

INSTRUCTION DOCUMENT

FOR TRAINING PROGRAM DEVELOPMENT COUNCILS

(Pursuant to the content of the Project on Development of Training Programs
for the period 2017-2025)

MỤC LỤC

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1. General objectives and principles

1.1. General objectives

A set of Training Program for undergraduate and graduate students should be developed and finished so that they meet the needs of students, are practical and modern, meet international standards in structure and content, and are consistent and integrated. They should also make connections between training levels.

1.2. Specific objective

- Completing a set of output standards for Training Program, meeting the requirements of professional skills for graduates in the field of training, the provisions of the law on Higher Education and other requirements from social practice.

- Complete the redesign, adjustment, and renewal of the existing Training Program based on the established output standards.

- Complete the evaluation of the results of pilot operation of the Training Program and collect comments from stakeholders related to the Training Program in order to continue to improve the Training Program for the next stage and verify the Training Program according to international standards.

1.3. General principles

(a) The entire Training Program is designed according to the CDIO approach based on the output standards of the Training Programs to ensure training objectives and practicality (see further instructions in section 4. Each developed training program needs to be consulted, compared and contrasted by at least one training program of the same discipline being applied at a university in a developed country (*see more professional textbooks about the provided CDIO*).

(b) Training Program must be designed to provide learners with fundamental and core knowledge of the training industry while also emphasizing creative research skills, positive behavior toward society and the environment in professional activities, and adaptability in an international working environment.

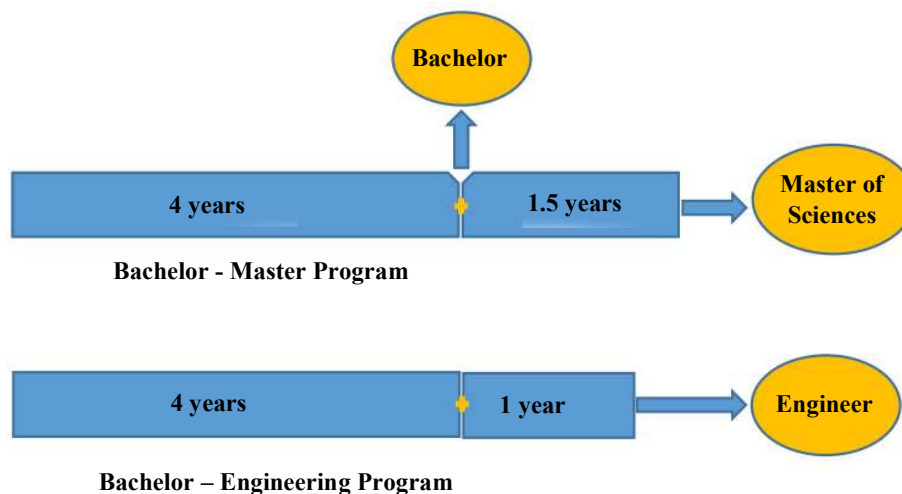


Figure 1: Integrated training programs

(c) Training program are designed to be integrated, connecting different levels of study with blocks of knowledge and giving students enough time to learn and teach. See Section 2 for more instructions.

Bachelor training program with 4-year design time (Bachelor of Engineering; Bachelor of Science; Bachelor of Economics-Management; Bachelor of English Language); broad industry design and grant of Bachelor's degree (Engineering/Science/Economics-Management/Languages). Program objectives and content are built with basic knowledge and solid professional knowledge to be able to adapt well to a wide field of study.

+ Bachelor-Engineer Integrated Training Program (5-year design period), culminating in the awarding of an Engineer degree. The part of the Program of In-depth Training of Engineers according to the field of application of the discipline

+ 5.5-year integrated Bachelor-Master training program, Bachelor degree (Engineering/Science/Economics-Management), and Master of Science degree in two directions:

- The direction of *Academic Research* is for learners who have career aspirations as lecturers and scientific researchers.

- *Research and development* direction to train technical experts capable of designing, researching, and developing systems/products.

+ The Master of Science program in *Engineering and Technology Management* (ETM - Engineering and Technology Management) aims to train future business leaders and managers with the following basic requirements:

- The program is built in the direction of multi-disciplinary, including professional and technical knowledge blocks, as well as economic-management and management knowledge blocks.

- The knowledge blocks are designed according to modules for learners to choose in a way that is suitable for their level and training industry.

+ The Master of Engineering/Master of Business Administration (MBA) training program is oriented to the field of application of the discipline.

+ A bachelor of technology training program that takes four years to complete, giving students a Bachelor of technology degree and giving them a wide range of skills and knowledge. It focuses on competencies and professional practice skills, the deployment and operation of systems, and technological processes, and the Bachelor of Technology takes more time to get to the next level than the Bachelor of Engineering.

(d) A Training Program is designed holistically from undergraduate to graduate level training by a *Training Program Development Council* (Training Program Development). The Training Program Development Council maintains operations in a cycle of applying the Training Program (about 6 years) to supplement, correct, and update the Training Program regularly and in a timely manner (see details in the Training Program, Section 3).

(d) All documents, minutes and proofs during the development of the Training Program must be archived according to regulations to serve the accreditation of the Training Program in the future (see details in Section 5).

(e) Based on the proposal of the Training Program Development Council, the University approves in writing:

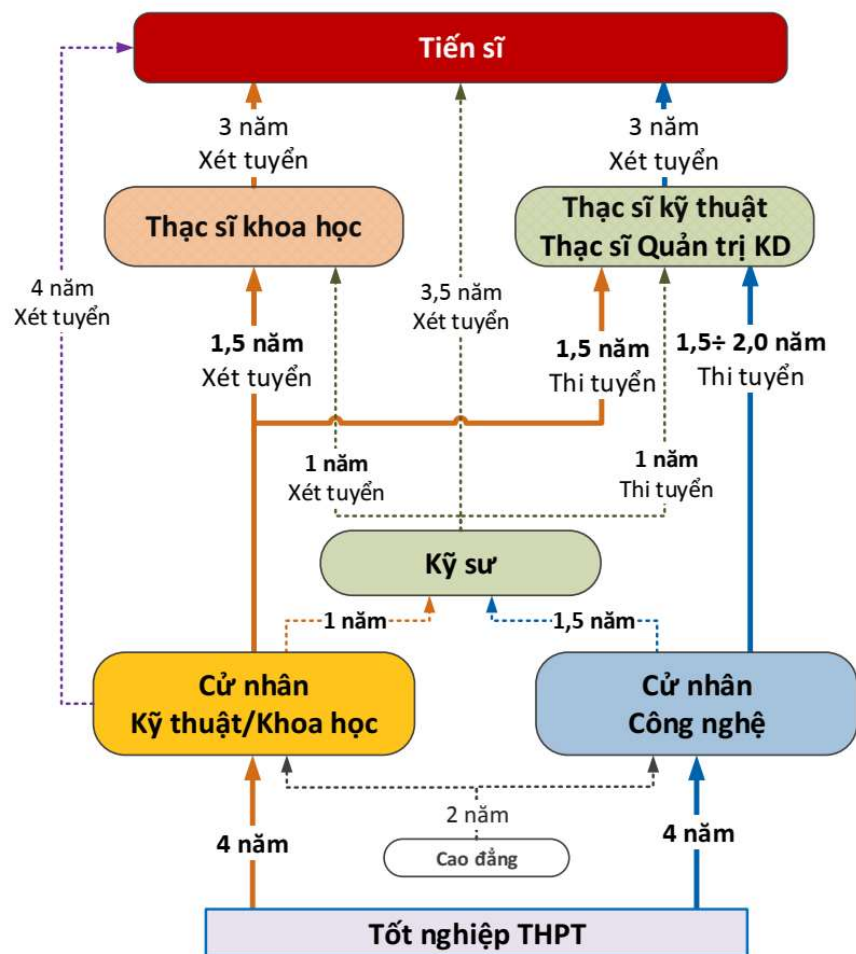
(1) Name of the training program, including the name of the major (for the Master of Science program) and the name of the field of application (for the Engineering/Master of Engineering program),

(2) Output standards of the Training Program, (3) Framework of the training programs (including summary description and output standards of the modules).

2. Some orientations on training program design

2.1. Design time of the Training Program

The training levels/levels with design time are described in detail in Figure 2.



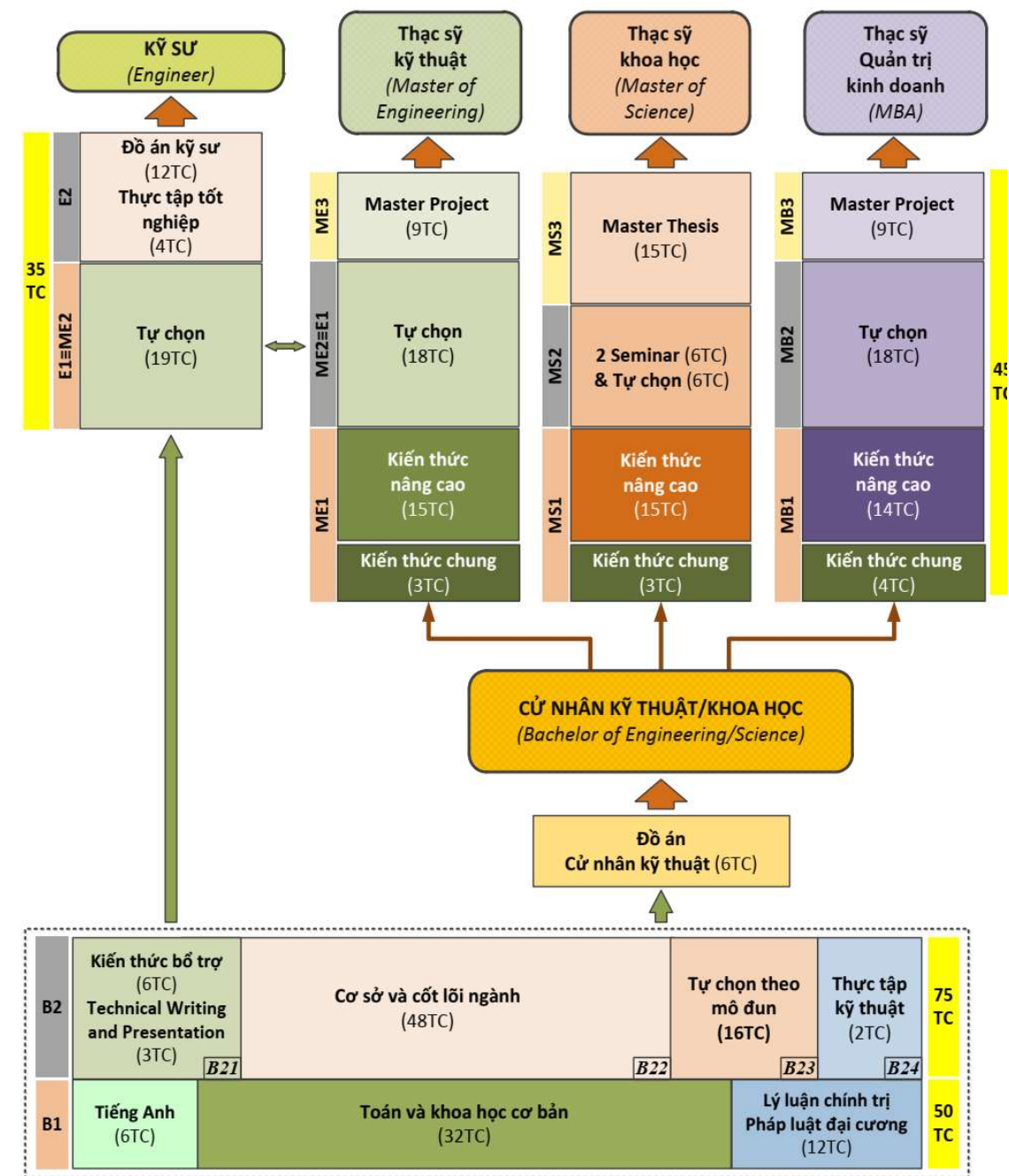
Tiến sĩ	Doctor	Kỹ sư	Engineer
3 năm xét tuyển	3 years of admission	1 năm	1 year
Thạc sĩ khoa học	Master of Science	1,5 năm	1.5 years
Thạc sĩ Kỹ Thuật	Master of engineering	Cử nhân kỹ thuật khoa học	Bachelor of Science Engineering

Thạc sĩ quản trị KD	Master of Business Administration	Cử nhân công nghệ	Bachelor of Technology
4 năm xét tuyển	4 years of admission	4 năm	4 years
1.5 năm xét tuyển	1.5 years of recruitment	2 năm	2 years
3.5 năm xét tuyển	3.5 years of recruitment	Cao đẳng	Colleges
1.5 năm thi tuyển	1.5 years of entrance exam	4 năm	4 years
1.5+2.0 năm thi tuyển	1.5+2.0 years of entrance exam	Tốt nghiệp trung học phổ thông	High School Graduation
1 năm xét tuyển	1 year of admission	1 năm thi tuyển	1 year of entrance exam

Figure 2: Design time of the training program

2.2. Structure of the training program

- Structure, minimum amount of knowledge of the Training Program from Bachelor of Engineering/Science/Accounting - Management is depicted in Figure 3. Detailed instructions on the design of knowledge blocks are provided. presented in Table 1-3.



Kỹ sư	Engineer	Thạc sỹ quản trị kinh doanh (MBA)	Master of Business Administration (MBA)
Đồ án kỹ sư	Engineer project	Master Project (9 TÍN CHỈ)	Master Project (9 CREDIT)
Thực tập tốt nghiệp	Graduation internship	Tự chọn (18 TÍN CHỈ)	Elective (18 CREDIT)
Tự chọn	Elective	Kiến thức nâng cao (14 TÍN CHỈ)	Advanced Knowledge (14 CREDIT)

Thạc sĩ kỹ thuật	Master of engineering	Kiến thức chung (4 TÍN CHỈ)	General Knowledge (4 CREDIT)
Master Project (9 TÍN CHỈ)	Master Project (9 CREDIT)	Cử nhân Kỹ thuật/Khoa học	Bachelor of Engineering/Science
Tự chọn (18 TÍN CHỈ)	Elective (18 CREDIT)	Đồ án Cử nhân Kỹ Thuật (6 TÍN CHỈ)	Bachelor of Engineering Project (6 CREDIT)
Kiến thức nâng cao (15 TÍN CHỈ)	Advanced Knowledge (15 CREDIT)	Kiến thức bổ trợ (6 TÍN CHỈ) Technical Writing and Presentation (3 TÍN CHỈ)	Supplementary Knowledge (6 CREDIT) Technical Writing and Presentation (3 CREDIT)
Kiến thức chung (3 TÍN CHỈ)	General Knowledge (3 CREDIT)	Cơ sở và cốt lõi ngành (48 TÍN CHỈ)	Industry Foundation and Core (48 CREDIT)
Thạc sĩ khoa học	Master of Science	Tự chọn theo mô-đun (16 TÍN CHỈ)	Modular Electives (16 CREDIT)
Master Thesis (15 TÍN CHỈ)	Master Thesis (15 CREDIT)	Thực tập kỹ thuật (2 TÍN CHỈ)	Technical Internship (2 CREDIT)
2 Seminar (6 TÍN CHỈ) & Tự chọn (6 TÍN CHỈ)	2 Seminar (6 CREDIT) & Elective (6 CREDIT)	Tiếng anh (6 TÍN CHỈ)	English (6 CREDIT)
Kiến thức nâng cao (15 TÍN CHỈ)	Advanced Knowledge (15 CREDIT)	Toán và khoa học cơ bản (32 TÍN CHỈ)	Math and Basic Science (32 CREDIT)
Kiến thức chung (3 TÍN CHỈ)	General Knowledge (3 CREDIT)	Lý luận chính trị Pháp luật đại cương (12 TÍN CHỈ)	Political Theory General Law (12 CREDIT)
75 TÍN CHỈ	75 CREDIT	50 TÍN CHỈ	50 CREDIT

Figure 3: Framework for Bachelor of Engineering and Integrated Programs

Table 1: Framework for Integrated Bachelor - Engineering

Training Programs	Cre.	Note
Integrated Bachelor - Engineering	160	
General Education	50	Council builds General Knowledge
Basic math and science	32	Orientate the design of courses according to the group of training disciplines appropriately.
Political Theory General Law	12	According to the regulations of the Ministry of Education and Training
Physical Education/ National Defense and Security Education	-	
English	6	Includes 2 basic English lessons
Professional Education	110	Training Program Development Council
Industry base and core	48	Including from 1÷3 design, manufacture/deployment projects. It is possible to arrange from period 4 to period 7, each period must not exceed 1 project.
Additional knowledge	9 (6+3)	Consists of two compulsory knowledge sections: Supporting knowledge about society, entrepreneurship and other skills (6Cre.) & Technical Writing and Presentation (3Cre.). - The school provides a list of many auxiliary courses. The council chooses about 12Cre. from this category, Student must choose 6Cre. to study (equivalent to 2-3 modules). - Tech. Writing and Presentation: is a compulsory course, designed to study in term 7 or 8.
Optional by module	16	The modular electives give students access to an applied field. - A module is a group of modules designed to approach an application area of a control program set by the Training Program Development Council. - Students choose a module by themselves and must study all the modules in that module. - The total number of credits of the modules in the modules must be at least 30 Cre. for students to choose from. The amount of knowledge between “Basic and Core” and “Elective by Module” can be adjusted within ± 2 credits, but the total number of credits remains unchanged.
Technical Internship	2	Taken from the third year level
Optional Engineer	19 (13+6)	The Engineer Elective (19Cre.) consists of two parts: - Compulsory block of professional knowledge 13 Cre. designed in modules, each module corresponds to an application area, including at

		least one Design Project with a duration of 3 credits, focusing on design skills. Students are elective and must study all modules in the module. - 6 Cre elective knowledge block. for students to choose from a general list designed by the Training Program Development Council.
Graduation internship	4	Should be deployed mainly in industrial facilities
Engineer project	12	The graduation topic should be related to the field of application and should be relevant to the content of the graduation internship.

Table 2: Framework for Integrated Bachelor - Master of Science

Training Programs	Cre.		Note
Integrated Bachelor - Master of Science	176		
General Education	50		Council builds General Knowledge
Basic math and science	32		Orientate the design of courses according to the group of training disciplines appropriately.
Political Theory General Law	12		According to the regulations of the Ministry of Education and Training
Physical education / National defense and security education	-		
English	6		Includes 2 basic English lessons
Professional Education	81		Council develops the Training Program
Industry base and core	48		Including from 1÷3 design, manufacture/deployment projects. It is possible to arrange from period 4 to period 7, each period must not exceed 1 project.
Additional knowledge	9 (6+3)		Consists of two compulsory knowledge parts: Additional knowledge about society, entrepreneurship and other skills (6Cre.) & Technical Writing and Presentation (3Cre.). - The school provides a list of many supplementary courses. The council chooses about 12Cre. from this category, Student must choose 6Cre. to study (equivalent to 2-3 modules).

			- Tech. Writing and Presentation: is a compulsory course, designed to study in term 7 or 8.
Optional by module	16		The elective (16 Cre.) is designed according to the modules in the wide field of the training (broad discipline). - Students choose a module by themselves and must study all the modules in that module.
Technical Internship	2		Taken from the third year level
Bachelor's Project	6		
After university	45		Training Program Development Council
General knowledge	3		Philosophy
Advanced knowledge	15		Is a block of advanced knowledge, in-depth according to the majors of the training industry.
Optional	12		The Training Program Development Councils design knowledge content in two directions: - Academic research direction focuses on in-depth theory, in which 2 seminars (6Cre.) are directly related to the content of the master's thesis. The specific content of the seminar is decided by the Instructor; evaluate results in the form of presenting scientific reports in front of specialized units (Department). - Research and Development direction focuses on design ability of learners, in which 2 seminars are replaced with 2 design projects, organized in groups of students. The content of the project is directly related to the content of the master's thesis.
Thesis of Master of Science	15		

Table 3: Framework for the Bachelor of English Language

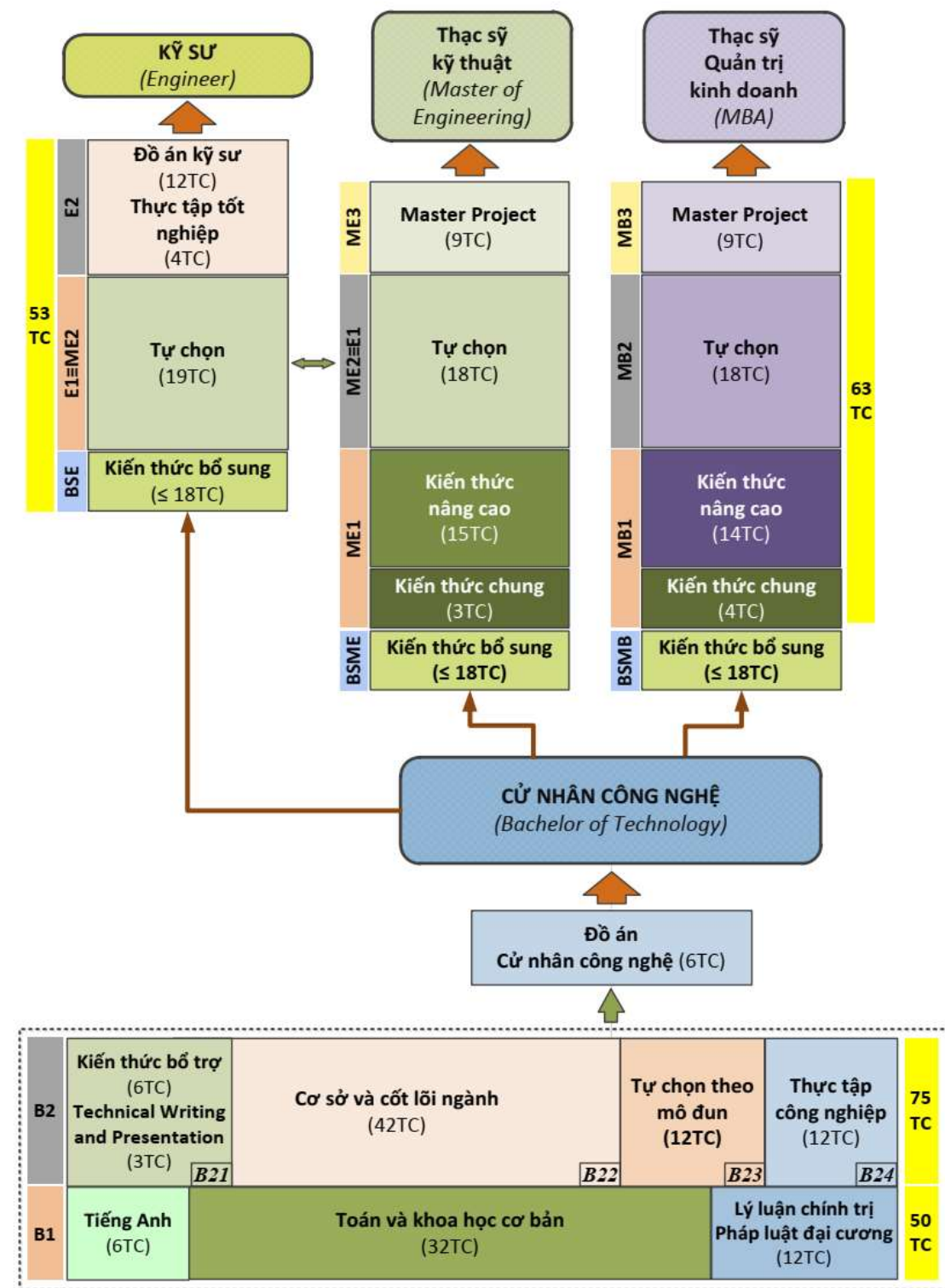
Training Programs	Cre.	Note
Bachelor of English Language	131	
General Education	34	Council builds General Knowledge

General knowledge	12	
Political Theory General Law	12	According to the regulations of the Ministry of Education and Training
Physical education / National defense and security education	-	
2nd foreign language	10	Language other than English
Professional Education	97	Council develops the Training Program
Industry base and core	67	
Additional knowledge	6	The school offers a list of many auxiliary courses on social, entrepreneurship and other skills (6Cre.). The council chooses about 12Cre. from this category, Student must choose 6Cre. to study (equivalent to 2-3 modules).
Optional by module	15	The elective (16 Cre.) is designed according to the modules in the wide field of the training major (wide discipline). - Students choose a module by themselves and must study all the modules in that module. - The total number of credits of the modules in the modules must be at least 30 Cre. for students to choose from the amount of knowledge between the "Basic and core industry" and "Elective by module" can be adjusted within ± 2 credits, but the total number of credits remains unchanged.
Graduation internship	3	
Graduation thesis	6	

Table 4: Framework for Bachelor of Technology

Training Programs	Cre.	Note
Bachelor of Technology	131	
General Education	50	Council builds General Knowledge
Basic math and science	32	Orientate the design of courses according to the group of training disciplines appropriately.
Political Theory General Law	12	According to the regulations of the Ministry of Education and Training
Physical education / National defense and security education	-	
English	6	Includes 2 basic English lessons
Professional Education	81	Council develops the Training Program
Industry base and core	42	Including from 03 technology design/manufacturing/deployment projects, arranged from period 4 to period 7, no more than 1 project/term.
Additional knowledge	9	Consists of two compulsory knowledge parts: Additional knowledge about society, entrepreneurship and other skills (6Cre.) & Technical Writing and Presentation (3Cre.). - The school provides a list of many supplementary courses. The council chooses

	(6+3)	about 12Cre. from this category, Student must choose 6Cre. to study (equivalent to 2-3 modules). - Tech. Writing and Presentation: is a compulsory course, designed to study in term 7 or 8.
Optional by module	12	The elective part (12 Cre.) is designed according to the modules in the broad field of the training (broad discipline). - Students choose a module by themselves and must study all the modules in that module. - The total number of credits of the modules in the modules must be at least 30 Cre. for students to choose from. The amount of knowledge between “Basic and Core” and “Elective by Module” can be adjusted within ± 2 credits, but the total number of credits remains unchanged.
Industrial internship	12	Implemented from the third year qualification at the industrial base
Bachelor of Technology Project	6	



Kỹ sư	Engineer	Thạc sĩ quản trị kinh doanh (MBA)	Master of Business Administration (MBA)
Đồ án kỹ sư	Engineer project	Master Project (9 TÍN CHỈ)	Master Project (9 CREDIT)

Thực tập tốt nghiệp	Graduation internship	Tự chọn (18 TÍN CHỈ)	Elective (18 CREDIT)
Tự chọn	Elective	Kiến thức nâng cao (14 TÍN CHỈ)	Advanced Knowledge (14 CREDIT)
Thạc sĩ kỹ thuật	Master of engineering	Kiến thức chung (4 TÍN CHỈ)	General Knowledge (4 CREDIT)
Master Project (9 TÍN CHỈ)	Master Project (9 CREDIT)	Cử nhân Kỹ thuật/Khoa học	Bachelor of Engineering/Science
Tự chọn (18 TÍN CHỈ)	Elective (18 CREDIT)	Đồ án Cử nhân Kỹ Thuật (6 TÍN CHỈ)	Bachelor of Engineering Project (6 CREDIT)
Kiến thức nâng cao (15 TÍN CHỈ)	Advanced Knowledge (15 CREDIT)	Kiến thức bổ trợ (6 TÍN CHỈ) Technical Writing and Presentation (3 TÍN CHỈ)	Supplementary Knowledge (6 CREDIT) Technical Writing and Presentation (3 CREDIT)
Kiến thức chung (3 TÍN CHỈ)	General Knowledge (3 CREDIT)	Cơ sở và cốt lõi ngành (48 TÍN CHỈ)	Industry Foundation and Core (48 CREDIT)
Thạc sĩ khoa học	Master of Science	Tự chọn theo mô-đun (16 TÍN CHỈ)	Modular Electives (16 CREDIT)
Master Thesis (15 TÍN CHỈ)	Master Thesis (15 CREDIT)	Thực tập kỹ thuật (2 TÍN CHỈ)	Technical Internship (2 CREDIT)
2 Seminar (6 TÍN CHỈ) & Tự chọn (6 TÍN CHỈ)	2 Seminar (6 CREDIT) & Elective (6 CREDIT)	Tiếng anh (6 TÍN CHỈ)	English (6 CREDIT)
Kiến thức nâng cao (15 TÍN CHỈ)	Advanced Knowledge (15 CREDIT)	Toán và khoa học cơ bản (32 TÍN CHỈ)	Math and Basic Science (32 CREDIT)
Kiến thức chung (3 TÍN CHỈ)	General Knowledge (3 CREDIT)	Lý luận chính trị Pháp luật đại cương (12 TÍN CHỈ)	Political Theory General Law (12 CREDIT)
75 TÍN CHỈ	75 CREDIT	50 TÍN CHỈ	50 CREDIT

Figure 4: Curriculum framework for Bachelor of Technology and higher

2.3. Design orientation of courses and modules

2.3.1. University training program

The General Education Knowledge Council (General Council) of the University is responsible for designing the general knowledge block in the general education block, adding additional knowledge about society, skills in software, entrepreneurship (6 Cre.), scientific writing, and presentation skills in English (3 Cre.). The content of knowledge about political theory, physical education, and defense-security education is in accordance with the regulations of the Ministry of Education and Training. The programs for some subjects in general

mathematics and physics will be designed in accordance with the characteristics of each industry group.

Elective courses are designed in groups of subjects (modules). Each module follows a defined specialization topic and is assigned a brief title that describes the core knowledge of the module. The courses in a module are designed so that the knowledge contents have a close relationship, and it is important to pay attention when determining the conditions for the pre-study course for the elective courses under the module. Students can choose to study based on the module so that they have a certain amount of professional knowledge when they finish.

The elective module in the Engineer program is designed according to the application areas of the training industry. This is a new point in the development of the training program to increase the practicality of the program and, at the same time, to make the most of the intellectual strengths and training capacity of the subjects of the school and even outside the school to participate in training and application areas of the major. The areas of application are proposed by the Training Program Development Council based on the results of the survey on the employment situation of graduates, the human demand for industrial production, and expert opinions. A new survey may show that the Training Program Development Council should keep adding new areas and making new modules.

For each module of the training program,

- + Improving subjects that require student autonomy and encouraging creativity in professional learning, such as design project modules (individuals or groups collaborate) that can be included in the Training Program in the third year.

- + Extend the duration of practical/experimental training and redesign experimental modules to meet output standards.

Plus, consider the design of thematic modules that can change topics each school year so that knowledge is updated according to current issues in engineering and technology.

- + Emphasis on courses that teach students how to use information technology, such as numerical simulation calculation methods and tools.

- + When studying at higher levels, a Bachelor of Technology must study additional knowledge up to 18 Cre to ensure a level of knowledge equivalent to that of a technical major (Figure 4).

Regarding foreign language skills, the school will raise the output English language standard higher (expected TOEIC 500 and equivalent) and offer English classes (optional, outside the program) to students who study a certain number of hours will be considered to meet English standards according to their academic year level (besides the form of an internal English test).

2.3.2. Postgraduate training program

- The training program consists of two main blocks (besides the general knowledge block): advanced knowledge and elective knowledge.

- For the Master of Engineering Program, the elective block (18Cre.) in applied fields has the same knowledge content as the Engineering program in the same discipline (Figure 3). Thus, engineers need to study general knowledge (Philosophy), advanced knowledge, and do

a Master of Engineering thesis over a period of about 1 year to receive a Master of Engineering degree.

For the Master of Science training program, in addition to the advanced and specialized knowledge block (15 Cre.) and elective modules (6 Cre.) corresponding to 2 to 3 modules, the block knowledge includes 2 seminars or 2 design projects (6 Cre.) designed in the following directions:

(1) The direction of academic research focuses on in-depth theory of the major so that graduates can do research, teach, or study at a higher level. In which 2 seminars (6Cre.) are directly related to the scientific content of the Master's thesis in Science, the specific content of the seminar is decided by the scientific instructor, and the results are evaluated in the form of a presentation. Scientific reports before specialized units (department)

(2) The direction of research and development focuses on knowledge in order to improve the capacity of designing, researching, and developing systems/products to train learners to become experts in research and development in industry and enterprises, which replaces 2 seminars with 2 design projects organized into groups of students. To put it another way, the project's subject matter is directly linked to the subject matter of the master's thesis.

The Master of Science training program in Engineering-Technology Management is organized by the university and developed by a separate council (multidisciplinary).

2.4. Orientation to develop the subject program (detailed course outline)

Each subject (module) belonging to a knowledge block in the Training Program has a certain role in achieving the output standards, and there is a relationship and interaction between other modules in the Training Program. When someone is being trained, their position and how they interact with other people must be clear.

In the curriculum, it is necessary to identify:

+ The subject's position in the training program, specifying the type of subject, the prerequisite subject, and the next subject of that subject, as well as the structure, content, and duration of instruction and study.

Subject objectives: objectives of each content area in terms of knowledge, skills, and attitudes. This goal is considered the knowledge standard and skill standard of the subject and serves as the basis for the management of the assessment check-evaluate course results.

On the basis of the specific objectives of the subject and the subject content, it is necessary to specify the learning materials for the subject and the learning materials for each content area of the subject. Also, on the basis of course objectives, the number and level of students, and the conditions of facilities and equipment for teaching, lecturers select and harmoniously combine organizational forms and methods with appropriate teaching methods.

3. Mission of the Training Program Development Council

The Training Program Development Council is a professional council with the following tasks: organizing the compilation and development of one or several assigned training programs; evaluating the quality of the training program during implementation to supplement, adjust, and complete the training program. Thus, a Training Program Development Council operates at the end of a training cycle (approximately 6 years). During

the operation, the council's personnel may be adjusted and supplemented according to the actual situation to ensure the completion of tasks.

A Council is responsible for developing and completing the Undergraduate and Postgraduate Training Programs for the training sector. As for the development of doctoral training programs, the training programs for special programs (talented and advanced) will continue to be implemented in the coming year (2018). If you want to study engineering or technology, you need to work with the same Training Program Development Council that worked on the engineering or technology program.

After completing the list of courses in the Training Program, the detailed outline of the modules will be compiled by a specialized group established by the School or by the Department as assigned by the School.

Specific duties include:

- + Proposing the fields of application for the training of engineers and masters of engineering in the training industry.

- + Proposing training majors for the Master of Science in training.

- + Develop a set of output standards for 2 Integrated Training Programs: Bachelor Training Programs and Master of Engineering Training Programs (or Master of Business Administration).

- + Create the Training Program based on the output standards that have been developed.

- + Organize the development of detailed outlines of the modules under the developed training program.

- + Evaluate the training program's quality during implementation in order to supplement, adjust, and complete the training program.

4. Guidelines for building output standards

4.1. General introduction

In the 80s of the 20th century, universities in developed countries began to realize the widening gap between the capabilities of newly graduated engineers and the actual requirements of engineering disciplines. The dramatic advancement of technology requires the engineer to possess the intellectual abilities and profession-specific skills necessary to master it. To achieve this, the education programs need to be rebuilt towards a more appropriate approach, emphasizing the technical foundation in the context of "Conceive – Design – Implement - Operate" (CDIO: Conceiving – Designing – Implementing - Operating) actual systems and products.

The essence of the CDIO process approach is output-driven development and aims to address two central questions:

What knowledge, skills, and attitudes do graduates need to acquire (what to study)?

What needs to be done so that graduates can acquire that knowledge, skills, and attitudes (how to teach/learn)?

In training according to the CDIO model, students need to achieve four blocks of skills and knowledge, and upon graduation, students will develop those skills and knowledge. The goal of CDIO training is to help students acquire the necessary hard and soft skills upon graduation, to meet the requirements and demands of society as well as to keep pace with the rapidly changing realities of real world social life. Good students can master and lead the necessary change in a positive direction.

The benefits of training according to the CDIO model are: connecting the training institution to the requirements of the employer, thereby bridging the gap between the training of the school and the requirements of the employer. help learners develop comprehensively with "hard skills" and "soft skills" to quickly adapt to the ever-changing working environment and even take the lead in that change; helping training programs be developed and designed according to a standard process; The stages of the training process are interconnected and closely linked with science.

4.2. Steps to build output standards

The development and completion of training programs according to the output standards according to the CDIO approach is implemented by industry groups. The development of output standards will determine the framework of the training program, the detailed outline of the modules, the form of examination and evaluation, and affect all stages of training. As part of the CDIO approach, the Training Program Development Councils use these steps to make sure that the output standards of the Training Program meet the standards.

■ Step 1: The Chairman of the Training Program Development Council proposed to establish a group of experts to develop output standards for the Training Program and appoint a team leader. The expert group consists of representatives of institutions employing graduates (agencies, organizations, enterprises, ...); lecturers; managers at all levels; domestic and foreign experts from universities and research institutes related to the training majors; students and alumni.

■ Step 2: The Chairman of the Training Program Development Council discusses and agrees on the objectives, content, structure, time plan, implementation method, resources and assigns tasks to the training programs. Council members are primarily responsible for setting output standards (1st Workshop).

■ Step 3: The group of experts researches the current training programs of the industry, proposes expert consultations, and proposes knowledge, skills, ethical qualities and competencies corresponding to the training industry. created to have a list of industry output standards towards specific training products according to career orientation. It took a lot of work for the expert group to figure out what they were going to do, how much it would cost, and how they were going to get the information they needed to improve their output standards.

■ Step 4: The expert group consulted the sample questions to design the questionnaire suitable for the respondents and the information they need to know. Training for officers, staff and survey takers. The required level of knowledge, skills and ethical qualities are described according to the proficiency levels: know, understand, apply, analyze, synthesize and evaluate. Conduct a trial survey and adjust the questionnaire. The result of this step is a survey form for different subjects.

■ Step 5: The group of experts conducts the survey to collect information from the following subjects: lecturers; specialists from the Higher Education Office, Graduate School, Quality Assurance Center; business leaders, agencies employing graduates, alumni who have graduated within 5 years, freshmen, seniors, etc.

■ Step 6: The Chairman of the Training Program Development Council organizes the 2nd Workshop to collect comments from representatives of experts, scientists, experts, lecturers, students and alumni, etc.

■ Step 7: The Chairman of the Training Program Development Council gathers the output standards, organizes a workshop to collect additional comments and approves the Council to get the complete output standards of all training disciplines. created in the hospital. The product of this step is the Output Standard of the Training Program.

■ Step 8: After receiving the comments and finalizing the output standard document, the Council submits the output standard and requests for approval.

■ Step 9: The President approves the Output Standards after consulting the Science and Training Council.

4.3. Introduction of CDIO Outline Standard Output

The output standards of the CDIO Syllabus Training Program have 4 levels, are compatible with all ABET output standards, and satisfy the requirements of accreditation standards. The output standard represents the training content and objectives. The next level details and concretizes the content from the previous level.

Level 1:

(1) technical and inferential knowledge: assists students in acquiring the necessary professional knowledge

(2) Professional and personal skills demonstrate that learners have developed skills and qualities for themselves.

(3) Teamwork skills: assist learners in developing the ability to collaborate with others.

(4) Idea generation, design, implementation, and operation skills: focusing on learners' practical ability (skills to create new products, processes, and systems)

In which items 2 and 3 are almost the same in the programs of engineering and engineering technology. Depending on the program, engineering, engineering technology, applied science, etc. Depending on the research or application-oriented program, sections 1 (technical knowledge) and 4 (capacity to form ideas, design, etc) will be different.

Level 2: Each part of Level 1 will be implemented in more detail, with the output standard content presented in a simple and concise manner. Level 2 is applied when developing the output standards for the training program.

Level 3: Detail Level 2 in the output standards of each module.

Level 4: Detailing Level 3, serves as the basis when drafting for each content chapter in the detailed course outline.

In the table below, you can see what Level 1 Output Standards for training levels at Hanoi University of Science and Technology look like. This is just for your reference.

Training Program	Requirement
Bachelor of Technology	<ol style="list-style-type: none"> 1. Broad professional knowledge to be able to adapt well to suitable job positions in the field of study. Focusing on the ability to apply basic and core knowledge of the discipline combined with the ability to use modern tools to operate technical technology systems/processes/products 2. Professional skills and personal qualities needed for career success 3. Social skills needed to work effectively in multidisciplinary teams and in an international environment: teamwork and communication skills 4. Capability to participate in deploying and testing systems/processes/products/technological solutions and capacity to operate/use/exploit systems/processes/products/technology solutions Skill
Bachelor of Engineering	<ol style="list-style-type: none"> 1. Solid professional knowledge to be able to adapt well to different jobs in a wide field of study, focusing on the ability to apply knowledge to participate in the design and evaluation of solutions, system/process/product engineering 2. Professional skills and personal qualities required for career success: 3. Social skills needed to work effectively in multidisciplinary teams and in an international environment: 4. Ability to participate in the design, construction/development of systems/products/technical solutions within the discipline in the context of economic, social and actual environments.
Engineer	<ol style="list-style-type: none"> 1. Solid professional knowledge to be able to adapt well to different jobs in the broad field of the discipline and in-depth specialized knowledge, especially design computing knowledge in an application field use of the discipline. 2. Professional skills and personal qualities required for career success: 3. Social skills needed to work effectively in multidisciplinary teams and in an international environment: 4. Capability to design, build and manufacture technical systems/products/solutions in an application field of the discipline in the context of economic, social and actual environments.
Master of engineering	<ol style="list-style-type: none"> 1. Broad professional knowledge to be able to adapt well to different jobs in a wide field of study to be able to work independently 2. Professional skills and personal qualities needed for career success 3. Social skills necessary to be able to work in multidisciplinary teams, meeting the requirements of industrial projects related to many different industries. 4. <i>Competence to design, research and develop</i> systems/products in <i>an applied field of the discipline</i> in the context of economic, social and actual environments.

Master of Science	1. Broad professional knowledge to be able to adapt well to different jobs in a wide field of study to be able to work independently 2. Professional skills and personal qualities necessary for career success: scientific and professional working methods, good systems thinking and analytical thinking; be able to integrate in the international working environment 3. Social skills needed to work effectively in a multidisciplinary team and integrate in an international environment 4. Ability to self-train, self-update knowledge and self-study science. Ability to explore practical problems, apply knowledge and creative scientific and technical achievements to solve real-life problems.
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4.4. Some notes when writing standard output

4.4.1. Bloom cognitive scale

The output standards are based on the output standards of the CDIO Training Program, but each specific output standard in each group is based on the Bloom cognitive scale. In which, it is required to determine the level of awareness of students after finishing the course/training program as follows:

a. Knowledge

Knowledge is the ability to reproduce or recall facts or information without having to understand them.

Action verbs commonly used when writing output standards are: arrange, collect, define, describe, check, recognize, identify, name, outline, present, report, quote. refer, record, repeat, reproduce, show, recount, affirm, ...

b. Comprehension

Comprehension is the ability to make sense of information and to interpret learned information.

Action verbs commonly used when writing output standards are: associate, change, classify, clarify, construct, contrast, transform, decode, protect, describe, differentiate, discuss, evaluate, explain, demonstrate, extend, generalize, illustrate, infer, forecast, report, select, solve, transform, reaffirm, consider, ...

c. Application

Application is the ability to apply information learned to new situations, new situations, new conditions, and solve problems.

Action verbs often used when writing output standards are: Apply, apply, evaluate, calculate, change, choose, complete, construct, calculate, prove, develop, discover, exploit , check, experiment, recognize, illustrate, interpret, adapt, control, operate, organize, practice, create, plan, schedule, demonstrate, sketch, use,

d. Analysis

Analysis is the ability to break down information into components in order to know their internal relationships and structure.

Action verbs commonly used when writing output standards are: Analyze, evaluate, arrange, disassemble, classify, calculate, connect, compare, contrast, identify, distinguish, perform, test, investigate, survey, show, break down, test, infer, ...

d. Synthesis

Synthesis is the ability to link information together to create new ideas, generalize information to infer consequences.

Action verbs commonly used when writing output standards are: Argue, assemble, classify, collect, coordinate, construct, create, design, develop, explain, establish, integrate, make, organize, reorganize, install, summarize, plan, ...

e. Evaluation

Evaluation is the ability to make judgments and judgments about the value of information, problems, things, or phenomena according to a specific purpose.

Action verbs commonly used when writing output standards are: Argue, assemble, classify, collect, coordinate, construct, create, design, develop, explain, establish, integrate, make, organize, reorganize, implement, summarize, plan, approve, assert, communicate, decide, support etc.

4.4.2. Notes

- Start each output standard with an action verb, followed by the object of that action verb, and then the content

- Each output standard uses only one verb

- Avoid using vague terms such as “know”, “understand”, “learn”, “to get used to”, “to master”, “to grasp” etc.

- Avoid using complex sentences. If necessary, more than one sentence can be used to ensure clarity.

- It is necessary to ensure that the output standards cover the entire Training Program

- Output standards must ensure measurement and evaluation

- While writing the output standards, it is necessary to pay attention to the time period that learners need to achieve. Usually when writing standard output tends to be too ambitious. To avoid this, it is necessary to consider whether it is achievable on the basis of training time and available resources.

- When writing an output standard, it is necessary to always think about how to evaluate that output standard, that is, how to know if a student meets that output standard. If the output standard is too broad, it is difficult to evaluate effectively. Conversely, if the output standard is too narrow, the number of output standards may be too long and detailed.

- When writing output standards, for first-year students, try to avoid too many output standards equivalent to the cognitive levels of “Knowledge” and “Comprehension” on the

Bloom scale. Attempts to make higher demands on the knowledge they already have by setting a higher level of output (e.g. Application, Analysis, Synthesis and Evaluation)

- Output standards must be clearly displayed so that stakeholders (students, lecturers, external experts, businesses, ...) can understand.

- Here are two examples for reference on how to write standard output:

Example 1:

Program Educational Objectives (Undergraduate Program in Mechanical Engineering)

The mission of the undergraduate program in Mechanical Engineering is to provide students with a balance of intellectual and practical experiences that enable them to address a variety of societal needs. The curriculum encompasses elements from a wide array of disciplines built around the themes of biomedicine, computational engineering, design, energy, and multiscale engineering. Course work may include mechatronics, computational simulation, solid and fluid dynamics, microelectromechanical systems, biomechanical engineering, energy science and technology, propulsion, sensing and control, nano- and micro-mechanics, and design. The program prepares students for entry-level work as mechanical engineers and for graduate studies in either an engineering discipline or another field where a broad engineering background is useful.

Student Learning Outcomes (Undergraduate)

The department expects undergraduate majors in the program to be able to demonstrate the following learning outcomes. These learning outcomes are used in evaluating students and the department's undergraduate program. Students are expected to demonstrate:

- an ability to apply knowledge of mathematics, science, and engineering.
- an ability to design and conduct experiments, as well as to analyze and interpret data.
- an ability to design a system, component, or process to meet desired needs.
- an ability to function on multidisciplinary teams.
- an ability to identify, formulate, and solve engineering problems.
- an understanding of professional and ethical responsibility.
- an ability to communicate effectively.
- the broad education necessary to understand the impact of engineering solutions in a global and societal context.
- a recognition of the need for and an ability to engage in life-long learning.
- a knowledge of contemporary issues.
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice...
- the ability to apply advanced mathematics through multivariate calculus and differential equations.
- the ability to work professionally in both thermal and mechanical systems areas including the design and realization of such systems.

(References:

<http://exploreddegrees.stanford.edu/schoolofengineering/mechanicalengineering/>)

Example 2:

Program Educational Objectives (Undergraduate Program in Electrical Engineering)

Program Educational Objectives for the BSEE program are:

- The graduates of the BSEE program will possess a strong technical background as well as analytical, critical-thinking, and problem-solving skills that enable them to excel as professionals contributing to a variety of engineering roles within the various fields of electrical engineering and the high-tech industry.

<ul style="list-style-type: none"> ■ The graduates of the BSEE program are expected to be employed in electrical engineering positions including (but not limited to) design engineers, test engineers, characterization engineers, applications engineers, field engineers, hardware engineers, process engineers, control engineers, and power engineers. ■ The graduates of the BSEE program will be committed to professional development and lifelong learning by engaging in professional or graduate education in order to stay current in their field and achieve continued professional growth. ■ The graduates of the BSEE program will be working as effective team members possessing excellent oral and written communication skills, and assuming technical and managerial leadership roles throughout their career. <p>Expected Student Learning Outcomes</p> <p>Graduates of the Bachelor of Science in Electrical Engineering program must have:</p> <ul style="list-style-type: none"> ■ an ability to <u>apply</u> knowledge of mathematics, science, and engineering. ■ an ability to <u>design</u> and conduct experiments, as well as to analyze and interpret data. ■ an ability to <u>design</u> a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. ■ an ability to <u>function</u> on multi-disciplinary teams. ■ an ability to <u>identify, formulate, and solve</u> engineering problems. ■ an <u>understanding</u> of professional and ethical responsibility. ■ an ability to <u>communicate</u> effectively. ■ the broad education necessary to <u>understand</u> the impact of engineering solutions in a global, economic, environmental, and societal context. ■ a <u>recognition</u> for the need for, and the ability to engage in life-long (independent) learning. ■ a <u>knowledge</u> of contemporary issues. ■ an ability to <u>use</u> the techniques, skills, and modern engineering tools necessary for engineering practice. <p>(References: http://www.oit.edu/faculty-staff/provost/learning-outcomes/electrical-engineering)</p>

5. List of evidencing documents that need to be controlled and stored

(Refer to AUN-QA standard)

Build output standards (Output standards)	
1	The decision of the University issued on the development of the Training Program, which clearly stipulates two stages: Developing and updating output standards, Developing and updating the framework program and detailed outline.
2	Survey form and report summarizing the results of the alumni survey about the Training Program (3 months, 6 months, 1 year after graduation).
3	Survey form and synthesis of employer survey forms about each Training Program (survey 3 months, 6 months, 1 year after graduation) and a summary of opinions on the Output Standards and Training Program create
4	Minutes of the School's meeting on reviewing Output Standards, Participatory Training Programs of enterprises, alumni
5	Minutes of School's meetings to discuss editing, updating (developing) the Training Program
6	Official letter of the Schools sent to the Higher Education Office on the update and adjustment of the Training Program

7	Meeting of the Science And Academic Council to discuss updating and editing the Training Program (collecting proposals from the Schools)
8	The President's Decision to establish the Training Program Development Council
9	Minutes of the meeting of the Training Program Development Council to introduce a new output standard with reference to the survey of alumni and businesses (1, 2, 3)
10	Opinion form on the output standards of the Training Program for alumni, employers, lecturers, officials and managers
11	Minutes of conferences and seminars with the participation of businesses, alumni comments on the Output Standards
12	Summary of comments on output standards from opinion forms, conferences and seminars
13	Minutes of the Scientific-Training Council meeting to decide on the approval of output standards, including comments from the summary of survey forms, minutes of conferences, seminars, scientists
14	The President's Decision on Promulgating Output Standards
Develop the framework program and detailed outline of the modules	
15	Decision to establish a Council to develop detailed training programs (Decision-making by School)
16	Minutes of meetings on editing and updating the framework of the Training Program based on the new Output Standards, with reference to the Training Programs of prestigious schools in the region and the world, with the participation of employers, alumni
17	Table comparing the framework of the Training Program with the Training Program of the prestigious Schools in the region and in the world
18	Deciding on writing detailed outlines, minutes of meetings on detailed course outlines
19	Minutes of meeting on approval of detailed course outlines
21	Study plan of each module in the Training Program (Training Program Diagram)
22	Application for approval of the Training Program
Completing the Training Program	
23	Decision approving the Training Program of the President
24	The Training Program book, with the list of courses in Vietnamese and English
25	Description of training industry (Vietnamese and English)

6. Implementation plan

Start date	End date	Main job	Unit in charge of implementation	Coordinate Units
15/4/2017	30/4/2017	Establishment of Training Program Development Councils	School (approved)	School (recommended)
5/5/2017	19/5/2017	Identify the category of application areas/specialties of the 2 Integrated Programs	Training Program Development Council	School
5/5/2017	5/7/2017	Developing output standards for Training Programs	Training Program Development Council	Higher Education Office, Graduate School

				Training Program Development Council
15/5/2017	15/7/2017	Building the part of the Training Program under the General knowledge block and supplementary knowledge	General Council	Higher Education Office Graduate School Training Program Development Council
15/7/2017	15/9/2017	Design 2 Integrated Training Programs, Bachelor Training Program, Master Training Program in Engineering/Business Administration	Training Program Development Council	School
15/9/2017	15/10/2017	Evaluation of Training Programs	Training Program Appraisal Council	Higher Education Office Graduate School
16/10/2017	15/11/2017	Editing and perfecting the Training Program according to appraisal evaluation	Training Program Development Council	School
01/12/2017	15/12/2017	Promulgating the Ministry of Training Programs 2017	University	School
01/12/2017	15/1/2018	Develop a detailed course outline	School, Department	Higher Education Office Graduate School