ASIIN Seal & Euro-Inf

Accreditation Report

Bachelor's Degree Programmes
Computer Science
Computer Science with minor in Business

Master's Degree Programme
Computer Science

Provided by
Reykjavik University (RU)

Version: 24.03.2023

Table of Content

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for [1]	Previous accreditation (issuing agency, validity)	Involved Technical Committee (TC)[2]
Tölvunarfræði BSc	Computer Science BSc	ASIIN, Euro-Inf® Label	Euro-Inf® 2016-2021 (EQANIE)	04
Tölvunarfræði með viðskiptafræði sem aukagrein BSc	Computer Science with minor in Business BSc	ASIIN, Euro-Inf® Label	Euro-Inf® 2016-2021 (EQANIE)	04
Tölvunarfræði MSc	Computer Science MSc	ASIIN, Euro-Inf® Label	Euro-Inf® 2016-2021 (EQANIE)	04
Date of the contract: 25.01.2021 **Submission of the final version of the self-assessment report:** 20.10.2021 **Date of the onsite visit:** 17.-19.11.2021 **at:** Reyjkavik, Iceland				
Peer panel: Prof. Dr. Jörg Desel, FernUniversität Hagen Prof. Dr. Gregor Engels, Paderborn University Prof. Dr. Olaf Zukunft, Hamburg University of Applied Sciences Dr. Burkhard Petin, privacy/design GmbH Bonn Dominik Kubon, Student at RWTH Aachen				
Representative of the ASIIN headquarter: Sophie Schulz				

[1] ASIIN Seal for degree programmes; Euro-Inf®: Label European Label for Informatics

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

Responsible decision-making committee: Accreditation Commission	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria as of December 10, 2015 Subject-Specific Criteria of Technical Committee 04 – Informatics/Computer Science as of March 29, 2018	

B Characteristics of the Degree Programmes

a) Name	Final degree	b) Areas of Specialization	c) Corresponding level of the EQF[3]	d) Mode of Study	e) Double/ Joint Degree	f) Duration	g) Credit points/ unit	h) Intake rhythm & First time of offer
Computer Science	B.Sc.	/	6	Full time	/	6 semesters	180 ECTS	Annually Fall 2000
Computer Science with minor in Business	B.Sc.	/	6	Full time	/	6 semesters	180 ECTS	Annually Fall 2014
Computer Science	M.Sc.	/	7	Full time	Double degree available with University of Camerino	4 semesters	120 ECTS	Per semester Fall 2003

[3] EQF = The European Qualifications Framework for lifelong learning

C Peer Report for the ASIIN Seal[4]

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 programme
- Module descriptions
- Procedure of mapping module learning outcomes
- Stakeholder surveys
- Webpage of all degree programmes
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The Department of Computer Science has described and published programme objectives and programme learning outcomes for each of the three degree programmes. The expert panel approves that for each programme a detailed presentation of learning outcomes and graduates' profiles is given in combination with learning outcome matrices matching the described learning outcomes with the respective modules of the programmes. Moreover, the department has aligned the programme objectives with the subject-specific criteria of the Technical Committee 04 – Informatics/Computer Science of ASIIN and the Euro-Inf® standards and criteria. A detailed overview of the learning objectives and outcomes of each programme can be found in the appendix of this document.

The auditors hold the view that the objectives and intended learning outcomes of all three programmes under review are generally reasonable, well founded and adequately reflect

[4] This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

EQF level 6 for the bachelor's programmes and level 7 for the master's programme. Yet, they understand that the master's degree programme can be undertaken in either a research-based or a course-based option. In the research-based option, students write an individual master's thesis reporting on 60 ECTS worth of research work, whereas the master's thesis in the course-based option can be co-authored by a small group of students and is worth 30 ECTS. The two options differ not only in the different number of ECTS credits for the master's thesis: Since both programmes have 120 ECTS credits, the course-based option contains 30 ECTS more modules; the students thus gain in-depth knowledge, which is replaced by in-depth research for the research-based option. The auditors consider both options functional and appropriate. However, since the options pursue different goals - research vs. in-depth knowledge - the auditors ask that these different options also be reflected in the qualification goals of the master's degree programmes. The track chosen by the students should also be indicated in the diploma supplement.

The auditors discuss the low number of students taking on the master's programmes (intake of approximately 10 students per academic year). During the discussions with the industry representatives, they learn that the Icelandic industry neither requires employees to hold a master's degree nor actively encourages them to attain one. On the opposite, since the need for qualified employees in the field of software engineering and computer science is currently very high in Iceland, companies hire graduates even before they have finished their bachelor's degree and do not wish them to leave the company for undertaking additional studies. As a professional career thus does not require students to obtain a master's degree, very few students opt to do so. Those that do are oftentimes planning a career in research or simply opt to learn more.

The auditors learn during the discussions with the industry representatives that there is no systematic involvement of them in the process of reviewing and regularly adapting the study programmes. Although the university and industry are quite familiar with each other, also due to the small size of the country, and cooperate with each other in many projects, in the view of the auditors, a systematic approach is lacking which ensures the participation of industry representatives in the further development of the study programmes. The same applies to other important stakeholders, such as students and alumni.

Nonetheless, the auditors can confirm that the qualification objectives and the overall strategic alignment of both Reykjavik University and the study programmes at hand result in great chances for graduates on the national and international job market as well as opportunities to continue with other academic programmes to complete a master's or a PhD-programme.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment Report
- Study Regulations
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The expert panel considers the names of the study programmes to be adequately reflecting the respective aims, learning outcomes, and curricula.

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report
- Study plans of the degree programme
- Module descriptions
- Webpage of all degree programmes
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The curriculum of the BSc Computer Science consists of 114 ECTS of mandatory modules and 66 ECTS of elective modules and activities, the latter including independent studies, undergraduate research opportunities and internships. The BSc Computer Science is the most flexible program within the whole university, as the department recognizes up to 60 ECTS of electives that can be taken from other programs.

The curriculum of the BSc Computer Science with minor in Business consists of 180 ECTS, of which 162 are mandatory and 18 elective modules, the latter including independent studies, undergraduate research opportunities or internships.

The curriculum of the MSc Computer Science comprises 120 ECTS. As mentioned under criterion 1.1, students can choose between a course-based and a research-based option. In the research track, students write an individual thesis reporting on 60 ECTS research work, whereas the thesis in the course track can be co-authored by a small group of students and is worth only 30 ECTS. Both tracks consist of only three mandatory modules, which are Research Methodology, Software Project Management, and Theory of Computation**.** All other modules are electives. As this means that the large majority of the modules are elective courses, the auditors are glad to learn that individual consultations with students take place on a regular basis, during which they discuss their choice of modules with

a professor in order to make sure that the electives form a meaningful and logical learning path.

The peers generally have a good impression of the curricula of all three programmes. They are coherent and enable an individual specialization through many elective courses. The curricula allow the students to achieve the intended learning outcomes. The programme objectives and intended learning outcomes are systematically substantiated and the individual modules build upon and complement each other in a meaningful way, if well chosen. By thoroughly analysing the official documents provided by the department and following the discussions during the on-site visit, the peers learn that the programmes have not been updated since 2017. This explains why some cutting-edge topics are missing in the curricula by the time of the on-site visit, or at least in the mandatory courses. Specifically, this concerns IT security, data science, artificial intelligence and quality management in computer science. As the expert panel considers these topics to be of great importance, they highly recommend including them into the mandatory courses of all three programs. In general, the reviewers would very much like to see the curricula updated on a regular basis. This also includes removing contents that are no longer relevant or up to date.

During the discussions with the industry representatives and with the students, the auditors learn that both are generally very satisfied with the curricula of the three study programmes. However, both groups would like more opportunities to acquire soft skills, in particular the ability to work in teams, (project) management skills, quality management and presentation skills that would aid them in their future career. In addition, although the auditors understand that the programmes follow a practical orientation (the exception being the research option of the master's degree programmes) they learn from the teaching staff that students' ability to conduct research and scientific work needs to be strengthened in the bachelor's programme. To do so, the peers highly recommend including a mandatory course in which students engage with current scientific literature and literature research, and practice scientific presentation.

Overall, the auditors gain the impression that the graduates of all three programmes under review are well prepared for entering the labour market and can find adequate jobs in Iceland and abroad. During the discussion with the auditors, the representatives from the industry confirm that the graduates have a broad scientific education, are very adaptable, and have manifold competences, allowing them to find an appropriate job very easily.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report
- Higher Education Institution Act
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Article 19 of the Higher Education Institution Act No. 63/2006 requires that students who wish to enrol in a higher-education institution must have completed a matriculation examination from an upper secondary school or equivalent final examination. As such, admission requirement for both bachelor's programmes is a matriculation exam or equivalent qualification. In addition, both programmes require at least 21 credits from mathematics courses at high school.

According to the Iceland Qualification Framework for Higher Education Act no. 63/2006, students enrolling in master's studies must have completed a bachelor's degree or equivalent three-year study at higher-education level. Students are expected to enrol in a study programme that is based upon the learning outcomes they have acquired during studies at the first cycle of higher education.

Admission to the MSc in Computer Science requires a BSc in Computer Science or a related area. Students who do not have a BSc degree in Computer Science are required to take some of the core computer science courses before being formally admitted to the MSc degree programme in Computer Science. The Research and Graduate Study Council (RGSC) and the office at the Department of Computer Science prepare a customised study programme for students who need to take additional courses. Applications are reviewed by the RGSC, which makes a recommendation on acceptance or rejection, possibly after having interviewed the applicant.

Admission requirements for all study programmes can be found on the university's website. Here, interested applicants also find detailed information about the process of admission and the documents to be handed in.

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

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

Criterion 1.1 – Qualification Goals

The university thanks the auditor for pointing out that the educational objectives and learning outcomes should reflect the specificities of the research-based and the course-based track and will indicate them in the Diploma Supplement.

Criterion 1.1 – Stakeholder involvement

Reykjavic University agrees with the auditors that a systematic approach ensuring the participation of important stakeholders (students, alumni, industry) is currently lacking and is currently discussing how best to address this. Reykjavic University mandates periodic reviews of degree programmes that involve the above-mentioned stakeholder at three-year intervals. In addition, however, the programme coordinators plan to involve stakeholders more frequently. To start with, the Department Chair, the Chair of Research and Graduate Study Council and the Programme Administrators have started monthly meetings with representatives from RUMPS, the graduate-student association at the department, to discuss the quality of the Master's programmes and receive their feedback in an informal setting. RU has also just completed a draft report for the Subject Level Review mandated by the Quality Board for Icelandic Higher Education at five-year-intervals. Representatives of all stakeholders participate in the review of the quality of all the degree programmes in that exercise.

Criterion 1.3 – Curriculum

Reykjavic Univeristy agrees with the auditors about integrating more current topics. Regarding IT security, the Undergraduate Study Council is currently examining a proposal to modify the three-week course "Practical Project 1" so that it provides all students with a practical introduction to IT security. That council has also received a proposal to split the course "Calculus and Statistics" into two 6-ECTS modules, one dealing with the topics in calculus underlying computer science and machine learning, and the other introducing applied statistics and topics in data science. The university expects both proposals to be considered for approval by the department at its March 2022 meeting. The university will also carefully consider whether the course "Introduction to Artificial Intelligence" ought to be compulsory, as suggested by the auditors. The introduction of a mandatory course on quality management in computer science will also be given due consideration by the department.

Criterion 1.3 – Soft Skills and Scientific Literature

RU states that all students in the Bachelor's programmes in Computer Science and Computer Science with a minor in Business take "Software Requirements and Design" and the "Software Engineering" courses, where soft skills are practiced and play a key role in the learning outcomes. Moreover, all students must take part in the Entrepreneurship course,

which hones soft skills. However, RU will take this insightful suggestion to heart and will encourage lecturers in selected second and third year courses to incorporate more activities developing soft skills in their courses.

In addition, RU fully agrees with the suggestion of engaging students more with current scientific literature and practice scientific presentation. To address this suggestion, they will create and offer an elective, seminar-style Bachelor course on "Current Research in Computer Science", where students read, present and discuss scientific papers in the areas covered by the research centers at the department. The course is also deemed an ideal vehicle to attract Bachelor's students to undergraduate research opportunities. Master's students engage with current scientific literature and literature research as part of their master's thesis work and practice scientific presentation in the "Research Methodology" course. However, RU admits that there is room for offering advanced seminar-style courses for them too and will strive to do so on a regular basis. The peers still urge RU to integrate a compulsory seminar instead of an elective.

In summary, the auditors deem criterion 1 to be **mostly fulfilled.**

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Report
- Study plans of the degree programme
- Module descriptions
- Webpage of all degree programmes
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Both bachelor's programmes are offered by the Department of Computer Science. They have a duration of three years each, covering 180 ECTS credits and consisting of a collection of core courses (mandatory modules) and electives. In addition, the two programmes offer students the possibility to obtain credits through independent study activities or undergraduate research opportunities (both carried out under the supervision of faculty mem-

bers), as well as via internships or periods of study abroad at one of the department's partner institutions. Each degree programme requires a 12 ECTS final group project, which is often carried out in cooperation with the industry, but may also be research-based.

The master's programme is a two-year, full-time programme covering 120 ECTS. The programme has a course- and a research-based option. In the research-based option, students write an individual master's thesis reporting on 60 ECTS research work, whereas the master's thesis in the course-based option can be co-authored by a small group of students and is worth 30 ECTS. As has been mentioned in criterion 1.1, the auditors are of the opinion that graduates of the two different options hold different skills: research-based vs. more in-depth practical knowledge. This should be mentioned in both the qualification objectives and the diploma supplement.

Students may take course credits in BSc courses or courses outside the Department of Computer Science or the Department of Engineering, provided that those BSc courses are advanced courses that do not overlap with courses completed before. The list of acceptable courses is posted before each semester. At least 2/3 of the required course credits must be from master-level courses in Computer Science. Students must satisfy a breadth requirement, by taking at least one (minimum 6 ECTS) master-level course from each of the following three major areas of Computer Science: Systems, Applications, and Theory. The auditors confirm that the bachelor's courses chosen as electives in a master's programme are indeed advanced courses that fulfil the requirements of EQF 7. However, students in the master's must achieve a higher level in the exams of these modules in order to pass them than in the bachelor's. Moreover, courses already taken during the bachelor's programme cannot be taken again during the master's programme.

After analysing the module descriptions and the study plans, the auditors confirm that all degree programmes under review are divided into modules and that each module is a sum of coherent teaching and learning units.

In addition, the peers 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.

Mobility

The main measure that the department uses to promote and support student mobility is the Erasmus Programme. For an Erasmus study period, the department automatically recognizes the credits earnt at the foreign host institution. The department also awards credits for internships taken at one of its core cooperation institutions for up to 24 ECTS. All the department's internship programmes are duly and regularly advertised to students. The

applications that the department receives are typically examined by a cognizant committee, which selects the students whom the department recommends for the respective mobility.

Over the last four years, 44 students from the Department of Computer Science have been on exchange study programmes and twelve students have been to the Fraunhofer Center for Experimental Software Engineering at the University of Maryland College Park. The number of exchange students who have been at the department over the last five years is 102.

Students enrolled in the MSc in Computer Science have the opportunity to earn a double degree with the University of Camerino (UNICAM) in Italy. The programme involves a term or a year at the guest university and includes financial support during the stay abroad. The focus of the programme is to provide students with an excellence in scientific and industrial relevant domains, based on both theoretical foundations and practical experience with an international perspective, and to prepare them to participate in building and managing complex and large software systems and infrastructure.

In summary, the auditors appreciate the effort to foster international mobility and support the students, both incomings and outgoings, in these endeavours.

Criterion 2.2 Workload and credits

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Statistical data for each study programme
- Discussions during the audit

Preliminary assessment and analysis of the peers:
According to the Icelandic Higher Education Act No. 63/2006 Icelandic credits are equivalent to the European Credit Transfer System (ECTS). A full study programme shall thus consist of 60 credits per academic year (30 per semester) and reflect all student workload during that time. Student workload includes class attendance, preparation, project work and assessment. The department can grant a student allowance to register for up to 38 ECTS each semester. According to calculation behind one ECTS unit, students can expect to work for 25-30 hours for every ECTS.

RU states in their self-assessment report that the instructor of a module is responsible to include the total number of hours that a student is expected to work on average on each of the listed study components as well as the course in total. This information is then handed in to the Director of Studies before the course starts. However, it has proven difficult to get that information on time from all instructors, which means that not all instructors are aware of the expected workload and the director has no chance to correct it beforehand if necessary. An additional problem is that the teaching evaluation survey does not include a question regarding the student workload. As such, there is no dependable way to monitor and – if necessary – revise the workload of the students. During the discussions with the students, the auditors learned that students feel that credits are arbitrarily distributed and do not correspond to the actual workload of each respective module. As such, RU must ensure that the credits awarded for the modules do indeed match the workload of the students. In order to do so, a process must be established to regularly evaluate and adept the workload.

The auditors further notice that students on average finish their degree within the allotted time, sometimes despite working full-time or having a family. As the students explain, this is due to the costs of the programme that work as an incentive to finish their studies in time. In addition, all programmes can optionally be studied part-time, which is utilized by some students, especially in the master's programme. This may be one of the reasons why all programmes have a very high success rate.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Report
- Teaching handbook
- Study plans and module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Each of the degree programmes submitted for accreditation consists of several different course formats. A typical 12-week course consists of two 90-minute slots devoted to lectures and one 90-minute slot devoted to a small group-exercise/laboratory session. In addition, in some of the early semesters, the Department of Computer Science offers a so-called "open-exercise session", during which students can ask for assistance and further explanation on any of the courses they are currently following to several teaching assistants. Given the small number of students in most classes, course slots devoted to "lecturing" often combine standard delivery of course materials with hands-on exercise sessions

and peer-instruction. Moreover, some courses are based on blended learning and some three-week courses mainly consist of group work.

The department has ensured that project-based courses are not adversely affected by the increase in class sizes over time by providing supplementary resources. For example, several of the department's project-based courses (Practical Project I, Practical Project II, Undergraduate Research Opportunity, Final Project) are taught in such a way that students work in small groups on realistic projects and, in case of their final project, in collaboration with industry partners.

In summary, the peer group judges 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 all three degree programmes 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
- Organisation and Operation Rules of RU
- Discussions during the audit

Preliminary assessment and analysis of the peers:
Reykjavik University emphases the use of modern and diverse methods of teaching and provides students with support services that contribute to student-centred learning and academic progress, such as study facilities, classrooms, and library and information services. The university also offers specific services to international students and exchange students, as well as students requiring special solutions. Moreover, it provides students with advice and assistance they need in their daily work and in managing their academic career. Reykjavik University regularly informs students about the services offered to them by the university.

The administrative office of the Department of Computer Science plays a key role in the student academic journey. Each study programme has a designated Programme Administrator whose main function is to support and assist students during their studies and to coordinate their navigation through their programme. The department´s administrative office is open to students during office hours for appointment and drop-ins, as well as via phone and e-mail. Student needs, concerns and feedback are channelled in a variety of

ways through administrators, faculty, student representatives and specific entities created for dealing with the particularities of every case and programme.

Students at Reykjavik University have access to career and guidance counsellors, as well as free psychological services within the university. The career and guidance counsellors provide individual support for students during their studies at Reykjavik University, focusing on the student´s strengths and interests. In addition to individual counselling, the career and guidance counsellors provide group counselling and a variety of lunch-time lectures and workshops. The university's psychological services are provided by a clinical psychologist and MSc students in the Clinical Psychology programme, who receive professional guidance. The university´s psychological services offer courses taught in Icelandic, as well as individual therapy sessions in Icelandic and English.

The peers notice the good and trustful relationship between the students and the teaching staff; there are enough resources available to provide individual assistance, advice and support for all students. The support system helps the students to achieve the intended learning outcomes and to complete their studies successfully and without delay. The students are well informed about the services available to them.

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

Criterion 2.2 – Workload

RU agrees that measuring the workload is one of the areas for improvement and acknowledges that greater success can be achieved in this regard. In order to obtain better data on student workload in each course, they plan on proceeding as follows:

1. Based on the experience with measuring student workload during the final BSc projects, as a pilot experiment, we will ask students in selected key courses to report the time they spend working on each course component as part of the delivery of assignments during the semester. To this end, they might follow the methodology in the study "Are Students Overworked? Understanding the Workload Expectations and Realities of First-Year Engineering" by Gerrard et al., ASEE Paper ID #18877, 2017.

2. Teachers of each course will be mandated to specify the estimated number of hours they expect students to spend on each course component and this information will be published with the course description. The aforementioned paper by Gerrard et al. provides useful information on how one might approach this goal in a coordinated and consistent fashion across courses. The paper "Give me time to think" by Karjalainen et al., University of Oulu

(2006) gives a good breakdown of different course components and estimated workload per component on which we might build.

3. The Undergraduate Study Council will compare student-generated data with the student workload, as estimated by the teacher, for selected courses after each semester. Data collected by CLARU on students' use of resources on Canvas will also be useful.

4. The Undergraduate Study Council will gather information on how some other departments monitor student workload and use their experience to improve the processes.

In addition, RU mentions that Teaching Affair, the RU Curriculum Council and representatives from the student association at RU have just produced a revised version of the student course evaluation form that now also includes the question "How much or little did the workload in the course correlate with its ECTS credits, when each credit should amount to 25-30 hours of work?".

The peers thank RU for their explanation and believe the plans to be very promising.

In summary, the auditors deem criterion 2 to be **mostly fulfilled.**

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Exam tables
- Exam regulations (Rules on Study and Assessment, Teacher's Handbook)
- Exemplary exams and final theses / final projects

Preliminary assessment and analysis of the peers:
According to the self-assessment report and the exam regulations, in each individual course teachers examine whether students achieve the intended learning outcomes. Examiners award grades in whole and half numbers on a scale of 0 to 10. To pass a course, a bachelor's students must receive a grade of at least 5.0 and a master's students must receive a grade of at least 6.0.

The course teachers are responsible for writing all course examinations and assignments and for determining their weight in the final grade. The latter typically includes grades for performances in one or more of the following components: final examination, mid-term examination, class participation as well as projects, reports, simulations and other student

work submitted during the course. The "Rules on Study and Assessment" and the "Teacher's Handbook" emphasise diversity in assessment, which means that no student is evaluated solely based on a final examination.

Written and oral final examinations and final assignments occur over a specific two-week period at the end of each semester. The examination and assignment schedule is available six weeks before the first final examination. There are usually between 3 and 4 final exams per semester as practical courses are evaluated via projects that are undertaken during the semester.

Makeup and resit final examinations or final assignments are taken after the end of the assessment period of each semester. If a student fails his first attempt at a resit or makeup examination or assignment he must repeat the entire module again. Disability compensations are in place for students.

The bachelor's programmes require a 12-credit final project that is mostly carried out in groups of 2-3 students. The auditors can confirm that these projects are up to EQF Level 6 and that albeit a group project, each individual student's achievement is measured and individual grades are provided. The final projects are nearly always a piece of software development that allows students not only to utilize their theoretical skills in a practical manner but mimics the work in a company where multiple specialists collaborate on a joint project.

The master's programme entails either a final thesis of 30 or 60 ECTS based on the tract the students choose. These theses can be done at RU or in cooperation with a local company.

The auditors gain the impression that the examination system is set up to work smoothly and in the students' best interest. During the discussions with the programme coordinators and staff members, the peers notice that traditionally, final exams have been written exams. Although the number of oral exams has increased in recent years, traditional exams continue to be the norm. The peers thus encourage the department to introduce more oral exams (or other forms of examination) where applicable, in order to make sure that the forms of examination are chosen based on the competences to be acquired.

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

RU fully agrees with this suggestion and will encourage its lecturers to employ more varied forms of examination, especially in smaller courses. Some larger courses such as "Programming" and "Data Structures" already have exams in which students write a code that is

supposed to pass some test cases. The code is then also reviewed by the examiners. These exams are hands-on assessments of how well the students have achieved the learning outcomes for those courses and cannot be considered classic "written exam."

In summary, the auditors deem criterion 3 to be **completely fulfilled.**

4. Resources

Criterion 4.1 Staff

Evidence:

- CVs of academic staff members, including full list of publications
- Self-Assessment Report
- Discussions during the audit

Preliminary assessment and analysis of the peers:
Reykjavik University has a Human Resource Strategy, whose aim is to ensure that teachers and other university staff have the appropriate qualifications. The Human Resource Strategy consists of transparent processes for recruitment and promotion of employees, and opportunities for their professional development.

The core teaching faculty at the Department of Computer Science at RU consists of 7 professors, 2 associate professors and 9 assistant professors. In addition, the Department of Computer Science hires 2 so-called adjuncts, a staff member who is hired, possibly part-time, for teaching purposes. The university presents a staff handbook that lists the qualification and accomplishments of all staff members.

Since Iceland itself has a limited population, the evaluators ask how a sufficient number of professors can be ensured. The programme coordinators state that their Department receives an annual budget for hiring new professors, yet it is difficult to actually recruit new professors. This is due to the fact that Iceland is a small country that produces a limited amount of graduates and doctorates. In addition, Computer Science is a competitive field internationally and not everybody is willing to relocate to Iceland. Nonetheless, RU advertises vacancies internationally and has been capable in the past to recruit a satisfactory amount of new staff members.

During the audit, the auditors learn that most teachers hold three courses per year, while those that have other functions at the university (e.g. the chairmen) have a reduced workload of 1.5 classes per year. The number of classes taught also depends on the amount of

students per class. The auditors believe that this teaching load leaves enough time for individual research projects and the support of an ever-growing number of PhD-students.

In summary, the auditors confirm that the composition, scientific orientation and qualification of the teaching staff is suitable for successfully implementing and sustaining the degree programmes. The auditors are furthermore impressed by the excellent and open-minded atmosphere among the students and the staff members.

Criterion 4.2 Staff development

Evidence:

- Teaching Handbook
- Professional Development Strategy
- Self-Assessment Report
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the self-assessment report, RU places special emphasis on providing employees with suitable training and opportunities to maintain their knowledge and grow professionally. The Human Resource Strategy of RU stipulates the efforts that must be made to enable employees to learn, grow and take on new challenges and increasing responsibility.

Each new teacher is trained and supervised by an older colleague. In addition, the Department of Computer Science offers a one-day orientation session for newly hired staff, whose sessions include opportunities for campus and community involvement, resources available at the Office of Teaching Affairs, and explanations and access to campus-wide record-keeping and reporting systems.

All teachers are able to enhance their teaching through the Teaching Affairs Office, which offers various workshops, e.g. for teacher training on Canvas, the learning management system, and extensive support for online teaching and hybrid classes.

Each research-active faculty member can apply for a sabbatical semester at three years' intervals. Apart from paying the salary of the faculty member, the department provides the faculty member with additional funds to support travel and accommodation visits for the research visit during the sabbatical. In addition, employees who intend to undertake studies leading to an academic degree can apply for study leave or a temporary decrease in employment ratio.

Staff members are also active in visiting international conferences or presenting themselves. As a member of Informatics Europe, for example, the department can now offer its

faculty to attend workshops, courses and other career-development events organised by that association.

In summary, the auditors confirm that RU offers sufficient support mechanisms and opportunities for members of the teaching staff who wish to further develop their professional and teaching skills.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment Report
- DCS space documents and plan
- IT-Benchmarking
- Tour during the audit

Preliminary assessment and analysis of the peers:
The Department Chair is accountable to the Dean of the School of Technology for the department's finances. The Chair prepares a budget for the department and must present it to the Dean, as part of the University´s comprehensive budgeting process. Provided that contribution goals are met, the department has substantial autonomy on how to allocate resources and invest in infrastructure. It should, however, be noted that the department relies heavily on the university for support services, such as technical support, IT, and marketing. Reykjavik University has a long-term agreement with the Icelandic State that assures the university a fixed amount for each active student, which varies with the degree course in which the student is enrolled, as well as funds for research activity. The key factor affecting the finances of the department has been to strengthen its core faculty. In addition, individual research budgets have been introduced, giving faculty increased autonomy in performing their research activity. Other costs, including compensation to part-time faculty, are the responsibility of the Programme Director.

During the audit, the auditors were able to visit the laboratories and teaching spaces. In addition, RU has provided extensive documentation, including lists of the laboratories and equipment. The Self-Assessment Report also provided details regarding the overall infrastructure of the university and its campuses. The auditors are convinced that the teaching and office facilities, the library and the computer labs are sufficient for all students and staff members.

In summary, the auditors confirm that the current funding allows for maintaining the standards as well as purchasing further equipment, if necessary, and that RU generally holds enough work spaces and laboratories and that all laboratories are equipped with modern

and sophisticated instruments. The students are generally very satisfied with the infrastructure and equipment available to them; yet, the bachelor's students wish for more space to do group work or independent self-study, especially during the examination periods. While the auditors saw no such shortage during their visit, they nonetheless ask RU to take the students wish into consideration for future planning and are glad to hear that the university has already formed a Space Committee that works on proposals for the future use of the space available to the department and its research centres.

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

RU does not issue a statement for this criterion.

In summary, the auditors deem criterion 4 to be **fulfilled.**

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Module handbooks for all three degree programmes
- Discussion during the audit

Preliminary assessment and analysis of the peers:
The module descriptions are published on the university's website so that students and stakeholders can access them at any time.

After studying the module descriptions, the peers confirm that they include all necessary information about the person responsible for each module, the teaching methods and workload, the awarded credit points, the intended learning outcomes, the content, the applicability, the admission and examination requirements, and the forms of assessment and details explaining how the final grade is calculated.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Exemplary of diploma per degree programme
- Exemplary of diploma supplement per degree programme

Preliminary assessment and analysis of the peers:
The peers confirm that the students of all three degree programmes are awarded a Diploma and a Diploma Supplement after graduation. The Diploma consists of a Diploma Certificate and a Transcript of Records. The Diploma Supplement contains all necessary information but is lacking statistical data as set forth in the ECTS User's Guide to categorise the individual result/degree. This needs to be added for future usage.

Criterion 5.3 Relevant rules

Evidence:

- Relevant regulations for all important matters
- All relevant regulations are published on the university's website

Preliminary assessment and analysis of the peers:
The auditors confirm that the rights and duties of both Reykjavik University and its students are clearly defined and binding. All rules and regulations are published on the university's website and hence are available to all relevant stakeholders. In addition, students receive all relevant course material in the language of the degree programme at the beginning of each semester.

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

Criterion 5.2 – Diploma Supplement

RU states that it will add grade classification to the diploma supplement.

In summary, the auditors deem criterion 5 to be **mostly fulfilled.**

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-Assessment Report
- Organisation and Operational Rules
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The University´s Executive Committee oversees the management of the quality and standards at RU. The work of the Departments, the Curriculum and Research Council, and support services assist the Executive Committee. The University´s participation in various external quality exercises, including accreditation and benchmarking exercises, strengthens RU's international competitiveness.

RU actively monitors all its study programmes. RU reviews all study programmes, individual courses, learning outcomes and descriptions every three years. The process shall consider development within the respective discipline. The reviewers consult with stakeholders. The university publishes all changes that this process leads to. In discussing and reviewing study programmes, the reviewers shall focus following points: the content of the programme considering the latest research in the given discipline; the changing needs of society and industry; the students' workload, actual time spent on learning, dropout, and graduation rate; the effectiveness of procedures for assessment of students; the expectations, needs and satisfaction concerning the programme, the learning environment and support services of the programme.

Students are involved in the ongoing management of the programme via the Quality Council consisting of student representatives of the programmes (typically one from each study year), the programme administrator and the programme director. The Quality Council typically meets at least once each term to discuss quality-related issues and student satisfaction regarding the programmes and individual courses. It is the forum of discussion and dialogue between students and programme management, and it is a means to detect issues and irregularities early.

The auditors find that the quality management system of RU generally reads very well. They are surprised, however, that the self-assessment report reads that "[the] department of computer science must improve its ability to put into action policies, procedures and strategic decisions that are taken at department or university-wide-level." The programme coordinators explain that enforcing the rules and regulations set forth has been an ongoing process. In 2006, when RU was still a rather small university, so the quality management system was based on informal structures albeit very efficient. When RU began to grow the informal quality management system was no longer enough and rules, regulations and various committees were implemented. However, so far, most of these committees work independently from one another and an overarching quality management system exists for the most part on paper alone.

A prime example of this is that evaluations are conducted, yet their results are not discussed with the students, which leaves the feedback loop effectively open. There are two

evaluations per module, one short one during the semester that mostly consists of questions towards the students' liking of the course, and one detailed one at the end of the semester, whose results are not shared with the students. The auditors gain the impression that students are generally very outspoken at RU and that, given the general small sizes of the classes, they contact their teachers directly in case of criticism. Nonetheless, the auditors are of the opinion that RU must improve its quality management system. First, RU must ensure that the defined processes of the quality management system are actually applied. Second, the results of the evaluation and the students' criticism must be followed up and appropriate measures must be derived and communicated.

Furthermore, the auditors recommend that RU involve all stakeholders in the process of the continuing development of the programmes. During the discussion with the students and alumni the auditors learn that the industry representatives are generally willing to aid their university in improving their programmes but that such a feedback is not systematically asked for. Similarly, the industry representatives are very keen on working more closely with RU, especially since the university provides 75% of all Icelandic computer scientists and engineers and wish RU would more actively involve them in reviewing and developing the programmes.

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

RU comments that they fully agree with the recommendation of the auditors to improve their quality management system. They will mandate that each teacher of each course discuss the results of the mid-term evaluation with all students and point out which suggestions they will implement and how. Many of the teachers already do so, but not all. Moreover, a review framework of the degree programme will be implemented in a more structured fashion and at regular intervals, involving all stakeholders.

In summary, the auditors deem criterion 6 to be **partially fulfilled.**

D Additional Documents

Not relevant.

E Summary: Peer recommendations (25.02.2022)

Taking into account the comment of the university, the peers summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN Seal	Subject-specific label	Maximum duration of accreditation
Ba Computer Science	With requirements for one year	Euro-Inf®	30.09.2029
Ba Computer Science with minor in Business	With requirements for one year	Euro-Inf®	30.09.2029
Ma Computer Science	With requirements for one year	Euro-Inf®	30.09.2029

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Establish a process to systematically and continuously monitor the student workload. As a consequence, it must be ensured that the credits awarded for the modules correspond with the actual workload of the students.

A 2. (ASIIN 5.2) The diploma supplement must entail statistical data as set forth in the ECTS user's guide to categorize the individual result/degree.

A 3. (ASIIN 6) It must be ensured that the defined processes of the quality management system are actually applied, especially the results of the evaluation must be followed up and appropriate measures must be derived.

For the master's degree programme

A 4. (ASIIN 1.1) The educational objectives/learning outcomes must reflect the specificities of the research and course track. This must also be reflected in the diploma supplement.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended to update the curriculum on a regular basis and include current topics, in particular security, data science, artificial intelligence and quality management.

E 2. (ASIIN 3) It is recommended to better align the range of possible forms of examination with the intended learning outcomes.

E 3. (ASIIN 6) It is recommended to involve all stakeholders in the process of the continuous further development of the curriculum.

For the bachelor's degree programmes

E 4. (ASIIN 1.3) It is recommended to include a mandatory course in which students engage with current scientific literature, synthesize it, and practice scientific presentation.

F Comment of the Technical Committee 04 – Informatics/Computer Science (08.03.2022)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and follows the decision of the peers.

Assessment and analysis for the award of the Euro-Inf® Label:

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the Subject-Specific Criteria of the Technical Committee 04 – Informatics/Computer Science.

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

Degree Programme	ASIIN Seal	**Subject-specific** label	Maximum duration of accreditation
Ba Computer Science	With requirements for one year	Euro-Inf®	30.09.2029
Ba Computer Science with minor in Business	With requirements for one year	Euro-Inf®	30.09.2029
Ma Computer Science	With requirements for one year	Euro-Inf®	30.09.2029

Requirements

For all degree programmes

A 5. (ASIIN 2.2) Establish a process to systematically and continuously monitor the student workload. As a consequence, it must be ensured that the credits awarded for the modules correspond with the actual workload of the students.

A 6. (ASIIN 5.2) The diploma supplement must entail statistical data as set forth in the ECTS user's guide to categorize the individual result/degree.

A 7. (ASIIN 6) It must be ensured that the defined processes of the quality management system are actually applied, especially the results of the evaluation must be followed up and appropriate measures must be derived.

For the master's degree programme

A 8. (ASIIN 1.1) The educational objectives/learning outcomes must reflect the specificities of the research and course track. This must also be reflected in the diploma supplement.

Recommendations

For all degree programmes

E 4. (ASIIN 1.3) It is recommended to update the curriculum on a regular basis and include current topics, in particular security, data science, artificial intelligence and quality management.

E 5. (ASIIN 3) It is recommended to better align the range of possible forms of examination with the intended learning outcomes.

E 6. (ASIIN 6) It is recommended to involve all stakeholders in the process of the continuous further development of the curriculum.

For the bachelor's degree programmes

E 5. (ASIIN 1.3) It is recommended to include a mandatory course in which students engage with current scientific literature, synthesize it, and practice scientific presentation.

G Decision of the Accreditation Commission (18.03.2022)

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

The Accreditation Commission discusses the procedure and in particular the fact that in the master's degree programme, students can take up to one third of the elective courses from the bachelor's degree programme. Although this is not problematic per se, the Commission considers the extent of courses from bachelor's programmes to be unusually high. The Commission, therefore, decides to add another recommendation on this particular topic.

Assessment and analysis for the award of the Euro-Inf® Label:

The Accreditation Commission deems that the intended learning outcomes of the degree programmes do comply with the Subject-Specific Criteria of the Technical Committee 04 – Informatics/Computer Science.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Subject-specific label	Maximum duration of accreditation
Ba Computer Science	With requirements for one year	Euro-Inf®	30.09.2029
Ba Computer Science with minor in Business	With requirements for one year	Euro-Inf®	30.09.2029
Ma Computer Science	With requirements for one year	Euro-Inf®	30.09.2029

Requirements and recommendations for the applied labels

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Establish a process to systematically and continuously monitor the student workload. As a consequence, it must be ensured that the credits awarded for the modules correspond with the actual workload of the students.

A 1. (ASIIN 5.2) The diploma supplement must entail statistical data as set forth in the ECTS user's guide to categorize the individual result/degree.

A 2. (ASIIN 6) It must be ensured that the defined processes of the quality management system are actually applied, especially the results of the evaluation must be followed up and appropriate measures must be derived.

For the master's degree programme

A 3. (ASIIN 1.1) The educational objectives/learning outcomes must reflect the specificities of the research and course track. This must also be reflected in the diploma supplement.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended to update the curriculum on a regular basis and include current topics, for example security, data science, artificial intelligence and quality management.

E 2. (ASIIN 3) It is recommended to better align the range of possible forms of examination with the intended learning outcomes.

E 3. (ASIIN 6) It is recommended to involve all stakeholders in the process of the continuous further development of the curriculum.

For the bachelor's degree programmes

E 4. (ASIIN 1.3) It is recommended to include a *mandatory* course in which students engage with current scientific literature, synthesize it, and practice scientific presentation.

For the master's degree programme

E 5. It is recommended that bachelor's degree courses contributing to the electives in the master's degree have a valid system in place to ensure that the higher qualification level is reached.

H Fulfillment of Requirements (24.03.2023)

Analysis of the peers and the Technical Committee (08.03.2023)

Requirements

For all degree programmes

A 1. (ASIIN 2.2) Establish a process to systematically and continuously monitor the student workload. As a consequence, it must be ensured that the credits awarded for the modules correspond with the actual workload of the students.

Initial Treatment	
Peers	fulfilled Justification: A question on workload was included in the module evaluation. In addition, the faculty is experimenting with further attempts to survey the real workload.
TC 04	not (completely) fulfilled Vote: unanimous Justification: The university has established a very good process to involve the students in the calculation of the workload, which is explained in detail in their cover letter. But these figures have to show an effect in adapting the given workload to the feedback of the students. Latter has not happened yet.

For all degree programmes

A 2. (ASIIN 5.2) The diploma supplement must entail statistical data as set forth in the ECTS user's guide to categorize the individual result/degree.

Initial Treatment	
Peers	fulfilled Justification: The Diploma Supplement was adapted accordingly.
TC 04	fulfilled Vote: unanimous Justification: The TC follows the assessment of the peers.

For all degree programmes

A 3. (ASIIN 6) It must be ensured that the defined processes of the quality management system are actually applied, especially the results of the evaluation must be followed up and appropriate measures must be derived.

Initial Treatment	
Peers	fulfilled Justification: The university will ensure a feedback (loop) of the results of the evaluation in the future.
TC 04	fulfilled Vote: unanimous Justification: The TC follows the assessment of the peers.

For the Master's degree programme

A 4. (ASIIN 1.1) The educational objectives/learning outcomes must reflect the specificities of the research and course track. This must also be reflected in the diploma supplement.

Initial Treatment	
Peers	fulfilled Justification: The University has initiated the appropriate steps, which will then be officially decided at the next meeting of the Research and Graduate Study Council
TC 04	not fulfilled yet Vote: unanimous Justification: According to the words of the rector, the Research and Graduate Study Council has reviewed the learning outcomes and will present updated learning outcomes for the research-based and course-based tracks for approval by the faculty in the spring semester 2023. Thus, this requirement remains unfulfilled.

Decision of the Accreditation Commission (24.03.2023)

The accreditation commission discusses the procedure and follows the assessment of the peers. Regarding requirement A1, a question on workload was included in the module evaluation. In addition, the faculty is experimenting with further attempts to survey the real workload. Although results could not have been included yet, the AC is confident this process will lead to regular updates in the assigned student workload for each module. And regarding requirement A4, the AC is of the opinion that the University has initiated the

appropriate steps, which will then be officially decided at the next meeting of the Research and Graduate Study Council so that the requirement can be considered as fulfilled.

Therefore, the Accreditation Commission decides as follows:

Degree programme	**ASIIN-label**	**Subject-specific label**	**Accreditation until max.**
Ba Computer Science	All requirements fulfilled	Euro-Inf®	30.09.2027
Ba Computer Science with minor in Business	All requirements fulfilled	Euro-Inf®	30.09.2027
Ma Computer Science	All requirements fulfilled	Euro-Inf®	30.09.2027

Appendix: Programme Learning Outcomes and Curricula

According to the Diploma Supplement, the following **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Computer Science:

Knowledge

The learning outcomes for the BSc in Computer Science state that degree holder possesses knowledge of:

- A number of recurring themes, and a set of general principles that have broad application to the field of computer science.
- The social, legal, ethical, and cultural issues inherent in the discipline of computing
- That software systems are used in many different domains. This requires both computing skills and domain knowledge
- Software development fundamentals, including programming, data structures, algorithms and complexity
- Systems fundamentals, including architectures and organization, operating systems, networking and communication, parallel and distributed computation, and security
- Mathematics fundamentals, including discrete structures, statistics and calculus
- Software engineering fundamentals, including software analysis and design, evaluation and testing, and software engineering processes
- Application fundamentals, including information management and intelligent applications
- Multiple programming languages, paradigms, and technologies

Skills

The learning outcomes for the BSc in Computer Science state that degree holders can apply the methods and procedures as follows:

- Know how to apply the knowledge they have gained to solve real problems
- Realize that there are multiple solutions to a given problem and these solutions will have a real impact on people's lives
- Communicate their solution to others, including why and how a solution solves the problem and what assumptions were made
- Successfully apply the knowledge they have gained through project experience
- Encompass an appreciation for the structure of computer systems and the processes involved in their construction and analysis
- Understand individual and collective responsibility and individual limitations as well as the limitations of technical tools
- Understand the range of opportunities and limitations of computing

Competences

The learning outcomes for the BSc in Computer Science state that degree holders can apply their knowledge and skills, as follows:

- Understand the multiple levels of detail and abstraction
- Recognize the context in which a computer system may function, including its interactions with people and the physical world.
- Able to communicate with, and learn from, experts from different domains throughout their careers
- Possess a solid foundation that allows and encourages them to maintain relevant skills as the field evolves
- To be able to manage their own career development and advancement
- Manage their own learning and development, including managing time, priorities, and progress
- Have developed interpersonal communication skills as part of their project experience
- Work effectively both individually and as members of teams
- Make effective presentations to a wide range of audiences about technical problems and their solutions
- Encompass an appreciation of the interplay between theory and practice

The following **curriculum** is presented:

1. semester - fall					2. semester - spring				
Course ID	**Course name**	**ECTS**	**Length**	**Workload**	**Course ID**	**Course name**	**ECTS**	**Length**	**Workload**
T-111-PROG	Programming	6	12 weeks	2+1	T-201-GSKI	Data Structures	6	12 weeks	2+1
T-107-TOLH	Computer Architecture	6	12 weeks	2+1	T-419-STR2	Discrete Mathematics II	6	12 weeks	2+1
T-117-STR1	Discrete Mathematics I	6	12 weeks	2+1	T-213-VEFF	Web-Programming	6	12 weeks	2+1
T-216-GHOH	Software requirements and Design	6	12 weeks	2+1	T-202-GAG1	Databases	6	12 weeks	2+1
T-113-VLN1	Semester Project 1	6	3 weeks	L+E	T-220-VLN2	Semester Project 2	6	3 weeks	L+E
3. semester - fall					**4. semester - spring**				
Course ID	**Course name**	**ECTS**	**Length**	**Workload**	**Course ID**	**Course name**	**ECTS**	**Length**	**Workload**
T-317-CAST	Calculus and Statistics	6	12 weeks	2+1	T-501-FMAL	Programming Languages	6	12 weeks	2+1
T-301-REIR	Algorithms	6	12 weeks	2+1	T-215-STY1	Operating Systems	6	12 weeks	2+1
T-303-HUGB	Software Engineering	6	12 weeks	2+1	-	Elective course	6	12 weeks	2+1
-	Elective course	6	12 weeks	2+1	-	Elective course	6	12 weeks	2+1
-	Elective course	6	3 weeks	L+E	X-204-STOF	Entrepreneurship and Starting New Ventures	6	3 weeks	L+E
5. semester - fall					**6. semester - spring**				
Course ID	**Course name**	**ECTS**	**Length**	**Workload**	**Course ID**	**Course name**	**ECTS**	**Length**	**Workload**
T-409-TSAM	Computer Networks	6	12 weeks	2+1	-	Elective course	6	12 weeks	2+1
-	Elective course	6	12 weeks	2+1	-	Elective course	6	12 weeks	2+1
-	Elective course	6	12 weeks	2+1	-	Elective course	6	12 weeks	2+1
-	Elective course	6	12 weeks	2+1	T-404-LOKA	Final Project	12	15 weeks	L+E
-	Elective course	6	3 weeks	L+E					

BSc in Computer Science	Credits	Length (weeks)		Term		Workload		
Elective Courses	**(ECTS)**	**12 w**	**3 w**	**F**	**S**	**L**	**E**	**L+E**
T-218-ALCO Algebra and Combinatorics	6	x			x	2	1	
T-219-REMO Real-time Models	6		x		x			x
T-622-ARTI Artificial Intelligence	6	x			x	2	1	
T-315-IUPP Introduction to experience design	6		x	x				x
T-316-UPPL The Information and Technology Society	6	x		x		2	1	
E-402-STFO Mathematical Programming	6		x	x				x
T-403-FORC Programming in C++	6	x			x	2	1	
I-406-IERP Introduction to ERP Systems (ERP)	6	x				2	1	
T-414-AFLV Effective programming and probem solving	6		x		x			x
T-417-TOOR Computer Security	6		x	x				x
T-419-CADP Concurrent and distributed programming	6	x				2	1	
T-427-WEPO Web-Programming II	6	x				2	1	
T-430-TOVH Developing Open-Sourced Web Solutions/Software	6	x		x		2	1	
T-431-HANE Practical Networks	6	x			x	2	1	
T-445-GRTH Graph Theory	6	x			x	2	1	
T-488-MAPP Mobile App Development	6		x	x				x
T-498-GAGR Data Analysis	6	x			x	2	1	
T-504-ITML Introduction to Machine Learning	6	x		x		2	1	
T-505-ROKF Logic in Computer Science	6	x			x	2	1	
T-511-TGRA Computer Graphic	6	x		x		2	1	
T-513-CRNU Cryptography and Number Theory	6	x		x		2	1	

T-514-VEFT Web Services	6	x		x		2	1	
T-515-NOTH User Centred Software Development	6	x			x	2	1	
T-519-STOR Theory of Computation	6	x		x		2	1	
T-535-CPSY Cyber-Physical Systems	6	x		x		2	1	
T-542-HGOP Introduction to Quality Management and Testing	6		x	x				x
T-603-THYD Compilers	6	x		x		2	1	
T-604-HGRE Design and analysis of algorithms	6	x			x	2	1	
T-622-UROP Undergraduate Research Opportunity	6	x		x		2	1	
T-624-CGDD Computer Game Design & Development	6		x	x				x
T-634-AGDD Advanced Game Design & Development	6	x			x	2	1	
T-631-SOE2 Software Engineering II - Testing	6	x			x	2	1	
T-636-SMAT Human Computer Interaction	6	x			x	2	1	
T-637-GEDE Game Engine Architecture	6	x			x	2	1	
I-707-VGBI Business Intelligence	6	x			x	2	1	

According to the Diploma Supplement, the following **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Computer Science with minor in Business:

Knowledge

A number of recurring themes, and a set of general principles that have broad application to the field of computer science

The social, legal, ethical, and cultural issues inherent in the discipline of computing

Can rationalise how theoretical knowledge in business administration is created and know the scientific approaches and technical methods used in the field. Understand the role of all the core areas of business administration

Can define and describe current knowledge on various more specialised areas of business administration and related disciplines, such as entrepreneurship and business ethics

Can explain the basic elements of search and information technology

Demonstrate that they possess the theoretical basis to pursue graduate studies

Understands how academic knowledge in the field of business is created and knows the methods used to analyse and process information concerning the discipline

That software systems are used in many different domains. This requires both computing skills and domain knowledge

Software development fundamentals, including programming, data structures, algorithms and complexity

Systems fundamentals, including architectures and organization, operating systems, networking and communication, parallel and distributed computation, and security

Mathematics fundamentals, including discrete structures, statistics and calculus

Software engineering fundamentals, including software analysis and design, evaluation and testing, and software engineering processes

Application fundamentals, including information management and intelligent applications

Can use application fundamentals, including information management and intelligent applications

Multiple programming languages, paradigms, and technologies

Skills

Can use relevant computer equipment and software tools that are relevant in the field of business and computer science

Know how to apply the knowledge they have gained to solve real problems

Can interpret and apply critical methods to analyse issues in business administration

Realize that there are multiple solutions to a given problem and these solutions will have a real impact on people's lives

Communicate their solution to others, including why and how a solution solves the problem and what assumptions were made

Can interpret and rationalise decisions on a professional basis with reference to the basic elements of business administration and computer science

Successfully apply the knowledge they have gained through project experience

Can work on tasks with others and lead work groups

Can research and evaluate independently the methods applied within the field of business administration

Encompass an appreciation for the structure of computer systems and the processes involved in their construction and analysis

Can recognise when data is needed and have the ability to retrieve it, assess its reliability, and apply it in an appropriate

manner

Can use reliable data- and information-resources in the field of business administration and computer science

Understand individual and collective responsibility and individual limitations as well as the limitations of technical tools

Have acquired critical thinking and an open-minded and innovative way of thinking

Understand the range of opportunities and limitations of computing

Competences

Understand the multiple levels of detail and abstraction

Recognize the context in which a computer system may function, including its interactions with people and the physical world.

Able to communicate with, and learn from, experts from different domains throughout their careers

Have developed the competences and independence needed for further studies within the field, including self-study

Possess a solid foundation that allows and encourages them to maintain relevant skills as the field evolves

To be able to manage their own career development and advancement

Manage their own learning and development, including managing time, priorities, and progress

Are able to apply the studies in a systematic way to analyse problems, find sensible solutions to different projects, and explain solutions with theoretical arguments

Can organise and establish their own organisation, develop business ideas, and put together a business plan

Can perform common analyses of the operating environment of organisations

Can critique and solve issues in the operation and management of organisations based on a theoretical foundation

Can participate in the making of financial-, operating-, and/or business plans for organisations

Have developed interpersonal communication skills as part of their project experience

Work effectively both individually and as members of teams

Can formulate a strategy in an organised manner (set goals for their work) and devise a work schedule and follow it

Can develop, organise, and participate actively in interdisciplinary cooperation, and manage conflict

Make effective presentations to a wide range of audiences about technical problems and their solutions

Encompass an appreciation of the interplay between theory and practice

Are capable of interpreting and presenting scientific issues and research findings

Can draw out and analyse the state of economic affairs

Can present theories and assess the research results of other scholars for practical purposes

The following **curriculum** is presented:

1. semester - fall					2. semester - spring				
Course ID	Course name	ECTS	Length	Workload	Course ID	Course name	ECTS	Length	Workload
T-111-PROG	Programming	6	12 weeks	FC	T-201-GSKI	Data Structures	6	12 weeks	2+1
T-107-TOLH	Computer Architecture	6	12 weeks	2+1	T-419-STR2	Discrete Mathematics II	6	12 weeks	2+1
T-117-STR1	Discrete Mathematics I	6	12 weeks	2+1	T-213-VEFF	Web-Programming	6	12 weeks	2+1
T-216-GHOH	Software requirements and Design	6	12 weeks	2+1	T-202-GAG1	Databases	6	12 weeks	2+1
T-113-VLN1	Semester Project 1	6	3 weeks		T-220-VLN2	Semester Project 2	6	3 weeks	
3. semester - fall					**4. semester - spring**				
Course ID	Course name	ECTS	Length	Workload	Course ID	Course name	ECTS	Length	Workload
T-317-CAST	Calculus and Statistics	6	12 weeks	2+1	T-501-FMAL	Programming Languages	6	12 weeks	2+1
T-301-REIR	Algorithms	6	12 weeks	2+1	T-215-STY1	Operating Systems	6	12 weeks	2+1
T-303-HUGB	Software Engineering	6	12 weeks	2+1	V-202-REGR	Managerial Accounting	6	12 weeks	2+1
V-108-REHA	Financial Accounting	6	12 weeks	2+1	V-201 RHAG	Microeconomics	6	12 weeks	2+1
-	Elective Course	6	3 weeks	L+E	X-204-STOF	Entrepreneurship and Starting New Ventures	6	3 weeks	L+E
5. semester - fall					**6. semester - spring**				
Course ID	Course name	ECTS	Length	Workload	Course ID	Course name	ECTS	Length	Workload
T-409-TSAM	Computer Networks	6	12 weeks	2+1	V-311	Operations Management	6	12 weeks	2+1
T-307-GARS	Design and Analysis of Annual Financial Statements	6	12 weeks	2+1	I-707	Business Intelligence	6	12 weeks	2+1
V-107 FJAR	Corporate finance	6	12 weeks	2+1	-	Elective Course	6	12 weeks	2+1
E-406-IERP	Introduction to ERP Systems	6	12 weeks	2+1	T-404-LOKA	Final Project	12	15 weeks	L+E
-	Elective Course	6	3 weeks	L+E					

BSc in Computer Science with minor in Business	Credits	Length (weeks)		Term		Workload		
Elective Courses	(ECTS)	12 w	3 w	F	S	L	E	L+E
T-218-ALCO Algebra and Combinatorics	6	x			x	2	1	
T-219-REMO Real-time Models	6		x		x			x
T-622-ARTI Artificial Intelligence	6	x			x	2	1	
T-302-HONN Software Design and Implementation	6	x		x		2	1	
T-315-IUPP Introduction to experience design	6		x	x				x
T-316-UPPL The Information and Technology Society	6	x		x		2	1	
E-402-STFO Mathematical Programming	6		x	x				x
T-403-FORC Programming in C++	6	x			x	2	1	
T-414-AFLV Effective programming and probem solving	6		x		x			x
T-417-TOOR Computer Security	6		x	x				x
T-419-CADP Concurrent and distributed programming	6	x			x	2	1	
T-427-WEPO Web-Programming II	6	x			x	2	1	
T-430-TOVH Developing Open-Sourced Web Solutions/Software	6		x	x				x
T-431-HANE Practical Networks	6	x		x		2	1	
T-445-GRTH Graph Theory	6		x		x	2	1	
T-488-MAPP Mobile App Development	6		x	x				x
T-498-GAGR Data Analysis	6	x			x	2	1	
T-504-ITML Introduction to Machine Learning	6	x		x		2	1	
T-505-ROKF Logic in Computer Science	6	x			x	2	1	
T-511-TGRA Computer Graphic	6	x		x		2	1	
T-513-CRNU Cryptography and Number Theory	6	x		x		2	1	
T-514-VEFT Web Services	6	x		x		2	1	

T-515-NOTH User Centred Software Development	6	x			x	2	1	
T-519-STOR Theory of Computation	6		x	x				x
T-535-CPSY Cyber-Physical Systems	6	x		x		2	1	
T-542-HGOP Introduction to Quality Management and Testing	6		x	x				x
T-603-THYD Compilers	6	x		x		2	1	
T-604-HGRE Design and analysis of algorithms	6	x			x	2	1	
T-622-UROP Undergraduate Research Opportunity	6	x	x	x	x	N/A	N/A	N/A
T-624-CGDD Computer Game Design & Development	6		x	x				x
T-634-AGDD Advanced Game Design & Development	6	x			x	2	1	
T-631-SOE2 Software Engineering II - Testing	6	x			x	2	1	
T-636-SMAT Human Computer Interaction	6	x			x	2	1	
T-637-GEDE Game Engine Architecture	6	x			x	2	1	
T-423-ENOP Engineering Optimization (DE)	6	x		x		2	1	

According to the Diploma Supplement, the following **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree programme Computer Science:

Degree holders possess knowledge of:

- Basic theoretical principles in Computer Science. This includes knowledge of the following topics:
- various types of finite automata,
- the formal definitions of programming languages and their connection with automata,
- Turing machines and computability theory,
- algorithmic complexity classes.
- Research methodology, including basic history of science, the fundamentals of scientific writing, how to give a scientific talk, how to evaluate a scientific paper, and research ethics.
- Statistical principles, and software tools embodying those.
- Advanced principles and techniques from the elective areas in which the student decided to develop special expertise. Such expertise is developed by following elective courses in the research areas of the members of staff, by means of advanced independent studies, and mainly during the MSc thesis work. Areas of specialization include artificial intelligence (e.g., agent technology, computer games, robotics and virtual environments), concurrency theory (with emphasis on modelling and verification of reactive systems, process algebra, and structural operational semantics), databases (with focus on efficient indexing of multimedia databases), and language technology (e.g., tagging of Icelandic and software support for the analysis of Icelandic text).
- Established and potential applications of techniques developed within the chosen area of specialization.

Skills:

- Degree holder possess skills of:
- Methods and tools to design, implement, test, document, and maintain a computer-based system.
- Apply research methods, techniques, and problem solving approaches from the field of research in which they are specializing.
- Access, retrieve and evaluate relevant professional information reliably.
- Methods and tools for analyzing complex real-world problems and devise computer-based solutions.
- Be receptive to new ideas and innovation.
- Communicate effectively and professionally both in writing and by means of presentations to both specialist and a general audience
- Analyse complex real-world problems and devise efficient computer-based solutions.

Competences:

- Degree holders can apply their knowledge and skills in as follows:
- Work in a collaborative manner with others on a team, contributing to the management, planning and implementation of a computer system.
- Independently propose a small scale research project, plan its execution, undertake its development, evaluate its outcome and report on its results in a professional manner.
- Advance knowledge through innovation and knowledge creation.
- Pursue life-long learning in practice
- Interpret and present theoretical issues and empirical findings.

The following **curriculum** is presented:

1. semester - fall

Course ID	Course name	ECTS	Length	Workload
T-519-STOR	Theory of Computation	6	12 weeks	2+1
-	Elective course	8	12 weeks	
-	Elective course	8	12 weeks	
T-740-SPMM	Software Project Management	8	12 weeks	2+0

2. semester - spring

Course ID	Course name	ECTS	Length	Workload
T-701-REM4	Research Methodology	8	12 weeks	
-	Elective course	8	12 weeks	
-	Elective course	8	12 weeks	
-	Elective course	6	3 weeks	

3. semester - fall

Course ID	Course name	ECTS	Length	Workload
-	Elective course	8	12 weeks	
-	Elective course	8	12 weeks	
-	Elective course	8	12 weeks	
-	Elective course	6	3 weeks	

4. semester - spring

Course ID	Course name	ECTS	Length	Workload
T-899-MSTH	Master project	24	15 weeks	
T-991-TPDE	Master project defence	6	15 weeks	

MSc in Computer Science	Credits	Length (weeks)		Term		Workload		
Elective Courses	(ECTS)	12 w	3 w	F	S	L	E	L+E
T-622-ARTI Artificial Intelligence	6	x			x	2	1	
T-431-HANE Practical Networks	6		x		x			x
T-498-GAGR Data Analysis	6	x			x	2	1	
T-504-ITML Introduction to Machine Learning	6	x		x		2	1	
T-511-TGRA Computer Graphic	6	x		x		2	1	
T-535-CPSY Cyber-Physical Systems	6	x		x		2	1	
T-603-THYD Compilers	6	x		x		2	1	
T-624-CGDD Computer Game Design & Development	6		x	x				x
T-634-AGDD Advanced Game Design & Development	6	x			x	2	1	
T-631-SOE2 Software Engineering II - Testing	6	x			x	2	1	
T-637-GEDE Game Engine Architecture	6	x			x	2	1	
T-423-ENOP Engineering Optimization (DE)	6		x		x			x
T-424-SLEE Sleep (DE)	6		x		x			x
T-502-HERM Simulation (DE)	6		x	x				
T-707- MOVE Modelling and Verification	8	x			x	2	0	
T-717-SPST Speech Synthesis	6	x			x			
T-720-ATAI Advanced topics in Artificial Intelligence.	8	x		x		2	0	
T-723- VIEN Virtual Environments	8	x		x		2	0	
T-725-MALV Natural Language Processing	8			x		2	2	
T-732- FSAA Financial simulation and analysis-systems	6		x					x
T-732-ISIT Introduction to embedded systems and the internet of things	6		x	x				x
T-738- VIRH Virtual Humans	8	x		x		2	0	
T-742-CSDA Computer Security- Defence against the Dark Arts	6		x		x			x
T-743-PLSA Semantics with application	6		x		x			x

T-747- RELE Reinforcement Learning	8	x				2	0	
T-749-INDS Independent study	2-16	x	x	x	x	N/A	N/A	N/A
T-754-SPLP Spoken Language Processing	8	x		x		2	0	
T-764-DATA Big Data Management	8	x			x	2	0	
T-814-INNO Creating a Complete Business Plan for a Technical Idea-Entrepreneurship and the Innovation Process (DE)	2-16							
T-786- APDS Applied Data Science	8	x				2	0	
T-809-DATA Datamining and Machine Learning (DE)	8	x		x		2	1	
T-810-OPTI Optimization Methods (DE)	8		x	x		2	1	
T-811-PROB-Applied Probability (DE)	8			x		2	1	
T-796- DEEP Introduction to Deep learning	6		x	x				x
V-733-ENTR Entrepreneurial Finance	7,5	x			x			x
V-715-ENIC Enterpreneurship and Innovation in Context	3,75	x			x	2	0	