of FME.

14.1. The pass rate is satisfactory and dropout rate is of acceptable level

HCMUTE has been applying Statute No. 43/2007 and university statute to consider the rate of successful and dismissed students. To complete the programme, students must pass and accumulate at least 150 credits with final grades greater or equal to 2 (in the 4-point scale) or 5 (in the 10-point scale) [Exh. 14-01: Statute No.43]. The university offers an online system <http://online.hcmute.edu.vn> to help students refer rapidly to their examination scores and this is also a tool to monitor the progression in study of each student [Exh. 14-02: Instruction of use for student email accounts and online reference]. In addition, the rates of successful and dismissed students in every course, in every semester and every year, and the rate of graduated students are continuously observed [Exh. 14-03: Annual summary of rates of successful and dismissed students].

The summarized values have shown that within the recent years, the rate of on-time graduated students is stable within 40-50% with an ascending trend. This proves that course distribution in the study program is proper and a medium studying ability student may still complete the undergraduate programme.

Students who do not achieve enough 150 credits yet may be shifted to lower level programme [Exh. 14-04: Statute No.34 Implementation Guide - Chapter 2, Article 16: Rules of student dismissing or transfer to lower training level programmes]. This regulation is also announced in Student's handbook [Exh. 14-05: Student's handbook - Page 23: Rules of student dismissing or transfer to lower training level programmes].

Table 14.1 shows the rates of graduated students and dismissed students within the last 8 years. It can be seen that the rate of graduated students is fair while the rate of dismissed students is acceptable and in descending trend. In order to reduce the dismissed student number, the university has reinforced the consulting system [Exh. 14-06: Regulation for student consulting responsibility], [Exh. 14-07: Announcement for consultant nomination]; email system and online grade checking system... Besides, FME and HCMUTE also

summarize lists of poor progression students [Exh. 14-08: List of warned students] and timely inform the lists to the consultants. This shows the great care of FME and the university to students' progression.

Table 14-1: Rate of graduated students and dropout rate of MET students

Academic year	Cohort size	% first degree after			% drop-out after			
		4 year	4.5 years	> 4.5 years	1 year	2 years*	3 years*	> 3 years*
2015-2016	179	–	–	–	–	–	–	–
2014-2015	205	–	–	–	1.0%	–	–	–
2013-2014	216	–	–	–	2.3%	3.2%	–	–
2012-2013	172	–	–	–	4.1%	7.0%	8.1%	–
2011-2012	154	60.4%	26.0%	–	5.2%	7.8%	9.7%	9.7%
2010-2011	88	56.8%	22.7%	15.9%	2.3%	3.4%	4.5%	4.5%
2009-2010	88	59.1%	19.3%	11.4%	5.7%	6.8%	10.2%	10.2%
2008-2009	92	52.2%	21.7%	9.8%	7.6%	12.0%	16.3%	16.3%
2007-2008	88	54.5%	21.6%	8.0%	9.1%	11.4%	15.9%	15.9%
2006-2007	82	58.5%	18.3%	6.1%	11.0%	13.4%	17.1%	17.1%
2005-2006	78	55.1%	16.7%	12.8%	9.0%	11.5%	15.4%	15.4%
2004-2005	69	50.7%	30.4%	11.6%	4.3%	5.8%	7.2%	7.2%

* Percentage are cumulative

14.2. Average time to graduate is satisfactory

HCMUTE applies a credit-based education system [Exh. 14-09: Regulation for HCMUTE education program]. From 2008 to 2012, MET students have been trained with a 187-credit program structure and an average amount of time to graduate is approximately 4 years and a half. Since 2012, FME and all of its departments have shifted to a 150-credit program structure which only takes totally 4 years [Exh. 14-10: MET program curriculum]. For special cases, students may extend their study duration to maximum 8 years in total. According to reported results, the rate of on-time graduated students is very stable and the average duration is from 4 to 4.5 years [Exh. 14-11: Summary of average study duration]. This duration is suitable with the planned training period shown in students' handbook, plan for MET training program as well as the Statue No.43/2007 on credit-based training program, Education laws 2012 (Article 35: Training duration). [Exh. 14-12: Education laws 2012, Article 35].

To increase the rate of graduated students, the university and FME have done several methods such as: announce in advance expected annual teaching/learning plans [Exh. 14-

13: Annual learning plan]; develop online course registration [Exh. 14-14: Course online registration guide], [Exh. 14-15: Announcement for course online registration and amendment]; organize the extra (3rd) semester (besides the 2 main semesters) in summer vacation [Exh. 14-16: Plan for Summer (3rd) semester] so that students may retry their failed courses in the previous semesters; provide curriculum with more elective courses or relevant courses so that students may flexibly select the courses [Exh. 14-17: List of elective courses], [Exh. 14-18: List of relevant courses]; encouragement and awards for students' excellent performance [Exh. 14-19: Regulation for scholarships for high score students].

14.3. Employability of graduates is satisfactory

Quality Assurance Office has done investigation on occupation status of the MET graduated students after 3 months since their graduation. The survey form has been designed on the basis of the announced programme outputs [Exh. 14-20: Survey form for graduated students]. Survey results show that over 57% of the MET graduated students get their job within 3 months (Table 14-2) [Exh. 14-21: Survey results on occupation status of graduated students] and nearly 100% within 6 months (from the annual feedback of MET alumni).

Table 14-2: Employability rate of MET graduates within 3 months after graduation

No	Year	2011	2012	2013	2014	2015
	Employability rate	%	%	%	%	%
1	Having a job right after graduation	24.3	26.2	26.7	29.5	27.1
2	Having a job within 3 months after graduation	33.1	29.3	24.3	26.4	35.5
3	Pursuit of another degree	4.8	5.4	6.3	5.5	4.5
	Total	62.2	60.9	57.3	61.4	67.1

Since 2015, FME has decided on conducting annual survey for MET graduates. The result from the survey in October 2015 shows that their employability is satisfactory (about 78%), which means the training programme has met requirements of the labor market, and also the need for MET engineers in the market is large [Exh. 14-22: Survey results on occupation status of graduated MET students]. A quite high average salary level of MET students is about 7 million VND per month and the rate of students satisfying with their job is as high as 74%.

Additionally, to facilitate students to find a job as soon as possible after their graduation, HCMUTE and FME have cooperated with Student Affairs Office, Student Service Center and

Public Relations Office to organize Job Fairs frequently [Exh. 14-23: Announcement for Job Fair Day; Exh. 14-24: Organization plan for Job Fair Day; Exh. 14-25: List of industrial participants on Job Fair Day]. These are excellent opportunities for students to meet and discuss with employers, companies to find their own chances for the most suitable jobs.

14.4. The level of research activities by academic staff and students is satisfactory

In the present education, scientific research takes a key role to improve education quality and produce qualified manpower for increasing demands from the labor market. Therefore, the university encourages faculty members to join in research projects in addition to teaching work. The university has created a procedure for research project registration and implementation [Exh. 14-26: Research project implementation procedure]; made the research work a compulsory responsibility of teachers [Exh. 14-27: Regulation for scientific research norm of teachers]; issued special stimulation and awards for teachers who are active in scientific research or have papers published on esteemed international journals [Exh. 14-28: Budget distribution plan for scientific projects], [Exh. 14-29: Regulation for Financial support for scientific papers published on international journals]. Moreover, FME also forms research teams and issues regulation for each team to promote their scientific research [Exh. 14-30: Decision on Featured research teams]. FME in specific and HCMUTE in general also stimulate all students to participate in scientific research by offering supporting policy. Within the last years, the number and quality of FME research projects have been increasing significantly (Table 14-3) [Exh. 14-31: List of research projects of teachers and students], many of students' projects have won high prizes in contests [Exh. 14-32: List of students achieving scientific research awards], many scientific publications of teachers have been published on professional scientific journals or conferences (Table 14-4) [Appendix 7: List of publications published in the period of 2011-2015 by lecturers]. FME is highly ranking in Top paper publication rate in VN 2015 (Table 14-5). It shows that the scientific research in FME has been well developed.

Table 14-3: Number of FME students' and lecturers' scientific research projects (2010-2015)

Level of projects	Number of Research projects						Total
	2010	2011	2012	2013	2014	2015	
University-level lecturers' research projects	10	20	43	50	39	39	201
University-level lecturers' featured research projects	3	4	3	10	12	9	41
University-level Young lecturers' research projects	–	–	–	3	3	3	9
University-level Students' research projects	14	19	40	20	10	25	128

Table 14-4: Number of journal publications of FME lecturers (2011-2015)

Year	International Journals	National Journals	International Conferences	National Conferences
2011	5	3	4	6
2012	5	5	4	12
2013	7	7	6	19
2014	6	8	7	21
2015	11	9	9	34

Table 14-5: Top paper publication rate in VN 2015

Source: Tuoi Tre Online (<http://tuoitre.vn/tin/can-biet/20150925/ket-qua-va-nang-suat-nghien-cuu-khoa-hoc-quoc-te-cua-cac-dai-hoc-viet-nam-dau-2015/974884.html>)

Rank	Institution	Number of PhD. lecturer	Number of ISI paper	Puplication Rate
	FME - HCMUTE	17	7	0.41
1	Duy Tan University	122	52	0.43
2	Ton Duc Thang University	187	73	0.39
3	Hanoi University of Science and Tech.	703	138	0.20
4	Can Tho University	285	57	0.20
5	VN National University - Hanoi City	881	141	0.16
6	Hanoi National University of Education	387	51	0.13
7	VN National University - HCM City	1087	94	0.09

Note: Puplication Rate = Number of ISI paper/ Number of PhD. lecturer

CRITERION 15. STAKEHOLDERS SATISFACTION

15.1. The feedback from stakeholders is satisfactory

1. Feedback from undergraduates

FME undergraduates are provided with full information about training programme and expected learning outcomes of each field through FME website <http://fme.hcmute.edu.vn/>. Furthermore, lecturers also inform detailed curriculum of each subject to them in the very first class hours.

Quality Assurance Office has developed an evaluating system for teaching activities of lecturers in each subject [<http://online.hcmute.edu.vn/>]. Students are claimed to give their feedback by filling in an online survey form with several criteria: Lecture preparation, Lecturing methodologies, Lecture contents, Teaching statute fulfilment and Pedagogical manners. The answers are separated into 5 levels: 1- Strongly disagree, 2- Disagree, 3- Neutral, 4- Agree and 5- Strongly agree. The collected results are treated carefully. The summary report is publicly announced on the university website and sent to FME as well. [*Exh. 15-01: Survey report of FME lecturers' teaching performance*]. From this overall report, report for each individual lecturer is created and sent to the lecturer [*Exh. 15-02: Survey report of FME individual lecturer's teaching performance*].

Table 15-1: Undergraduates' feedback on teaching activities

Year	Criteria	Undergraduates' feedback					
		No. of samples	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
2010	1. Lecture preparation	423	1%	6%	15%	47%	31%
	2. Lecturing methodologies		2%	12%	19%	46%	31%
	3. Lecture contents		1%	9%	15%	45%	30%
	4. Teaching statute fulfilment		1%	7%	7%	40%	45%
	5. Pedagogical manners		1%	3%	10%	46%	40%
2011	1. Lecture preparation	501	3%	5%	12%	45%	35%
	2. Lecturing methodologies		3%	13%	17%	44%	33%
	3. Lecture contents		1%	11%	14%	44%	30%
	4. Teaching statute fulfilment		1%	3%	7%	44%	43%
	5. Pedagogical manners		2%	5%	12%	42%	39%
2012	1. Lecture preparation	611	1%	4%	17%	45%	33%

	2. Lecturing methodologies		3%	10%	20%	47%	30%
	3. Lecture contents		2%	9%	14%	45%	30%
	4. Teaching statute fulfilment		3%	7%	7%	40%	43%
	5. Pedagogical manners		2%	3%	10%	45%	40%
2013	1. Lecture preparation	691	3%	6%	12%	45%	34%
	2. Lecturing methodologies		2%	11%	17%	40%	30%
	3. Lecture contents		3%	10%	16%	41%	30%
	4. Teaching statute fulfilment		1%	8%	9%	42%	40%
	5. Pedagogical manners		2%	5%	11%	46%	36%
2014	1. Lecture preparation	805	2%	7%	12%	48%	31%
	2. Lecturing methodologies		2%	12%	19%	36%	31%
	3. Lecture contents		4%	9%	15%	40%	32%
	4. Teaching statute fulfilment		1%	3%	7%	44%	45%
	5. Pedagogical manners		1%	3%	6%	46%	45%

From Table 15-1, it shows that 75% of students are satisfied and very satisfied with the teaching activities, especially 85% of them are happy with the Teaching statute fulfilment and Pedagogical manners of lecturers. For teachers who are evaluated at lower than GOOD levels (lower than 72 points) by students, FME share a statement to each teacher to ask for an immediate improvement. FME then reports to Quality Assurance Office *[Exh. 15-03: Report of students' evaluation on lecturers from FME]*. Moreover, the university and FME frequently foster lecturers with teaching methodologies and professional knowledge. *[Exh. 15-04: Professional and Pedagogical Skills Fostering Plan]*.

2. Feedback from newly graduated students

Quality Assurance Office researches newly graduated students after every graduation ceremony. The feedback contents include: occupation status, training programme, outcomes and management and services of the university and FME with 5 different satisfaction levels: 1- Strongly disagree, 2- Disagree, 3- Neutral, 4- Agree and 5- Strongly agree. *[Exh. 15-05: Survey form for newly graduated students]*.

Research results have shown that 65% of FME newly graduated students may find a job within the first 3 months *[Exh. 15-06: Survey results of newly graduated students]*. This rate increases significantly within 1 year after graduation. Most of them (74%) have found jobs related to their professional knowledge. However, up to 26% of them are working out of their studied field. This is explained by the students that they are anxious to find whatever kind of jobs to cover their living expenses, or they would like to challenge themselves with

other work fields to gain experience, or simply because the job they obtained offers high salary with which they can afford their further education. Therefore, up to 86.3% of the newly graduated students say they are satisfied with their current jobs.

Table 15-2 shows that more than 70% of agree or strongly agree that the current training programme truly equips students with necessary professional knowledge and skills to work, and basing on this foundation, they may promote further their studied knowledge and adapt well with the labor market.

Table 15-2: Feedback from newly graduated alumni

Year	Criteria	Newly graduated alumni's feedback (%)				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
2010	1. Students satisfy with learning outcomes	3%	3%	14%	62%	18%
	2. The training programme is properly distributed	2%	12%	23%	52%	11%
	3. Curricula contents fit well with real work requirements	2%	6%	20%	58%	14%
	4. Practice and experiment contents fit well with skills required by the labor market	3%	9%	25%	52%	11%
	5. Overall satisfaction on the whole training programme	2%	4%	19%	60%	13%
2011	1. Students satisfy with learning outcomes	4%	5%	17%	54%	20%
	2. The training programme is properly distributed	3%	9%	25%	50%	13%
	3. Curricula contents fit well with real work requirements	4%	9%	21%	48%	18%
	4. Practice and experiment contents fit well with skills required by the labor market	5%	11%	24%	42%	18%
	5. Overall satisfaction on the whole training programme	3%	6%	16%	57%	18%
2012	1. Students satisfy with learning outcomes	3%	6%	14%	52%	25%

	2. The training programme is properly distributed	4%	10%	21%	48%	17%
	3. Curricula contents fit well with real work requirements	2%	7%	23%	48%	20%
	4. Practice and experiment contents fit well with skills required by the labor market	6%	9%	24%	40%	21%
	5. Overall satisfaction on the whole training programme	6%	8%	19%	48%	19%
2013	1. Students satisfy with learning outcomes	2%	5%	16%	52%	15%
	2. The training programme is properly distributed	3%	11%	21%	42%	23%
	3. Curricula contents fit well with real work requirements	4%	6%	19%	48%	13%
	4. Practice and experiment contents fit well with skills required by the labor market	4%	9%	22%	42%	23%
	5. Overall satisfaction on the whole training programme	2%	7%	17%	57%	17%
2014	1. Students satisfy with learning outcomes	3%	10%	16%	52%	18%
	2. The training programme is properly distributed	2%	12%	22%	42%	22%
	3. Curricula contents fit well with real work requirements	4%	7%	18%	48%	23%
	4. Practice and experiment contents fit well with skills required by the labor market	3%	11%	21%	42%	23%
	5. Overall satisfaction on the whole training programme	4%	8%	18%	47%	23%

Since September 2014, the university has established Public Relations Office in order to assist students in job hunting, soft-skill development and site visit at companies/factories *[Exh. 15-07: Strategic Plan Implementation Report of Public Relations Office]*.

3. Feedback from alumni and industry

Feedback from alumni and employers is extremely important since the graduated students' quality reveals the quality of the training programme. Survey data have been collected directly on Job fair days or through replied survey forms.

The university and FME yearly do investigate satisfaction level of employers on HCMUTE students' quality [*Exh. 15-08: Survey data on employers' satisfaction level on HCMUTE students' job handling capability*]. According to the survey results, most of FME graduated students are working in technical sections of companies. In the 48 companies' feedback, 60% of their employed graduated students are highly evaluated in professional knowledge, job approaching, managing and problem solving capability. The employers suggest that students' foreign language proficiency and soft-skills be improved. Basing on the feedback summary, Public Relations Office and FME have cooperated with companies to open short courses on soft-skills to prepare and match better with employers' requirements [*Exh. 15-09: List and images of soft-skills seminars/talks*]. In addition, FME as well as Faculty of Foreign Language and Faculty of Economics have organized “English Speaking Club for students” and keep operation weekly to improve their foreign language capability [*Exh. 15-10: Plan for English Speaking Club; Exh. 15-11: Images of Activities of English Speaking Club*].

Table 15-3: Feedback from industry

Year	Criteria	Feedback from industry				
		No. of samples	Weak	Fair	Good	Excellent
2010	1. Professional knowledge	16	5%	10%	43%	42%
	2. Practical skills		13%	17%	40%	30%
	3. Discipline awareness		2%	4%	55%	39%
	4. Communication skills		12%	26%	42%	20%
	5. Foreign language capability		14%	21%	43%	22%
2011	1. Professional knowledge	20	5%	11%	44%	40%
	2. Practical skills		10%	15%	41%	34%
	3. Discipline awareness		4%	5%	55%	36%
	4. Communication skills		10%	25%	42%	23%
	5. Foreign language capability		12%	20%	43%	25%

2012	1. Professional knowledge	22	5%	11%	53%	31%
	2. Practical skills		13%	20%	40%	27%
	3. Discipline awareness		3%	7%	55%	35%
	4. Communication skills		10%	22%	39%	29%
	5. Foreign language capability		10%	23%	41%	26%
2013	1. Professional knowledge	35	5%	9%	44%	42%
	2. Practical skills		9%	16%	47%	28%
	3. Discipline awareness		5%	9%	49%	37%
	4. Communication skills		10%	25%	42%	23%
	5. Foreign language capability		9%	21%	39%	31%
2014	1. Professional knowledge	48	4%	10%	43%	43%
	2. Practical skills		7%	14%	49%	30%
	3. Discipline awareness		4%	11%	50%	35%
	4. Communication skills		10%	24%	40%	26%
	5. Foreign language capability		10%	19%	43%	28%

PART 3: ANALYSIS OF STRENGTHS AND AREAS AND PLANS FOR IMPROVEMENT

1. Criterion 1: Expected learning outcomes

Strengths

- The objectives and ELOs of MET programme are fully presented and clearly reflects all stakeholders' requirements.
- The ELOs are publicly disseminated to all relevant stakeholders via the FME website. Developing and assessing ELOs involve collaborative and transparent discussions with multiple stakeholders.
- The ELOs are translated into the programme, delivered to learners through active teaching/learning environment and scientific research activities, and promote life-long learning.
- The ELOs cover all three aspects: general and professional knowledge, professional and soft skills and attitude.
- The ELOs has been continuously assessing and developing, resulting in the positive support and agreement from the stakeholders, with high rates of satisfaction in the annual surveys.
- The ELOs has been continuously assessing and developing, resulting in the positive support and agreement from the stakeholders, with high rates of satisfaction in the annual surveys.

Areas and plans for improvement

- Size of the past ELOs surveys was not very large due to the significant time and effort required to collect the data as well as the strong dependence on the stakeholders' enthusiasm. Thus, from 2015 a sophisticated web survey system, which is easy-to-take and time saving, has being used to collect the feedback from stakeholders about the ELOs, curriculum and other activities related to the programme.

2. Criterion 2: Programme specification

Strengths

- The programme specification clearly shows the ELOs and provides descriptive information how these can be achieved.
- The programme specification is transparently available to the stakeholders. The programme specification is publicized on FME website, Student Handbook, printed hard copy and printed posters hung on the academic bulletin board. Changes in the

programme are quickly updated on website and posted on the board for announcement to relevant stakeholders.

Areas and plans for improvement

- It may take longer time to update the English version of the FME website due to the translation process. This could be improved with a full-time translation team in future.

1.3. Criterion 3: Programme structure and content

Strength

- The programme is up-to-date and meets the requirements of the stakeholders.
- The programme reflects the vision and mission of the university and FME.
- The programme structure is designed in such a way that contents of different courses support each other. The curriculum has a good T-shape (both depth and breadth) which helps students to adapt easily with the real working environment.
- The process of assessing and updating the programme is appropriate and well-monitored.

Areas and plans for improvement

- FME will add some elective courses such as General management, Public relation, and so on into the curriculum that help students learn and attain more soft-skills.
- Investigate on course integration to reduce the total credit number following the international trend.

4. Criterion 4: Teaching and learning strategy

Strength

- The MET's programme strategies for teaching and learning help students understand and apply successfully the provided knowledge into practice.
- Approaches such as active learning, project-based learning are well employed by lecturers to stimulate students' activeness in learning. Students are motivated to apply theory into practice and research to solidify and deepen their understanding.
- The effectiveness of FME teaching and learning strategy has been validated by remarkable student achievements in both national and international competitions.

Areas and plans for improvement

- To further improve the educational quality, FME has proposed a plan to reinforce online teaching plan, bilingual teaching and in-full-English teaching for the whole FME. However, this may take time to implement due to the limited English language competence of students.

5. Criterion 5: Student assessment

Strength

- The HCMUTE national entrance examination pass grade is high compared to other university, assuring excellent student intake.
- The student assessment system has a clear system of criteria. Lecturers use many different assessment tools/strategies to evaluate the whole learning process of students in each course, to show the progression on students' knowledge, skills and capabilities.

Areas and plans for improvement

- More assessment methods should be reviewed and designed to evaluate not only student technical skills but also their soft skills since the employers are paying more and more attention on soft skills nowadays.

6. Criterion 6: Academic staff quality

Strength

- There are enough qualified lecturers in HCMUTE and FME to conduct the curriculum.
- There is a harmony between young lecturers and experienced lecturers. The young lecturers are passionate and enthusiastic, while the elders are more experienced and willing to share their knowledge, helping the young lecturers improve quickly.
- Most of the PhD graduated abroad from developed countries such as France, Singapore, Korea, Taiwan, etc. Thus, they are equipped with knowledge of advanced technologies as well as modern teaching techniques. This is beneficial to the educational quality.
- Lecturers can continuously improve their professional skills thanks to many encouraging policies established by the university and the faculty.

Areas and plans for improvement:

- Since faculty members have to concurrently take many responsibilities and their quality is not so even, it truly affects the teaching work of the members and the learning process of students. To address this problem, FME is recruiting more talented academic staff. According to the Development strategy, by 2018, 40% of the faculty members will be PhD holders.

7. Criterion 7: Support staff quality

Strength

- Supporting staff are well-qualified and chosen thoroughly. They are efficient and willing to help students in both academic and administration activities.

- The performance of supporting staff are periodically evaluated by student. Based on these feedback, necessary actions will be implemented to improve the quality of supporting services.

Areas and plans for improvement

- Along with the development of the university, the standard of supporting services may need to be improved. Thus, the university has planned to expand number of supporting staff.

8. Criterion 8: Student quality

Strengths

- Many strategy has been employing by the university to attract excellent students and ensure student input quality, such as using brochures and leaflets to provide information about the university, the programme; Organizing Student Recruitment Consulting Days; online consulting; On-air consulting. As a result, the number of candidate has been increased year by year.
- Only top high school student with high pass grade in the national entrance exam are admitted to the programme. That provides the FME faculty with student who are smart and have ability to learn the programme successfully.
- The studying load is designed reasonably and is conducted scientifically.

Areas and plans for improvement

- The input English proficiency is not high as expected since most of freshmen come from countryside areas where investment for English is very limited. These students have to spend more efforts to keep up with other students in the programme. To address this issue, the university has offered several methods to improve their English competence such as organize further English courses, create English zone where they can practice English.

9. Criterion 9: Student advice and support

Strength

- The university has monitoring systems to keep track with the progress of students. Beside academic activities, this system also helps monitor student's moral conduct, extracurricular activities.
- MET students receive full support from the university, offices, FME and MET department managing board, teachers and teaching assistants, consultants. Students can express their opinions to FME managing board or even to University Presidential board.

- The university offers scholarships or financial supports to excellent students or poor students. Besides, students also have many chance to obtain the scholarship from big companies such as Mitsubishi, Intel, Bosch thanks to the close relationship between FME with these company.

Areas and plans for improvement

- Some students are less actively seeking for timely support.

10. Criterion 10: Facilities and infrastructure

Strength

- About the infrastructure and facilities, HCMUTE in general and FME in specific are able to provide good support for MET student training with a system of modern classrooms, well-equipped and frequently updated laboratories/workshops, libraries and computer rooms.
- The campus is a wide, fresh and clean area which is a healthy environment for students. Students' health is also carefully protected.

Areas and plans for improvement

- Despite the best efforts made by the university to annually update laboratory/workshop equipment, it is still impossible to gain the most modern systems for the laboratories/workshops due to the rapid development of the technology and outside companies.
- Increase equipment usage efficiency in laboratories/workshops.

11. Criterion 11: Quality assurance of teaching and learning process

Strengths

- Evaluating and developing of curriculum are based on inputs of all relevant stakeholders.
- Annually, the curriculum will be evaluated and revised to meet the new requirements.
- Student feedback of teaching activities and curriculum are conducted every semester by the Quality Assurance Office.

Areas and plans for improvement

- The university, faculty and department will review contents, processes and quality of activities for the continuous improvements.

12. Criterion 12: Staff development activities

Strength

- The university always focuses on the staff development by short-term and long-term fostering trainings. Besides, the FME also collects the opinion of faculty staffs for

additional trainings every year. Based on this demand, the FME sketches out the annual training plan and long-term plan for the development of its staffs.

- Recruitment of staff based on the key criteria of capacity and ethics has resulted in high quality and stable human resources.
- Young lecturers are encouraged to apply for PhD scholarships to study abroad.

Areas and plans for improvement

- In 2016, the university, faculty and department will balance workload of support staff, at same time they are in charge many things, because under quota from MOET it is limited number of support staff.

13. Criterion 13: Stakeholders feedback

Strength

- The university and FME have had a system to collect feedback from multiple stakeholders for continuous improvement of the programme.
- The feedback from stakeholders is frequently collected and carefully analyzed.

Areas and plans for improvements

- FME will continuously reinforce the fruitful and close relationships with companies that expect to recruit MET students or facilitate students' site visit, internship, to shorten students "industry-penetrating" period after their graduation and to have more opportunities for students to gain suitable jobs. With that, it is also easier for FME collect feedback data for curriculum modification purpose.
- Create a multi-channel system to acquire information or feedback from undergraduate students to fulfill their justifiable requests

14. Criterion 14: Output

Strengths

- High employability rate, over 65% of the graduated students get their job within 3 months since their graduation, 74% students satisfy with their job and salary.
- Graduated students' quality is also confirmed by the labor market. The students can adapt rapidly with new working environment and thus employing companies do not need to spend more time and cost to retrain them.
- The scientific research in FME has been well developed. The number of publications is high compare to other national universities.

Areas and plans for improvement

- Currently, MET programme has not been accredited by oversea organization. Therefore, the plan for development of FME is to be recognized by the regional (AUN) and international organizations (ABET)

15. Criterion 15: Stakeholders satisfaction

Strength

- 75% of students are satisfied and very satisfied with the teaching activities, especially 85% of them are happy with the Pedagogical skills of lecturers.
- Feedback from industry show high satisfaction with MET student.

Areas and plans for improvement

- Keep strongly renewing/improving the current curriculum every 2 years basing on the stakeholders' feedback to increase the training quality.

Checklist for AUN Quality Assessment at Programme Level

Criteria	1	2	3	4	5	6	7
1. Expected Learning Outcomes							
1.1 The expected learning outcomes have been clearly formulated and translated into the programme						x	
1.2 The programme promotes life-long learning						x	
1.3 The expected learning outcomes cover generic skills and knowledge as well as specific skills and knowledge						x	
1.4 The expected learning outcomes clearly reflect the requirements of the stakeholders					x		
Overall Opinion	5.75						
2. Programme Specification							
2.1 The university uses programme specification					x		
2.2 The programme specification shows the expected learning outcomes and how these can be achieved					x		
2.3 The programme specification is informative, communicated, and made available to the stakeholders					x		
Overall Opinion	5.00						
3. Programme Structure and Content							
3.1 The programme content shows a good balance between generic and specialized skills and knowledge						x	
3.2 The programme reflects the vision and mission of the university						x	
3.3 The contribution made by each course to achieving the learning outcomes is clear					x		
3.4 The programme is coherent and all subjects and courses have been integrated						x	
3.5 The programme shows breadth and depth					x		
3.6 The programme clearly shows the basic courses, intermediate courses, specialized courses and the final project ,thesis or dissertation						x	
3.7 The programme content is up-to-date					x		
Overall Opinion	5.57						

4. Teaching and Learning Strategy							
4.1 The faculty or department has a clear teaching and learning strategy					X		
4.2 The teaching and learning strategy enables students to acquire and use Knowledge academically					X		
4.3 The teaching And learning strategy is student oriented and stimulates quality learning					X		
4.4 The teaching and learning strategy stimulates active learning and facilitates learning to learn					X		
Overall Opinion	5.00						
5. Student Assessment							
5.1 Student assessment covers student entrance, student progress and exit tests					X		
5.2 The assessment is criterion referenced					X		
5.3 Student assessment uses a variety of methods					X		
5.4 The assessment reflects the expected learning outcomes and the content of the programme				X			
5.5 The criteria for assessment are explicit and well known					X		
5.6 The assessment methods cover the objectives of the curriculum					X		
5.7 The standards applied in the assessment are explicit and consistent				X			
Overall Opinion	4.71						
6. Academic staff quality							
6.1 The staff are competent for their tasks				X			
6.2 The staff are sufficient to deliver the curriculum adequately				X			
6.3 Recruitment and promotion are based on academic merits					X		
6.4 The roles and relationship of staff members are well defined and understood					X		
6.5 Duties allocated are appropriate to qualifications, experience and skills					X		
6.6 Staff workload and incentive systems are designed to support the quality of teaching and learning					X		

6.7 Accountability of the staff members is well regulated					X		
6.8 There are provisions for review, consultation, and redeployment					X		
6.9 Termination and retirement are planned and well implemented					X		
6.10 There is an efficient appraisal system					X		
Overall Opinion	4.80						
7. Support staff quality							
7.1 The library staff are competent and adequate in providing a satisfactory level of service					X		
7.2 The laboratory staff are competent and adequate in providing a satisfactory level of service					X		
7.3 The computer facility staffs are competent and adequate in providing a satisfactory level of service					X		
7.4 The student services staffs are competent and adequate in providing a satisfactory level of service				X			
Overall Opinion	4.75						
8. Student quality							
8.1 There is a clear student intake policy						X	
8.2 The student admission process is adequate						X	
8.3 The actual study load is in line with the prescribed load					X		
Overall Opinion	5.67						
9. Student advice and support							
9.1 There is an adequate student progress monitoring system					X		
9.2 Students get adequate academic advice, support and feedback on their performance					X		
9.3 Mentoring for students is adequate					X		
9.4 The physical, social and Psychological environment for the student is satisfactory					X		
Overall Opinion	5.00						
10. Facilities and infrastructure							
10.1 The lecture facilities (lecture halls, small course rooms) are adequate					X		
10.2 The library is adequate and up-to date					X		

10.3 The laboratories are adequate and up-to date					X		
10.4 The computer facilities are adequate and up-to date					X		
10.5 Environmental health and safety standards meet requirements in all aspects					X		
Overall Opinion	5.00						
11. Quality assurance of teaching and learning process							
11.1 The curriculum is developed by all teaching staff members					X		
11.2 The curriculum development involves students					X		
11.3 The curriculum development involves the labor market					X		
11.4 The curriculum is regularly evaluated at reasonable time periods					X		
11.5 Courses and curriculum are subject to structured student evaluation					X		
11.6 Feedback from various stakeholders is used for improvement					X		
11.7 The teaching and learning process, assessment schemes, the assessment methods and the assessment itself are always subject to quality assurance and continuous improvement					X		
Overall Opinion	5.00						
12. Staff development activities							
12.1 There is a clear plan on the needs for training and development of both academic and support staff					X		
12.2 The training and development activities for both academic and support staff are adequate to the identified needs					X		
Overall Opinion	5.00						
13. Stakeholders feedback							
13.1 There is adequate structured feedback from the labor market					X		
13.2 There is adequate structured feedback from the students and alumni					X		
13.3 There is adequate structured feedback from the staff					X		

Overall Opinion	5.00					
14. Output						
14.1 The pass rate is satisfactory and dropout rate is of acceptable level				x		
14.2 Average time to graduate is satisfactory			x			
14.3 Employability of graduates is satisfactory				x		
14.4 The level of research activities by academic staff and students is satisfactory				x		
Overall Opinion	4.75					
15. Stakeholders satisfaction						
15.1 The feedback from stakeholders is satisfactory				x		
Overall Opinion	5.00					
Overall Verdict	5.07					

Supporting documents and evidences

No	Code	Title of evidences	Category
CRITERION 1. EXPECTED LEARNING OUTCOMES			
1.	Exh. 1-01	<i>Survey report on satisfaction level of stakeholders for Programme Objectives of MET programme in 2011</i>	Document
2.	Exh. 1-02	<i>FME meeting reports on the Working Environment Job Analysis of MET engineers in 2011</i>	Document
3.	Exh. 1-03	<i>List of prominent national and foreign universities and the curriculum comparison with FME</i>	Document
4.	Exh. 1-04	<i>Final report on curriculum benchmarking of Mechatronics programme among some prominent national and foreign universities.</i>	Document
5.	Exh. 1-05	<i>Survey report on satisfaction level of stakeholders for ELOs of MET programme in 2011</i>	Document
6.	Exh. 1-06	<i>Decision of HCMUTE for the promulgation of Mechatronics' ELOs in 2012.</i>	Decision
7.	Exh. 1-07	<i>Survey report on satisfaction level of stakeholders for ELOs of MET programme in 2014, 2015.</i>	Document
8.	Exh. 1-08	<i>Students' Handbook.</i>	Document
9.	Exh. 1-09	<i>MET Programme specification</i>	Document
10.	Exh. 1-10	<i>Samples of courses' portfolios</i>	Sample
11.	Exh. 1-11	<i>MET curricula before 2012 and the 2012 version.</i>	Document
12.	Exh. 1-12	<i>Graduation thesis posters</i>	Document
13.	Exh. 1-13	<i>Local Mechatronics Journal</i>	Sample
14.	Exh. 1-14	<i>Plans and Reports of extracurricular activities to teach ethics and social responsibilities for students</i>	Document
15.	Exh. 1-15	<i>Plans and final reports of Youth Union and Student Association</i>	Document
16.	Exh. 1-16	<i>Meeting minutes between FME and skateholdes</i>	Document
17.	Exh. 1-17	<i>Meeting minutes of FME Academic and Scientific Committee</i>	Document
CRITERION 2. PROGRAMME SPECIFICATION			
18.	Exh. 2-01	<i>HCMUTE Decision on Opening New Programmes 559/ĐHSPKT- ĐT</i>	Decision

19.	Exh. 2-02	<i>HCMUTE Decision on Promulgation of MET Programme</i>	Decision
20.	Exh. 2-03	<i>MET programme specification</i>	Document
21.	Exh. 2-04	<i>List of teaching schedule and assigned lecturers for each semester</i>	Document
22.	Exh. 2-05	<i>Samples of courses' portfolios</i>	Sample
23.	Exh. 2-06	Syllabus of "Introduction to MET"	Sample
24.	Exh. 2-07	<i>Samples of Project on Theory of machine and machine design, Control and Drive Project, Project of Mechatronic systems</i>	Sample
25.	Exh. 2-08	<i>Syllabi of "Practice in Applied Programming with C++"; "Practice of Digital Techniques and Microcontroller"</i>	Sample
26.	Exh. 2-09	<i>Factory internship reports</i>	Document
27.	Exh. 2-10	<i>Students' competitions: Dancing Robot, Contest@Bosch</i>	Picture
28.	Exh. 2-11	<i>Students' competitions: Micom Car Rally (MCR)</i>	Picture
29.	Exh. 2-12	<i>Students' competitions: National Koma-Taisen</i>	Picture
30.	Exh. 2-13	<i>List of assigned teachers for Orientation Seminars for Freshmen.</i>	Document
31.	Exh. 2-14	<i>Syllabus of "Introduction to Mechatronics Engineering"</i>	Document
CRITERION 3. PROGRAMME STRUCTURE AND CONTENT			
32.	Exh.3-01	<i>Employers' recruitment needs of mechanical engineers from 2008 to 2014</i>	Document
33.	Exh.3-02	<i>FME meeting reports on the Working Environment Job Analysis of MET engineers in 2011</i>	Document
34.	Exh.3-03	<i>Mechatronics curricula of prominent national and foreign universities.</i>	Document
35.	Exh.3-04	<i>MET curriculum</i>	Document
36.	Exh.3-05	<i>Vision and Mission of UTE</i>	Document
37.	Exh.3-06	<i>Samples of courses' syllabi</i>	Sample
38.	Exh.3-07	<i>Samples of courses' portfolios</i>	Sample
39.	Exh.3-08	<i>Samples of students' course projects</i>	Sample
40.	Exh.3-09	<i>The MET curricula used in 2001, 2005 and 2008.</i>	Document
41.	Exh.3-10	<i>Procedures of Reviewing and Revising Curriculum</i>	Document

42.	Exh.3-11	<i>Meeting reports of the FME Academic and Scientific Committee on revising the MET programme</i>	Document
CRITERION 4. TEACHING AND LEARNING STRATEGY			
43.	Exh.4-01	<i>Syllabus of "Introduction to MET"</i>	Document
44.	Exh.4-02	<i>Courses' portfolios using computer simulation</i>	Document
45.	Exh.4-03	<i>Online video lectures</i>	Document
46.	Exh.4-04	<i>Laboratories with modern industrial facilities (Robot Lab, Process Control System)</i>	Picture
47.	Exh.4-05	<i>Students' awards in the ABU Robocon Contests</i>	Document
48.	Exh.4-06	<i>Pictures of Meetings with employers and other Organizations</i>	Picture
49.	Exh.4-07	<i>Pictures of some students' competitions: Dancing robot, MCR, SUMO robot</i>	Picture
50.	Exh.4-08	<i>Outstanding products made by students from FME' labs</i>	Picture
51.	Exh.4-09	<i>Awards for students and supervisors from research labs</i>	Document
52.	Exh.4-10	<i>Teaching visit reports of MET department</i>	Document
53.	Exh.4-11	<i>Statistic reports for courses evaluation of students from 2010-2015</i>	Document
CRITERION 5. STUDENT ASSESSMENT			
54.	Exh.5-01	<i>Student Enrollment Project</i>	Document
55.	Exh.5-02	<i>Regulations of AAO on Entrance English placement tests</i>	Decision
56.	Exh.5-03	<i>Samples of students' presentations and reports.</i>	Sample
57.	Exh.5-04	<i>Sample products of students from some course projects</i>	Sample
58.	Exh.5-05	<i>Regulations on graduation requirements</i>	Decision
59.	Exh.5-06	<i>Regulations on Capstone Projects</i>	Decision
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325.	Exh. 14-02	<i>Instruction of use for student email accounts and online reference</i>	Document
326.	Exh. 14-03	<i>Annual summary of rates of successful and dismissed students</i>	Document
327.	Exh. 14-04	<i>Statute No.34 Implementation Guide - Chapter 2, Article 16: Rules of student dismissing or transfer to lower training level programmes</i>	Decision
328.	Exh. 14-05	<i>Student's handbook - Page 23: Rules of student dismissing or transfer to lower training level programmes</i>	Document
329.	Exh.14-06	<i>Regulation for student consulting responsibility</i>	Decision
330.	Exh. 14-07	<i>Announcement for consultant nomination</i>	Document
331.	Exh. 14-08	<i>List of warned students</i>	Document
332.	Exh. 14-09	<i>Regulation for HCMUTE education programme</i>	Decision
333.	Exh. 14-10	<i>MET programme curriculum</i>	Document
334.	Exh.14.11	<i>Summary of average study duration</i>	Document
335.	Exh. 14-12	<i>Education laws 2012, Article 35</i>	Decision
336.	Exh. 14-13	<i>Annual learning plan</i>	Document
337.	Exh. 14-14	<i>Course online registration guide</i>	Document
338.	Exh. 14-15	<i>Announcement for course online registration and amendment</i>	Document
339.	Exh. 14-16	<i>Plan for Summer (3rd) semester</i>	Document

340.	Exh. 14-17	<i>List of elective courses</i>	Document
341.	Exh. 14-18	<i>List of relevant courses</i>	Document
342.	Exh. 14-19	<i>Regulation for scholarships for high score students</i>	Decision
343.	Exh. 14-20	<i>Survey form for graduated students</i>	Sample
344.	Exh. 14-21	<i>Survey results on occupation status of graduated students</i>	Document
345.	Exh. 14-22	<i>Survey results on occupation status of graduated MET students</i>	Document
346.	Exh. 14-23	<i>Announcement for Job Fair Day</i>	Document
347.	Exh. 14-24	<i>Organization plan for Job Fair Day</i>	Document
348.	Exh. 14-25	<i>List of industrial participants on Job Fair Day</i>	Document
349.	Exh. 14-26	<i>Research project implementation procedure</i>	Document
350.	Exh. 14-27	<i>Regulation for scientific research norm of teachers</i>	Decision
351.	Exh. 14-28	<i>Budget distribution plan for scientific projects</i>	Document
352.	Exh. 14-29	<i>Regulation for Financial support for scientific papers published on international journals</i>	Decision
353.	Exh. 14-30	<i>Decision on Featured research teams</i>	Decision
354.	Exh. 14-31	<i>List of research projects of teachers and students</i>	Document
355.	Exh. 14-32	<i>List of students achieving scientific research awards</i>	Document
CRITERION 15. STAKEHOLDERS SATISFACTION			
356.	Exh. 15-01	<i>Survey report of FME lecturers' teaching performance</i>	Document
357.	Exh. 15-02	<i>Survey report of FME individual lecturer's teaching performance</i>	Document
358.	Exh. 15-03	<i>Report of students' evaluation on lecturers from FME</i>	Document
359.	Exh. 15-04	<i>Professional and Pedagogical Skills Fostering Plan</i>	Document
360.	Exh. 15-05	<i>Survey form for newly graduated students</i>	Sample
361.	Exh. 15-06	<i>Survey results of newly graduated students</i>	Document
362.	Exh. 15-07	<i>Strategic Plan Implementation Report of Public Relations Office</i>	Document
363.	Exh. 15-08	<i>Survey data on employers' satisfaction level on HCMUTE students' job handling capability</i>	Document
364.	Exh. 15-09	<i>List and images of soft-skills seminars/talks</i>	Document

			& Picture
365.	Exh. 15-10	<i>Plan for English Speaking Club</i>	Document
366.	Exh. 15-11	<i>Images of Activities of English Speaking Club</i>	Picture

PART 4: APPENDICES

Appendix 1: List of Laboratories and Research Groups

<i>Laboratories and Workshops for learning and practicing</i>			
No	Laboratory / Workshop title	Room	Director
1	CNC Milling Lab	E1-307	Nguyễn Văn Sơn, MSc.
2	CNC Turning Lab	E1-305	Huỳnh Đỗ Song Toàn, MSc.
3	3D Scanning Lab	E1-306	Nguyễn Trọng Hiếu, MSc.
4	Computer Base Training System Lab	E1-303	Nguyễn Văn Sơn, MSc.
5	Smart CMM Machine Lab	E1-304	Trần Minh Thế Uyên, MSc.
6	Rapid Prototype Machine	E1-308	Trần Văn Trọn, MSc.
7	Automation Simulation Lab	Section E	Dr. Vũ Quang Huy
8	Manufacturing Process Automation Lab	Section E	Đình Nhật Huy, MSc.
9	Process Control & Industrial Communication Networks Lab	E1-311	Nguyễn Xuân Quang, MSc.
10	Industrial Robots Lab	02CNC1	Assoc. Prof. Dr. Nguyễn Trường Thịnh
11	Digital Techniques & Microcontroller Lab	02CNC1	Bùi Hà Đức, Dr.
12	Electrical & Electronics Engineering Lab	Section E	Trần Thụy Uyên Phương, MSc.
13	Advanced Control Lab	Section E	Vũ Quang Huy, Dr.
14	Electric Drives Lab	02ĐLCK	Dương Thế Phong, MSc.
15	Pneumatics - Hydraulics Lab	02BTBD	Tương Phước Thọ, MSc.
16	Machine Design Lab	TNVL	Nguyễn Văn Đoàn, MSc.
17	Engineering Materials Lab	02TKM	Nguyễn Văn Thức, MSc.
18	Metal Technology Lab	Section E	Nguyễn Thanh Tân, MSc.
19	Arc Welding Lab	Section E	Nguyễn Văn Hương, BSc.
20	Gas Welding Lab	Section E	Nguyễn Văn Hương, BSc.
21	Electrical Equipments Lab	Section E	Trần Thanh Lam, MSc.
22	Industrial Maintenance Lab	Section E	Trần Thái Sơn, MSc.
23	Mechanical Measuring Lab	Section E	Đặng Minh Phụng, MSc.
24	Plastic Technology Practice	Section E	Trần Minh Thế Uyên, MSc.
25	CAD/CAM-CNC Lab	Section E	Dương Thị Vân Anh, MSc.
26	Electrical Discharge Machining Lab	Section E	Nguyễn Văn Minh, MSc.
27	CNC Lab	Section E	Trần Chí Thiên, MSc.

<i>Distinctive Research Groups</i>			
No	Laboratory title	Room	Group leader
1	Mechanics of Energy and Industrial Equipment	A1-121	Assoc. Prof. Dr. Lê Hiếu Giang
2	Industrial Automation	Section F	Assoc. Prof. Dr. Nguyễn Trường Thịnh
3	Mechanical and Environmental Engineering	Section E	Assoc. Prof. Dr. Đặng Thiện Ngôn
<i>Research Laboratories</i>			
No	Laboratory title	Room	Director
1	Open Lab	Section F	Assoc. Prof. Dr. Nguyễn Trường Thịnh
2	Young Scientist Club	Section F	Lê Tấn Cường, MSc.
3	Applied Mechatronics	Section E	Cái Việt Anh Dũng, Dr.
4	MET Research and Application Lab	Section E	Dương Thế Phong, MSc.
5	Automatic and Intelligent Control Lab	Section E	Vũ Quang Huy, Dr.
6	Creativity, Environment and Service Lab	Section E	Trần Ngọc Đảm, Dr.
7	Power Electronics and New Energy Lab	Section E	Nguyễn Minh Khai, Dr.
8	Laboratory for Designing, Simulating, Manufacturing and Transferring Mechanical Engineering Equipment	Section E	Phạm Huy Tuấn, Dr.

Appendix 2: Matrix of courses vs. expected learning outcomes

Code	Course	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	ELO 14	ELO 15	ELO 16
MATH130101	Advanced Mathematics A1	1	S	N	N	N	N	N	N	N	N	N	N	S	N	N	N	N
MATH130201	Advanced Mathematics A2	1	S	N	N	N	N	N	N	N	N	N	N	S	N	N	N	N
ENGL130137	English 1	1	S	N	N	N	N	N	N	N	S	N	N	S	N	N	N	N
GCHE130103	Fundamental Chemistry A1	1	S	N	N	N	N	N	N	N	N	N	N	S	N	N	N	N
INME130125	Introduction to Engineering Technology	1	N	S	N	N	N	N	H	H	S	S	S	S	S	N	N	N
VBPR131085	Visual Basic Programming	1	N	S	N	N	N	N	N	S	N	N	N	S	N	N	N	N
GELA220405	General Law	1	N	N	N	N	N	N	N	N	N	S	S	N	N	N	N	N
PHYS130102	Fundamental Physics 1	1	S	N	N	N	N	N	N	N	N	N	N	S	N	N	N	N
PHED110513	Physical Education 1	1	N	N	N	N	N	N	S	N	N	N	N	S	N	N	N	N
MATH130301	Advanced Mathematics A3	2	H	N	N	N	N	N	N	N	N	N	N	H	N	N	N	N
MATH130401	Applied Probability & Statistics	2	H	N	N	N	N	N	N	N	N	N	N	H	N	N	N	N
LLCT150105	Theory of Marxism & Leninism	2	N	N	N	N	N	N	N	N	N	S	S	N	N	N	N	N
ENGL230237	English 2	2	S	N	N	N	N	N	N	N	S	N	N	S	N	N	N	N
PHYS120202	Fundamental Physics 2	2	H	N	N	N	N	N	N	N	N	N	N	H	N	N	N	N
MATH131501	Applied Mathematics in Engineering	2	H	N	N	N	N	N	N	N	N	N	N	H	N	N	N	N
MHAP120227	Mechanical Works Practice	2	S	N	N	S	S	S	N	N	N	N	S	N	N	N	N	N
	Social Sciences and Humanities 1 (Elective)	2																

Code	Course	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	ELO 14	ELO 15	ELO 16
PHED110613	Physical Education 2	2	N	N	N	N	N	N	N	S	N	N	N	N	S	N	N	N
LLCT120314	Ho Chi Minh's Ideology	3	N	N	N	N	N	N	N	N	N	N	S	S	N	N	N	N
PHYS110302	Experiment of Physics	3	H	N	N	N	N	N	N	N	N	N	N	S	N	N	N	N
ENGL330337	English 3	3	H	N	N	N	N	N	N	N	N	H	N	N	H	N	N	N
THME230721	Theory of Mechanics	3	N	S	N	N	N	N	N	S	S	S	N	N	N	N	N	N
EEEN230129	Electrical & Electronic engineering	3	N	S	N	N	N	N	N	S	S	S	N	N	N	N	N	N
EDDG230120	Descriptive Geometry & Technical Drawing	3	N	H	N	N	N	N	N	S	S	S	N	N	N	N	N	N
TOMT220225	Measuring Techniques & Tolerances	3	N	H	N	S	N	N	N	S	S	S	N	N	N	N	N	N
EXMM210325	Experiment of Mechanical Measurement	3	N	S	N	S	S	N	N	S	S	S	S	N	N	N	N	N
	Social Sciences and Humanities 2 (Elective)	3																
	Social Sciences and Humanities 3 (Elective)	3																
PHED130715	Physical Education 3 (Elective)	3	N	N	N	N	N	N	N	S	N	N	N	N	S	N	N	N
LLCT230214	Vietnamese Communist Party History	4	N	N	N	N	N	N	N	N	N	N	S	S	N	N	N	N
TMMP230220	Principles & Parts of Machines	4	N	H	N	S	N	N	N	S	S	S	N	N	N	S	S	N
STMA230521	Material Strength	4	N	H	N	S	N	N	N	S	S	S	N	N	N	N	N	N
DTMC240929	Digital Techniques and Micro-Controller	4	N	N	H	S	N	N	N	N	N	N	N	N	N	N	N	N
ENMA220126	Material Science 1	4	N	S	S	S	N	N	N	S	S	S	N	N	N	N	N	N

Code	Course	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	ELO 14	ELO 15	ELO 16
	Fundamental course 1 (elective)	4	N	S	N	N	N	N	N	N	N	N	N	N	N	N	N	
ETDR336429	Electrical drives	4	N	H	H	N	N	N	N	N	N	N	N	N	N	N	N	
EEEE210229	Experiment of Electrical & Electronic engineering	4	N	H	H	N	H	N	N	N	N	N	N	N	N	N	N	
EWEP210426	Electric Welding Practice	4	N	S	N	S	S	N	S	N	N	N	S	N	N	N	N	N
FMMT330825	Fundamentals of Machinery Manufacturing Technology	5	N	H	N	S	S	N	S	S	S	N	N	N	N	N	N	N
MPAU320729	Manufacturing Process Automation	5	N	N	H	N	N	N	N	N	N	N	N	S	S	S	S	
PNHY330529	Pneumatic –Hydraulic Technology	5	N	N	H	N	N	N	N	N	N	N	N	S	S	S	S	
APEN331329	Applied Programming in Engineering	5	N	N	H	N	N	N	N	N	N	N	N	S	S	S	S	
METE210321	Experiment on Mechanics	5	N	S	N	N	S	S	N	N	N	N	N	N	N	N	N	N
MATE211126	Experiment on Material Science	5	N	S	N	N	S	S	S	S	S	N	N	N	N	N	N	N
PMMD310423	Project on Theory of machine and machine design	5	N	H	N	S	N	N	S	S	N	N	N	N	S	S	N	N
PDTM311029	Practice of Digital Techniques and Micro-Controller	5	N	N	N	S	H	H	N	N	N	N	N	N	S	S	S	S
PETD316529	Practice of Electric drives	5	N	N	N	N	H	H	N	N	N	N	N	N	S	S	S	S
PAPE311429	Practice of Applied Programming in Engineering	5	N	N	N	N	H	H	N	N	N	N	N	N	S	S	S	S

Code	Course	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	ELO 14	ELO 15	ELO 16
BAMP220327	Basic Milling Practice	5	N	S	N	N	S	S	S	N	N	N	S	N	N	N	N	N
	Fundamental course 2 (elective)	6	N	S	N	N	N	N	N	N	N	N	N	N	S	S	S	S
AUCO330329	Automatic Control	6	N	H	N	N	N	N	S	S	S	N	N	N	S	S	S	S
INRO321129	Industrial Robots	6	N	N	H	N	N	N	S	S	S	N	N	N	S	S	S	S
EMEE320124	English in Mechanical Engineering	6	N	N	N	N	N	N	N	S	H	N	N	H	N	N	N	N
PCAD315129	Project of Control and Drive	6	N	N	N	N	N	N	N	N	N	N	N	N	S	S	S	S
EPHT310629	Practice of Pneumatic – Hydraulic Technology	6	N	N	N	N	H	H	N	N	N	N	N	N	S	S	S	S
BATP230227	Basic Turning Practice	6	N	S	N	N	S	S	S	N	N	N	S	N	N	N	N	N
PMPA316629	Practice of Manufacturing Process Automation	6	N	N	N	N	S	H	N	N	N	N	N	N	S	S	S	S
PINR411229	Practice of Industrial Robots	7	N	N	N	N	H	H	N	N	N	N	N	N	S	S	S	S
PAUC410429	Practice of Automatic Control	7	N	N	N	N	H	H	N	N	N	N	N	N	S	S	S	S
SERV424029	Servo Driving Systems	7	N	H	S	H	S	S	H	H	S	N	N	N	H	H	H	H
PSER414129	Practice of Servo Driving Systems	7	N	H	H	S	N	N	S	S	S	N	N	N	H	H	H	H
	Major Courses (Mechatronics systems direction) (elective)	7																
INCN421629	Industrial Communication Networks	7	N	N	H	N	N	N	H	H	H	N	N	N	H	H	H	H
EICN411729	Experiment of Industrial Communication Networks	7	N	N	H	N	H	H	N	N	N	N	N	N	H	H	H	H

Code	Course	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	ELO 14	ELO 15	ELO 16
PCTR421929	Process Control	7	N	N	H	N	N	N	H	H	H	N	N	N	H	H	H	H
EPCT412029	Experiment of Process Control	7	N	N	H	N	H	H	N	N	N	N	N	N	H	H	H	H
IIPR422529	Image processing in industry	7	N	N	H	N	N	N	H	H	H	N	N	N	H	H	H	H
EIIP412629	Experiment of Image processing	7	N	N	H	N	H	H	N	N	N	N	N	N	H	H	H	H
CBMC423629	Computer – based Measurement and Control	7	N	N	H	N	N	N	H	H	H	N	N	N	H	H	H	H
ECMC413729	Experiment of Computer – based Measurement and Control	7	N	N	H	N	H	H	N	N	N	N	N	N	H	H	H	H
PRMS415229	Project of Mechatronics systems	7	N	N	H	N	N	N	N	N	N	N	N	H	H	H	H	H
FAIN425429	Factory Internship	8	N	N	H	H	N	N	H	H	H	H	H	H	H	H	H	H
UGRA405529	Undergraduate Thesis	8	N	N	H	H	N	N	H	H	H	H	H	H	H	H	H	H
	Exit Examination	8																
STOG445629	- Graduation seminar 1	8	N	N	H	H	N	N	H	H	H	N	N	H	H	H	H	H
STOG435729	- Graduation seminar 2	8	N	N	H	H	N	N	H	H	H	N	N	H	H	H	H	H
STOG435829	- Graduation seminar 3	8	N	N	H	H	N	N	H	H	H	N	N	H	H	H	H	H
	Elective General knowledge courses (3 courses)																	
GEEC220105	General Economics		N	N	N	N	N	N	N	N	N	N	S	N	N	N	N	S
INMA220305	Introduction of Management		N	N	N	N	N	N	N	N	N	N	S	N	N	N	N	S
INLO220405	Introduction to Logic		N	N	N	S	N	N	S	N	N	N	N	N	N	N	N	N

Code	Course	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	ELO 14	ELO 15	ELO 16
ULTE121105	University Learning methods		N	N	N	S	N	N	S	N	N	N	N	N	N	N	N	N
SYTH220505	Systems Thinking		N	N	N	S	N	N	S	N	N	N	N	N	N	N	N	N
PLSK320605	Planning Skills		N	N	N	N	N	N	S	N	N	N	N	N	N	N	N	S
IVNC320905	Fundamental of Vietnamese Culture		N	N	N	N	N	N	N	N	N	S	S	N	N	N	N	N
INSO321005	Introduction to Sociology		N	N	N	N	N	N	N	N	N	S	S	N	N	N	N	N
	Fundamental courses (elective) (6 credits)																	
CADM230320	Computer Graphic Techniques		N	H	N	N	N	N	S	S	S	N	N	N	N	N	N	N
ENVI320921	Engineering Vibrations		N	S	N	N	N	N	S	S	S	N	N	N	N	N	N	N
FLUI220132	Fluid Mechanics		N	S	N	N	N	N	S	S	S	N	N	N	N	N	N	N
THER222932	Thermal Engineering		N	S	N	N	N	N	S	S	S	N	N	N	N	N	N	N
CACC320224	Basic CAD/CAM/CNC Technology		N	S	N	N	N	N	S	S	S	N	N	N	N	N	N	N
ECCC310324	Experiments on Basic CAD/CAM/CNC Technology		N	S	N	N	N	N	S	S	S	N	N	N	N	N	N	N

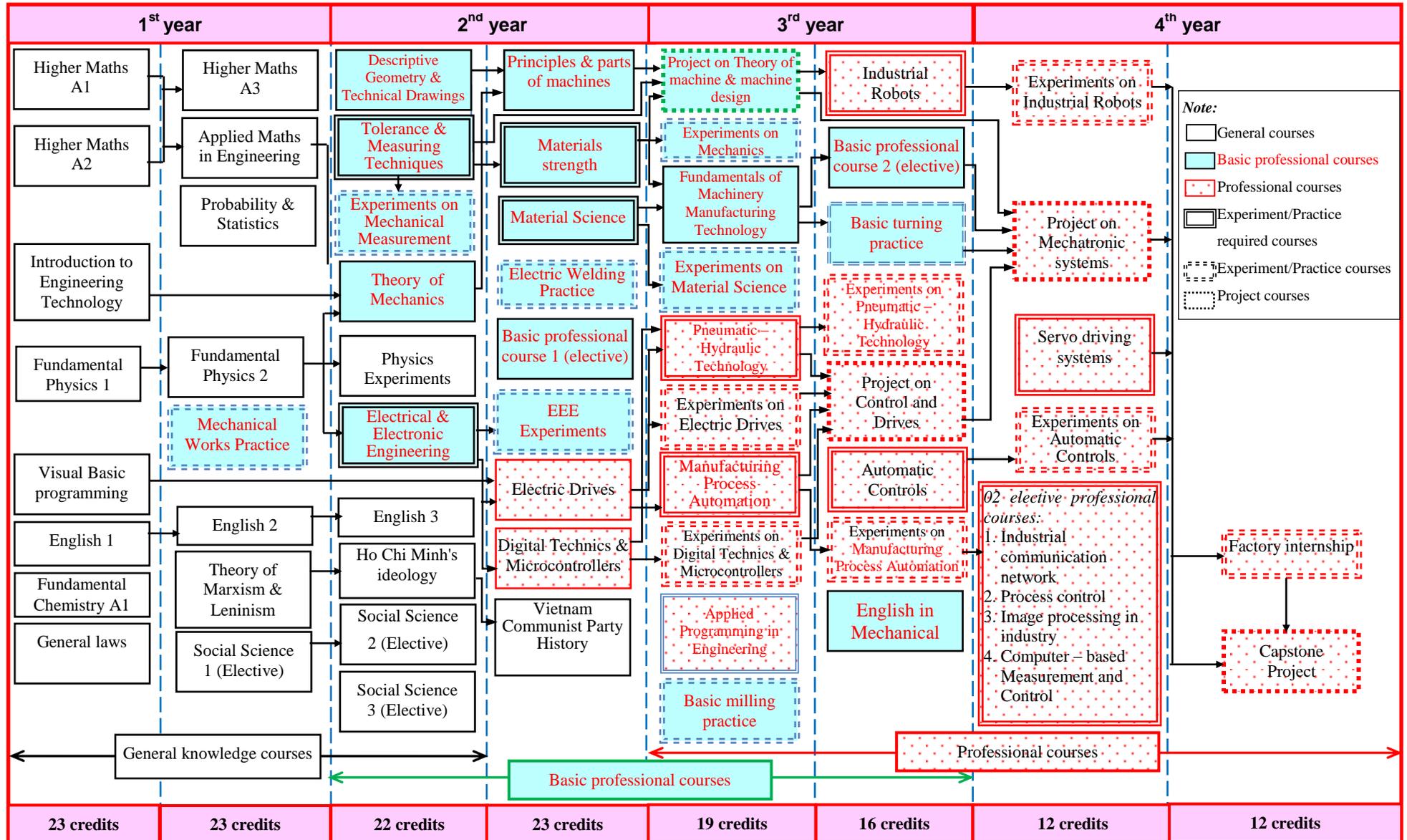
Note: (H = Highly Supporting, S = Supporting, N = None Supporting)

Appendix 3: Matrix of extracurriculum activities vs. expected learning outcomes

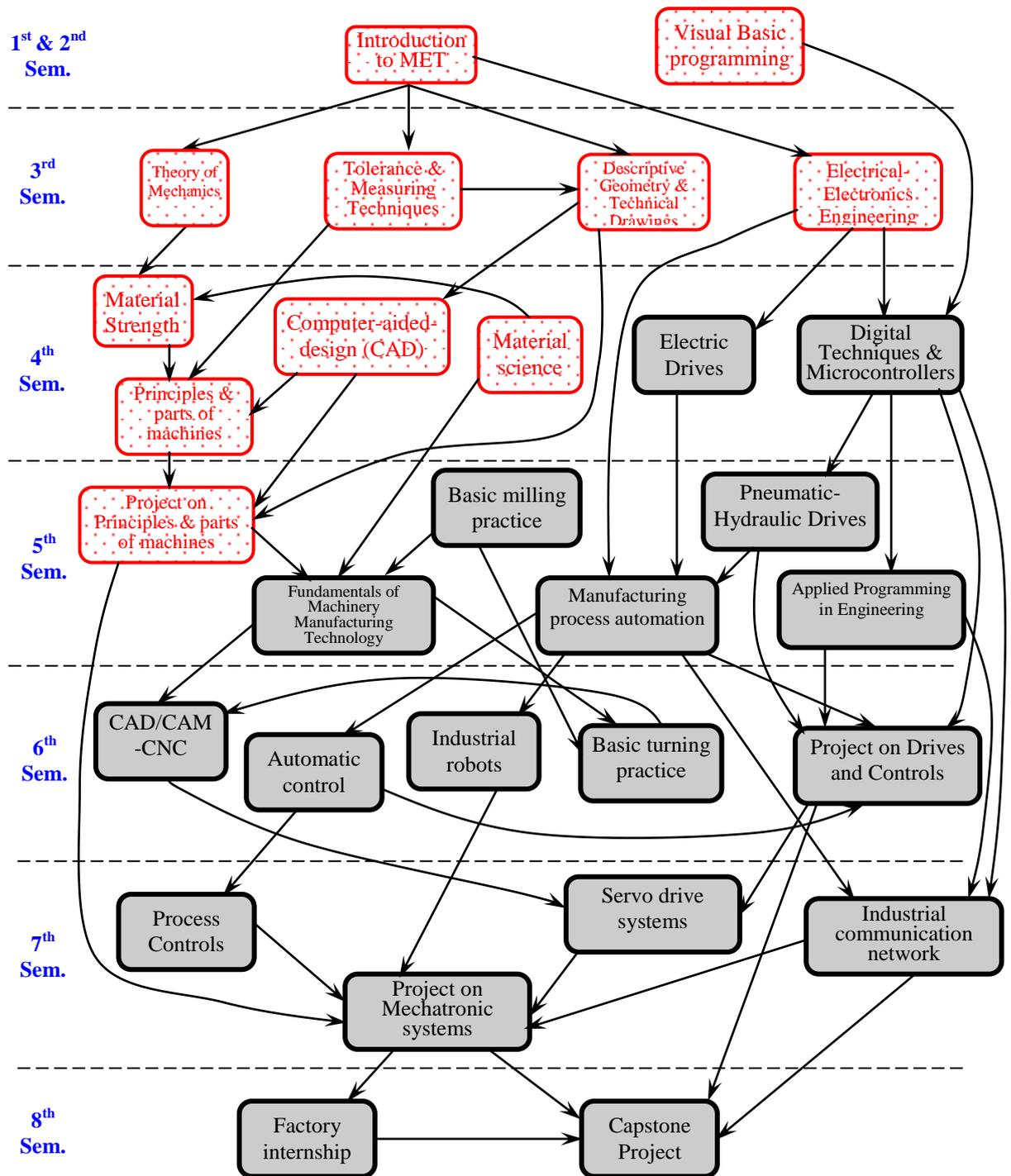
No	Activities	ELOs/ Contribution level															
		ELO 01	ELO 02	ELO 03	ELO 04	ELO 05	ELO 06	ELO 07	ELO 08	ELO 09	ELO 10	ELO 11	ELO 12	ELO 13	ELO 14	ELO 15	ELO 16
1	National Entrance Exam Supports	N	N	N	N	N	N	S	S	N	S	N	N	N	N	N	N
2	Green Summer Volunteer Campaign	N	N	N	N	N	N	S	S	N	S	N	N	N	N	N	N
3	Environmental hygiene	N	N	N	N	N	N	S	S	N	S	N	N	N	N	N	N
4	Field trips	N	N	N	N	N	N	S	N	S	S	S	S	N	N	N	N
5	Social Union Activities	N	N	N	N	N	N	H	S	N	S	N	S	N	N	N	N
6	English club	N	N	N	N	N	N	S	H	H	N	N	S	N	N	N	N
7	Soft skills clubs	N	N	N	N	N	N	H	H	S	S	S	S	N	N	N	N

Notes: (**H** = Highly Supporting, **S** = Supporting, N = None Supporting)

Appendix 4: Curriculum map



Appendix 5: Interacting map of core courses



Appendix 6: Comparison between MET programmes applied in 2008 and in 2012

No		Curriculum (applied from 2008 to 2011)	Credit No.	Curriculum (applied from 2012 till now)	Credit No.	Note
17	Basic professional courses	Technical Drawings	4	Technical Drawings	3	Credit reduced
18		Basic AutoCAD	2	Computer aided design (CAD)	2+1	Merged course
19		Basic AutoCAD practice	1			
20		Theory of Mechanics	4	Theory of Mechanics	3	Credit reduced
21		Material strength	4	Material strength	3	Credit reduced
22		Principles & Parts of machines	4	Principles & Parts of machines	3	Credit reduced
23		Electrical engineering	3	Electrical – Electronic Engineering Experiments on Electrical – Electronic Engineering	3	Merged course
24		Electronic engineering	3		1	
25		Thermal engineering	2	Thermal engineering	2	Elective course
26		Tolerance and measurement techniques	2	Tolerance and measurement techniques	2	Unchanged
27		Experiments on Mechanical measurements	1	Experiments on Mechanical measurements	1	Unchanged
28		Material science 1	2	Material science	2	Unchanged
29		Experiments on Material science	1	Experiments on Material science	1	Unchanged
30		Fundamentals of machinery manufacturing technology	4	Fundamentals of machinery manufacturing technology	3	Credit reduced
31		Automatic control	3	Automatic control	3	Unchanged
32		Applied digital techniques	3	Digital techniques & Microcontrollers	4	Merged course
33		Microcontrollers & Microprocessors	3			
34		Applied power electronics	2	Electric Drives	3	Merged course
35		Electric drives	3			
36		Pneumatic – Hydraulic technology	4	Pneumatic – Hydraulic technology	3	Added experiments
37				Experiments on Pneumatic – Hydraulic technology	1	
38		Mechanical handy practice	2	Mechanical handy practice	2	Unchanged
39		Basic turning practice	3	Basic turning practice	3	Unchanged
40		Experiments on Basic milling practice	2	Experiments on Basic milling practice	2	Unchanged
41		Working safety and environment	2			Merged with workshop

						practice
42		Project on Pneumatic-Hydraulic drives	1	Project on Drives & Controls	1	Unchanged
43	Professional courses	Project on Hydraulic-Pneumatic Drives	3	Servo drive systems	2	Credit reduced
44		Project on Electrical-Hydraulic-Pneumatic Drives	1	Experiments on Servo drive systems	1	According to real need
45		Sensor technology	3	Manufacturing Process Automation	2	Merged course
46		PLC programming techniques	2		Experiments on Manufacturing Process Automation	
47		Industrial Robots	2	Industrial Robots	2	Unchanged
48		Experiments on Industrial Robots	1	Experiments on Industrial Robots	1	Unchanged
49		Bais CAD/CAM - CNC	3	CAD/CAM - CNC	2	Elective & credit reduced course
50		Experiments on Bais CAD/CAM - CNC		Experiments on CAD/CAM-CNC	1	Elective course
51		Industrial communication network	2	Industrial communication network	2	Merged course
52		Distribution control system (DCS)	2		Experiments on Industrial communication network	
53		Project on Mechatronics systems	1	Project on Mechatronics systems	1	Elective course
54		MPS automatic manufacturing system	3	Computer based measurement & control	2	Elective course according to real needs
55				Experiments on Computer based measurement & control	1	
56		Process control systems	3	Process control	2	Elective course
57	Experiments on process control			1		
58	Graduation dissertation	7	Graduation dissertation	10	Credit increased	

Appendix 7: List of publications published in the period of 2011-2015 by lecturers

1. **Pham Huy Tuan, Nguyen Xuan Quang, Nguyen Ngoc Phuong.** *Design and Fabrication of a High-Intensity Ultrasonic Transducer for Food Dehydration (in Vietnamese).* J. Science & Technology: Technical Universities, Vol. 110, 2016 (Accepted).
2. **Lê Chí Cương and Đặng Thiệu Ngôn,** *Study on the Influence between Cutting Speed and Surface Layer Residual Stress of Cold-Forging Mold after CNC Wire Cutting Machining Using X-Ray Diffraction,* Journal of Science and Technology, 2015 (Accepted).
3. L.A. Tuyen^{a, c,}, E. Szilágyi^b, E. Kótai^b, K. Lázár^c, L. Bottyán^b, T.Q. Dung^a, **L.C. Cuong^d**, D.D. Khiem^a, P.T. Phuc^a, L.L. Nguyen^a, P.T. Hue^a, N.T.N. Hue^a, C.V. Tao^e, H.D. Chuong^e, *Structural Effects Induced by 2.5MeV Proton Beam on Zeolite4A: Positron Annihilation and X-Ray Diffraction Study,* Radiation Physics and Chemistry, Elsevier, Vol.106, Jan. 2015, pp.335-339 (SCI Journal). ISSN: 0969-806X, IF 1.3.
4. **Nguyễn Trường Thịnh, Nguyễn Ngọc Phương,** Nguyễn Trọng Tuấn. *Planning walking trajectory for a biped robot.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 2, pp. 3-12.
5. Nguyễn Trọng Tuấn, **Nguyễn Trường Thịnh.** *Design of robotic lawn mower.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 2, pp. 13-22.
6. **Đặng Thiệu Ngôn,** Phan Van Toan. *Research and proposal on welding technique for longitudinal crack defect welding.* International Journal of Mechanical Engineering and Applications, Science Publishing Group, ISSN 2330-0248, Vol. 3, No 1-3, 2/2015: Pp. 29-34.
7. **Đặng Thiệu Ngôn,** Huy-Bich Nguyen. *A Study on Durian Processing Technology and Defleshing Machine.* Asia Pacific Journal of Sustainable Agriculture Food and Energy (APJSAFE), ISSN 2338-1345, Vol. 3, No 1 (4/2015): Pp. 12-16.
8. **Đặng Thiệu Ngôn,** Ngô Ngọc Tuyền, Nguyễn Văn Trung. *The research on applying-ability of aerostatic bearings for centrifugal machine.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 1, pp. 44-52
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10. **Đặng Thiệu Ngôn,** Huỳnh Tấn Đạt. *Simulation to determine the structure of windcube for small horizontal-axis wind turbine.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 1, pp. 594-601.
11. **Phạm Sơn Minh , Đỗ Thành Trung.** *Verification of External Gas-Assisted Mold Temperature Control for Injection Molding Process.* Applied Mechanics and Materials, Volumes 752-753, pp 949-954, ISSN 1662-7482, 4/2015.
12. **Phạm Sơn Minh, Đỗ Thành Trung, Trần Minh Thế Uyên,** Phạm Thanh Bình. *Application of cae to design the waste heat recovery from the internal combustion engines.* Proceedings of

- the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 1, pp. 594-601.
13. **Phạm Sơn Minh, Đỗ Thành Trung, Trần Minh Thế Uyên, Phan Thế Nhân.** *Effect of part thickness and mold temperature on the warpage of polypropylene plate.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 2, pp. 536-543.
 14. **Nguyễn Vũ Lâm, Hsiao Ming Chien.** *Improvement of microwave effect on Biodiesel transesterification process by using activated carbon.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 1, pp. 666-673.
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 16. **Dang Minh Phung, Le Hieu Giang, Nguyen Van Lam, Nguyen Truong Hai, Le Tan Cuong.** *Researching design and manufacturing 4-axis CNC milling machine using Mach3 software applied to manufacture aluminium and ferrous metals.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 1, pp. 112-120.
 17. **Dang Minh Phung, Nguyen Dang Khoa, Truong Nguyen Luan Vu, Le Minh Tuan.** *Researching design development and manufacturing the cocoa pod cutting machine.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 1, pp. 934-942.
 18. **Lê Phan Hung, Nguyễn Trường Thịnh.** *Driving kinetic model and combining control method on autonomous car.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 2, pp. 30-38.
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 20. **Lê Chí Cường, Nguyễn Vĩnh Phối, Nguyen Trong Thanh.** *Determination of generalized absorption function using X-ray diffraction on ellipsoid surface using ψ measurement method.* Proceedings of the 4th National Conference on Mechanical Science & Technology, HCMC November 6th, 2015, vol. 2, pp. 337-344.
 21. **Le Chi Cuong^{1,a}, Nguyen Trong Thanh and Luu Anh Tuyen^{2,b}.** *Determination of Thickness of Coating Thin Films Using X-ray Diffraction.* Journal of Science and Technology, Vol. 105A, 2015, pp. 51-55.
 22. **Minh-Tai Le, Shyh-Chour Huang.** *Investigation of effective parameters on mechanical property in nanoindentation of polymer/carbon nanotubes nanocomposite using square*

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23. **Minh-Tai Le**, Shyh-Chour Huang. *Numerical Simulation of Nanoindentation of Single Wall Carbon Nanotube Reinforced Epoxy Composite*. Applied Mechanics and Materials Vols. 764-765 (2015) pp 66-70 (EI).
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