

## **ASIIN Seal**

## **Accreditation Report**

Bachelor's Degree Programmes Computer Science

Master's Degree Programmes Computer Science

Provided by Ton Duc Thang University

Version: 6<sup>th</sup> December 2024

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## **A** About the Accreditation Process

Name of the degree programme (in original language)	(Official) Eng- lish transla- tion of the name	Labels applied for	Previous accredita- tion (issu- ing agency, validity)	Involved Technical Commit- tees (TC) <sup>2</sup>	
Cử nhân Khoa học máy tính	Bachelor's De- gree in Com- puter Science	ASIIN	/	04	
Thạc sĩ Khoa học máy tính	Master's De- gree in Com- puter Science	ASIIN	/	04	
Date of the contract: 05.09.2022					
Submission of the final version of th	e self-assessmen	t report: 27.03.2023			
Date of the onsite visit: 2223.05.20	)23				
at: Ton Duc Thang University, Ho Chi	Minh City				
Peer panel:					
Prof. Dr. Paul Grimm, Hochschule Da	rmstadt Universit	y of Applied Science	S		
Quang Duc Nguyen, student from U sity, Ho Chi Minh City	niversity of Techn	ology – Vietnam Na	tional Univer-		
Thien Nguyen, SGH-Asia, Head of Sof	tware Developm	ent			
Prof. Dr. Carsten Vogt, Cologne University of Applied Sciences					
Representative of the ASIIN headquarter: David Witt					
Responsible decision-making comm grammes	n <b>ittee:</b> Accreditat	ion Commission for	Degree Pro-		

<sup>&</sup>lt;sup>1</sup> ASIIN Seal for degree programmes

<sup>&</sup>lt;sup>2</sup> TC: Technical Committee for the following subject areas: TC 04 – Informatics/Computer Science.

#### Criteria used:

European Standards and Guidelines as of May 15, 2015

ASIIN General Criteria, as of December 07, 2021

Subject-Specific Criteria Technical Committee 04 – Informatics/Computer Science as of March 29, 2018

## **B** Characteristics of the Degree Programmes

a) Name	Final degree (origi- nal/English translation)	b) Areas of Specializa- tion	c) Corre- sponding level of the EQF <sup>3</sup>	d) Mode of Study	e) Dou- ble/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Computer Science	Cử nhân/ Bachelor		6	Full time	/	8 Semester	220 ECTS/144 CPs	Annually/2012
Computer Science	Thạc sĩ/ Mas- ter	<ul> <li>Data Sci- ence</li> <li>Computer</li> <li>Networks &amp;</li> <li>Data Com- munication</li> </ul>	7	Full time	/	4 Semester	91 ECTS/60 CPs	Annually/2014

For the <u>Bachelor's degree programme Computer Science</u> the institution has presented the following profile on their website:

"The branch of Computer Science (CS) at Faculty of Information Technology, Ton Duc Thang University has trained Bachelor of computer science with theoretical knowledge and computational techniques as the foundation for the design and development of computer software systems. Students can study the basic and advanced knowledge about CS, then they can select one of two majors: Information Systems or Intelligent Computing.

For background knowledge, students study algebraic and analytical mathematics, statistical probability applications in IT; study programming languages; study problem analysis and data structures as well as algorithms; study basic concepts and techniques in networking and computer communications, databases, software engineering; they also can practice at a company. Students also study English language, the knowledge of human society and soft skills is the common knowledge foundation of TDTU students.

Students are also trained to develop teamwork skills, self-study skills, professional qualities in a career, and ethical qualities in life as well as social devotion.

After graduation, students have a solid foundation of knowledge and ability of self-study and scientific research to continue to study and research at a higher level. Graduates can

<sup>&</sup>lt;sup>3</sup> EQF = The European Qualifications Framework for lifelong learning

work as programmers for software development; system design analysis; system management; development of intelligent software systems. Students are able to work not only for Vietnamese companies but also for international companies in Vietnam or abroad."

For the <u>Master's degree programme Computer Science</u> the institution has presented the following profile on their website:

"The Master of Science (M.Sc.) in Computer Science is an advanced training program that meets the demand for highly qualified human resources in dynamic and constantly developing economies, when computer science has become an indispensable tool for almost all occupations in socio-economic life. [...]

- The training program is designed to ensure the students have theoretical knowledge and the ability to apply the knowledge learned to the practical problems for the trainees. Students are able to develop applications that solve practical issues in the areas of technical production, economics, social sciences and biomedical sciences.
- Teaching staff are experienced lecturers working in the field of computer science, most of them graduated from famous universities abroad. Along with the modern American standard, namely the computer science program of Stanford University, the program is constantly updated to meet the actual needs in Vietnam.
- Ton Duc Thang University's Master of Science (M.Sc.) degree program offers the opportunity to access the most modern and advanced knowledge in the world; At the same time, students are taught in a new motif, creating new sources of inspiration and new approaches for participants in the training program.
- Special information: After excellent graduating of Computer Science from Ton Duc Thang University, students are given priority in examining the transfer of doctoral degree in some European countries."

## **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
- Diploma Supplements
- Websites of all study programmes
- Discussion during the audit
- Objective-module-matrix per programme

#### Preliminary assessment and analysis of the peers:

The experts base their assessment of the learning outcomes on the information provided in the module descriptions, on the websites, the Diploma Supplements, the objective-module-matrices and in the Self-Assessment Report of the <u>two degree programmes</u> under review. For both programmes, TDTU has described programme objectives (POs) as well as programme learning outcomes (PLOs). The PEO and PLO are published on the programme's website. and easily accessible for students as well as other stakeholders. Furthermore, there are regular revision processes in place that take into account feedback by external and internal stakeholders.

The experts refer to the Subject-Specific Criteria (SSC) of the Technical Committee Informatics/Computer Science and use the objective-module-matrix and the module descriptions as a basis for judging whether the intended learning outcomes correspond with the competences as outlined by the SSC.

The experts 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,

TDTU 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 TDTU members (students, teaching staff, and non-academic employees), while the external stakeholders include the industry, alumni, the government, and society.

For the <u>Bachelor's degree in Computer Science</u>, TDTU defines the following programme objectives:

- "B-PO1: Graduates have basic knowledge of the natural sciences, social sciences and humanities, politics; have foreign language skills and soft skills for work.
- B-PO2: Graduates master both theoretical and practical knowledge, are capable of solving practical requirements in the IT field, are capable of coming up with ideas, solutions, and building scientific and effective IT applications.
- B-PO3: Graduates have the capacity to self-study, self-study for professional development and can continue their studies at a higher level; have a sense and entrepreneurial spirit in the IT field.
- B-PO4: Graduates have a professional working style, have skills and working style according to international standards, comply with the law, have responsibility and ethics at work, have a spirit of desire to learn and learn for life."

For the <u>Bachelor's degree in Computer Science</u>, TDTU defines the following programme learning objectives:

- "B-PLO1: Have basic knowledge of the natural sciences, social sciences and humanities, politics; have foreign language skills and soft skills for the job.
- B-PLO2: Apply the knowledge of IT and computer science to practical economic and social problems in the domestic and global environment.
- B-PLO3: Explain the operation of IT systems, especially information system management software systems as well as software systems applying artificial intelligence.
- B-PLO4: Evaluate the processes of software construction and development, including analysis, modeling, design, installation, testing, deployment, operation, maintenance, and system security.
- B-PLO5: Apply algorithms and computational models in the IT field.
- B-PLO6: Solve problems related to software, computer, and information systems.
- B-PLO7: Develop IT application software, especially problems of building information management and analysis systems, problems of artificial intelligence application to meet the actual needs of society.
- B-PLO8: Creativity in approach, model selection, solution design to solve problems in the field of Computer Science in a scientific, highly effective way.

- B-PLO9: Develop logical and critical thinking, communication skills, teamwork skills, and health skills to solve real-world problems effectively and creatively.
- B-PLO10: Develop the ability to self-study, self-research, update and apply new technologies in coming up with solutions for IT systems.
- B-PLO11: Create valuable IT application products that contribute to the scientific and technical development of the country.
- B-PLO12: Adhere to professional ethics, honesty, progressive spirit, inquisitiveness, always self-research to continue to improve professional skills in the spirit of respect for domestic and international laws."

TDTU states that graduates of this study programme are capable of working in several areas as data analysis, virtual physical systems, robots and self-operating systems, machine learning, artificial intelligence. Graduates shall also have "a strong knowledge base and scientific research ability to be able to continue studying and researching at higher education level."

For the <u>Master's degree in Computer Science</u>, TDTU defines the following programme objectives:

- "M-PO1: Graduates will demonstrate professional competency and leadership to become computer science experts leading to a successful career
- M-PO2: Graduates will pursue lifelong learning in generating innovative IT solutions using research and complex problem-solving skills
- M-PO3: Graduates will demonstrate commitment towards sustainable development of digital society and global citizens."

For the <u>Master's degree in Computer Science</u>, TDTU defines the following programme learning objectives:

- "M-PLO1: Apply knowledge of mathematics, science, computer science fundamentals and specialization to the solutions of complex IT-related problems;
- M-PLO2: Demonstrate the ability to identify, formulate, conduct research literature, analyze and design complex IT-related problems using principles of mathematics, natural sciences and computer sciences. M-PLO3: Select appropriate solutions for complex IT-related problems and systems, models or processes that meet specified needs, especially in the AI field;
- M-PLO4: Conduct investigation of complex problems using research-based knowledge and research methods to provide valid conclusions;
- M-PLO5: Engage in independent and life-long learning in a broad context of technological change in practice;

- M-PLO6: Empirically evaluate IT systems using systematic procedures and to apply current adequate methods, as well as to evaluate interdisciplinary systems or, in new operating contexts.
- M-PLO7: Demonstrate ability to communicate effectively on professional activities with the community and with society at large; as an individual, a member or a leader in diverse teams and in multidisciplinary settings."

TDTU states that graduates of this study programme are capable of working in several professions, especially as computer science specialists, software experts in non-business units, state agencies, and domestic or international enterprises, teacher, researcher or be capable of establishing a new company or label.

In the experts' opinion, the intended qualification profiles of both degree programmes are clear, plausible and allow students to take up an occupation, which corresponds to their qualification. They learn that the graduates of TDTU are much sought after in the labour market. The representatives of industry emphasize the high quality of the graduates of both programmes under review and students as well as graduates are satisfied with and well aware of their good job perspectives.

During the on-site visit, the experts are presented with written examinations and final theses to check the achievement of the programmes' learning objectives. The experts conclude that these exams and theses corresponds to the EQF 6 level, respectively EQF-7 level. Therefore, the experts are convinced that the intended learning objectives are adequately achieved.

In summary, the experts confirm that the degree programmes adequately reflect level 6 and level 7 of the European Qualification Framework (EQF). The programme learning outcomes of both programmes are consistent with the respective ASIIN Subject-Specific Criteria of the Technical Committees of Informatics/Computer Science. They aim at the acquisition of specific competences and are well-anchored, binding and easily accessible to all stakeholders.

#### Criterion 1.2 Name of the degree programme

#### Evidence:

- Self-Assessment Report
- Diploma Supplements

#### Preliminary assessment and analysis of the peers:

The experts confirm that the English translation and the original Vietnamese names of the Bachelor's and Master's degree programmes correspond with the intended aims and learning outcomes as well as the content of the respective degree programme.

#### Criterion 1.3 Curriculum

#### Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Webpage TDTU
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

The curricula of the <u>two degree programmes</u> are designed to comply with the programme objectives and learning outcomes and they are subject to constant revision processes (cf. chapter 1.1). As such, the curricula are reviewed regularly and commented on by students and teachers as well as by external stakeholders such as alumni or partners from government and the private sector. Regular changes are made to ensure that the curricula are up to modern standards (every two or four years). In the Self-Assessment Report and the curriculum for each programme, TDTU describes how the POs and PLOs of each programme are to be achieved in the individual modules and thus explains the significance of each module for the programme as a whole. The curricula are reviewed by the experts in order to identify whether the described learning objectives can be achieved by the available modules. Course descriptions as well as matrices matching the general learning objectives and the module contents were provided for a detailed analysis.

The curriculum of the <u>Bachelor's degree programme Computer Science</u> under review is structured for eight semesters and 144 Vietnamese Credits (equivalent to 220 ECTS) need to be achieved by the students. The <u>Master's degree programme Computer Science</u> has a

duration of four semesters and 60 Vietnamese Credits (equivalent to 91 ECTS) need to be achieved.

The <u>Bachelor's degree programme Computer Science</u> consists of 58 modules without the graduation thesis or 56 modules including the graduation thesis which are divided into the categories: General knowledge (including Politics, Natural sciences, Social sciences, Informatics, English, Support skills), Fundamental knowledge of Computer Science, Specialized knowledge of Computer Science, and Professional and Graduation. The following figure illustrates this structure of the Bachelor's degree programme and shows the corresponding subjects to each knowledge block:



"The fundamental knowledge group includes [...] the compulsory subjects of 41 credits for programming, data structure and algorithms, computer operating systems, database systems, and computer networks." Since the programme focusses on the subjects of Artificial

Intelligence and Machine Learning, these courses are included in the fundamental knowledge block. "The third group is about specialized knowledge, subjects are electives which belong to different directions. They include specific AI domains (natural language processing, speech processing, computer vision, business intelligent systems); information systems development (web programming, mobile programming, distributed databases, administration of information systems), Information security and networking (cryptography and information security, network security, cloud computing) and some other advanced subjects for algorithm analysis, machine learning and knowledge based systems. Students can choose their favorite subjects and career-oriented subjects for them later, or subjects to support further study at the master's and doctoral levels. The students are required to choose 21 credits that are equivalent to 7 subjects among listed subjects." In the seventh and eighth semester, students have to take the courses "Information Technology Project", "Industrial Experience Requirement", "Graduation Internship", and "Professional Skill Exam". Furthermore, in the seventh semester, students can choose to write a graduation thesis or take three so-called "graduation elective courses". This option, however, is in conflict with the ASIIN criteria, as they require a final thesis, a final project or an equivalent examination to complete a degree programme. Students who do not write the thesis are required to take the "Information Technology Project", but the programme coordinators explain during the discussion rounds that this project is done at a lower level than the Graduation Thesis. Therefore, the experts argue that the higher education institution must introduce a graduation work corresponding to EQF-Level 6 as a compulsory component of the degree programme.

The experts positively highlight the wide variety of electives. However, they want to know during the discussion rounds whether there is assistance for students to find their way through this selection. The programme coordinators explain that there are advisors and teachers who help the students to choose corresponding courses. This was also confirmed by the students. However, the experts recommend to provide the students with a curricular roadmap that shows different specialization paths and publish this on the Faculty's website so that students get an overview of the various courses and different specializations paths right from the beginning of their studies.

In the discussion round with industry representatives and alumni, the experts especially wanted to get an assessment of the graduates' qualifications and to hear about potential room for improvements. In general, the industry as well as the alumni are very satisfied with the study programme and the skills of the graduates. However, one key suggestion from these groups is to incorporate a project that involves a variety of tasks, with students assuming different roles such as developer, tester, and project manager. This collaborative project would not only provide students with valuable practical experience but also ensure

they are well-rounded professionals, ready to contribute effectively in diverse job roles within the industry. Therefore, the experts recommend including such a project where students are able to play different roles, e.g. as developer, tester, or project manager.

Furthermore, the experts argue for the inclusion of Software Engineering as a core component in the curriculum, rather than just an elective course. They are of the opinion that the students should participate in such a course as part of their foundational education. In response, the program coordinators point out that there is a separate programme at the University dedicated to Software Engineering that students can choose if they are more interested in this subject. However, the experts insist that even within broader academic programs, a fundamental understanding of software engineering principles and practices should be mandatory. They believe this would better prepare graduates to meet the requirements of the job market, even if they are not pursuing a specialized Software Engineering degree.

Overall, the experts are satisfied with the curricular structure of the Bachelor's degree programme. They see that the programme is well structured and that the modules build on each other in a reasonable way, enabling the students to effectively reach the learning outcomes as laid down for the programme as a whole. However, they point out that the option to choose three elective courses instead of the graduation project does not meet ASIIN criteria.

The <u>Master's degree programme in Computer Science</u> consists of 14 modules and is completely taught in English. There are only five mandatory courses: The three "General Courses" "English", "Philosophy", and "Research Methodology" which can be taken in each semester and the courses "Machine Learning" and "Randomized Algorithms and Probabilistic Analysis" which both take place in the first semester. Apart from that, students have to take a total of eight elective courses in the first and second semester. These courses can be divides into the two areas "Data Science" and "Computer Networks & Data Communication". In the last semester, students are expected to write a Master's Thesis.

The following figure illustrates this structure of the Master's degree programme and shows the corresponding subjects to each knowledge block:



The expert group is very convinced of the structuring of the submitted curriculum and the corresponding content level of the Master's degree programme in Computer Science. This is also confirmed by the satisfaction of the various stakeholders, which is evident in the different discussion rounds with students, alumni, industry representatives and teachers.

In summary, the experts gain the impression that the content and the structure of the curriculum ensure that the intended learning outcomes of the degree programme can be achieved and that the students are well prepared for entering the labour market and can find adequate jobs or for further academic careers.

#### **Criterion 1.4 Admission requirements**

#### **Evidence:**

- Admission Regulations
- Webpage TDTU
- Self-Assessment Report
- Discussion during the audit

#### Preliminary assessment and analysis of the peers:

According to the Self-Assessment Report, there are five different paths of admission into <u>undergraduate (Bachelor's degree) programmes</u>. The minimum requirement for all five methods is that the candidates have graduated from high school "or equivalent according to the provisions of Article 5 of the Regulations on University Admission and Admission to preschool education college-level programs issued together with the Circular No. 09/2020/TT-BGDDT dated May 7, 2020 of the Minister of MOET." These methods include:

#### "Method 1: Admission based on the high school results

The first method is applied to those who have finished their high school programme in the recent year. It is divided into 2 bookings: the first one for TDTU allied high schools or from high schools in the TDTU allied provinces, and the second one for the others.

#### Method 2: Admission based on the high school graduation exam results

The second method is applied to those who have officially graduated from high school after taking graduation exam

#### Method 3: Priority admission according to TDTU's regulations

The third method is for candidates from specialised high schools across the country or some key schools in Ho Chi Minh City; candidates with an international English certificate; candidates graduating from high school abroad; candidates studying international programmes at international schools in Vietnam; candidates with SAT, A-Level, IB, ACT certificates. Except for the first case, the others are used to guarantee the English requirement of high quality and joint programs.

#### Method 4: Direct admission, priority admissions according to the Admission Regulation of the MOET

The fourth method follows the government's regulations to support minor communities, and encourage excellent persons.

#### Method 5: Admission is based on the results of the competency assessment test of Ho Chi Minh City's Vietnam National University

The last method is based on another prestigious test's result."

In its Self-Assessment Report, TDTU states the admission requirements for the <u>Master's</u> <u>degree programme in Computer Science</u> as follows:

- "Having an undergraduate degree in computer science or in other majors whose undergraduate curriculum is different from the undergraduate computer science programme of TDTU by less than 10% of the total number of periods (or units of study, or credits) of the specialized knowledge.
- Having an undergraduate degree in a major that is relevant to computer science, including: Computer Science, Computer networks and data communication, Software engineering, Information system, Computer Engineering, Computer engineering technology, Information technology, Information Security; or majors not mentioned above but having a curriculum that is only different from the undergraduate computer science programme of TDTU by 10% - 40% of the total number of periods (or unit of study or credits) of the specialized knowledge.
- Regarding foreign language requirements: Applicants must have an English certificate equivalent to level 3/6 of the 6-level foreign language competency framework of Vietnam; or have one of the following international English certificates: IELTS 4.5, TOEFL iBT 45, TOEIC 500 within the 24-month validity period until the date of application submission;
- Having a clear personal record, not in the period of disciplinary action from warning level or higher and not in the time of criminal judgment execution (certified by the human resources department at their workplace or the local government where they reside)"

In the discussions during the audit, the representatives of the rector's office explain that students have to pay tuition fees of around 1000€ per year. However, they also explain that students coming from abroad do not have to pay tuition fees in order to increase the number of international incomings. Furthermore, TDTU provides "scholarships for students from the schools that have signed MOU with TDTU" as well as for students "with outstand-ing performance in both academia and extra-curricular results". In addition, students "with difficult circumstances will get financial support from the University. The Faculty also provides support for study abroad programmes with scholarships from cooperated international universities."

In summary, the experts 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:

#### Criterion 1.3:

Regarding the need of a mandatory final thesis or equivalent work, TDTU provides the following statement: "Finally, we deeply appreciate the experts' efforts to inform us about a conflict between our programme and ASIIN criteria, as they require a final thesis, a final project or and an equivalent examination. We will address this matter by mandating all students to under-take a graduation project (thesis)." The Experts welcome TDTU's plans. However, as no measurements have been taken yet, they agree to maintain the requirement.

Regarding the recommendation to provide a curricular roadmap, TDTU clarifies that such an overview already exists and provides a corresponding link. The experts are thankful for the clarification and are therefore in favour of deleting the recommendation.

Regarding the recommendation to include a mandatory Software Engineering module, TDTU states that they want to introduce such a course. The experts support this and want to adhere to the recommendation until this practice is actually reflected in the curriculum.

TDTU states, "in [their] project-type courses, students are required to undertake various roles such as developer, tester, or business analyst (BA), even though these role terms are not explicitly mentioned in the module descriptions." However, they also state that they intend to adapt the module handbooks accordingly. The experts support this and want to adhere to the recommendation until this practice is actually reflected in the module descriptions.

The experts consider criterion 1 to be partly fulfilled.

## 2. The degree programme: structures, methods and implementation

#### **Criterion 2.1 Structure and modules**

#### Evidence:

- Self-Assessment Report
- Study plan
- Module descriptions
- Academic Handbook
- Regulation on the Bachelor's Admission and Training
- Regulation on the Master's Admission and Training
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

The curriculum of the Bachelor's degree programme is designed for eight semesters. The Master's degree programme has a length of four semesters. "For undergraduates, students can extend their studies up to 7 years, and for graduate students it is 4 years."

In the <u>Bachelor's programme</u> the curriculum is divided into four categories: general knowledge/skills, fundamental knowledge in Computer Science, specialized knowledge in Computer Science, and courses to prepare for graduation like graduation thesis (or three graduation elective courses) and internship. The first years focus on the general and fundamental modules whereas in the higher academic years, students advance their skills and knowledge in their specialized field and complete their internship and their graduation project or choose three graduation elective courses instead of the thesis. In the <u>Bachelor's programme Computer Science</u>, students can take seven electives courses equivalent to 21 credits. In the third academic year, students are required to complete an internship (4 credits, 240 hours) at a company of their choice. The performance of the students is co-evaluated by the industrial supervisor and a lecturer of the faculty.

The <u>Master's programme</u> is structured similarly to the Bachelor's programme. Here, the curricula are divided into three categories as well: general knowledge (English, philosophy, and research methodology) (15 credits), core and specialized knowledge (30 Credits), and the Master thesis (15 credits). By choosing a certain group of courses, students can form a specialization in "Data Science" or in "Computer Networks & Data Communication".

The experts note that the degree programmes are divided into modules and that each module is a sum of teaching and learning whose contents are concerted. They gain the impression that the choice of modules and the structure of the curriculum ensure that the intended learning outcomes of the respective degree programme can be achieved. The internship is well embedded in the Bachelor's degree programme and contribute to the achievement of the learning outcomes.

#### International Mobility

Study achievements acquired abroad are recognised at TDTU in accordance with the "Regulations for Admission and Training for Bachelor's and Master's Studies". Recognition takes place by applying for recognition to the management of the respective study programme. Students who wish to study abroad may receive a scholarship and financial support if they meet certain requirements in terms of academic merit and social contribution.

TDTU has a number of partner universities abroad. In particular, the Faculty of Information Technology cooperates for the Computer Science programmes with Ulsan University (Korea), KDU Penang University College (Malaysia), Technical University of Ostrava (Czech Republic), and La Trobe University (Australia).

Furthermore, the Teaching staff is also encouraged to participate in academic exchange opportunities. During the discussion rounds, the teachers confirm that they are encouraged to go abroad in order to gain international experience and to further develop their (professional) competences. The university also supports teachers in obtaining a higher degree (e.g. PhD) abroad.

Overall, however, the experts note that the number of students and teaching staff going abroad is rather small. One main explanation for the student numbers is that there are quite strict regulations for the recognition of externally earned credits. For example, mostly only courses that are largely identical to the actual courses at TDTU are recognised. Students and lecturers describe that it can therefore sometimes be difficult to find universities that offer equivalent courses. The experts therefore recommend becoming more flexible in recognising competences acquired at other universities in order to improve opportunities for student mobility.

#### Criterion 2.2 Work load and credits

#### **Evidence:**

- Self-Assessment Report
- Module Handbooks for all degree programmes
- Curricula for all degree programmes
- Academic regulations according to credit institutions
- Guidance document on how to convert Vietnamese credit system to European credit transfer system
- Student and graduate survey forms and results
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

According to the legal requirements, the total credit load is 144 Vietnamese credits (equivalent to 220 ECTS) for the <u>Bachelor's degree programme Computer Science</u>, and 60 Vietnamese credits (equivalent to 91 ECTS) for the <u>Master's degree programme Computer Science</u>. 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 both degree programmes, students need to take at least 10 credits and maximum up to 40 credits in one semester. The workload of the last two semesters in the <u>Bachelor's degree programme</u> and the workload of the last semester in the <u>Master's degree programme</u> are 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 or 4 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, in the project work and the thesis it is equivalent to 30 periods. One period lasts for 50 minutes. The workload calculation is depicted in the following table:

Course type	In-class periods	Self-study peri- ods	Total study peri- ods
Theoretical lecture	15	30	45
Practice, experiment or discus- sion	30	30	60

Course type	In-class periods	Self-study peri- ods	Total study peri- ods
Internship	-	-	30
Project, graduation project	-	-	30

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 1.42 and for practical work 1.83.

However, the module descriptions mention a different workload. For example, the module descriptions for "Applied Calculus for IT" mention a total workload of 195 hours (45 hours contact time, 30 hours exercises, 120hours self-study) and 4 Vietnamese credits (6,08 ECTS) are awarded, while 4 Vietnamese credits would mean 150 hours (4 x 37.5) and 6,08 ECTS would require 182,4hours. Therefore, the experts underline that the workload and credit calculation is faulty and inconsistent in several ways. The experts 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. TDTU must 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 experts 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 experts suggest asking the students directly about their experiences. This could be done by including respective questions in the course questionnaires. The experts point out that the faculty 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.

As the statistical data provided by TDTU shows, the average length of study was 4,5 years in the <u>Bachelor's degree programme</u> and 2 years in the <u>Master's degree programme</u> in the last 3 years. According to the SAR, this is due to all the written examinations and also due to the fact that they have research and a final thesis or work next to studying. Moreover, for the Bachelor's degree programmes, the lack of English certificates (which are one of the PLOs of the programmes) are a common issue. Therefore, the faculty puts a lot of effort into motivating the graduating students to take the English proficient certification in advance to meet the requirement. In addition, other co-curricular or extra-curricular programs have been organized to help students improve their English skills, especially English for their specializations.

Additionally, the experts see that almost all students complete the degree programmes as the drop-out rate of both degree programmes in the last few years is quite low. The data verifies that both degree programmes under review can be completed in the expected period.

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

#### Criterion 2.3 Teaching methodology

#### **Evidence:**

- Self-Assessment Report
- Module Handbooks for all degree programmes
- Curricula for all degree programmes
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

Teaching staff at TDTU apply various teaching and learning methods, which are outlined in the module handbooks and linked narrowly to the respective course learning outcomes. According to them, 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 written 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.

During the audit, the teachers particularly emphasise the role of internships and projectbased learning in the curricula in the context of student-centred learning. Furthermore, teachers of both programmes heavily employ the problem-based and project-based learning method. The problem-based learning method is supposed to encourage critical thinking and cooperative learning and improving problem-solving skills by solving real-world problems. The project-based learning method is a teaching approach that involves students' interests and motivations, links theoretical concepts learned in the classroom and their applications explored during activities outside the school, and is supposed to provide more opportunities for direct interaction between students. It should have the potential to deepen student understanding and enhance interaction between students in completing authentic problem-based assignments that occur in everyday life. The Master's programme additionally focuses on developing the students' skills in autonomously carrying out and solving (research) projects. Thus, teaching and learning methods mostly include projects and essay assignments.

To help students achieving the intended learning outcomes and to facilitate adequate learning and teaching methods, TDTU has developed a student information system (student portal), where students and teachers can interact.

In summary, the expert 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 concepts of both programmes under review comprise 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 Report
- Student Handbook
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

TDTU offers a comprehensive advising system for its students, both in terms of academic support and general student life support. If students need academic counselling, they can contact the academic counselling team of the respective faculty or their individual academic supervisor (mentor). These offer, among other things, help in designing the study plan, finding a suitable company for an internship or preparing a research proposal for the Bachelor's or Master's thesis. Through a student portal, students can access all relevant information about their studies and TDTU, view their study progress and receive news about student life at TDTU. In general, TDTU places great emphasis on extracurricular activities; this is also evident from the large number of sports clubs.

To support students in their career planning and bring them into contact with industry at an early stage, the faculty regularly organises career events and invites companies to seminars. They also advise students on choosing the right company for their internship.

As far as general support for students is concerned, they can turn to the Counselling and Support Office. The office offers psychological counselling on a range of topics. In addition,

TDTU offers scholarships for students with exceptional academic performance and financial support for students from low-income families.

The students report that they are aware of the numerous support services offered by TDTU. They especially praise the teaching staff, who are open-minded and offer help at any time. They also appreciate the job fairs, which help them get in touch with a variety of companies.

The experts are pleased about the good and trusting relationship between students and teachers and about the fact that there are enough resources for individual support, counselling and assistance for the students. The support system helps students to achieve the desired learning outcomes and to complete their studies successfully and without delay. The comprehensive support and counselling system is one of TDTU's strengths.

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

#### Criterion 2.1:

TDTU provides the following statement: "We concur with this assessment and express our appreciation for the experts' recommendation to encourage students and faculty to participate in exchange programs at foreign universities. In the first semester of 2023, the number of exchange students in-creased by approximately 100% compared to previous years, reaching a total of 20 students. Our faculty will also be more flexible in recognizing the equivalence of transfer credits between courses in our programs and those offered at partner universities." The experts are pleased that the university agrees with the assessment and is willing to take further steps. As this is only a recommendation and the experts and university agree, the experts are in favour of retaining it.

#### Criterion 2.2:

With regard to the requirement to verify the students' total workload and award the ECTS points accordingly as well as to define how many hours of students' workload is required for one ECTS point, TDTU points out that during the onsite visit, they might not have sufficiently clarified this matter. TDTU underlines that as a result, there are aspects where the ECTS conversion at TDTU has not been appropriately addressed, and the report's conclusions may not fully reflect the actual situation. To rectify this, TDTU submits a document named "The ECTS Conversion," which offers a more detailed and accurate explanation.

Within this document, TDTU explains that the workload and credit calculation for academic credits is prescribed by the Regulation on University Education promulgated by the Ministry

of Education and Training of Vietnam - MOET (Circular No. 08/2021/TT-BGDĐT). In compliance with the regulations of the MOET and in accordance with the ECTS Users' Guide, TDTU has issued Guide No. 2554/TĐT-HD to implement the conversion of Vietnamese credits to ECTS.

Furthermore, TDTU clarifies some details as follows in this document:

"1. There is a difference between 1 learning period (contact time) and 1 hour of self-study according to the Vietnamese credit system. We apologize for the misunderstanding caused by the translation in the SAR and the module description. As regulated by the MOET, one learning period (contact time) lasts for 50 minutes (~0.83 hours) and one self-study hour is equivalent to 60 minutes (1 hour). We have fixed the mistranslation in our system to indicate the accurate terms of the workload unit (see Figure 1).

2. To calculate the workload, one academic credit is prescribed differently depending on whether it is a theoretical or practical credit.

a. For 1 theoretical credit, learners need to spend 15 learning periods x 50 minutes + 30 hours of self-study = 42.5 hours,

b. For 1 practical credit, learners need to spend 30 learning periods x 50 minutes + 30 hours of self-study = 55 hours.

3. For the example of workload calculation for "Applied Calculus for IT", it is awarded 3 theoretical credits and 1 practical credit, which would mean 182.5 hours ( $3 \times 42.5$  hours +  $1 \times 55$  hours), which is equivalent to 6.08 ECTS (182.5 / 30).

[...] For your further information, TDTU has officially started collecting learner feedback on the workload of all programs since the 2023-2024 academic year. The information gained from the feedback will be taken into account to revise the curriculum accordingly."

TON DUC THANG UNIVERSITY FACULTY OF INFORMATION TECHNOLOGY DIVISION OF COMPUTER SCIENCE		SOCIALIST REPUBLIC OF VIETNAM Independence – Freedom – Happiness Ho chi minh city, October 26, 2022				
COURSE SYLLABUS APPLIED CALCULUS FOR IT						
1. General information	1:		/ [. ]	01001		
Credits		4(3,1)		ECTS		6.08
Time allocation         Theory (periods):         45         Practice (periods):         30				Self-Study (hours):	120	
Prerequisite No				Prerequisite Code	No	
Prior-Completion No				Prior-Completion Code	No	

The experts appreciate these helpful explanations and conclude that according to the submitted figures and documents, TDTU's credit conversion is accurate, consistent, and in compliance with the MOET's regulation as well as in accordance with the ECTS Users' Guide. They understand that the misunderstanding was only caused by the mistranslation of the terms "hour" and "learning period" in the self-assessment report and the module descriptions and the fault caused by the sub-system bug. Therefore, they consider this requirement to be fulfilled.

The experts consider criterion 2 to be fulfilled.

### 3. Exams: System, concept and organisation

#### Criterion 3 Exams: System, concept and organisation

#### Evidence:

- Self-Assessment Report
- Module descriptions
- Examination Regulations
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

The design, organisation and assessment of examinations at TDTU follows the Educational Guidelines for Examinations issued by the Ministry of Education and Training and the Examination Regulations set by TDTU. All assessment methods are designed to individually measure the extent to which students have achieved the respective learning outcomes of the module and the programme.

The most common type of assessment is written examinations; however, other examinations may also be included in the final grade. In <u>Bachelor's programme</u>, assessment of theoretical courses, which make up the majority of courses, consists of a combination of progressive assessment (to track student progress; 30%), midterm examination (20%) and final examination (50% of final grade). These three types of examinations usually include quizzes, homework, e-learning exercises, multiple choice questions, constructed response tests, essays, presentations and reports. In laboratory courses, the final grade is based on the students' results in the practical test. In project courses, students are graded based on their project and presentation at the end of the course. In <u>Master's courses</u>, the assessment of theoretical lectures is based on the progressive assessment (40%) and the final report (60% of the final grade). Successfully passed exams are evaluated by lectures with a grading system based on a 10point scale: Excellent (9 to 10), Very good (8 to near 9), Good (7 to near 8), Fairly good (6 to near 7) and Average (5 to near 6). The maximum score for each course is 10 points, and 5 points are required to pass the course.

The criteria to assess students' performance are stated in the assessment plan of each course syllabus. To ensure transparency and fairness for all students, the assessment components, their weights, and schedules are introduced to the students from the first class of the course. The course syllabus is also available through the student portal for enrolled students to assess. In addition, students and teaching staff can also find the information related to the course specifications and assessment criteria in the Programme Specification that has been published on the department's website.

The <u>Master's thesis</u> is awarded 15 credits. Before starting the thesis, students have to submit a research proposal to their academic supervisor. After the completion of the thesis, they need to defend their thesis in front of a committee, which consists of five members: the chairman, secretary, two reviewers and commissioner. The faculty encourages students to publish their projects in international journals.

Students who have failed a course must attend it again in the next semester. Students who have passed a course but want to improve their result can also repeat it. Students who cannot take the exam for unavoidable reasons (e.g. illness, accident, death of a family member, etc.) may apply to retake the exam. Students with disabilities will receive appropriate support for the examination. If students are not satisfied with their grade, they can file an appeal. In this case, the exam will be re-assessed by another teacher. The student also has the right to see the original examination and to have the grade explained by the teacher.

The experts conclude that the assessment methods are appropriately chosen in both programmes under review to assess the achievement of module and programme learning outcomes. Students confirm that they are well informed about the examination schedule, form and rules for grading.

The experts also inspect a sample of examination papers as well as Bachelor's and Master's theses and are overall satisfied with the general quality of the samples.

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

The experts consider criterion 3 to be fulfilled.

### 4. Resources

#### Criterion 4.1 Staff

#### Evidence:

- Self-Assessment Report
- Staff Handbook
- Study plan
- Module descriptions
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

The Faculty of Information Technology (FIT) at TDTU follows a standardized process for recruiting faculty members. Criteria for recruitment include graduation from reputable foreign universities, English proficiency, research expertise, teaching experience, and specific aptitudes required by the Faculty. Applicants undergo preliminary assessment, followed by interviews with the head of the department and the Faculty's dean. They are also required to give a lecture or presentation. Successful candidates proceed to interviews with the TDTU President and FEEE Dean and the TDTU Recruitment Board.

The following table illustrates the number of the different academic staff members at the FIT:

			Total		
Category	M F Headcount		FTE	Percentage of PhD	
Professors	0	0	0	0.0	
Associate/ Assistant Professors	2	0	2	2.0	100%
Full-time lecturer	17	2	19	19.0	42.1%
Part-time lecturer	1	0	1	0.5	100%

Visiting Professors/ Lectures	32	9	41	6.56	24.4%
TOTAL	50	11	61	28.06	

The workload of teachers is clearly defined, with full-time doctoral degree holders assigned 486 teaching hours annually, and Master's degree holders assigned 414 teaching hours. Workloads can be adjusted based on research outputs. The FIT regularly monitors whether academic staff are meeting their teaching and research obligations and evaluates their workload.

Staff-to-student ratios are closely monitored as well to enhance education quality. TDTU states that the student-staff ratio does not exceed MOET's national target of 20 students to 1 lecturer. The following table shows the staff-to-student ratio in the last three years:

Academic Year	Total FTEs of Academic Staff	Total FTE of students	Staff-to-student Ratio
2019-2020	23.07	350	15.17
2020-2021	23.55	424	18.01
2021-2022	27.62	457	16.55

As already mentioned, the mission of TDTU is to become a research university in the next 5-10 years. To realize this vision, they focus on regular publications, conferences, and participation incentives for teachers. FIT is one of TDTU's leading faculties in research, and statistics show that the number and quality of FIT's scientific research is increasing year by year.

In addition to the teaching staff and researchers, the university and FIT ensure that there is sufficient administrative staff to assist teachers and students.

TDTU's support staff encompasses library personnel, facility support staff, personnel in computing and computer services, teaching support staff, student services, dormitory support staff, and security personnel. The FIT specifically includes academic and student service staff, secretarial staff, and laboratory personnel within its support staff category.

The experts review the staff handbook and confirm that the composition, scientific orientation and qualification of the teaching staff are suitable for successfully implementing and sustaining the degree programmes. They particularly welcome the efforts of TDTU and FIT to raise the academic qualifications of academic staff in order to improve the quality of research and teaching. They also agree that there is sufficient administrative staff to assist teachers and students in the programmes under review.

#### Criterion 4.2 Staff development

#### Evidence:

- Self-Assessment Report
- Staff Handbooks for all degree programmes
- 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, TDTU encourages the continuing professional development of its staff according to their training and developmental plan. For this purpose, various opportunities are provided. Faculty members regularly participate in didactic training that encompasses curriculum design, teaching material, and innovative teaching and learning methods. Moreover, workshops related to subject-specific fields 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. New academic staff is required to complete compulsory teacher training. In this case, experienced faculty members teach and supervise the work of apprentices and tutors.

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. The experts learn from the teaching staff that there are many different options to apply for funding for research projects, not only from TDTU but also from the government and big companies the university collaborates with. In general, the exchange programmes are funded by international partner universities and organizations. TDTU particularly encourages its academic staff to enhance their professional qualifications through scholarships for doctoral projects. The general rule at the TDTU is that lecturers who do not have a PhD degree are required to plan their completion and determine their completion time. Academic staff enrolled in a PhD programme in Vietnam are exempted from their workload with full salary for three years and the university fully covers their tuition fees. Furthermore, TDTU encourages its staff members to pursue a PhD abroad and offers scholarships as an incentive. As a result, a number of lecturers have earned their doctorates abroad. During the audit, the experts discuss with members of the teaching staff about their obligations to do research and incentives to reach for higher levels of professorship. In response, the experts learn that teaching staff cannot solely be lecturers but are obliged to devote at least a third of their time to research. In terms of their career progression, however, the present staff indicate that the financial benefits of aiming e.g. for full professorship are not in relation to the additional responsibility and workload.

Finally, the experts inquire in the audit to what extent teachers are in contact with the industry and how they receive up-to-date information about new developments in the industry. The teachers state that they are regularly invited by the companies to visit them and learn about the newest technologies and processes. By supervising student projects carried out in companies, the teachers also establish contacts with various companies and occasionally start their own projects with them. In addition, many teachers also work in industry alongside their teaching activities. The experts appreciate the teachers' contact with the local industry.

In summary, the experts 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 of participating institutes and laboratories
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

Basic funding of the degree programmes and the facilities is provided by TDTU and the different faculties. To ensure sufficient operational funds, TDTU develops a financial plan for each academic year in compliance with the state's regulations for universities.

From the discussion with the Rector's office and the programme coordinators, the experts learn that the primary funding sources of TDTU are tuition fees from students and technology transfer from industry. The figures presented by the university show that the faculties' income is stable and the funding of the degree programmes is secured. The academic staff emphasise that from their point of view, both programmes under review receive sufficient funding for teaching and learning activities as well as research, which results in facilities that are equipped according to the standard 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, TDTU 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 experts take a look at some central facilities, relevant research and teaching facilities and, in particular, a selection of different laboratories available for both study programmes. The TDTU main campus houses 3 large halls, 7 conference rooms and many classrooms equipped with projectors or smart TVs. In addition, students and staff can use seminar rooms for discussions and seminars. The Faculty of Information Technology has three laboratories and has equipped simulation laboratories with 40 computers per room (2100 computers for training activities in total) that offer students access to licensed software. The university has licensed Microsoft Office and other standard software and provides the students full access to this software.

During the audit, the experts find that the facilities and laboratories are adequate and contain everything necessary for the programme's objectives.

With regard to library capacities, TDTU's central library includes a 24/7 self-study area and 7 functional floors, which can serve about 3,000 users at the same time, including group and personal study rooms, an online conference room, a creative communication space and a computer area. The general catalogue provides access to almost 250,000 titles, including books, serials, theses, scientific reports and more, in addition to digital and electronic databases. Additionally, the library website provides access to a range of online publishing databases. During the audit, students express their satisfaction with the respective programmes' facilities as well as with the library capacities and available literature.

In summary, the expert group appreciates the range of learning tools and resources available to the students and 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 experts consider criterion 4 to be fulfilled.

### 5. Transparency and documentation

#### **Criterion 5.1 Module descriptions**

#### Evidence:

• Module Handbooks for all degree programmes

#### Preliminary assessment and analysis of the peers:

The experts review the module descriptions for the programmes and see that they provide adequate information about all relevant and required aspects: module identification code, respective content, learning outcomes, examinations, credit points and workload distribution, grading, person responsible for the module, teaching methods, admission requirements, recommended literature, and date of last amendment made. The auditors are particularly impressed by the comprehensiveness of the module descriptions. The students confirm during the discussions that information about the courses are always available online and that details concerning examinations and contents are provided at the beginning of each course by the teaching staff. However, the module handbooks does not contain module descriptions for all compulsory courses. For example, there are no corresponding module descriptions for the various English courses in the Bachelor's degree programme. Therefore, the experts argue that the module handbooks need to be reviewed, especially with regard to the completeness.

#### Criterion 5.2 Diploma and Diploma Supplement

#### Evidence:

- Self-Assessment Report
- Sample Diploma per programme
- Sample Diploma Supplement per programme

#### Preliminary assessment and analysis of the peers:

The experts confirm that the students of both programmes are awarded a Diploma and a Diploma Supplement upon graduation. The Diploma consists of a Diploma Certificate and a Transcript of Records. The Transcript of Records lists all the courses that the graduate has completed, the achieved credits, grades, and cumulative GPA. The Diploma Supplement contains almost all the necessary information about the degree programme. However, it does not list the learning outcomes achieved by the student upon completion of the programme. Therefore, TDTU must ensure that the Diploma Supplement contains information on the graduate's qualifications profile.

#### **Criterion 5.3 Relevant rules**

#### **Evidence:**

- Self-Assessment Report
- All relevant regulations as published on the university's webpage

#### Preliminary assessment and analysis of the peers:

From the documents provided and the discussions during the audit, the peers learn that TDTU follows a policy of transparent and open rules and regulations. All required rules and regulations are made accessible to students at any time online. The discussion with the students confirms that they feel well informed about regulations and comfortable about the access to any information about their degree programmes and the courses. Yet, the experts note that the English version of the module descriptions are not published on the website of TDTU.

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

#### Criterion 5.1:

The TDTU states that it is considering updating the module handbooks in order to include more comprehensive information. As the document does not yet contain all the necessary information, the experts adhere to their assessment.

#### Criterion 5.2:

The TDTU states that it is considering updating the Diploma Supplement to include the qualification profile of graduates. As the document does not yet contain all the necessary information, the experts adhere to their assessment.

#### Criterion 5.3:

TDTU provides the following statement: "TDTU strictly adheres to the information disclosure regulations set forth by the Ministry of Education and Training (MOET). As per these guidelines, we have already made all relevant information about our training programs publicly available on our website. However, we understand that it's possible that some relevant parties might not have been aware of the existence of this information. To address this, we will take additional steps to actively disseminate this public information to ensure that all relevant parties have access to it." The experts thank for this clarification and recognise that all relevant information is already available to stakeholders in the language of instruction. However, they still recommend adapting the information on the English-language website accordingly.

#### The experts consider criterion 5 to be partly fulfilled.

## 6. Quality management: quality assessment and development

#### Criterion 6 Quality management: quality assessment and development

#### **Evidence:**

- Self-Assessment Report
- Quality handbook
- Discussions during the audit

#### Preliminary assessment and analysis of the peers:

The experts discuss the quality management system at TDTU with the programme coordinators and the students. They learn that TDTU 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 members. The central unit responsible for quality management is the Department for Testing and Quality Assurance (DTQA). DTQA has developed a quality handbook, which sets out the University's quality control mechanisms for the whole university. The individual faculties are obliged to follow this handbook 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 faculty 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 faculty's academic committee, who receives the results of surveys and reports from other groups, suggests improvements to the individual programmes. According to TDTU, all surveys are carried out on a regular basis. Alumni, for instance, are asked for their feedback at the time of their graduation as well as and a year after their graduation. General student feedback regarding their study experience is collected once per academic year. Teaching evaluations are conducted shortly after the middle 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 experts inquire whether the results of the surveys are also shared and discussed with the students. The programme coordinators explain that students receive the survey results. The discussion with the students revealed that those in charge are always eager and open for feedback aside from the official evaluations and that students have the impression that their comments are taken into consideration with regard to the further improvement of the programmes. This becomes apparent in the already mentioned constant curricular revision process that is performed under participation of students and industry partners. The experts are glad to hear that students are satisfied with the programmes and included in the feedback loop.

TDTU 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 TDTU. 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 TDTU, especially in terms of their work ethic. Furthermore, the industry partners confirm that their suggestions are generally adopted by TDTU. The experts appreciate that TDTU has a close relationship with the industry partners and regularly collects feedback from them. Thus, the experts agree that the quality management circles at TDTU are well established and work under participation of all stakeholders.

In summary, the experts are satisfied with the quality management system at TDTU, especially with the continuous feedback loops and the involvement of important stakeholder groups such as students, alumni and representatives from the industry.

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

The experts consider criterion 6 to be fulfilled.

## **D** Additional Documents

No additional documents needed.

# E Comment of the Higher Education Institution (10.11.2023)

The institution provided the following statement as well as a questionnaire for students, which includes questions on workload:

#### "Criteria 1.3 (page 13-14)

We are grateful for the assessors' feedback and would like to provide further clarification on some matters.

First, TDTU lecturers and students use their university portal accounts to access major-specific program specifications, in accordance with the university's information disclosure policy. All necessary information is available on the portal or website for each stakeholder. During discussions, it is possible that the public information channel was not explicitly mentioned by lecturers. We appreciate the experts' highlighting of this matter, as it enables us to regularly inform lecturers and students through this and similar channels.

However, we would respectfully point out that our university has already provided a detailed curricular roadmap for the program specification.

The evidence for this statement (<u>LINK</u>) includes:

- Curricular roadmap in lecturer and student interfaces

Second, in our project-type courses, students are required to undertake various roles such as developer, tester, or business analyst (BA), even though these role terms are not explicitly mentioned in the module descriptions. Evidence of this can be found in the requirements for IT Project 2. Specifically, the tasks in weeks 1, 2, and 3 represent the role of BA; the tasks from weeks 4 to 11 indicate the Developer role; and the tasks in weeks 12 and 13 depict the role of Tester.

We value the experts' input and will refine the descriptions of specific roles in project-related courses to enhance students' understanding. This enhancement will be implemented during our next regular curriculum review.

Therefore, please include in the report that we have project-based courses with task assignments corresponding to various job positions in a real-world project. However, it is necessary to improve the clarity of this description to enable students to better visualize the roles.

The evidence for this statement (LINK) includes:

#### - Requirements of an IT project 2

Third, during the development of our computer science programme, we referenced top 100 universities, including the Computer Science major at the National University of Singapore (NUS), where Software Engineering was an elective. Subsequently, we shared our program with stakeholders.

We will revise the Software Engineering subject to become a mandatory subject in the program. This change will be reflected in the program for students in the 2023 intake and later.

The evidence for this statement (LINK) includes:

Computer Science programme at NU

Finally, we deeply appreciate the experts' efforts to inform us about a conflict between our programme and ASIIN criteria, as they require a final thesis, a final project or and an equivalent examination. We will address this matter by mandating all students to undertake a graduation project (thesis).

#### Criteria 2.1 (page 19-20)

We concur with this assessment and express our appreciation for the experts' recommendation to encourage students and faculty to participate in exchange programs at foreign universities. In the first semester of 2023, the number of exchange students increased by approximately 100% compared to previous years, reaching a total of 20 students. Our faculty will also be more flexible in recognizing the equivalence of transfer credits between courses in our programs and those offered at partner universities.

#### Criteria 2.2 (page 21)

Regarding the ECTS conversion matter, we understand there may have been some misunderstandings during the onsite visit. To clarify and ensure the accuracy of the ECTS conversion at TDTU, please refer to the evidence file for more details on the ECTS conversion. We kindly request the expert panel's understanding and agreement concerning this clarification.

In addition, we are pleased to inform you that TDTU has commenced the official collection of learner feedback on the workload of all programs since the academic year 2023–2024. The valuable insights gained from this feedback will be carefully considered in the ongoing process of curriculum revision.

The evidence for these statements (LINK) includes:

- ECTS Conversion guide

- Student feedback on course questionnaire

#### Criteria 5.1 (page 32)

The handbook module primarily provides concise information about the subjects within the industry's training program.

The handbook module provides a concise overview of the subjects covered in the industry's training program. Detailed outlines of all subjects, including general topics such as English, physical education, and politics, are available on the training information system for learners to access at their convenience.

Additionally, TDTU disseminates information about the subjects on its website. However, we acknowledge the need for improvement in the handbook to include more comprehensive information, which will be incorporated in subsequent versions. This enhancement will enable students to quickly gain a comprehensive understanding of the program through the handbook.

The evidence for this statement (LINK) includes:

- Public information of programme specification
- Syllabus portal:

#### Criteria 5.2 (page 33)

TDTU is considering updating the diploma supplement with information on the program learning outcomes (PLOs) for students enrolled in the 2022 cohort onwards.

#### Criteria 5.3 (page 33)

TDTU strictly adheres to the information disclosure regulations set forth by the Ministry of Education and Training (MOET). As per these guidelines, we have already made all relevant information about our training programs publicly available on our website. However, we understand that it's possible that some relevant parties might not have been aware of the existence of this information. To address this, we will take additional steps to actively disseminate this public information to ensure that all relevant parties have access to it."

#### "According to the ECTS conversion:

We would like to thank the experts for pointing out the misunderstanding about the workload and credit calculation. The workload and credit calculation for academic credit is prescribed by the Regulation on University Education promulgated by the Ministry of Education and Training of Vietnam - MOET (Circular No. 08/2021/TT-BGDĐT). In compliance with the regulations of the MOET and in accordance with the ECTS Users' Guide, TDTU has issued Guide No. 2554/TĐT-HD to implement the conversion of Vietnamese credits to ECTS. We would like to clarify some details as follows:

- There is a difference between 1 learning period (contact time) and 1 hour of selfstudy according to the Vietnamese credit system. We apologize for the misunderstanding caused by the translation in the SAR and the module description. As regulated by the MOET, one learning period (contact time) lasts for 50 minutes (~0.83 hours) and one self-study hour is equivalent to 60 minutes (1 hour). We have fixed the mistranslation in our system to indicate the accurate terms of the workload unit (see Figure 1).
- 2. To calculate the workload, one academic credit is prescribed differently depending on whether it is a theoretical or practical credit.
  - a. For 1 theoretical credit, learners need to spend 15 learning periods x 50 minutes + 30 hours of self-study = 42.5 hours,
  - b. For 1 practical credit, learners need to spend 30 learning periods x 50 minutes + 30 hours of self-study = 55 hours.
- 3. For the example of workload calculation for "**Applied Calculus for IT**", it is awarded 3 theoretical credits and 1 practical credit, which would mean 182.5 hours (3 x 42.5 hours + 1 x 55 hours), which is equivalent to 6.08 ECTS (182.5 / 30).

Therefore, be aware that TDTU's credit conversion is **accurate**, **consistent**, **and in compliance with the MOET's regulation and in accordance with the ECTS Users' Guide**. The misunderstanding was only caused by the mistranslation of the terms "hour" and "learning period" in the SAR and the module description.

For your further information, TDTU has officially started collecting learner feedback on the workload of all programs since the 2023-2024 academic year. The information gained from the feedback will be taken into account to revise the curriculum accordingly."

Figure 1:

#### TON DUC THANG UNIVERSITY FACULTY OF INFORMATION TECHNOLOGY DIVISION OF COMPUTER SCIENCE

SOCIALIST REPUBLIC OF VIETNAM Independence – Freedom – Happiness Ho chi minh city, October 26, 2022

## COURSE SYLLABUS APPLIED CALCULUS FOR IT

COURSE CODE: 501031

1. General information:							
Credits 4(3,1) ECTS					ECTS		6.08
Time allocation	Theory (periods):	45	Practice (periods):	30	Self-Study (hours):	120	
Prerequisite	No				Prerequisite Code	No	
Prior-Completion	No				Prior-Completion Code	No	

## F Summary: Peer recommendations (15.11.2023)

Taking into account the additional information and the comments given by the experts summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of ac- creditation
Ba Computer Science	With requirements for one year	30.09.2029
Ma Computer Science	With requirements for one year	30.09.2029

#### Requirements

#### For all degree programmes

- A 1. (ASIIN 5.1) Review the module descriptions and make them accessible for students and teaching staff.
- A 2. (ASIIN 5.2) The Diploma Supplement must provide information on the graduate's qualifications profile.

#### For the Bachelor's degree programme Computer Science

A 3. (ASIIN 1.3) A mandatory final thesis or an equivalent work has to be included.

#### Recommendations

#### For all degree programmes

- E 1. (ASIIN 2.1) It is recommended to become more flexible in recognizing competencies achieved abroad/externally in order to improve students' mobility.
- E 2. (ASIIN 5.3) It is recommended to publish the English module descriptions on the TDTU website.

#### For the Bachelor's degree programme Computer Science

E 3. (ASIIN 1.3) It is recommended to include Software Engineering as a mandatory course.

E 4. (ASIIN 1.3) It is recommended to include a project where multiple students learn to play different roles, e.g. as a developer, tester, or project manager.

## G Comment of the Technical Committee 04- Informatics/Computer Science (28.11.2023)

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the case and follows the vote of the experts without change.

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

Degree Programme	ASIIN Seal	Maximum duration of ac- creditation
Ba Computer Science	With requirements for one year	30.09.2029
Ma Computer Science	With requirements for one year	30.09.2029

# H Decision of the Accreditation Commission (08.12.2023)

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

The AC discusses the procedure and follows the assessment of the experts without any changes.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of ac- creditation
Ba Computer Science	With requirements for one year	30.09.2029
Ma Computer Science	With requirements for one year	30.09.2029

#### Requirements

#### For all degree programmes

- A 1. (ASIIN 5.1) Review the module descriptions and make them accessible for students and teaching staff.
- A 2. (ASIIN 5.2) The Diploma Supplement must provide information on the graduate's qualifications profile.

#### For the Bachelor's degree programme Computer Science

A 3. (ASIIN 1.3) A mandatory final thesis or an equivalent work has to be included.

#### Recommendations

#### For all degree programmes

E 1. (ASIIN 2.1) It is recommended to become more flexible in recognizing competencies achieved abroad/externally in order to improve students' mobility.

E 2. (ASIIN 5.3) It is recommended to publish the English module descriptions on the TDTU website.

#### For the Bachelor's degree programme Computer Science

- E 3. (ASIIN 1.3) It is recommended to include Software Engineering as a mandatory course.
- E 4. (ASIIN 1.3) It is recommended to include a project where multiple students learn to play different roles, e.g. as a developer, tester, or project manager.

## I Fulfilment of Requirements (24.10.2024)

## Analysis of the experts and the Technical Committee (21.11.2024)

#### Requirements

#### For all degree programmes

A 1. (ASIIN 5.1) Review the module descriptions and make them accessible for students and teaching staff.

Initial Treatment	Initial Treatment					
Experts	Fulfilled.					
	Justification: The module descriptions have been reviewed and					
	now cover all required information. Furthermore, the module de-					
	scriptions are available on the university's website. Therefore,					
	the experts consider the requirement to be fulfilled.					
TC 04	Fulfilled.					
	Justification: The TC follows the experts' assessment without any					
	changes.					

A 2. (ASIIN 5.2) The Diploma Supplement must provide information on the graduate's qualifications profile.

Initial Treatment	Initial Treatment				
Experts	Fulfilled.				
	Justification: The university provides updated Diploma Supple- ments covering sufficiently detailed descriptions of the qualifica- tion profiles. Therefore, the experts consider the requirement to be fulfilled.				
TC 04	Fulfilled.				
	Justification: The TC follows the experts' assessment without any				
	changes.				

#### For the Bachelor's programme Computer Science

A 3. (ASIIN 1.3) A mandatory final thesis or an equivalent work has to be included.

Initial Treatment	
Experts	Fulfilled.

	Justification: The university has updated the curriculum accord- ingly. Now, students have to complete a final thesis or a gradua- tion project which is considered to be equivalently by the ex- perts. Therefore, the experts consider the requirement to be ful- filled.
TC 04	Fulfilled. Justification: The TC follows the experts' assessment without any
	changes.

## Decision of the Accreditation Commission (06.12.2024)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Computer Science	All requirements fulfilled	-/-	30.09.2029
Ma Computer Science	All requirements fulfilled	-/-	30.09.2029

## Appendix: Programme Learning Outcomes and Curricula

According to the Curriculum Handbook, the following **objectives** and **learning outcomes** (intended qualifications profile) shall be achieved by the <u>Bachelor's degree programme</u> <u>Computer Science</u>:

- "B-PO1: Graduates have basic knowledge of the natural sciences, social sciences and humanities, politics; have foreign language skills and soft skills for work.
- B-PO2: Graduates master both theoretical and practical knowledge, are capable of solving practical requirements in the IT field, are capable of coming up with ideas, solutions, and building scientific and effective IT applications.
- B-PO3: Graduates have the capacity to self-study, self-study for professional development and can continue their studies at a higher level; have a sense and entrepreneurial spirit in the IT field.
- B-PO4: Graduates have a professional working style, have skills and working style according to international standards, comply with the law, have responsibility and ethics at work, have a spirit of desire to learn and learn for life."
- B-PLO1: Have basic knowledge of the natural sciences, social sciences and humanities, politics; have foreign language skills and soft skills for the job.
- B-PLO2: Apply the knowledge of IT and computer science to practical economic and social problems in the domestic and global environment.
- B-PLO3: Explain the operation of IT systems, especially information system management software systems as well as software systems applying artificial intelligence.
- B-PLO4: Evaluate the processes of software construction and development, including analysis, modeling, design, installation, testing, deployment, operation, maintenance, and system security.
- B-PLO5: Apply algorithms and computational models in the IT field.
- B-PLO6: Solve problems related to software, computer, and information systems.
- B-PLO7: Develop IT application software, especially problems of building information management and analysis systems, problems of artificial intelligence application to meet the actual needs of society.
- B-PLO8: Creativity in approach, model selection, solution design to solve problems in the field of Computer Science in a scientific, highly effective way.
- B-PLO9: Develop logical and critical thinking, communication skills, teamwork skills, and health skills to solve real-world problems effectively and creatively.

- B-PLO10: Develop the ability to self-study, self-research, update and apply new technologies in coming up with solutions for IT systems.
- B-PLO11: Create valuable IT application products that contribute to the scientific and technical development of the country.
- B-PLO12: Adhere to professional ethics, honesty, progressive spirit, inquisitiveness, always self-research to continue to improve professional skills in the spirit of respect for domestic and international laws."

The following **curriculum** is presented:

	SEMESTER 1						
No.	Course ID	Course Title	Mandatory	Credits			
1.	501031	Applied Calculus for IT	Х	4			
2.	001511	English 1	Х	5			
3.	L00019	Essential Skills for Sustainable Development - Life Attitude 1	х	0			
4.	L00030	Essential Skills for Sustainable Development - Cultural Integration of TDTU	х	0			
5.	D01001	Swimming	Х	0			
6.	D02033	National Defense and Security Education - 3rd Course	Х	0			
7.	D02034	National Defense and Security Education - 4th Course	Х	0			
8.	501042	Programming Methodology	Х	4			
9.	502044	Computer Organisation	Х	4			
		Total		17			
		SEMESTER 2					
No.	Course ID	Course Title	Mandatory	Credits			
1.	302053	Introduction to Laws	Х	2			
2.	501032	Applied Linear Algebra for IT	Х	4			
3.	001512	English 2	Х	5			
4.	001513	English 3	Х	5			
5.	L00020	Essential Skills for Sustainable Development - 5S and Kaizen Skills	х	0			
6.	L00026	Essential Skills for Sustainable Development - Self- Study Skills	х	0			
7.	D02031	National Defense and Security Education - 1st Course	Х	0			
8.	D02032	National Defense and Security Education - 2nd Course	Х	0			
9.	502047	Introduction to Operating Systems	X	4			
10.	503005	Object-Oriented Programming	Х	4			
11.		Physical Education 1		0			
		Total		24			

	SEMESTER 3						
No.	Course ID	Course Title	Mandatory	Credits			
1.	306102	Philosophy of Marxism and Leninism	Х	3			
2.	502061	Applied Probability and Statistics for IT	Х	4			
3.	001514	English 4	Х	5			
4.	001515	English 5	Х	5			
5.	L00033	Essential Skills for Sustainable Development - Life At- titude 2	Х	0			
6.	504008	Data Structures And Algorithms	Х	4			
7.	502051	Database Systems	Х	4			
8.		Essential Skills for Sustainable Development – Group 1		0			
9.		Essential Skills for Sustainable Development – Group 2		0			
10.		Physical Education 2		0			
		Total		25			
		SEMESTER 4					
No.	Course ID	Course Title	Mandatory	Credits			
1.	306103	Political Economics of Marxism and Leninism	Х	2			
2.	001516	English 6	Х	5			
3.	503073	Web Programming and Applications	Х	3			
4.	501044	1         Discrete Structures         X		4			
5.	502046	46 Introduction to Computer Networks		4			
6.	503043	Introduction to Artificial Intelligence	Х	3			
		Total		21			
		SEMESTER 5					
No.	Course ID	Course Title	Mandatory	Credits			
1.	306104	Scientific Socialism	Х	2			
2.	L00041	Essential Skills for Sustainable Development - Life Attitude 3	Х	0			
3.	503044	Introduction to Machine Learning	Х	3			
4.		Essential Skills for Sustainable Development – Group 1		0			
5.		Essential Skills for Sustainable Development – Group 2		0			
6.		Elective Group 1		12			
		Total		17			
SEMESTER 6							
No.	Course ID	Course Title	Mandatory	Credits			
1.	306105	History of Vietnamese Communist Party	Х	2			
2.	306106	Ho Chi Minh Ideology	Х	2			
3.	L00040	Essential Skills for Sustainable Development	Х	5			
4.		Elective Group 2		9			
		Total		18			
		SEMESTER 7					

No.	Course ID	Course Title	Mandatory	Credits			
1.	504091	Information Technology Project	Х	3			
2.			9				
	Total						
	SEMESTER 8						
No.	Course ID	Course Title	Mandatory	Credits			
1.	504074	Industrial Experience Requirement	Х	4			
2.	503090	Х	4				
3.	3. 513CM1 Professional Skills Exam			2			
		Total		10			

According to Curriculum Handbook, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the <u>Master's degree programme Com-</u> <u>puter Science</u>:

- "M-PO1: Graduates will demonstrate professional competency and leadership to become computer science experts leading to a successful career
- M-PO2: Graduates will pursue lifelong learning in generating innovative IT solutions using research and complex problem-solving skills
- M-PO3: Graduates will demonstrate commitment towards sustainable development of digital society and global citizens."
- M-PLO1: Apply knowledge of mathematics, science, computer science fundamentals and specialization to the solutions of complex IT-related problems;
- M-PLO2: Demonstrate the ability to identify, formulate, conduct research literature, analyze and design complex IT-related problems using principles of mathematics, natural sciences and computer sciences. M-PLO3: Select appropriate solutions for complex IT-related problems and systems, models or processes that meet specified needs, especially in the AI field;
- M-PLO4: Conduct investigation of complex problems using research-based knowledge and research methods to provide valid conclusions;
- M-PLO5: Engage in independent and life-long learning in a broad context of technological change in practice;
- M-PLO6: Empirically evaluate IT systems using systematic procedures and to apply current adequate methods, as well as to evaluate interdisciplinary systems or, in new operating contexts.
- M-PLO7: Demonstrate ability to communicate effectively on professional activities with the community and with society at large; as an individual, a member or a leader in diverse teams and in multidisciplinary settings."

The following **curriculum** is presented:

#	Course ID	Course title	Credits
Gener	r <b>al course</b> (availa	able course for each semester)	15
1	FL700000	English	10
2	SH700000	Philosophy	3
3	IN700000	Research Methodology	2

Semester	1		15
1	IT701010	Machine Learning	3
2	IT701030	Randomized Algorithms and Probabilistic Analysis	3
3		Selective Course 1	3
4		Selective Course 2	3
5		Selective Course 3	3
Semester	2		15
1		Selective Course 4	3
2		Selective Course 5	3
3		Selective Course 6	3
4		Selective Course 7	3
5		Selective Advanced Topic	3
Semester	3		
EE702000		Master's Thesis	15
		Total	60

No.	Course ID	Course name	Credits	The- ory cre- dits	Practi- cal cre- dits	ECTS	The- ory ECTS	Practi- cal ECTs
1	FL700000	English	10	10	0	14.17	14.17	0.0 0
2	SH700000	Philosophy	3	3	0	4.25	4.25	0.0 0
3	IN700000	Research Methodology	2	2	0	2.83	2.83	0.0 0
4	IT701010	Machine Learning	3	3	0	4.25	4.25	0.0 0

5	IT701030	Randomized Algorithms and Probabilistic Analy- sis	3	3	0	4.25	4.25	0.0 0
		General Specialist knowledge	12	12	0	17.00	17.00	0.0 0
6	IT701020	Advanced Digital Image Processing	3	3	0	4.25	4.25	0.0 0
7	IT701070	Advanced Graph algo- rithms	3	3	0	4.25	4.25	0.0 0
7	IT701050	Information Security	3	3	0	4.25	4.25	0.0 0
8	IT701110	Cryptography	3	3	0	4.25	4.25	0.0 0
9	IT701080	Knowledge based Systems	3	3	0	4.25	4.25	0.0 0
10	IT701040	Distributed Systems	3	3	0	4.25	4.25	0.0 0
11	IT701060	Uncertainty models in Artificial Intelli- gence	3	3	0	4.25	4.25	0.0 0
12	IT701090	Multi Agent Systems	3	3	0	4.25	4.25	0.0 0
13	IT701100	Probabilistic Graphi- cal Models	3	3	0	4.25	4.25	0.0 0
		Selective Specia- list knowledge	12	12	0	17.00	17.00	0.0 0
14	IT701120	Computer Vision	3	3	0	4.25	4.25	0.0 0
15	IT701130	Information Retrieval and Web Search	3	3	0	4.25	4.25	0.0 0
16	IT701150	Mining Massive Data Sets	3	3	0	4.25	4.25	0.0 0
17	IT701160	Computational Genomics	3	3	0	4.25	4.25	0.0 0
18	IT701170	Representations and Algorithms for Compu- tational Molecular Biology	3	3	0	4.25	4.25	0.0 0
19	IT701140	Decision Making un- der Uncertainty	3	3	0	4.25	4.25	0.0 0
20	IT701190	Multimedia Computing and Applications	3	3	0	4.25	4.25	0.0 0
21	IT701200	Natural Language Processing	3	3	0	4.25	4.25	0.0 0
22	IT701210	Spoken Langu- age Processing	3	3	0	4.25	4.25	0.0 0
23	IT701220	Data Mining	3	3	0	4.25	4.25	0.0 0
24	IT701240	Advanced Topics in Data Science	3	3	0	4.25	4.25	0.0 0

#### 0 Appendix: Programme Learning Outcomes and Curricula

No.	Course ID	Course name	Credits	The- ory cre- dits	Practical credits	ECTS	Theory ECTS	Pra cti- cal EC Ts
25	EE702010	Advanced Wireless Communications	3	3	0	4.25	4.25	0.0 0
26	EE702020	Wireless Networks	3	3	0	4.25	4.25	0.0 0
27	EE702130	Machine Learning for Communications	3	3	0	4.25	4.25	0.0 0
28	EE702040	Optical Communication Systems and Networks	3	3	0	4.25	4.25	0.0 0
29	EE702050	Broadband Communi- cation Networks	3	3	0	4.25	4.25	0.0 0
30	EE702180	Advanced Digital Communications	3	3	0	4.25	4.25	0.0 0
31	IT701230	Internet of Things	3	3	0	4.25	4.25	0.0 0
32	EE702200	Advanced Topics in Networking	3	3	0	4.25	4.25	0.0 0
33	EE702210	Advanced Topics in Communications	3	3	0	4.25	4.25	0.0 0
34	EE703020	Nonlinear and Adaptive Control	3	3	0	4.25	4.25	0.0 0
35	EE703050	Microcontroller and Embedded Systems	3	3	0	4.25	4.25	0.0 0
36	EE703040	Intelligent Control	3	3	0	4.25	4.25	0.0 0
37	EE703060	Robotics	3	3	0	4.25	4.25	0.0 0
38	EE703160	Advanced Topics in Robot	3	3	0	4.25	4.25	0.0 0
39	EE703170	Advanced Topics in Mechatronics	3	3	0	4.25	4.25	0.0 0
40	IT701000	Master's Thesis	15	0	15	27.50	0.00	27. 50