



ASIIN Seal

Accreditation Report

Bachelor's Degree Programmes

Computer Engineering

Computer Science

Global Information & Communication Technology

Talent of Science in Computer Science

Provided by

Hanoi University of Science and Technology, Vietnam

Table of Content

A About the Accreditation Process.....	3
B Characteristics of the Degree Programmes	5
C Peer Report for the ASIIN Seal	9
1. The Degree Programme: Concept, content & implementation	9
2. The degree programme: structures, methods and implementation.....	17
3. Exams: System, concept and organisation.....	25
4. Resources	28
5. Transparency and documentation.....	32
6. Quality management: quality assessment and development	36
D Additional Documents	39
E Comment of the Higher Education Institution.....	40
F Summary: Peer recommendations.....	41
G Comment of the Technical Committee 04 - Informatics/Computer Science (08.03.2023)	43
H Decision of the Accreditation Commission (23.03.2023)	44
I Fulfilment of Requirements (22.03.2024).....	46
Analysis of the experts and the Technical Committees (29.02.2024)	46
Decision of the Accreditation Commission (22.03.2024)	50
J Fulfilment of Requirements (24.09.2024).....	51
Analysis of the experts and the Technical Committee (05.09.2024).....	51
Decision of the Accreditation Commission (24.09.2024)	52
Appendix: Programme Learning Outcomes and Curricula	54

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for ¹	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC) ²
Kỹ thuật máy tính	Bachelor programme in Computer Engineering	ASIIN	-/-	04
Khoa học máy tính	Bachelor programme in Computer Science	ASIIN	-/-	04
Global ICT	Bachelor programme in Global Information & Communication Technology	ASIIN	-/-	04
Cử nhân Tài năng	Bachelor Talent of Science in Computer Science	ASIIN	-/-	04
Date of the contract: 09.03.2022 Submission of the final version of the self-assessment report: 21.10.2022 Date of the audit: 9.-10.11.2022				
Peer panel: Prof. Dr.-Ing Sandro Leuchter, Mannheim University of Applied Sciences Prof. Dr.-Ing. Helena Szczerbicka, Leibniz University Hannover Prof. Dr. Olaf Zukunft, Hamburg University of Applied Sciences Thien Nguyen, SGH-Asia, Head of Software Development				

¹ASIIN Seal for degree programmes

² TC: Technical Committee for the following subject areas: TC 04 - Informatics/Computer Science;

A About the Accreditation Process

Ba-Hoang Nguyen, Researcher Student, FAST Laboratory – Danang University of Technology	
Representative of the ASIIN headquarter: David Witt	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015 Subject-Specific Criteria of Technical Committee 04 – Informatics/Computer Science as of March 29, 2018	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF ³	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Computer Engineering	Cử nhân Kỹ thuật máy tính Bachelor in Computer Engineering	-/-	6	Full time	-/-	8 Semester	132 Vietnamese Credits / 264 ECTS	Annually /2017
Computer Science	Cử nhân Khoa học máy tính Bachelor in Computer science.	-/-	6	Full time	-/-	8 Semester	132 Vietnamese Credits / 264 ECTS	Annually /2017
Global ICT	Cử nhân Công nghệ thông tin Bachelor in Information Technology	-/-	6	Full time	-/-	8 Semester	133 Vietnamese Credits / 266 ECTS	Annually /2020 (Engineer program of Global ICT started in 2009)
Talent of Science in Computer Science	Bachelor in Computer science	-/-	6	Full time	-/-	8 Semester	132 Vietnamese Credits / 264 ECTS	Annually /1998

For the Bachelor's degree programme Computer Engineering the institution has presented the following profile and programme objectives (PO) in the self-assessment report:

„Computer Engineering (CE): focus on the development of integrated computing systems between hardware and software. In this major, students will learn both how to write software, how to make hardware, and how to integrate this software and hardware into an optimal system to solve a real-world problem.

PO1: Solid technical knowledge of Computer Engineering: basic knowledge of math, physics, electronics, algorithms, databases; analysis and design of information systems; Knowledge of infrastructure, mechanisms for interconnection, control, operation and in-

³ EQF = The European Qualifications Framework for lifelong learning

formation security of computer systems and data communication networks. Ability to detect and solve problems related to building, implementation and deployment of hardware and software of computing systems.

PO2: Skills to apply knowledge, reasoning skills and system thinking to solve specialized issues in practice. Have appropriate attitude and professional ethics.

PO3: Communication skills, teamwork skill, ability to use English efficiently and a professional working attitude suitable for a multidisciplinary and international collaboration environment.

PO4: Ability to apply professional knowledge, formulate ideas, analyze, offer solutions to effectively solve problems consistently with actual socio-economic conditions. The above POs align tightly with the vision and mission of HUST as one of the leading university in Vietnam.“

For the Bachelor’s degree programme Computer Science the institution has presented the following profile and programme objectives (PO) in the self-assessment report:

„Computer Science (CS): help students having the ability to master all stages of developing a software, a program, and an information system, handling real-world problems.

PO1. Solid fundamental knowledge on mathematics, physics, electronics, algorithms, databases; analyzing and designing systems; analyzing, designing and implementing software; programming techniques and skills; organizing, managing and exploiting data, information, and knowledge.

PO2. Ability to apply professional knowledge to solve research and practical issues.

PO3. Having professional and personal skills, professionalism, management skills, social knowledge, as well as different approaches and problem solving to adapt with different aspects of society.

PO4. Having skills in organization, leadership and teamwork; effective communication and English skills to work in a multi-disciplinary and international environment.

PO5. Ability to create ideas, participate in analysis, design, implementation, and operation of IT systems in practice. “

For the Bachelor's degree programme Global Information & Communication Technology the institution has presented the following profile and programme objectives (PO) in the self-assessment report

„In addition to standard training programs, SoICT also deploys programs under the Elitech advanced training system oriented to specific learners, in which the Global ICT program is taught entirely in English from the second year, oriented to those who want to continue studying or working in English-speaking countries after finishing university.

PO1. Having solid fundamental knowledge of mathematics, physics, electronics, algorithms, databases; analyzing and designing systems; analyzing, designing, and implementing software; programming techniques and skills; organizing, managing, and exploiting data, information, and knowledge.

PO2. Having the ability to apply professional knowledge to solve research and practical issues.

PO3. Having professional and personal skills, professionalism, management skills, social knowledge as well as different approaches and problem-solving to adapt to different aspects of society.

PO4. Having skills in organization, leadership, teamwork, effective communication, and English skills to work in a multidisciplinary and international environment.

PO5. Having the ability to create ideas, participate in analysis, design, implementation, and operation of IT systems in practice.

PO6. Ability to use English effectively in an international working environment. Ability to read, understand and write technical documents in English. Capable of meeting, presenting, expressing technical content in English.“

For the Bachelor's degree programme Talent of Science in Computer Science the institution has presented the following profile and programme objectives (PO) in the self-assessment report:

„Besides the standard training programs, the talent training program was developed with the goal of training the best students with good thinking and passionate enthusiasm for science, providing human resources for research, lecturers and experts in key technology industries. The training program was constructed on the basis of the CS program, supplemented with basic scientific knowledge and advanced research-oriented majors. Talent

students are selected from HUST entrance students who passed the aptitude test for the Talent Program.

PO1. Solid fundamental knowledge on mathematics, physics, electronics, algorithms, databases; analyzing and designing systems; analyzing, designing and implementing software; programming techniques and skills; organizing, managing and exploiting data, information, and knowledge.

PO2. Ability to apply professional knowledge to solve research and practical issues.

PO3. Having professional and personal skills, professionalism, management skills, social knowledge as well as different approaches and problem solving to adapt with different aspects of society.

PO4. Having skills in organization, leadership and teamwork; effective communication and English skills to work in a multi-disciplinary and international environment.

PO5. Ability to create ideas, participate in analysis, design, implementation and operation of IT systems in practice. “

C Peer Report for the ASIIN Seal

1. The Degree Programme: Concept, content & implementation

Criterion 1.1 Objectives and learning outcomes of a degree programme (intended qualifications profile)

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Websites
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The peers refer to the respective ASIIN Subject-Specific Criteria (SSC) of the Technical Committee 04 (Informatics/Computer Science), the objective-module-matrices for each degree programme, the matching learning objectives and the modules as a basis for judging whether the intended learning outcomes of the four Bachelor's degree programmes correspond with the competences as outlined by the SSC. The descriptions of the qualification objectives are comprehensive and include the achieved competencies and possible career opportunities of the graduates.

The Hanoi University of Science and Technology (HUST) has described programme objectives (POs) and programme learning outcomes (PLOs) for each of the four Bachelor's degree programmes under review. While the POs are developed based on the vision and mission of the university as well as the respective School and are rather general and concise, the PLOs describe in greater detail the competences the students should acquire during their studies. To what extent the information, including the POs and PLOs about the four Bachelor's degree programmes must be accessible to the students as well as to all stakeholders, for instance by publishing them on the School's website, will be described under criterion 5.3. Furthermore, there are regular revision processes in place that take into account feedback by external and internal stakeholders. A major revision including consultations of stakeholders takes place every two years.

The peers note that the development of PLOs of the study programmes involves both internal and external stakeholders so that the curricula can be adapted and modified according to the needs of the industry and the graduates on a regular basis. For example, HUST regularly conducts surveys, through which the different stakeholders get the chance to assess the programmes and their main objectives and adapt them if necessary. Internal stakeholders include all of HUST members (students, teaching staff, and non-academic employees), while the external stakeholders include the industry, alumni, the government, and society.

In the peers' opinion, the intended qualification profiles of all four Bachelor's degree programmes are clear, plausible and allow students to take up an occupation, which corresponds to their qualification. Moreover, the peers emphasise how well the students are received by future employers. During the audit discussions, the industry representatives were very satisfied with the graduates of the different programmes. According to the peers, this speaks for the intended learning outcomes of the four study programmes.

In summary, the peers confirm that the four Bachelor's degree programmes adequately reflect level 6 of the European Qualification Framework (EQF). The programme learning outcomes of all four programmes are consistent with the respective ASIIN Subject-Specific Criteria of the Technical Committees 04 (Informatics/Computer Science). They aim at the acquisition of specific competences and are well-anchored and binding.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment Report
- Samples of Diploma Supplement for each degree programme

Preliminary assessment and analysis of the peers:

The peers confirm that the English translation and the original Vietnamese names of all degree programmes under review correspond with the intended aims and learning outcomes as well as the main course language (Vietnamese, respectively English for the Global ICT programme).

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Webpage HUST
- Webpage School of Information and Communication Technology
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The curricula of all four Bachelor's degree programmes were being reviewed by the peers in order to identify whether the described learning objectives can be achieved by the available modules. All four degree programmes are managed by the School of Information and Communication Technology (SoICT).

All four Bachelor's degree programmes under review are structured for eight semesters and at least 132 Vietnamese credits (equivalent to 264 ECTS points) need to be achieved by the students (133 Vietnamese credits for the Global ICT programme). Students with superior academic performance can complete their studies within seven semesters. On the other hand, students who cannot fulfil all requirements for graduation within 13 semesters are not allowed to continue studying at HUST.

An academic year at HUST consists of two semesters and a short summer term which lasts for ten weeks. The summer term is normally used for conducting the internship. Some courses are offered in the summer term, based on the demands of students. A regular semester consists of sixteen weeks for learning and teaching, one week for mid-term tests, and two to three weeks for final exams. The mid-term tests are normally given at the ninth week of a semester.

The general structure of the curriculum is similar for all four Bachelor's degree programmes. In the first year, students mainly take general courses from subject areas such as mathematics, natural sciences, social sciences, and humanities. From the second year on, students can take part in core courses and specialized courses in their respective informatics field. Furthermore, after consultation with their academic advisor, students can select electives according to their personal interests. During their studies, all students must spend at least four weeks to study and work in companies for their internship. In the final year, students have to complete their Bachelor's thesis. For both internship and thesis, students have to submit their reports, present and defend it in front of a panel.

The members of the teaching staff explain on demand of the peers that they offer possible topics for the final projects related to their own research projects. All members of the teaching staff supervise theses. Students have to design a research proposal with a time schedule for the project, which is discussed with the supervisor. If agreed on, the students apply formally for being allowed to work on the suggested topic.

The degree programmes consist of courses in the areas:

- Mathematics and Natural Sciences (64 ECTS, all compulsory)
- Social Sciences and Humanities (24 ECTS, all compulsory)
- English (12 ECTS, all compulsory)
- Military and national defense education (no credits, see chapter 2.1)
- Basic and Core of Engineering (96 ECTS, all compulsory)
- Soft Skills (18 ECTS, all compulsory)
- Elective Modules (32 ECTS, all elective)
- Internship (4 ECTS, compulsory)
- Thesis (12 ECTS, compulsory)

The structure is depicted in the following table:

Professional component	Credit (VN)	Note
General Knowledge	50	
Mathematics and basic sciences	32	Conform to approved bachelor degree program
Social science and Humanities	12	In accordance with regulations of Vietnam Ministry of Education and Training and conform to approved bachelor degree program
Military and national defense education	-	
English	6	Consist of 02 basic English courses Conform to approved bachelor degree program.
Engineering Knowledge	82	
Basic and Core of Engineering	48 (± 2)	Consist of at least 1÷3 design, conception or implementation projects Conform to approved bachelor degree program
Soft skills	9	Include of 02 compulsory groups of courses: - Social/Start-up/other skill (6 credits) - Technical Writing and Presentation (3 credits)
Elective Modules	16 (± 2)	Elective module provides oriented knowledge toward minor.
		Conform to approved bachelor degree program

Engineering internship (practicum)	2	Scheduled for third year of study program. Conform to approved bachelor degree program
Bachelor Thesis	6	Applicable to students who decide to graduate at bachelor degree. Topic must be relevant to major and knowledge gained during engineering internship. Conform to approved bachelor degree program
Total		132 credits

Foreign students do not have to do military training.

The internship is conducted through collaboration with companies or other external institutions. Taken full-time, the internship usually lasts four weeks which is valued by the students as this allows them to apply the skills they learned in the programmes in a real working environment. The students point out that the university is very supportive in finding placements for the internship and always encourages them to gain as much practical experience as possible. The university has established useful guidelines for these internships and every student has one advisor at the company and one at the university to ensure that the work contributes to achieving the programme's learning outcomes. The assessment methods to evaluate this phase is comprehensive and includes a written report and a presentation of their results in front of a panel of two lecturers. The evaluation takes into account the aspects work plan, discipline, teamwork, programme implementation, and activity report.

During the discussion rounds, the peers discuss the amount of basic sciences courses, e.g. physics, which are included in the first study year. The peers are of the opinion that it would make more sense to integrate more (basic) courses from the field of computer science into the curricula right at the beginning, instead of several basic sciences courses. The responsible persons explain that these courses are part of the curricula due to national requirements and that they themselves would like to offer more computer science courses instead. The peers understand that the university has to follow national regulations here and is only flexible to a limited extent. Nevertheless, they are in favour of considering in the future whether the required basic science courses are actually necessary in the four programmes.

Since HUST has the goal to become more visible internationally and wants to further internationalize its degree programmes, the peers discuss with the programme coordinators and students what classes in regular programmes are taught in English. The programme coordinators outline that beside the English courses in the first year of study, usually all courses are delivered in Vietnamese, but some projects and the related presentations are done in English. In addition, English literature and textbooks are used, especially in advanced courses at the end of the studies. Also, the programme coordinators explain that

the Thesis can also be written in English. Furthermore, the degree programme Global ICT is completely taught in English. Therefore, this programme offers a set of additional English courses and support for student if necessary, especially at the beginning of the programme. The students confirm that some projects as well as parts of other modules are done in English, and English textbooks are used. The peers appreciate these efforts. However, the industry representatives also underline that the English skills of the students who absolve internships in their companies or of the graduates who they employed could still be improved. They suggest that students in the regular classes or in designated courses should be offered more opportunities to actively speak English. This could be achieved e.g. by discussing international papers or giving more oral presentations in English. Therefore, the peers recommend to improve the English skills of the students.

Moreover, the peers discuss with the teachers and especially with the industry representative how they assess the soft skills of the students. The Industry representatives particularly praise the students' critical thinking skills and give examples of how graduates and students during their internships always critically question problems and tasks and at the same time look for (new) ways to solve them. Overall, they think that the students have enough skills to start in a company. However, they also explain that there is still room for improvement, especially regarding the students' communication skills. They are of the opinion that the students should learn more how to share their ideas and how to communicate to different kind of audiences. Consequently, the peers recommend to strengthen the soft skills of the students through designated coursework or integration into existing coursework, in particular public speaking, communication, team work and project management skills.

In summary, the peers gain the impression that the graduates of all degree programmes under review are – besides the mentioned restrictions – well prepared for entering the labour market and can find adequate jobs in Vietnam.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Reports
- Admission handbooks
- Webpage HUST
- Webpage School of Information and Communication Technology
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the Self-Assessment Report, “[t]he admission procedure is organized and coordinated by HUST’s Admission department, with collaboration from SoICT, and is governed by the Ministry of Education and Training and by HUST. During January to February

each year, SoICT and the HUST's Admission department discuss about the quota of enrolment for each degree program in that year, and the Admission department makes detailed plan for the admission procedure. All information about this procedure are published on the Admission section of HUSTwebsite."

HUST, respectively the SoICT, provides two ways of admission: "Direct admission", and "Test score based admission":

"Direct admission": offered to talented high school students who are members of the Vietnamese team to participate in the International Mathematical Olympiad, International Physics Olympiad, or International Olympiad in Informatics, or who won the 1st, 2nd, or 3rd prizes in the National Excellent Student Contests in informatics, mathematics, and physics. Qualified talented students can submit application with their achievement and get direct admission."

"Test score based admission": prospective students submit application with their result from the National high school graduation exam. Each prospective student can select one of the two subject combinations including A00 (mathematics, physics, chemistry) or A01 (mathematics, physics, English. To be able to submit application, prospective students must pass the pre-qualification condition: average academic scores of each subject in their selected combination in high school must be higher or equal than 7.0 (over the 10 points scale). After prospective students submitted their applications, the HUST Admission department ranks all applications by the students' subject combination result in the National high school graduation exam score (THPT score), and decides the qualification score. All students with result higher than the qualification score will pass the admission process."

"Since 2017, the Global ICT program has had its own program code and own admission score, but it uses similar admissions methods to other SoICT programs. Although no English language requirements are set, the admitted students will be classified according to their English skills through an internal English examination. The students who obtained results equivalent to the IELTS band score of 5.5 or higher can participate in classes in the degree program using English. On the other hand, the students with the IELTS band score of 5.0 or lower need to take a supplementary English course in the "HUST start" program with the goal that students can participate in classes entirely in English after one year in HUST." In addition, there are further admission regulations for the Global ICT degree programme for international students at HUST. These differ for degree-seeking and non-degree-seeking students. The relevant information can be found on the English-language website.

There are also further admission regulations for the Talent of Science in Computer Science degree programme: "Students must be admitted to HUST before they can take the exam/admission to the talent program. Talent of Science in Computer Science program recruits from 30 to 40 students every year. There are two ways for the admission for applicants: direct admission and taking an entrance exam: Direct admission does not

exceed 40% of the total of admission: students who win OLP prizes in Math, Informatics, ... depending on each year will be judged according to the grade; Entrance exam: Math, Physics, and a face-to-face interview.” The relevant information are published on the admission website of HUST.

The tuition fee is fixed and the same for all semesters and all undergraduates programmes at HUST. It is 1000 USD per academic year for full-time students. There are different levels for these fees, depending on the amount of credits the student registered to fulfil in each semester and the tuition fee rate. Furthermore, the Academic Affairs Office awards scholarships to the students with excellent performance based on the student’s academic performance. Students with very good results (top 10% GPA of their respective intakes at their School) can receive scholarships in the following semester. In addition, students at HUST can also receive scholarships from external sources such as companies, non-government organisations, faculty alumni, and individuals.

In addition, HUST has a policy to award tuition fee waivers for students who are orphaned by both parents, students with disabilities in poor or near-poor households or students from remote areas.

In summary, the auditors find the terms of admission to be binding and transparent. They confirm that the admission requirements support the students in achieving the intended learning outcomes.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 1:

The peers consider criterion 1 to be fulfilled.

However, they are in favour of three recommendations:

(ASIIN 1.3) It is recommended to focus less on basic sciences and more on Computer Science in the first study year.

(ASIIN 1.3) It is recommended to strengthen the soft skills of the students, in particular public speaking and communication e.g. through designated coursework or integration into existing coursework.

(ASIIN 1.3) It is recommended to strengthen the English speaking skills of the students, e.g. by practicing speaking English in designated courses and also in usual lecture classes.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Academic Guidelines
- Module descriptions
- Webpage HUST
- Webpage School of Information and Communication Technology
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The curriculum of all four Bachelor's degree programmes under review are designed for eight semesters. HUST divides their degree programmes according to their Self-assessment report "into three levels: Basic knowledge (general education courses), Intermediate knowledge (basic and core of Engineering/ Information Technology courses), and Advanced knowledge (organized in elective modules)." Elective courses can be chosen by the students in accordance with their areas of interest and after consultation with their academic advisor. The courses in the first two semesters of the Bachelor's programmes convey basic knowledge of natural sciences, mathematics and languages. Courses mainly in the field of computer sciences and computer engineering are offered from the third to the sixth semester. During the seventh and eighth semester, students must complete the internship and the Bachelor's thesis.

The general education courses include the areas of (1) mathematics and basic sciences, (2) social sciences and humanities, (3) foreign languages (4) military and national defense education. Two English courses are designed to help students achieving a minimum level equivalent to Test of English for International Communication (TOEIC) of 300 or level 2/6 VSTEP upon graduation. The degree programme Global ICT includes further English courses in the first year.

The basic and core Engineering and Information Technology courses are designed to provide students with foundational knowledge and includes courses on "C programming language, data structures, algorithms, computer networks, operating system principles, etc."

The advanced knowledge courses “[i]ncludes subjects with advanced and in-depth knowledge in elective modules. For example, the Global ICT program has two distinct orientations: AI and Big Data and AI and IoT [...]. The Computer engineering program has three different orientations: Embedded Systems and IoT, Computer Networks and Data Communication, and Information Security [...]. The Computer science program has five elective modules called Software Engineering, Information System, Intelligent Data Analysis, Business Application Development, and Intelligent application development [...]. On the other hand, the advanced knowledge in the Talented program has courses such as Embedded System, Deep Learning and Application, IoT and Application [...]. In addition, this knowledge block contains Engineering internships to help students approach and familiarize themselves with the practical working environment in enterprises. At the end, six credits of bachelor thesis allows students to practice to solve a complete problem using integrated technical and social knowledge and also soft skills.”

While looking at the provided study plans, the peers notice that there are some compulsory classes, for which no credits are awarded. This concerns the physical education courses “Theory in Sport” and “Swimming” as well as the military education courses “Vietnam communist party’s direction on the National Defense”, “Introduction to the National Defense” and “General Military Education”. While the study plan does not indicate credits for the physical education courses, credits are indicated in the module handbook for the same courses. No credits are indicated for the military education courses in either the study plan or the module handbook. The peers acknowledge that this is a national regulation and all Vietnamese students have to take these courses (international students are exempted from the Military Training) and by government regulation, no Vietnamese credits can be awarded from them. However, since all mandatory parts of the degree programmes need to be awarded with ECTS points, the peers expect HUST to determine the students’ workload for these courses and award ECTS points accordingly.

In summary, the peers gain the impression that the choice of modules and the structure of the curricula ensure that the intended learning outcomes of the respective degree programme can be achieved.

International Mobility

The peers learn that the university provides various mobility opportunities for students. These include semesters abroad, short programmes, internships, and international conferences. To foster these, there are cooperation agreements with hundreds of partner institutions worldwide, with a certain focus on Asia (for instance Korea, Singapore, Japan), but also including many institutions in Europe and United States. Partly due to the COVID-19

pandemic, the number of students participating in mobility programs in 2020 and 2021 was relatively low, but is expected to markedly increase again after the pandemic. An international office has been established in order to coordinate HUST's efforts and to support the students in the planning and administration of international mobility. Moreover, the university provides scholarships for international mobility programmes and manages various external scholarships sponsored for instance by the Vietnamese government.

According to a regulation from the Ministry of Education and Training, a course taken at an international university can be considered equivalent to a course at the home university by a Scientific Academic Committee. Before a stay abroad, the university concludes a learning agreement with the respective student to ensure that the courses taken are relevant to the study programme and can thus be recognized.

According to the opinion of the peer group, the academic mobility of the students should be further promoted. The number of Bachelor's students who participate in international exchange programmes is still low despite students' high interest. In recent years, there have been a few incoming students. At the same time, a small number of students went abroad during their studies, e.g. to Cambodia, Finland, Sweden, and Germany.

The students confirm during the discussion with the peers that opportunities for international academic mobility exist and that they feel well supported when they want to go abroad. Furthermore, some inbound students who also attended the discussion round confirmed that they were well supported when starting at HUST.

The peers appreciate the efforts undertaken by the university to foster student mobility and they are satisfied with the structures and support mechanisms for international mobility.

Criterion 2.2 Work load and credits

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Academic Guidelines
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the legal requirements, the total credit load is 132 Vietnamese credits (equivalent to 264 ECTS) for the three Bachelor's degree programmes Computer Science, Computer Engineering, and Talent of Science in Computer Science and 133 Vietnamese credits

for the Global ICT degree programme. The workload is spread relatively evenly over the semesters. Moreover, the effective number of credits the students can take depends on their achievements in the previous semester. In the four Bachelor's degree programmes, students need to take at least 12 credits and maximum up to 24 credits in one semester. The workload of the last two semesters is markedly reduced to give the students enough time for their theses as well as to already start looking for a job. This mechanism is supposed to ensure that the students can really handle the workload. It also means that theoretically, students can finish their studies in less than 8 semesters respectively, although this is relatively rare due to the high workload in general.

In the Vietnamese system, each credit is equivalent to 15 periods of theoretical lecture in class or 30 periods of practical laboratory work with additional 30 periods of self-study. In the internship, the project work and the Bachelor's thesis, it is equivalent to 60 periods. One period lasts for 50 minutes. The workload calculation is depicted in the following table:

"The workload in form of HUST credit" (from SAR)

Form of study for 1 credit	In-class period	Self-study period	Total periods	Total hours (1 period = 50 minutes)
Theoretical lecture	15	30	45	37.5
Practice in laboratory/ Assignments/ Quizzes in class/ Internship/ Thesis	30	30	60	50

According to the ECTS credit system, 1 ECTS equals 25-30 hours of students' workload. As a result, there cannot be the same conversion rate between Vietnamese credits and ECTS points for all courses. For theoretical lectures, the rate would be 1 to 1.25 and for practical work 1 to 1.67.

However, the module descriptions mention a different workload. For example, 540 hours are calculated for the Bachelor's thesis of all four study programmes. This is not consistent with the 6 Vietnamese credits (12 ECTS) that are awarded, because this would result in a total workload of 300 hours (6 x 50). The same problem is relevant for the theoretical courses. For example, the module description for "English 1" mentions a total workload of 90 hours and 3 Vietnamese credits (6 ECTS) are awarded, while 3 Vietnamese credits would mean 112,5 hours (3 x 37.5) and 6 ECTS would require 180 hours. Therefore, the peers underline that the workload and credit calculation is faulty and inconsistent in several ways. The peers point out that it is necessary to eliminate the inconsistencies in the workload and credit calculation of the Vietnamese as well as the ECTS system. HUST should follow the

ECTS Users' Guide and define how many hours of students' total workload are required for one ECTS point (including lecture hours and self-study hours).

During the discussions with the programme coordinators and the students, the peers learn that so far there has been no specific survey asking the students to evaluate the amount of time they spend outside the classroom for preparing the classes and studying for the exams. Since this is necessary in the ECTS framework, the peers suggest asking the students directly about their experiences. This could be done by including respective questions in the course questionnaires. The peers point out that the School of Information and Communication Technology should follow the ECTS Users' Guide, while determining the students' total workload. This is the time students typically need to complete all learning activities (such as lectures, seminars, projects, practical work, self-study and examinations).

In other words, a seminar and a lecture may require the same number of contact hours, but one may require significantly greater workload than the other because of differing amounts of independent preparation by students. Typically, the estimated workload will result from the sum of:

- the contact hours for the educational component (number of contact hours per week x number of weeks),
- the time spent in individual or group work required to complete the educational component successfully (i.e. preparation beforehand and finalising of notes after attendance at a lecture, seminar or laboratory work; collection and selection of relevant material; required revision, study of that material; writing of papers/projects/dissertation; practical work, e.g. in a laboratory),
- the time required to prepare for and undergo the assessment procedure (e.g. exams).

Since workload is an estimation of the average time spent by students to achieve the expected learning outcomes, the actual time spent by an individual student may differ from this estimate. Individual students differ because some progress more quickly, while others progress more slowly. Therefore, the workload estimation should be based on the time an "average student" spends on self-study and preparation for classes and exams. The initial estimation of workload should be regularly refined through monitoring and student feedback.

Before 2020, all four degree programmes were designed for five years. Therefore, the statistical data presented by HUST regarding the average duration of studies should be evaluated accordingly. HUST provides in its Self-assessment report data on the average graduation time of students in the four programmes for the years 2020 and 2021. As the statistical data provided by HUST shows, the average length of study was between 5,22 and 4,77 years in the Computer Science degree programme, between 5,44 and 4,84 years in the

Computer Engineering degree programme, between 5,25 and 5 years in the Global ICT degree programme and between 5,17 and 5,20 years in the Talent of Science in Computer Science degree programme in the last 2 years. Additionally, the peers see that almost all students complete the degree programmes as there only low dropout rates out of the degree programmes in the last years. The data verifies that all four degree programmes under review can be completed in the expected period.

During the discussion rounds the peers learn that students have six years to finish the four year programmes which is achieved by nearly everyone. As HUST is in the top 1% of Universities in Vietnam, they receive the “top students” who usually graduate in the foreseen time. Furthermore, the programme coordinators explain that the dropout rates of the Global ICT degree programme and the Talent of Science in Computer Science degree problem are a bit higher, because some students in these programmes leave to foreign universities to finish their studies.

During the audit, the students emphasise that they consider the workload high but manageable and that it is possible to finish the degree programmes within the expected four years.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment report
- Study plans of the degree programmes
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Various teaching and learning methods (including lectures, computer training and classroom and lab exercises, individual and group assignments, seminars and projects, etc.) have been implemented. Structured activities include tutorials, homework, assignments (reading or problem exercises) and practical activities. Group project assignments are given in some courses to develop students’ skills in teamwork, communication, and leadership. The assignments and exercises should help students to develop their abilities with respect to critical thinking, written/oral communication, data acquisition, problem solving, and presentations.

The most common method of learning is class session, with several courses having integrated laboratory practices. Lecturers generally prepare presentations to aid the teaching process. With individual or group assignments, such as discussions, presentations, or writ-

ten tasks, students are expected to improve their academic as well as their soft skills. Laboratory work covers laboratory preparation, pre or post-tests, laboratory exercises, reports, discussions, and presentations. In addition, practical activities should enable students to be acquainted with academic research methods.

To help students achieving the intended learning outcomes and to facilitate adequate learning and teaching methods, HUST has developed an e-learning platform (Moodle Course Management System), where students and teachers can interact.

In summary, the peer group considers the teaching methods and instruments to be suitable to support the students in achieving the intended learning outcomes. In addition, they confirm that the study concept of all three undergraduate programmes comprises a variety of teaching and learning forms as well as practical parts that are adapted to the respective subject culture and study format. It actively involves students in the design of teaching and learning processes (student-centred teaching and learning).

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Reports
- Academic Handbooks
- Discussions during the audit

Preliminary assessment and analysis of the peers:

HUST offers a comprehensive advisory system for all undergraduate students. Students in the same intake year are organised into classes and every class has an academic advisor. If a class has more than 60 students, it may require more than one academic advisor. The role of the academic advisor is to help the students with the process of orientation during the first semesters, the introduction to academic life and the university's community, and to respond promptly to any questions. They also offer general academic advice, make suggestions regarding relevant careers and skills development and help if there are problems with other teachers. The students confirm during the discussion with the peers that they all have an academic advisor.

The academic advisors organise at least two meetings in each term for the classes they are supervising. From the third year, students will have a supervisor directly supervising them on the projects and the Bachelor's thesis. Each supervisor supervises 5 - 7 students and organises weekly meetings with them.

Students can receive assistance from the Student Affairs Office and the Alumni Office of HUST about career guidance and consultancy, career development training, soft skill training, and job opportunities. The Offices provide information on training and job seeking to

help students develop career plans and workplace understanding. The Office are also a bridge between students, staffs, lecturers and businesses in searching for scholarships, factory visits, internships, and employment opportunities. They are also responsible for keeping in contact with alumni associations, employers, and professional organizations. In addition, HUST support its graduates to find suitable jobs by annually conducting a job fair and by forwarding job vacancies to the students. Moreover, during the internship students are introduced to professional life and acquire additional skills that help them finding an adequate position after graduation. In summary, this results in good job perspectives for the graduates of all three undergraduates.

Finally, there are several student organizations at HUST; they include student's activity clubs, which are divided into arts, sports, religious and other non-curricular activities.

The peers notice that there are enough resources available to provide individual assistance, advice and support for all students. The support system helps the students to achieve the intended learning outcomes and to complete their studies successfully and without delay. The students are well informed about the services available to them. In summary, the comprehensive tutorial and support system for students is one of the strong points of the degree programmes.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 2:

With regard to the requirement that all compulsory modules of the curricula have to be awarded with credit points, HUST explains in its statement that, while reviewing the study programmes in 2017, the physical education and military education courses were appointed credits in the programme curricula. However, in order to avoid students' confusion about the fact that these courses earn credits like professional courses, HUST has clarified that no credits will be awarded for these courses in the recent versions of the programme curricula. This means that HUST used the given credits of the physical education and military education courses in the 2017 curricula versions to convert them into ECTS credit points. The peers appreciate those explanations, but point to the fact that it is not relevant that credit points have been awarded in the old version of the curricula from 2017 for the physical and military education modules. It is crucial that this is also the case for the current curricula. Therefore, the peers decide that this requirement remains in place.

The peers consider criterion 2 not to be fulfilled and are in favour of 2 requirements:

(ASIIN 2.1) Credits have to be awarded to all compulsory modules of the curriculum and the workload has to be determined accordingly.

(ASIIN 2.2) Verify the students' total workload and award the ECTS points accordingly. Define how many hours of students' workload is required for one ECTS point.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation
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Evidence:

- Self-Assessment Report
- Module descriptions
- Guidelines for Organising an Examination
- Regulation of Thesis Assessment
- Academic Guidelines

Preliminary assessment and analysis of the peers:

Each course has to determine objectives, which support the achievement of the Programme Learning Outcomes of the respective programme. Accordingly, each course must assess whether all defined learning outcomes stated in the module descriptions have been achieved. For this purpose, HUST utilises various types of examination.

In each course, short class assignments/quizzes, a mid-term and a final examination are employed. There are different assessment methods in the programmes, such as quizzes, written tests, practical performances, assignments, small projects and presentations. In most courses, mid-term and final exam consist of written tests and additional quizzes or assignments are used. However, the other assessment methods are also used to a certain degree. Via the Academic Calendar, the students are informed about mid-term and final exams. The form and length of each exam is mentioned in the module descriptions that are available to the students via the internal university system known as Student Information System (SIS). It is common to hold small quizzes every two or three weeks, but there are generally no unscheduled tests.

The final grade of each module is calculated based on the score of these individual kinds of assessment, whereby the lecturer determines the ratio between them in accordance with the Academic Guidelines. The exact formula (e.g. 20%, 20% and 60%) is given in the module handbook. At the first meeting of a course, the students are informed about what exactly is required to pass the module and about how the final grade is determined through the teaching and learning plan. HUST uses a grading system with the grades A+, A, B+, B, C+, C, D+, D and F, where a D (equivalent to a Grade Point of 1) is necessary to pass a module and C (equivalent to a Grade Point of 2) to pass the thesis.

Based on the university regulation, the students must retake the whole course if they fail. However, students can request to postpone the final exam due to important reasons (such as accidents, health problems, etc.). In these cases, students will take the final exam in the next semester without repeating the whole course. The reason, why there are no re-sits of

the final exam is that the final grade depends on the assessment of the learning activities that will be carried out continuously through the semester and not only on the final exam. Students who fail a course must attend the course again in the next semesters. The number of repetitions is unlimited. Students who have passed a course and want to improve the score, may also take the course again. The peers appreciate that corresponding rules are in place. However, according to the information obtained during the discussions, there are currently no official rules and regulations on disability compensation measures. As a result, students solely depend on the initiative of the respective lecturers. To guarantee that students with disabilities can study on an equal footing, HUST must establish formal compensation measures that specify under which conditions and how exams are modified to accommodate students' special needs.

Students who underperform will receive academic warnings. The warning system has three levels: "Academic warning level 1", "Academic warning level 2", and "Suspension". The academic warning is issued if the student violates one of the regulations, such as not affording the minimum number of required credits, finishing the semester with the average grade less than 3.0 (scale 10) or less than 4.0 in the last two consecutive semesters. Students who already have received "Academic warning level 1" would receive "Academic warning level 2" if their performance does not improve in the following semester. In those cases, the students will be suspended. As the student's academic advisor receives the notifications during the course as well, help and support can be given in time to improve the student's academic performance.

The peers discuss with the students how many and what kind of exams they have to take each semester. They learn that for most courses there is one mid-term exam and one final exam in every semester. Usually, there are additional practical assignments or quizzes. The students confirm that a variety of assessment methods is used, ranging from traditional in-methods to presentations or project reports. The mid-term exams are carried out in the 9th and the final exams in the 16th week of the semester, whereas the smaller quizzes and assignments take place in the other weeks. The final grade is the sum of the sub exams. Although this means that the total number of tests taken during a semester is comparatively high, the students do not complain about this workload and instead appreciate that there are several short exams instead of one big exam as this requires them to continuously study during the entire semester and not having to solely work for one final exam at the end of the semester. The students also confirm that they are well informed about the examination schedule, the examination form and the rules for grading. The peers appreciate their perception. However, since they also note that written exams are predominantly used and thus memorization/rote learning plays a dominant role, they recommend to better align the well elaborated learning outcomes and the mostly knowledge oriented corresponding assessment forms.

Every student is required to do a thesis in the last year of study. Prior to the actual research work, the students are required to write a research proposal and present it in a seminar attended by lecturers and other students who form a research group. The research proposal has to be accepted by the Dean and the supervisor committee who will then appoint the research supervisors. Usually, there are one or two research supervisors for each student. One will act as the principal supervisor and the other act as co-supervisor. In case the thesis is written in collaboration with the industry, a supervisor from the industry is assigned as well. After completing the work on the thesis, the student has to present and defend the results in front of teachers and fellow students.

The peers discuss with the programme coordinators, the members of the teaching staff, and the students about the process of finding suitable topic of the final project or thesis. There are two possibilities: either students can propose their own ideas or they can ask their academic advisor or other teachers for suggestions.

During the on-site visit, the peers had access to a selection of exams and final projects. They confirm that these represent an adequate level of knowledge as required by the EQF level 6 for the three Bachelor's programmes. The forms of exams are oriented in-line with the envisaged learning outcomes of the respective courses, and the workload is allocated in an acceptable way.

The peers conclude that the criteria regarding the examinations system, concept, and organization are fulfilled and that the examinations are suitable to verify whether the intended learning outcomes are achieved or not.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 3:

With regard to the requirement to establish formal compensation measures that specify under which conditions and how exams are modified to accommodate students' special needs, HUST explains, that despite facing many financial difficulties, they made efforts in implementing policies for disabled students. For example, HUST implemented classes (both theoretical and practical) with disabled students in lecture halls in newly built buildings (equipped with elevators). Disabled students are exempted from Physical Education modules. We have issued a guidance and policy about the support for disabled students and a policy of postponing exams for students who are unable to take the exam due to unexpected illness. These policies clearly demonstrate the initiative efforts in creating a positive learning environment for disabled students at HUST. The peers appreciate those explanations, but note that the compensation measures included in the regulations for student affairs are very general and do not specifically address the possible compensation measures for disabled students. In addition, the extent to which exams can be modified in

order to accommodate disabled students' special needs is not addressed either. Therefore, the peers decide that this requirement remains in place.

The peers consider criterion 3 not to be fulfilled and are in favour of 1 requirement:

(ASIIN 3) Disability measures and compensations for disabled students must be implemented.

4. Resources

Criterion 4.1 Staff

Evidence:

- Self-Assessment report
- Staff Handbooks
- Study plans
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

At HUST, the staff members have different academic positions. There are associate professors, and lecturers. The academic position of each staff member is based on research activities, publications, academic education, supervision of students, and other supporting activities.

In its Self-assessment report, HUST describes additionally that "SoICT has the total of 80 permanent lecturers, with 67 lecturers holding doctoral degree in which 19 lecturers are holding associate professor title. Among the doctoral degree holders, 93% graduated from universities abroad including the US, UK, France, Germany, Austria, Australia, Russia, East European Countries, Japan, Korea, and Singapore, and 7% graduated in Vietnam."

The following table depicts the number of staff in SoICT over the last five years:

The number of staff in SoICT over the last 5 years (from SAR)

Year	2017	2018	2019	2020	2021
Total number of staff	103	101	106	108	113
Number of permanent lecturers	80	80	79	77	79

Number of visiting lecturers	4	4	10	13	14
Number of support staff	19	17	17	16	15
Number of lecturers with doctoral degree*	63	65	65	64	67
Number of associate professors	15	18	17	17	19
Number of new recruitment for permanent lecturer position	2	1	0	4	1

(*) Including staff holding associate professor title

The university encourages the teaching staff with a Master’s degree to pursue further qualification. Based on the above figures, the peers conclude that the ratio of academic staff to students is sufficient in all four degree programmes.

Open positions are announced on HUST’s webpage, candidates have to do a presentation on their research activities and their teaching abilities are verified. Most of the lecturers are graduates of HUST, who were hired after finishing their undergraduate studies and were conducting their Master’s and PhD studies parallel to working as a lecturer or a supporting staff member. However, several teachers have graduated from international universities (for example, from USA, UK, France, Germany, Australia, Japan, Korea, Thailand, and Singapore).

All fulltime members of the teaching staff are obliged to be involved in teaching/advising, research, and administrative services. However, the workload can be distributed differently between the three areas from teacher to teacher and also depends on the academic position. For example, associate professors spend more time on research activities and less on teaching than lecturers. HUST expects staff members to conduct research activities and has issued a policy, which offers some financial support for publishing papers in international journals. In addition, students are encouraged to participate actively in scientific research activities.

Every year, associate professors or lecturers can apply for promotion to associate professor or full professor, respectively. The criteria of the positions are described by the Board of Professor Consideration. Basically, the candidates are considered based on three main criteria such as: years of working, hours of teaching graduate students, quantity and quality of scientific published papers.

Along with the information in the SAR, the HEI presented detailed staff handbooks for all study programmes. On this basis, the peers were convinced that the number of staff assigned to the programmes was sufficient to properly sustain the degree programmes. In

summary, the panel had no doubt about the qualification and the sufficient quantity of the staff for all study programmes.

Criterion 4.2 Staff development

Evidence:

- Self-Assessment report
- Staff handbook
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the self-assessment report and the discussions during the on-site audit, HUST encourages the continuing professional development of its staff. For this purpose, various opportunities are provided. There is a mandatory didactic training for new academic staff that encompasses curriculum design, teaching material, and innovative teaching and learning methods. Moreover, workshops are held to refresh and to deepen various didactic competences in each semester. The lecturers can also regularly participate in external didactical trainings offered and funded by the government. Senior lecturers must mentor and train the newly recruited staff for at least one year.

The teaching staff is encouraged to study abroad or to participate in international research projects and conferences in order to enhance their knowledge, increase their English proficiency and to build international networks. For this purpose, the university informs about possible scholarships to support academic mobility. In general, the exchange programmes are funded by international partner universities and organizations. Teachers involved in a staff exchange programme are generally assigned to a partner university abroad that has a MoU with HUST and the Schools.

Moreover, the peers learn from the teaching staff that there are many different options to apply for funding for research projects, not only from HUST but also from the government and big companies the university collaborates with.

In summary, the peers appreciate the university's efforts in the further development of its employees and consider the support mechanisms for the continuing professional development of the teaching staff adequate and sufficient.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment report
- On-site-visit
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Basic funding of the degree programmes and the facilities is provided by HUST and the different Schools. The financial sources are government funding, tuition fees from students, and industry funding. The figures presented by the university show that the School's income is stable and the funding of the degree programmes is secured. The academic staff emphasize that from their point of view, all three programmes under review receive sufficient funding for teaching and learning activities as well as research, which results in well-equipped facilities and good access to literature, databases and modern software. The students confirm this positive impression and state their satisfaction with the available resources.

In the self-assessment report, HUST gives an extensive overview of the available learning spaces and libraries. Moreover, they list detailed information of all laboratories available per study programme. During the on-site visit, the peers take a look at some central facilities, relevant research and teaching facilities and, in particular, all the different laboratories available for the four study programmes. The university has licensed Microsoft Office 365 and other standard software and provides for all staff and students full access to this software.

During the site visit, the experts were introduced to well-equipped laboratories. In the discussion with the experts, the students are very satisfied with the equipment at HUST including the laboratories. Generally, there are always two advisors for technical support. Overall, the students also appreciate the library as a learning environment for self-study and group activities and access to domestic and international literature.

In summary, the peer group judges the available funds, the technical equipment, and the infrastructure (laboratories, library, class rooms etc.) to comply with the requirements for adequately sustaining the degree programmes.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 4:

The peers consider criterion 4 to be fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Self-Assessment report
- Module descriptions
- Webpage HUST
- Webpage School of Information and Communication Technology
- Webpage School of Applied Mathematics and Informatics

Preliminary assessment and analysis of the peers:

The peers observe that the module descriptions contain the necessary information about the persons responsible for each module, the Vietnamese credit points awarded, the intended learning outcomes, the applicability, the admission and examination requirements, the forms of assessment, and details explaining how the final grade is calculated.

However, the peers note that the module descriptions do not make the calculation of the students' total workload and the conversion into ECTS points transparent. Moreover, HUST has to define how many hours of students' workload is required for one ECTS point. This issue is discussed in more detail under criterion 2.2. Furthermore, the module descriptions do not contain any information about the different teaching methods in the individual modules.

Finally, the peers realise that the module descriptions of some "General Education Courses", e.g. English modules, are missing for the Bachelor's degree programmes. For those reasons, it is necessary that HUST submits the complete and latest version of the corresponding module descriptions and makes them accessible for students and teaching staff.

To what extent the module handbooks for all three programmes must be accessible to the students as well as to all stakeholders will be described under criterion 5.3.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Self-Assessment Report
- Sample Diploma for each degree programme
- Sample Diploma Supplement for each degree programme
- Sample Transcript of Records for each degree programme

Preliminary assessment and analysis of the peers:

The peers confirm that the students of all four degree programmes under review are awarded a Diploma and a Diploma Supplement after graduation. The Diploma consists of a Diploma Certificate and a Transcript of Records. The Transcript of Records lists all courses that the graduate has completed, the achieved credit points, grades, and cumulative GPA. The Diploma Supplements are bilingual (Vietnamese and English). The Diploma Supplement and the Transcript of Records contain almost all necessary information about the respective degree programme. However, some information should be added. The Diploma Supplement must contain detailed information about the intended learning outcomes, the official duration, the access requirements and the grading system of the degree programme. Therefore, the peers urge HUST to include this information in the Diploma Supplement. Furthermore, the peers note that neither the Transcript of Records nor the Diploma Supplement contains the conversion of Vietnamese credits into ECTS. HUST must indicate how many ECTS credits are awarded for every individual degree programme. Therefore, the peers point out that the Transcript of Records needs to list the acquired ECTS points of each course and how many ECTS points are awarded for the whole degree programme. Moreover, the Diploma Supplement needs to follow the European template and needs to include statistical data about the distribution of final grade according to the ECTS Users' Guide. This allows the reader to categorise the individual result.

Criterion 5.3 Relevant rules

Evidence:

- Self-Assessment Reports
- Webpage HUST
- Webpage School of Economics and Management
- Webpage School of Applied Mathematics and Informatics

Preliminary assessment and analysis of the peers:

The auditors confirm that the rights and duties of both HUST and the students are clearly defined and binding. The students receive all relevant course material in the language of the degree programme at the beginning of each semester.

However, the peers notice that the Vietnamese as well as the English websites of the programmes do not include sufficient information. For this reason, the peers expect HUST to update both versions of the websites of the programmes, to align the information on the university's and the School's webpages, to include information about the intended learning outcomes, study plans, module descriptions, and academic guidelines of each degree programme and make them thus available to all relevant stakeholders.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:

Criterion 5.2:

Regarding the requirement to update the Diploma Supplement, HUST explains that they will continue to improve the Diploma Supplement and clarify the information about the intended learning outcomes, the official duration, the access requirements, and the grading system of the degree programmes in order to meet the mentioned standards. However, as HUST did not submit any updated version of the Diploma Supplements, the peers decide that the requirement remains in place.

Criterion 5.3:

With regard to the requirement to align the information on the university's and the School's webpages, to include information about the intended learning outcomes, study plans, module descriptions, and academic guidelines of each degree programme and make them thus available to all relevant stakeholders, HUST states in its response statement that they recognized some shortcomings in providing information to students. The study material is accessible to the students via the HUST's information system only. For example, students use the school's account to access the Syllabus including learning objectives, learning

content, learning schedule, course assessment, and other materials used for each registered course. On the website of each School, the university provides brief information about the academic programmes and the modules that students should take. Moreover, the academic advisors are officially in charge of sharing the information dealing with the curricula to students. The peers appreciate the explanations. However, as all programme information has to be publicly accessible to all relevant stakeholders, the peers point out that they need to be published on both versions of the websites. Therefore, they decide that the requirement remains in place.

The peers consider criterion 5 not to be fulfilled and are in favour of 5 requirements:

(ASIIN 5.1) The module descriptions need to include the correct information about the teaching methods, the students' workload and the awarded credits (Vietnamese and ECTS)

(ASIIN 5.1) Ensure that the latest version of the module descriptions of the general education modules is made accessible for students and teaching staff.

(ASIIN 5.2) The Transcript of Records needs to list the acquired ECTS points of each course and how many ECTS points are awarded for the whole degree programme. The Diploma Supplement needs to include statistical data about the distribution of final grade according to the ECTS Users' Guide.

(ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the intended learning outcomes, the official duration, the access requirements and the grading system of the degree programme.

(ASIIN 5.3) Make the information about the degree programmes (study plans, module descriptions, intended learning outcomes, etc.) available to all stakeholders e.g. by publishing them on the School's webpage.

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-Assessment Reports
- Academic Guidelines
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the self-assessment report, HUST has an extensive quality management system, which is aimed at constantly improving the quality of the degree programmes and the experience of students and faculty. The central unit responsible for quality management is the Center for Quality Assurance (CeQUA). Every year, HUST develops a quality assurance plan on the basis of regular tasks and the university's general quality policy. The individual Schools are obliged to follow these plans and carry out self-assessment tasks such as the revision of the curricula. The process of curriculum development is divided into three major steps. First, at the end of every academic year lecturers of the individual School meet in order to assess and discuss the courses syllabi. The lecturers hereby consider among other things the students' learning results, inspiration from other institutions, and new trends in the technical fields. The second step consists of conducting surveys and analysing the feedback from students, alumni, employers, and other stakeholders. Finally, the School's Scientific Council, which receives the results of surveys and reports from other groups, suggests improvements to the individual programmes. HUST states to carry out all surveys on a regular basis. Alumni, for instance, are asked for their feedback once at the time of their graduation and once a year after their graduation. General student feedback regarding their study experience is collected once per academic year. Teaching evaluations are conducted at the end of each semester for each module. Via an online tool, students can give their feedback anonymously on aspects such as the teaching quality, the course content and their learning progress. Afterwards, the results of the surveys are sent to the teachers for further improvement of the courses and teaching. In the audit, the peers inquire whether the results of the surveys are also shared and discussed with the students. The programme coordinators explain that students do not receive the survey results. However, students report that while their feedback is not officially discussed, they generally feel that their criticisms are noticed as they have witnessed changes in the curricula. Some students, for example, who had suggested changes to some modules, were able to see how those changes were implemented subsequently. Generally students indicate to be satisfied with

the programmes to be accredited and confirm that the programmes are very demanding but feasible. The peers are glad to hear that students are generally satisfied with the programmes and that their feedback seems to be recognized. However, to ensure a closed feedback loop, the peers agree that the results of all teaching and student evaluations have to be shared with the students. Furthermore, the peers learn that there is no formal definition of how teaching and student evaluations are conducted and how the results are processed. Therefore, all steps of the evaluations have to be formally and bindingly recorded in order to ensure that the teaching evaluation is organised in such a way that students receive a feedback of the results. In addition to including students in the feedback loop, the formal paper should also address the mechanism for handling complaints to ensure that all students' responses are formally processed.

HUST also regularly consults the industry for the assessment and development of the programmes. In extensive surveys, companies are asked among other things about changes in the labour market, expected qualifications of the graduates, and their satisfaction with interns and graduates from HUST. On this basis, the Board of Deans discusses whether the curricula and the learning objectives of the individual programmes need to be revised. In the audit discussions, the industry partners report to be satisfied with the students from HUST, especially in terms of their work ethic. Furthermore, the industry partners confirm that their suggestions are generally adopted by HUST. The peers appreciate that HUST has a rather close relationship with the industry partners and regularly collects feedback from them.

In conclusion, the peers agree that HUST's quality management ensures a continuous assessment and improvement of the programmes to be accredited that involves all stakeholders. However, the peers identify a few deficits. Thus, a closed feedback loop must be implemented and formalized.

Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 6:

With regard to the requirement to implement and formalize a closed feedback loop, HUST states in its response statement that they have reviewed and evaluated the changes regarding the training programmes, student services, as well as infrastructures after each stakeholder survey. However, this task still needs to be formalized and is usually submitted only in the form of a data report. HUST is planning to make adjustments to improve the quality of training as well as the quality loop. Moreover, since last year 2022, the Quality Management Office (QMO) started to improve the survey tools of Internal QA System in order to improve the self-assessment of HUST's programmes, especially focusing on the feedbacks from the stakeholders. The peers appreciate the explanations, but point out that

the requirement asked HUST to explain how teaching evaluation and subsequent feedback to students takes place and how these results are used for further programme development. Furthermore, this regulation needs to be formalised accordingly. Therefore, the peers decide that the requirement remains in place.

The peers consider criterion 6 not to be fulfilled and are in favour of 1 requirement:

(ASIIN 6) The teaching evaluation is to be organised in such a way that a feedback of the results to the students is ensured.

D Additional Documents

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

No additional documents needed

E Comment of the Higher Education Institution

HUST provided a statement and submitted the following documents:

- Development strategy plan 2017-2025
- Credit points overview for physical and military courses
- Regulation for student affairs
- Screenshots of programme websites

F Summary: Peer recommendations

The peers summarize their analysis and final assessment for the award of the seals as follows:

Degree Programme	ASIIN Seal	Subject-specific label	Maximum duration of accreditation
Ba Computer Engineering	With requirements for one year	–	30.09.2028
Ba Computer Science	With requirements for one year	–	30.09.2028
Ba Global Information & Communication Technology	With requirements for one year	–	30.09.2028
Ba Talent of Science in Computer Science	With requirements for one year	–	30.09.2028

Requirements

For all degree programmes

- A 1. (ASIIN 2.1) Credits have to be awarded to all compulsory modules of the curriculum and the workload has to be determined accordingly.
- A 2. (ASIIN 2.2) Verify the students' total workload and award the ECTS points accordingly. Define how many hours of students' workload is required for one ECTS point.
- A 3. (ASIIN 3) Disability measures and compensations for disabled students must be implemented.

- A 4. (ASIIN 5.1) The module descriptions need to include the correct information about the teaching methods, the students' workload and the awarded credits (Vietnamese and ECTS).
- A 5. (ASIIN 5.1) Ensure that the latest version of the module descriptions of the general education modules is made accessible for students and teaching staff.
- A 6. (ASIIN 5.2) The Transcript of Records needs to list the acquired ECTS points of each course and how many ECTS points are awarded for the whole degree programme. The Diploma Supplement needs to include statistical data about the distribution of final grade according to the ECTS Users' Guide.
- A 7. (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the intended learning outcomes, the official duration, the access requirements and the grading system of the degree programme.
- A 8. (ASIIN 5.3) Make the information about the degree programmes (study plans, module descriptions, intended learning outcomes, etc.) available to all stakeholders e.g. by publishing them on the School's webpage.
- A 9. (ASIIN 6) The teaching evaluation is to be organised in such a way that a feedback of the results to the students is ensured.

Recommendations

- E 1. (ASIIN 1.3) It is recommended to focus less on basic sciences and more on Computer Science in the first study year.
- E 2. (ASIIN 1.3) It is recommended to strengthen the soft skills of the students, in particular public speaking and communication e.g. through designated coursework or integration into existing coursework.
- E 3. (ASIIN 1.3) It is recommended to strengthen the English speaking skills of the students, e.g. by practicing speaking English in designated courses and also in usual lecture classes.

G Comment of the Technical Committee 04 - Informatics/Computer Science (08.03.2023)

Technical Committee 04 – Informatics/Computer Science (06.03.2023)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the accrediting procedure and follows the assessment of the peers without any changes.

The Technical Committee 04 – Informatics/Computer Science recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Subject-specific label	Maximum duration of accreditation
Ba Computer Engineering	With requirements for one year	–	30.09.2028
Ba Computer Science	With requirements for one year	–	30.09.2028
Ba Global ICT	With requirements for one year	–	30.09.2028
Ba Talent of Science in Computer Science	With requirements for one year	–	30.09.2028

H Decision of the Accreditation Commission (23.03.2023)

Assessment and analysis for the award of the subject-specific ASIIN seal:

The Accreditation Commission discusses the accreditation procedure and decides to delete the requirement A1, because it is considered to not contribute to the specific qualification of the four study programmes under review. With regard to the remaining requirements and recommendations, the AC follows the assessment of the peers and TC without any changes.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Subject-specific label	Maximum duration of accreditation
Ba Computer Engineering	With requirements for one year	–	30.09.2028
Ba Computer Science	With requirements for one year	–	30.09.2028
Ba Global ICT	With requirements for one year	–	30.09.2028
Ba Talent of Science in Computer Science	With requirements for one year	–	30.09.2028

Requirements

For all degree programmes

- A 1. (ASIIN 2.2) Verify the students' total workload and award the ECTS points accordingly. Define how many hours of students' workload is required for one ECTS point.

- A 2. (ASIIN 3) Disability measures and compensations for disabled students must be implemented.
- A 3. (ASIIN 5.1) The module descriptions need to include the correct information about the teaching methods, the students' workload and the awarded credits (Vietnamese and ECTS).
- A 4. (ASIIN 5.1) Ensure that the latest version of the module descriptions of the general education modules is made accessible for students and teaching staff.
- A 5. (ASIIN 5.2) The Transcript of Records needs to list the acquired ECTS points of each course and how many ECTS points are awarded for the whole degree programme. The Diploma Supplement needs to include statistical data about the distribution of final grade according to the ECTS Users' Guide.
- A 6. (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the intended learning outcomes, the official duration, the access requirements and the grading system of the degree programme.
- A 7. (ASIIN 5.3) Make the information about the degree programmes (study plans, module descriptions, intended learning outcomes, etc.) available to all stakeholders e.g. by publishing them on the School's webpage.
- A 8. (ASIIN 6) The teaching evaluation is to be organised in such a way that a feedback of the results to the students is ensured.

Recommendations

- E 1. (ASIIN 1.3) It is recommended to focus less on basic sciences and more on Computer Science in the first study year.
- E 2. (ASIIN 1.3) It is recommended to strengthen the soft skills of the students, in particular public speaking and communication e.g. through designated coursework or integration into existing coursework.
- E 3. (ASIIN 1.3) It is recommended to strengthen the English speaking skills of the students, e.g. by practicing speaking English in designated courses and also in usual lecture classes.

I Fulfilment of Requirements (22.03.2024)

Analysis of the experts and the Technical Committees (29.02.2024)

Requirements

For all degree programmes

- A 1. (ASIIN 2.2) Verify the students' total workload and award the ECTS points accordingly.
Define how many hours of students' workload is required for one ECTS point.

Initial Treatment	
Experts	Fulfilled Justification: HUST has issued a new policy regarding the conversion of study credits based on HUST and European universities regulations. This decision stipulates that 1 ECTS is equivalent to 30 hours of students' workload, encompassing classroom learning, practice, experiments, internships, and self-study. The university presents documents that verify the accurate conversion from Vietnamese credits to ECTS.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts without any changes.
AC	Not fulfilled Vote: unanimous Justification: As this is a cross-cluster requirement, the AC agrees on the same decision for all clusters that the requirement is not fully fulfilled yet. The Accreditation Commission considers that HUST needs to further present a mechanism to verify if the proposed credit points for each modules match the actual workload of the students. Furthermore, there are still courses in the curricula, which do not award credit points to the students. Until these issues are explained or resolved, the requirement is not considered as fully fulfilled.

- A 2. (ASIIN 3) Disability measures and compensations for disabled students must be implemented.

Initial Treatment	
Experts	Fulfilled Justification: In order to support disabled students during their studies, HUST issued 2 regulations that implement support policies for students with disabilities. According to those, all students with disabilities studying at HUST will receive financial support, supporting tools and specialized facilities as well as mental health care activities, psychological counselling to integrate them into the diverse cultural environment of HUST.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts without any changes.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts and the TC without any changes.

- A 3. (ASIIN 5.1) The module descriptions need to include the correct information about the teaching methods, the students' workload and the awarded credits (Vietnamese and ECTS).

Initial Treatment	
Experts	Fulfilled Justification: HUST submitted updated module descriptions that include the requested information.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts without any changes.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts and the TC without any changes.

- A 4. (ASIIN 5.1) Ensure that the latest version of the module descriptions of the general education modules is made accessible for students and teaching staff.

Initial Treatment	
Experts	Fulfilled. Justification: The university published the requested module descriptions on their website.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts without any changes.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts and the TC without any changes.

- A 5. (ASIIN 5.2) The Transcript of Records needs to list the acquired ECTS points of each course and how many ECTS points are awarded for the whole degree programme. The Diploma Supplement needs to include statistical data about the distribution of final grade according to the ECTS Users' Guide.

Initial Treatment	
Experts	Not fulfilled Justification: Justification: HUST explains in its statement that the information recorded in the Diploma Supplement must adhere to the regulations of the Ministry of Education and Training. The current content included in HUST's Diploma Supplement follows these regulations. To enhance procedures based on the expert's recommendations, HUST has issued guidelines for the administrative procedures concerning the confirmation of diplomas, certificates, and academic results for learners and organizations in need. The experts agree that the Diploma Supplement should comply with national regulations. Nevertheless, they also point out that European accreditation has been requested, meaning that the corresponding requirements for a Diploma Supplement must also be met. The experts therefore suggest that the HUST issue an additional Diploma Supplement that fulfils the required specifications.
TC 04	Not fulfilled. Vote: unanimous

	Justification: The TC follows the assessment of the experts without any changes.
AC	Not fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts and the TC without any changes.

- A 6. (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the intended learning outcomes, the official duration, the access requirements and the grading system of the degree programme.

Initial Treatment	
Experts	Not fulfilled Justification: HUST issues an updated Regulation on Certificates ("Promulgates Instructions for Implementing Administrative Procedures on Confirmation of Diplomas, Certificates and Learning Outcomes"). The experts find that the regulations are adequate, however, the university does not provide updated sample Diploma Supplements for the study programmes. On this basis, the experts cannot properly assess whether the requirement is fully met and require the submission of model Diploma Supplements.
TC 04	Not fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts without any changes.
AC	Not fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts and the TC without any changes.

- A 7. (ASIIN 5.3) Make the information about the degree programmes (study plans, module descriptions, intended learning outcomes, etc.) available to all stakeholders e.g. by publishing them on the School's webpage.

Initial Treatment	
Experts	fulfilled Justification: HUST made the information about the degree programmes available to all stakeholders by publishing them on its webpage.
TC 04	Fulfilled. Vote: unanimous

I Fulfilment of Requirements (22.03.2024)

	Justification: The TC follows the assessment of the experts without any changes.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts and the TC without any changes.

- A 8. (ASIIN 6) The teaching evaluation is to be organised in such a way that a feedback of the results to the students is ensured.

Initial Treatment	
Experts	Fulfilled Justification: The HUST has issued Regulations on Teaching Evaluations, which detail the organisation and procedure of the evaluations. The regulations stipulate that "Survey results need to be officially announced to survey participants". Therefore, the experts consider this requirement to be fulfilled.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts without any changes.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts and the TC without any changes.

Decision of the Accreditation Commission (22.03.2024)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Computer Engineering	Requirements 1, 5, and 6 not fulfilled		6 months prolonging
Ba Computer Science	Requirements 1, 5, and 6 not fulfilled		6 months prolonging
Ba Global Information & Communication Technology	Requirements 1, 5, and 6 not fulfilled		6 months prolonging
Ba Talent of Science in Computer Science	Requirements 1, 5, and 6 not fulfilled		6 months prolonging

J Fulfilment of Requirements (24.09.2024)

Analysis of the experts and the Technical Committee (05.09.2024)

Requirements

For all degree programmes

- A 1. (ASIIN 2.2) Verify the students' total workload and award the ECTS points accordingly. Define how many hours of students' workload is required for one ECTS point.

Second Treatment	
Experts	Fulfilled. Justification: HUST states that they have revised the teaching survey template and added 3 questions related to workload. These 3 questions ask students about the actual self-study time they spend on the course and how they rate the level of effort in the course. Once the results of the student survey have been collected, the course syllabus development team will meet to consider any necessary updates/adjustments to the course syllabus. The new syllabus will be applied to all courses from the next semester (2024/25). HUST also provides a formal document binding this change and the new survey template. The experts consider that HUST now has an official and systematic monitoring system in place and that the requirement has been met.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts.

- A 5. (ASIIN 5.2) The Transcript of Records needs to list the acquired ECTS points of each course and how many ECTS points are awarded for the whole degree programme. The Diploma Supplement needs to include statistical data about the distribution of final grade according to the ECTS Users' Guide.

Secondary Treatment	
Experts	Fulfilled. Justification: HUST has submitted a new template for the Diploma Supplement and transcript of records, which includes all the necessary information (including the grades and ECTS points of all courses taken) and is thereby in line with the ASIIN criteria. The new template will be used from 2025. The experts consider the requirement to be fulfilled.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts.

- A 6. (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the intended learning outcomes, the official duration, the access requirements and the grading system of the degree programme.

Secondary Treatment	
Experts	Fulfilled. Justification: HUST has submitted a new template for the Diploma Supplement, which includes all the necessary information. The new template will be used from 2025.
TC 04	Fulfilled. Vote: unanimous Justification: The TC follows the assessment of the experts.
AC	Fulfilled. Vote: unanimous Justification: The AC follows the assessment of the experts.

Decision of the Accreditation Commission (24.09.2024)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Computer Engineering	All requirements fulfilled		30.09.2028
Ba Computer Science	All requirements fulfilled		30.09.2028

J Fulfilment of Requirements (24.09.2024)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Global Information & Communication Technology	All requirements fulfilled		30.09.2028
Ba Talent of Science in Computer Science	All requirements fulfilled		30.09.2028

Appendix: Programme Learning Outcomes and Curricula

According to the Self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Computer Engineering:

LO1: Have a solid professional background to adapt well to various jobs in the wide field of Computer Engineering, able to participate in designing, building, deploying and operating computer systems, embedded systems, communication network systems, network services, cyber security solutions.	
	LO1.1: Mastering knowledge of Mathematics and basic science, mathematics for information technology for solving technical problems.
	LO1.2: Ability to apply core knowledge of the field including computer systems, algorithms and programming, computer network and data communication, software development techniques, information security, processing encoding of information and signals, network services, ... in research and development of systems, products, technical solutions for Computer systems, Computer Network Communication and Information Security.
	LO1.3: Understanding, mastering and being able to apply specialized knowledge, approaching application orientations on Computer Network & Data Communication, Information Security, Computers and embedded systems in construction and broadcasting Computer systems, services, technical solutions.
LO2: Professional skills and personal qualities needed to succeed in careers.	
	LO2.1: Technical problem analysis and solving, understanding the different approaches of the technology building process, appropriate for all aspects: socio-economic, professional ethics, law and information security.
	LO2.2: Ability to experiment, research and discover knowledge.
	LO2.3: System thinking and critical thinking.
	LO2.4: Active, creative and serious.
	LO2.5: Ethics and professional responsibilities.
	LO2.6: Understanding contemporary issues and lifelong studying awareness.
LO3: Social skills needed to work effectively in multidisciplinary teams and in the international environment.	

	LO3.1: Organizational, leadership and teamwork skills.
	LO3.2: Effective communication skills through writing, presentation, discussion, negotiation, case management, effective use of modern tools and facilities.
	LO3.3: Skills to use English effectively at work, get TOEIC score ≥ 500 .
LO4: Competence in design, development, implementation and maintenance of information technology systems, products and solutions in the economic, social and environmental context.	
	LO4.1: Awareness of the close relationship between information technology solutions with economic, social and environmental factors in the globalized world.
	LO4.2: Identify problems and formulate ideas of information technology solutions, participate in building information technology projects.
	LO4.3: Participate in designing information technology systems, products and solutions.
	LO4.4: Participating in implementing and deploying information technology systems, products and solutions
	LO4.5: Exploiting and maintaining information technology systems, products and solutions.

The following **curriculum** is presented:

TT (No.)	MÃ SỐ (Course ID)	TÊN HỌC PHẦN (Course Name)	KHỐI LƯỢNG (Tín chỉ) (Credit)	KỶ HỌC (Semester)									
				1	2	3	4	5	6	7	8		
Lý luận chính trị + Pháp luật đại cương (Laws and politics)			13										
1	SSH1111	Triết học Mác - Lênin	3(3-0-0-6)	3									
2	SSH1121	Kinh tế chính trị Mác - Lênin	2(2-0-0-4)		2								
3	SSH1131	Chủ nghĩa xã hội khoa học	2(2-0-0-4)			2							
4	SSH1141	Lịch sử Đảng Cộng sản Việt Nam	2(2-0-0-4)				2						
5	SSH1151	Tư tưởng Hồ Chí Minh (Ho Chi Minh's Thought)	2(2-0-0-4)					2					
6	EM1170	Pháp luật đại cương (General Law)	2(2-0-0-4)	2									
Giáo dục thể chất (Physical Education)			5										
7	PE1014	Lý luận thể dục thể thao (Theory in Sport)	1(0-0-2-0)										
8	PE1024	Bơi lội (Swimming)	1(0-0-2-0)										

0 Appendix: Programme Learning Outcomes and Curricula

9	Tự chọn trong danh mục (<i>Elective courses</i>)	Tự chọn thể dục 1 (<i>Elective course 1</i>)	1(0-0-2-0)										
10		Tự chọn thể dục 2 (<i>Elective course 2</i>)	1(0-0-2-0)										
11		Tự chọn thể dục 3 (<i>Elective course 3</i>)	1(0-0-2-0)										
Giáo dục Quốc phòng - An ninh (165 tiết) (<i>Military Education</i>)													
12	MIL1110	Đường lối quân sự của Đảng (<i>Vietnam Communist Party's Direction on the National Defense</i>)	0(3-0-0-6)										
13	MIL1120	Công tác quốc phòng, an ninh (<i>Introduction to the National Defense</i>)	0(3-0-0-6)										
14	MIL1130	QS chung và chiến thuật, kỹ thuật bắn súng tiểu liên AK (CKC) (<i>General Military Education</i>)	0(3-2-0-8)										
Tiếng Anh (English)			6										
15	FL1100	Tiếng Anh I (<i>English I</i>)	3(0-6-0-6)	3									
16	FL1101	Tiếng Anh II (<i>English II</i>)	3(0-6-0-6)		3								
Khối kiến thức Toán và Khoa học cơ bản (<i>Mathematics and basic sciences</i>)			32										
17	MI1111	Giải tích I (<i>Calculus I</i>)	4(3-2-0-8)	4									
18	MI1121	Giải tích II (<i>Calculus II</i>)	3(2-2-0-6)		3								
19	MI1131	Giải tích III (<i>Calculus III</i>)	3(2-2-0-6)			3							
20	MI1141	Đại số (<i>Algebra</i>)	4(3-2-0-8)	4									
21	MI2020	Xác suất thống kê (<i>Statistics</i>)	3(2-2-0-6)			3							
22	PH1110	Vật lý đại cương I (<i>Physics I</i>)	3(2-1-1-6)		3								
23	PH1120	Vật lý đại cương II (<i>Physics II</i>)	3(2-1-1-6)			3							
24	IT1110	Tin học đại cương (<i>Introduction to Computer Science</i>)	4(3-1-1-8)		4								
25	MI2010	Phương pháp tính (<i>Numerical Methods</i>)	2(2-0-0-4)			2							
26	IT3020	Toán rời rạc (<i>Discrete Math</i>)	3(3-1-0-6)			3							
Cơ sở và cốt lõi ngành (Basic and Core of Engineering)			48										
27	IT2000	Nhập môn CNTT và TT (<i>Introduction to Information and Communication Technology</i>)	3(2-0-2-6)	3									
28	IT3420	Điện tử cho CNTT (<i>Electronics for Information Technology</i>)	2(2-1-0-4)			2							
29	IT3011	Cấu trúc dữ liệu và thuật toán (<i>Data structure and Algorithms</i>)	2(2-1-0-4)				2						
30	IT3030	Kiến trúc máy tính (<i>Computer Architectures</i>)	3(3-1-0-6)				3						
31	IT3040	Kỹ thuật lập trình (<i>Programming techniques</i>)	2(2-0-1-4)					2					
32	IT3070	Nguyên lý hệ điều hành (<i>Operating Systems</i>)	3(3-1-0-6)				3						
33	IT3170	Thuật toán ứng dụng (<i>Applied Algorithms</i>)	2(2-0-1-4)										
34	IT3080	Mạng máy tính (<i>Computer Networks</i>)	3(3-0-1-6)					3					
35	IT3090	Cơ sở dữ liệu (<i>Database</i>)	3(2-1-1-6)					3					
36	IT3100	Lập trình hướng đối tượng (<i>Object Oriented Programming</i>)	2(2-1-0-4)					2					

0 Appendix: Programme Learning Outcomes and Curricula

37	IT3150	Project I (<i>Project I</i>)	2(0-0-4-8)						2		
38	IT4593	Nhập môn Kỹ thuật truyền thông (<i>Introduction to Communication Engineering</i>)	2(2-1-0-4)						2		
39	IT4172	Xử lý tín hiệu (<i>Signal Processing</i>)	2(2-1-0-4)						2		
40	IT3120	Phân tích thiết kế hệ thống (<i>System analysis and design</i>)	2(2-1-0-4)							2	
41	IT4060	Lập trình mạng (<i>Network Programming</i>)	2(2-1-0-4)							2	
42	IT3180	Nhập môn công nghệ phần mềm (<i>Introduction to Software Engineering</i>)	3(2-2-0-6)						3		
43	IT4015	Nhập môn an toàn thông tin (<i>Introduction to Information Security</i>)	3(3-1-0-6)							3	
44	IT3931	Project II (<i>Project II</i>)	2(0-0-4-8)							2	
45	IT4611	Các hệ thống phân tán và ứng dụng (<i>Distributed Systems and Applications</i>)	2(2-1-0-4)								2
46	IT3943	Project III (<i>Project III</i>)	3(0-0-6-12)								3
Kiến thức bổ trợ (<i>Soft skills</i>)			9								
<i>Bắt buộc (Mandatory)</i>											
47	IT2030	Technical Writing and Presentation	3(2-2-0-6)								
<i>Tự chọn (Elective)</i>											
48	EM1010	Quản trị học đại cương (<i>Introduction to Management</i>)	2(2-1-0-4)								
49	EM1180	Văn hóa kinh doanh và tinh thần khởi nghiệp (<i>Business Culture and Entrepreneurship</i>)	2(2-1-0-4)								
50	ED3280	Tâm lý học ứng dụng (<i>Applied Psychology</i>)	2(1-2-0-4)								
51	ED3220	Kỹ năng mềm (<i>Soft Skills</i>)	2(1-2-0-4)								
52	ET3262	Tư duy công nghệ và thiết kế kỹ thuật (<i>Technology and Technical Design Thinking</i>)	2(1-2-0-4)								
53	TEX3123	Thiết kế mỹ thuật công nghiệp (<i>Industrial Design</i>)	2(1-2-0-4)								
Tự chọn theo định hướng ứng dụng (<i>Elective Module</i>)											
<i>Mô đun 1: Hệ thống nhúng và IoT (Module 1: Embedded Systems and IoT)</i>			16								
54	IT4210	Hệ nhúng (<i>Embedded Systems</i>)	3(3-0-1-6)							3	
55	IT4785	Phát triển ứng dụng cho thiết bị di động (<i>Mobile Programming</i>)	2(2-1-0-4)						2		
56	IT4735	IoT và ứng dụng (<i>IoT and Applications</i>)	2(2-1-0-4)								2
57	IT4651	Thiết kế và triển khai mạng IP (<i>IP Network Design and Implementation</i>)	3(2-0-2-6)							3	
58	IT4409	Công nghệ Web và dịch vụ trực tuyến (<i>Web technologies and e-Services</i>)	3(2-2-0-6)								3
59	IT4931	Lưu trữ và xử lý dữ liệu lớn (<i>Bigdata storage and processing</i>)	3(3-1-0-6)								3
<i>Mô đun 2: Mạng máy tính và Truyền thông dữ liệu (Module 2: Computer Networks and Data communications)</i>			16								

0 Appendix: Programme Learning Outcomes and Curricula

60	IT4651	Thiết kế và triển khai mạng IP (<i>IP Network Design and Implementation</i>)	3(2-0-2-6)						3	
61	IT4409	Công nghệ Web và dịch vụ trực tuyến (<i>Web technologies and e- Services</i>)	3(2-2-0-6)						3	
62	IT4735	IoT và ứng dụng (<i>IoT and Applications</i>)	2(2-1-0-4)						2	
63	IT4681	Truyền thông đa phương tiện (<i>Multimedia Communication</i>)	3(2-1-1-6)						3	
64	IT4263	An ninh mạng (<i>Network Security</i>)	3(2-0-2-6)						3	
65	IT4785	Phát triển ứng dụng cho thiết bị di động (<i>Mobile Programming</i>)	2(2-1-0-4)				2			
Mô đun 3: An toàn thông tin (Module 3: Information Security)			16							
66	IT4025	Mật mã ứng dụng (<i>Applied Cryptography</i>)	3(3-1-0-6)						3	
67	IT4263	An ninh mạng (<i>Network Security</i>)	3(2-0-2-6)						3	
68	IT4785	Phát triển ứng dụng cho thiết bị di động (<i>Mobile Programming</i>)	2(2-1-0-4)				2			
69	IT4651	Thiết kế và triển khai mạng IP (<i>IP Network Design and Implementation</i>)	3(2-0-2-6)						3	
70	IT4409	Công nghệ Web và dịch vụ trực tuyến (<i>Web technologies and e- Services</i>)	3(2-2-0-6)						3	
71	IT4831	Phòng chống tấn công mạng (<i>Network Attack and Defense</i>)	2(2-0-1-4)							2
Thực tập kỹ thuật và Đồ án tốt nghiệp Cử nhân (Engineering Internship and Bachelor Thesis)			8							
72	IT4991	Thực tập kỹ thuật (<i>Engineering Internship</i>)	2(0-0-4-4)						2	
73	IT4997	Đồ án tốt nghiệp Cử nhân (<i>Bachelor Thesis</i>)	6(0-0-12-12)							6

According to the Self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Computer Science:

LO1: Having a solid professional knowledge to adapt to various jobs in the wide field of Computer Science, be able to participate in designing and building software systems and products	
	LO1.1: Mastering knowledges of mathematics and basic science, math for information technology to solve technical problems
	LO1.2: Ability to apply fundamental knowledges computer systems, algorithm and programming, database, design, analysis and develop software, information security, artificial and data mining, IT project management... in research and develop systems, products, IT solutions
	LO1.3: Mastering and being able to apply specialized knowledge, approach the application directions on software technology, information systems, intelligent data analysis in developing IT systems, products and technical solutions
LO2: Having professional skills and personal qualities needed to succeed in careers	
	LO2.1: Technical problem analysis and solving, understanding the different approaches of the technology building process, appropriate for all aspects: socio-economic, professional ethics, law and information security
	LO2.2: Having ability to experiment, research and discover knowledge
	LO2.3: Having system thinking and critical thinking
	LO2.4: Having active, creative and serious characteristics
	LO2.5: Having ethics and professional responsibilities
	LO2.6: Understanding contemporary issues and lifelong studying awareness
LO3: Having social skills needed to work effectively in multidisciplinary teams and in the international environment	
	LO3.1: Having organizational, leadership and teamwork skills (multidisciplinary)
	LO3.2: Having effective communication skills through writing, presentation, discussion, negotiation, case management, effective use of modern tools and facilities.
	LO3.3: Having skills to use English effectively at work, get TOEIC score ≥ 500
LO4: Having ability in design, development, implementation and maintenance of information technology systems, products and solutions in the economic, social and environmental context	
	LO4.1: Awareness of the close relationship between information technology solutions with economic, social and environmental factors in the globalized world

0 Appendix: Programme Learning Outcomes and Curricula

LO4.2: Identify problems and formulate ideas of information technology solutions, participate in building information technology projects
LO4.3: Participate in designing information technology systems, products and solutions
LO4.4: Participating in implementing and deploying information technology systems, products and solutions
LO4.5: Exploiting and maintaining information technology systems, products and solutions

The following **curriculum** is presented:

TT (No.)	MÃ SỐ (Course ID)	TÊN HỌC PHẦN (Course Name)	KHỐI LƯỢNG (Tín chỉ) (Credit)	KỲ HỌC (Semester)									
				1	2	3	4	5	6	7	8		
Lý luận chính trị + Pháp luật đại cương (Laws and politics)			12										
1	SSH1110	Những NLCB của CN Mác-Lênin I (Fundamental Principles of Marxism-Leninism I)	2(2-1-0-4)	2									
2	SSH1120	Những NLCB của CN Mác-Lênin II (Fundamental Principles of Marxism-Leninism II)	3(2-1-0-6)		3								
3	SSH1050	Tư tưởng Hồ Chí Minh (Ho-Chi-Minh's Thought)	2(2-0-0-4)			2							
4	SSH1130	Đường lối CM của Đảng CSVN (Revolution Policy of Vietnamese Communist Party)	3(2-1-0-6)				3						
5	EM1170	Pháp luật đại cương (General Law)	2(2-0-0-4)	2									
Giáo dục thể chất (STC) (Physical Education)													
6	PE1014	Lý luận thể dục thể thao (Theory in Sport)	1(0-0-2-0)										
7	PE1024	Bơi lội (Swimming)	1(0-0-2-0)										
8	Tự chọn trong danh mục (Elec- tive courses)	Tự chọn thể dục 1 (Elective course 1)	1(0-0-2-0)										
9		Tự chọn thể dục 2 (Elective course 2)	1(0-0-2-0)										
10		Tự chọn thể dục 3 (Elective course 3)	1(0-0-2-0)										
Giáo dục Quốc phòng - An ninh (165 tiết) (Military Education)													
11	MIL1110	Đường lối quân sự của Đảng (Vietnam Communist Party's Direction on the Na- tional Defense)	0(3-0-0-6)										
12	MIL1120	Công tác quốc phòng, an ninh (Introduction to the National Defense)	0(3-0-0-6)										

0 Appendix: Programme Learning Outcomes and Curricula

13	MIL1130	QS chung và chiến thuật, kỹ thuật bắn súng tiểu liên AK (CKC) (<i>General Military Education</i>)	0(3-2-0-8)																
Tiếng Anh (English)			6																
14	FL1100	Tiếng Anh I (<i>English I</i>)	3(0-6-0-6)	3															
15	FL1101	Tiếng Anh II (<i>English II</i>)	3(0-6-0-6)		3														
Khối kiến thức Toán và Khoa học cơ bản (Mathematics and basic sciences)			32																
16	MI1111	Giải tích I (<i>Calculus I</i>)	4(3-2-0-8)	4															
17	MI1121	Giải tích II (<i>Calculus II</i>)	3(2-2-0-6)		3														
18	MI1131	Giải tích III (<i>Calculus III</i>)	3(2-2-0-6)			3													
19	MI1141	Đại số (<i>Algebra</i>)	4(3-2-0-8)	4															
20	MI2020	Xác suất thống kê (<i>Probability and Statistics</i>)	3(2-2-0-6)			3													
21	PH1110	Vật lý đại cương I (<i>Physics I</i>)	3(2-1-1-6)		3														
22	PH1120	Vật lý đại cương II (<i>Physics II</i>)	3(2-1-1-6)			3													
23	IT1110	Tin học đại cương (<i>Introduction to Informatics</i>)	4(3-1-1-8)		4														
24	IT3020	Toán rời rạc (<i>Discrete Mathematics</i>)	3(3-1-0-6)			3													
25	MI3052	Nhập môn các phương pháp tối ưu	2(2-1-0-4)			2													
Cơ sở và cốt lõi ngành (Basic and Core of Engineering)			48																
26	IT2000	Nhập môn CNTT và TT (<i>Introduction to Information Technology and Communication</i>)	3(2-0-2-6)	3															
27	IT3011	Cấu trúc dữ liệu và thuật toán (<i>Data Structures and Algorithms</i>)	2(2-1-0-4)			2													
28	IT3030	Kiến trúc máy tính (<i>Computer Architecture</i>)	3(3-1-0-6)				3												
29	IT3040	Kỹ thuật lập trình (<i>Programming technique</i>)	2(2-0-1-4)					2											
30	IT3070	Nguyên lý hệ điều hành (<i>Operating systems</i>)	3(3-1-0-6)				3												
31	IT4480	Làm việc nhóm và kỹ năng giao tiếp (<i>Team work and Communication skill</i>)	2(2-1-0-4)					2											
32	IT3080	Mạng máy tính (<i>Computer Networks</i>)	3(3-0-1-6)						3										
33	IT3090	Cơ sở dữ liệu (<i>Database</i>)	3(2-1-1-6)						3										
34	IT3100	Lập trình hướng đối tượng (<i>Object Oriented Programming</i>)	2(2-1-0-4)					2											
35	IT3170	Thuật toán ứng dụng (<i>Applied Algorithms</i>)	2(2-0-1-4)							2									
36	IT3180	Nhập môn Công nghệ phần mềm (<i>Introduction to Software Engineering</i>)	3(2-2-0-6)							3									
37	IT3150	Project I	2(0-0-4-8)								2								
38	IT3160	Nhập môn Trí tuệ nhân tạo (<i>Introduction to Artificial Intelligence</i>)	3(3-1-0-6)								3								
39	IT3120	Phân tích và thiết kế hệ thống (<i>System Analysis and Design</i>)	2(2-1-0-4)									2							

0 Appendix: Programme Learning Outcomes and Curricula

40	IT4015	Nhập môn An toàn thông tin (<i>Introductory Information Security</i>)	3(3-1-0-6)							3	
41	IT3190	Nhập môn Học máy và khai phá dữ liệu (<i>Introduction to Machine Learning and Data Mining</i>)	3(3-1-0-6)							3	
42	IT3930	Project II	2(0-0-4-8)							2	
43	IT3940	Project III	3(0-0-6-12)							3	
44	IT4244	Quản trị dự án công nghệ thông tin (<i>Information Technology project administration</i>)	2(2-1-0-4)								2
Kiến thức bổ trợ xã hội (<i>Soft skills</i>)			9								
Bắt buộc (Mandatory) 3											
45	IT2030	Technical Writing and Presentation	3(2-2-0-6)								
Tự chọn (Elective)			6								
46	EM1010	Quản trị học đại cương (<i>Introduction to Management</i>)	2(2-1-0-4)								
47	EM1180	Văn hóa kinh doanh và tinh thần khởi nghiệp (<i>Business Culture and Entrepreneurship</i>)	2(2-1-0-4)								
48	ED3280	Tâm lý học ứng dụng (<i>Applied Psychology</i>)	2(1-2-0-4)								
49	ED3220	Kỹ năng mềm (<i>Soft Skills</i>)	2(1-2-0-4)								
50	ET3262	Tư duy công nghệ và thiết kế kỹ thuật (<i>Technology and Technical Design Thinking</i>)	2(1-2-0-4)								
51	TEX3123	Thiết kế mỹ thuật công nghiệp (<i>Industrial Design</i>)	2(1-2-0-4)								
Tự chọn theo định hướng ứng dụng⁽¹⁾ (<i>Elective Modules</i>)			16								
Mô đun 1: Định hướng Công nghệ phần mềm (<i>Module 1: Software Engineering</i>)											
48	IT4490	Thiết kế và xây dựng phần mềm (<i>Software Design and Construction</i>)	3(2-1-1-6)							3	
49	IT4441	Giao diện và trải nghiệm người dùng (<i>User Interface and User Experience</i>)	3(2-2-0-6)							3	
50	IT4501	Đảm bảo chất lượng phần mềm (<i>Software Quality Assurance</i>)	2(2-1-0-4)							2	
51	IT4785	Phát triển ứng dụng cho thiết bị di động (<i>Mobile Programming</i>)	2(2-1-0-4)							2	
Mô đun 2: Định hướng Hệ thống thông tin (<i>Module 2: Information System</i>)											
52	IT4350	Kiến trúc các hệ thống thông tin và ứng dụng (<i>Architecture of Information Systems and Applications</i>)	3(3-1-0-6)							3	
53	IT4611	Các hệ thống phân tán và ứng dụng (<i>Distributed systems and applications</i>)	2(2-1-0-4)							2	
54	IT4341	Hệ trợ giúp quyết định (<i>Decision support system</i>)	2(2-1-0-4)							2	
55	IT4863	Tìm kiếm thông tin (<i>Information Retrieval</i>)	3(3-1-0-6)							3	
Mô đun 3: Định hướng Phân tích dữ liệu thông minh (<i>Module 3: Intelligent data analysis</i>)											

	LO1.1: Mastering knowledge of Mathematics and basic science, mathematics for information technology for solving technical problems.
	LO1.2: Having the ability to apply fundamental knowledge of computer systems, algorithms and programming, database, design, analysis and develop software, information security, artificial and data mining, IT project management, ... in research and develop systems, products, IT solutions.
	LO1.3: Mastering and being able to apply specialized knowledge, approach the application directions on Web technologies and e-Services, information systems, Mobile Programming, Software Design and Construction.
LO2: Having professional skills and personal qualities needed to succeed in a career.	
	LO2.1: Having technical problem analysis and solving, understanding the different approaches of the technology building process, appropriate for all aspects: socio-economic, professional ethics, law, and information security.
	LO2.2: Having the ability to experiment, research and discover knowledge.
	LO2.3: Having system thinking and critical thinking.
	LO2.4: Having active, creative and serious.
	LO2.5: Having ethics and professional responsibilities.
	LO2.6: Understanding contemporary issues and lifelong studying awareness.
LO3: Having social skills needed to work effectively in multidisciplinary teams and in the international environment.	
	LO3.1: Having organizational, leadership and teamwork skills (multidisciplinary).
	LO3.2: Having effective communication skills through writing, presentation, discussion, negotiation, case management, effective use of modern tools and facilities.
	LO3.3: Having skills to use English effectively at work, meeting the minimum level of TOEIC 650.
LO4: Having the ability to design, development, implementation and maintenance of information technology systems, products and solutions in the economic, social and environmental context.	
	LO4.1: Awareness of the close relationship between information technology solutions with economic, social and environmental factors in the globalized world.
	LO4.2: Identify problems and formulate ideas of information technology solutions, participate in building information technology projects.
	LO4.3: Participate in designing information technology systems, products and solutions.

LO4.4: Participating in implementing and deploying information technology systems, products and solutions.
LO4.5: Exploiting and maintaining information technology systems, products and solutions.

The following **curriculum** is presented:

KHUNG CHƯƠNG TRÌNH CỬ NHÂN CNTT Global ICT (4 năm)													
TT #	MÃ SỐ Course ID	TÊN HỌC PHẦN Course Title	KHỐI LƯỢNG Credit	KỲ HỌC THEO KẾ HOẠCH CHUẨN Semester									
				1	2	3	4	5	6	7	8		
Lý luận chính trị +Pháp luật đại cương <i>Social sciences and Humanities</i>			13										
1	SSH1111	Triết học Mác - Lênin	3(3-0-0-6)	3									
2	SSH1121	Kinh tế chính trị Mác - Lênin	2(2-0-0-4)		2								
3	SSH1131	Chủ nghĩa xã hội khoa học	2(2-0-0-4)			2							
4	SSH1141	Lịch sử Đảng Cộng sản Việt Nam	2(2-0-0-4)				2						
5	SSH1151	Tư tưởng Hồ Chí Minh (<i>Ho Chi Minh's Thought</i>)	2(2-0-0-4)					2					
6	EM1170	Pháp luật đại cương (<i>General Law</i>)	2(2-0-0-4)		2								
Giáo dục thể chất - Physical Education			(5)										
6	PE1014	Lý luận thể dục thể thao (<i>Theory in Sport</i>)	0(0-0-2-0)	x									
7	PE1024	Bơi lội (<i>Swimming</i>)	0(0-0-2-0)		x								
8	Tự chọn (Elective)	Tự chọn thể dục 1 (<i>Elective course 1</i>)	0(0-0-2-0)			x							
9		Tự chọn thể dục 2 (<i>Elective course 2</i>)	0(0-0-2-0)				x						
10		Tự chọn thể dục 3 (<i>Elective course 3</i>)	0(0-0-2-0)					x					
GDQP - Defense and security education			(10)										
11	MIL1210	Đường lối quốc phòng và an ninh của Đảng Cộng sản Việt Nam	0(3-0-0-6)	x									
12	MIL1220	Công tác quốc phòng và an ninh	0(2-0-0-4)		x								
13	MIL1230	Quân sự chung	0(1-0-1-4)			x							

0 Appendix: Programme Learning Outcomes and Curricula

14	MIL1240	Kỹ thuật chiến đấu bộ binh và chiến thuật	0(0-0-4-8)				x						
Tiếng Anh HUST start - English			6 (25)										
15	FL1141	Practical Grammar for writing	3(1-4-0-6)	3									
16	FL1142	Communication skills 1	3(1-4-0-6)	3									
17	FL1143	Working with text 1	3(1-4-0-6)	3									
18	FL1144	Listening 1	3(2-2-0-6)		3								
19	FL1145	Speaking 1	2(1-3-0-4)		2								
20	FL1146	Reading 1	2(1-2-0-4)		2								
21	FL1147	Writing 1	3(2-2-0-6)		3								
22	FL1148	Foundation writing	2(1-2-0-4)										
23	FL1149	English communication skills 2	3(2-2-0-6)										
24	FL1150	Working with text 2	2(1-2-0-4)										
25	FL1120	IELTS Listening 1	2(2-1-0-4)										
26	FL1121	IELTS Speaking 1	1(1-1-0-4)										
27	FL1122	IELTS Reading 1	1(1-1-0-4)										
28	FL1123	IELTS Writing 1	2(2-1-0-4)										
29	FL1124	IELTS Listening 2	2(2-1-0-4)			2							
30	FL1125	IELTS Speaking 2	1(1-1-0-4)			1							
31	FL1126	IELTS Reading 2	1(1-1-0-4)			1							
32	FL1127	IELTS Writing 2	2(2-1-0-4)			2							
Toán và KH cơ bản <i>Math and Fundamental Science</i>			33										
33	MI1144E	Algebra	3(2-2-0-6)	3									
34	MI1114E	Calculus 1	3(2-2-0-6)	3									
35	MI1124E	Calculus 2	3(2-2-0-6)		3								
36	MI1134E	Derivative equations and series	3(2-2-0-6)		3								

0 Appendix: Programme Learning Outcomes and Curricula

37	MI2020E	Probability and Statistic 1	2(2-1-0-4)			2					
38	PH1110E	Physics 1	3(2-1-1-6)			3					
39	IT3420E	Electronics for Information Technology	2(2-1-0-4)				2				
40	IT2140E	Electronics for Information Technology lab	2(0-4-0-4)				2				
41	IT2110	Introduction to ICT	2(2-0-0-4)	2							
42	IT2120	Computer Literacy	2(0-4-0-4)	2							
43	IT3020E	Discrete Math	3(3-1-0-6)			3					
44	IT4110E	Scientific computing	3(3-1-0-6)				3				
45	IT4172E	Signal processing	2(2-1-0-4)						2		
Cơ sở Cốt lõi - Major core courses			49								
46	IT3210	C Programming Language	2(2-0-0-4)			2					
47	IT3220	C Programming Language Lab	2(0-4-0-4)			2					
48	IT4593E	Introduction to Communication Engineering	2(2-1-0-4)					2			
49	IT3312E	Data Structures and Algorithms	2(2-1-0-4)				2				
50	IT3230E	Data Structures and Algorithms Basic Lab	2(0-4-0-4)				2				
51	IT3170E	Applied Algorithms	2(2-0-1-4)					2			
52	IT4082E	Software Engineering	2(2-1-0-4)						2		
53	IT3070E	Operating Systems	3(3-1-0-6)					3			
54	IT3080E	Computer Networks	3(3-0-1-6)						3		
55	IT3292E	Database	2(2-0-0-4)					2			
56	IT3290E	Database Lab	2(0-4-0-4)					2			
57	IT3160E	Introduction to Artificial Intelligence	3(3-1-0-6)				3				
58	IT3100E	Object Oriented Language and Theory (Java)	3(2-1-1-6)				3				
59	IT3283E	Computer Architecture	2(2-1-0-4)					2			
60	IT3280E	Assembly Language and Computer Architecture Lab	2(0-4-0-4)					2			

0 Appendix: Programme Learning Outcomes and Curricula

61	IT4015E	Introduction to Information Security	3(3-1-0-6)								3	
62	IT5023E	Graduation Research 1	2(0-0-4-4)					2				
63	IT5024E	Graduation Research 2	2(0-0-4-4)								2	
64	IT4549E	ITSS Software Development	3(3-1-0-6)							3		
65	IT4062E	Network Programming	2(0-4-0-4)								2	
66	IT3323E	Compiler Construction	3(2-2-0-6)							3		
Kiến thức bổ trợ xã hội- Soft skills			9									
Bắt buộc (Mandatory)												
67	IT2030	Technical Writing and Presentation	3(2-2-0-6)			3						
Tự chọn (Elective) (Chọn 6 tín chỉ)			6									
68	EM1010	Quản trị học đại cương (<i>Introduction to Management</i>)	2(2-1-0-4)									
69	EM1180	Văn hóa kinh doanh và tinh thần khởi nghiệp (<i>Business Culture and Entrepreneurship</i>)	2(2-1-0-4)									
70	ED3280	Tâm lý học ứng dụng (<i>Applied Psychology</i>)	2(1-2-0-4)									
71	ED3220	Kỹ năng mềm (<i>Soft Skills</i>)	2(1-2-0-4)									
72	ET3262	Tư duy công nghệ và thiết kế kỹ thuật (<i>Technology and Technical Design Thinking</i>)	2(1-2-0-4)									
73	TEX3123	Thiết kế mỹ thuật công nghiệp (<i>Industrial Design</i>)	2(1-2-0-4)									
Tự chọn theo định hướng- Elective course			15									
Module 1- Trí tuệ nhân tạo và Dữ liệu lớn <i>Module 1- AI and Big Data</i>			15									
74	IT4409E	Web technologies and e- Services	3(2-2-0-6)							3		
75	IT4785E	Mobile Programming	2(2-1-0-4)								2	
76	IT4542E	Management of Software Development	2(2-0-0-4)								2	
77	IT4142E	Introduction to Data Science	2(2-1-0-4)								2	
78	IT3191E	Machine Learning and Data Mining	3(3-1-0-6)							3		
79	IT4441E	User Interface and User Experience	3(2-2-0-6)								3	

0 Appendix: Programme Learning Outcomes and Curricula

Module 2- IoT thông minh <i>Module 2- AIoT</i>			15									
80	IT4409E	Web technologies and e- Services	3(2-2-0-6)						3			
81	IT4785E	Mobile Programming	2(2-1-0-4)							2		
82	IT4542E	Management of Software Development	2(2-0-0-4)							2		
83	IT4210E	Embedded Systems	3(3-0-1-6)						3			
84	IT4735E	IoT and Applications	2(2-1-0-4)							2		
85	IT4651E	IP Network Design and Implementation	3(2-0-2-6)							3		
Thực tập kỹ thuật và Đồ án tốt nghiệp Cử nhân <i>Engineering Internship and Bachelor Thesis</i>			8									
86	IT4948	ITSS Internship	2(0-0-4-4)						2			
87	IT4125E	Bachelor Thesis	6(0-0-12-12)									6
Total credits - Tổng số tín chỉ			133	22	20	23	19	19	27	25	6	

According to the Self-assessment report the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Talent of Science in Computer Science.

General objectives:

- Training high-level bachelors who can participate in the process of creating knowledge, new products serving society and the country.

- Training high-level bachelors who can apply fluently fundamental and professional knowledge, having professional practice skills, and having creative ability to participate in solving problems related to Computer Science, adapting to the working environment, able to self-study to adapt with the continuous development of science and technology

Specific Goals

- Solid fundamental knowledge on mathematics, physics, electronics, algorithms, databases; analyzing and designing systems; analyzing, designing and implementing software; programming techniques and skills; organizing, managing and exploiting data, information, and knowledge.
- Ability to apply professional knowledge to solve research and practical issues.
- Having professional and personal skills, professionalism, management skills, social knowledge as well as different approaches and problem solving to adapt with different aspects of society.
- Having skills in organization, leadership and teamwork; effective communication and English skills to work in a multi-disciplinary and international environment.
- Ability to create ideas, participate in analysis, design, implementation and operation of IT systems in practice.

Programme Learning Outcomes:

LO1: Having a solid professional knowledge to adapt to various jobs in the wide field of Computer Science, be able to participate in designing and building software systems and products.	
	LO1.1: Mastering knowledges of mathematics and basic science, math for information technology to solve technical problems.
	LO1.2: Ability to apply fundamental knowledges computer systems, algorithm and programming, database, design, analysis and develop software, information security, artificial and data mining, IT project management, ... in research and develop systems, products, IT solutions.
	LO1.3: Mastering and being able to apply specialized knowledge, approach the application directions on software technology, information systems, intelligent data analysis in developing IT systems, products and technical solutions.
LO2: Having professional skills and personal qualities needed to succeed in careers.	

	LO2.1: Technical problem analysis and solving, understanding the different approaches of the technology building process, appropriate for all aspects: socio-economic, professional ethics, law and information security.
	LO2.2: Having ability to experiment, research and discover knowledge.
	LO2.3: Having system thinking and critical thinking.
	LO2.4: Having active, creative and serious.
	LO2.5: Having ethics and professional responsibilities.
	LO2.6: Understanding contemporary issues and lifelong studying awareness.
LO3: Having social skills needed to work effectively in multidisciplinary teams and in the international environment.	
	LO3.1: Having organizational, leadership and teamwork skills (multidisciplinary).
	LO3.2: Having effective communication skills through writing, presentation, discussion, negotiation, case management, effective use of modern tools and facilities.
	LO3.3: Having skills to use English effectively at work, meeting the minimum level of TOEIC 500.
LO4: Having the ability to design, development, implementation and maintenance of information technology systems, products and solutions in the economic, social and environmental context.	
	LO4.1: Awareness of the close relationship between information technology solutions with economic, social and environmental factors in the globalized world.
	LO4.2: Identify problems and formulate ideas of information technology solutions, participate in building information technology projects.
	LO4.3: Participate in designing information technology systems, products and solutions.
	LO4.4: Participating in implementing and deploying information technology systems, products and solutions.
	LO4.5: Exploiting and maintaining information technology systems, products and solutions.

The following curriculum is presented:

TT	MÃ SỐ	TÊN HỌC PHẦN	KHỐI LƯỢNG (TC)	KỶ HỌC THEO KẾ HOẠCH CHUẨN									
				1	2	3	4	5	6	7	8		
Lý luận chính trị + Pháp luật đại cương			12										
1	SSH1110	Những NLCB của CN Mác-Lênin I	2(2-1-0-4)	2									
2	SSH1120	Những NLCB của CN Mác-Lênin II	3(2-1-0-6)		3								
3	SSH1050	Tư tưởng Hồ Chí Minh	2(2-0-0-4)			2							
4	SSH1130	Đường lối CM của Đảng CSVN	3(2-1-0-6)				3						
5	EM1170	Pháp luật đại cương	2(2-0-0-4)	2									
Giáo dục thể chất (5TC)													
6	PE1014	Lý luận thể dục thể thao	1(0-0-2-0)										
7	PE1024	Bơi lội	1(0-0-2-0)										
8	Tự chọn trong danh mục	Tự chọn thể dục	1(0-0-2-0)										
9		Tự chọn thể dục 2	1(0-0-2-0)										
10		Tự chọn thể dục 3	1(0-0-2-0)										
Giáo dục Quốc phòng - An ninh (165 tiết)													
11	MIL1110	Đường lối quân sự của Đảng	0(3-0-0-6)										
12	MIL1120	Công tác quốc phòng, an ninh	0(3-0-0-6)										
13	MIL1130	QS chung và chiến thuật, kỹ thuật bắn súng tiểu liên AK (CKC)	0(3-2-0-8)										
Tiếng Anh													
14	FL1100	Tiếng Anh I (<i>English I</i>)	3(0-6-0-6)	3									
15	FL1101	Tiếng Anh II (<i>English II</i>)	3(0-6-0-6)		3								
Khối kiến thức Toán và Khoa học cơ bản			35										
16	MI1111	Giải tích I	4(3-2-0-8)	4									
17	MI1121	Giải tích II	3(2-2-0-6)		3								
18	MI1131	Giải tích III	3(2-2-0-6)			3							
19	MI1141	Đại số	4(3-2-0-8)	4									
20	MI2020	Xác suất thống kê	3(2-2-0-6)			3							
21	PH1110	Vật lý đại cương I	3(2-1-1-6)		3								
22	PH1120	Vật lý đại cương II	3(2-1-1-6)			3							
23	IT1110	Tin học đại cương	4(3-1-1-8)		4								
24	IT3020	Toán rời rạc	3(3-1-0-6)			3							
25	MI3052	Nhập môn các phương pháp tối ưu	2(2-1-0-4)			2							

0 Appendix: Programme Learning Outcomes and Curricula

Cơ sở và cốt lõi ngành			48								
26	IT2000	Nhập môn CNTT và TT	3(2-0-2-6)	3							
27	IT3011	Cấu trúc dữ liệu và thuật toán	2(2-1-0-4)				2				
28	IT3030	Kiến trúc máy tính	3(3-1-0-6)				3				
29	IT3040	Kỹ thuật lập trình	2(2-0-1-4)					2			
30	IT3070	Nguyên lý hệ điều hành	3(3-1-0-6)				3				
31	IT3080	Mạng máy tính	3(3-0-1-6)					3			
32	IT3090	Cơ sở dữ liệu	3(2-1-1-6)					3			
33	IT3100	Lập trình hướng đối tượng	2(2-1-0-4)				2				
34	IT3170	Thuật toán ứng dụng	2(2-1-0-4)					2			
35	IT3180	Nhập môn công nghệ phần mềm	3(2-2-0-6)					3			
36	IT3150	Project I	2(0-0-4-8)					2			
37	IT3160	Nhập môn Trí tuệ nhân tạo	3(3-1-0-6)					3			
38	IT3120	Phân tích và thiết kế hệ thống	2(2-1-0-4)						2		
39	IT4015	Nhập môn An toàn thông tin	3(3-1-0-6)						3		
40	IT3190	Nhập môn Học máy và khai phá dữ liệu	3(3-1-0-6)						3		
41	IT4593	Nhập môn kỹ thuật truyền thông	2(2-1-0-4)						2		
42	IT4172	Xử lý tín hiệu	2(2-1-0-4)						2		
43	IT3930	Project II	2(0-0-4-8)						2		
44	IT3940	Project III	3(0-0-6-12)							3	
Kiến thức bổ trợ xã hội			9								
	Bắt buộc		3								
45	IT2030	Technical Writing and Presentation	3(2-2-0-6)								
	Tự chọn		6								
46	EM1010	Quản trị học đại cương	2(1-2-0-4)								
47	EM1180	Văn hóa kinh doanh và tinh thần khởi nghiệp	2(1-2-0-4)								
48	ED3280	Tâm lý học ứng dụng	2(1-2-0-4)								
49	ED3220	Kỹ năng mềm	2(1-2-0-4)								
50	ET3262	Tư duy công nghệ và thiết kế kỹ thuật	2(1-2-0-4)								
51	TEX3123	Thiết kế mỹ thuật công nghiệp	2(1-2-0-4)								
Kiến thức chuyên ngành			16								
52	IT4931	Lưu trữ và xử lý dữ liệu lớn	3(3-1-0-6)							3	
53	IT4653	Học sâu và ứng dụng	2(2-1-0-4)							2	
54	IT4490	Thiết kế và xây dựng phần mềm	3(2-1-1-6)							3	

0 Appendix: Programme Learning Outcomes and Curricula

55	IT4663	Tối ưu và lập kế hoạch	3(3-1-0-6)								3	
56	IT4210	Hệ nhúng	3(3-0-1-6)								3	
57	IT4735	IoT và ứng dụng	2(2-1-0-4)								2	
Thực tập kỹ thuật và Đồ án tốt nghiệp Cử nhân			8									
58	IT4991	Thực tập kỹ thuật	2(0-0-4-4)							2		
59	IT4995	Đồ án tốt nghiệp	6(0-0-12-12)									6
CỘNG:					15	13	19	13	18	16	19	6