Software Development

Curriculum 2023 – National Section

CURRICULUM

for

Bachelor's Degree Programme in Software Development

Revised June 9 and August 24 2017

Content

This national part of the curriculum for the Bachelor's Degree Programme in Software Development has been released in accordance with section 18(1) in the Ministerial Order for technical and commercial Academy Profession Programmes and Professional Bachelor Programmes. This curriculum is supplemented with an institutional component, provided by the institution offering the programme.

After it has been approved by either the Board of Directors (or the Rectors) and after consultation with the institutions' Educational Committee and the External Examiners' chairmanship for the specific programme, the educational network for the Bachelor's Degree Programme in Software Development prepares the institutional part.

1. The programme's goals for learning outcomes

Knowledge

The student must have knowledge of:

- The strategic role of testing in system development

- Globalisation of software production

- System architecture and its strategic importance for the company's business

- Applied theory and methodology and common technologies within the domain

- Various database types and their applications.

Skills

The student can:

- Integrate IT systems and develop systems that support future integration

- Use contracts as a control and coordination mechanism in the development process

- Assess and select database systems, and design, redesign and optimise databases

- Plan and manage development processes involving many geographically separated project participants

- Identify links between applied theory, methods and technology and reflect on their suitability in various situations

Competencies

The student can:

- Plan and implement testing for large IT systems

- Engage in professional collaboration to develop large systems by applying common methods and technologies

- Familiarise themselves with new technologies and standards for handling integration between systems,

- Through practice, develop their own competency profile from a primarily back-end developer profile to performing tasks as a system architect

- Handle the establishment and realisation of a business and technologically appropriate architecture for large systems.

2. The programme includes four national subject elements

2.1. Developing Large Systems

Developing Large Systems

Scope: 10 ECTS
Content: The aim of the subject element is to TRAIN the student to develop large-scale IT systems, where scalability is a key characteristic. The student must have knowledge of how key system development methods handle issues related to scalability and the development of large distributed systems. The student must have knowledge of concepts, techniques and technologies for the continuous integration and delivery of software-based systems. The student must be able to design, implement, and maintain large distributed systems in distributed development teams.
Learning objectives: *Knowledge* The student must have knowledge of: • Issues related to the development of distributed and large-scale IT systems, and how disciplined and agile development methods prescribe how these issues should be handled • The advantages, disadvantages and costs of using a system for the continuous integration and delivery of IT systems • Quality criteria for the design of interfaces to subsystems • Configuration and error reporting systems dedicated to the development of large distributed systems *Skills* The student can: • Apply techniques for dividing a system into subsystems • Design and specify requirements for subsystems • Use version control systems dedicated to the development of large distributed systems in a distributed development team • Use a system for continuous integration and delivery • Use architecture patterns dedicated to the development of large distributed systems. *Competencies* The student can: • Cooperate in large systems development organizations • Participate in globally distributed development • Adapt development methods and processes to the development of large distributed systems

2.2. Databases for Developers

Databases for Developers
Scope: 10 ECTS
Content: The aim of the subject element is to train the student to be able to select and apply various database types appropriately in relation to various fields of application. The student must also be able to analyse and develop in relation to large databases, including redesign and optimisation.
Learning objectives: *Knowledge*

The student must have knowledge of:
- Various database types and the underlying models
- A specific database system's storage organisation and query execution
- A specific database system's optimisation possibilities – including advantages and disadvantages
- Database-specific security problems and their solutions
- Concepts and issues in relation to data warehousing, including big data
- The particular issues raised by having many simultaneous transactions, including in connection with distributed databases
- Relational algebra (including its relationship to execution plans)

Skills

The student can:
- Transform logical data models into physical models in various database types
- Implement database optimisation
- Use parts of the administration tool to assist in the optimisation and tuning of existing databases, including the incorporation of a specific DBMS' execution plans
- Use a specific database system's tools for handling simultaneous transactions
- Use the programming and other facilities provided by a modern DBMS
- Use an object-relational mapping tool

Competencies

The student can:
- Analyse the application domain in order to select a database type
- Divide responsibility for tasks between the application and DBMS during system development, to ensure the best possible implementation.

2.3. System Integration

System Integration
Scope: 10 ECTS
Content: This subject element must help ensure that the student develops the competencies to be able to work with technical system integration. After completing this module, the student must be able to integrate existing systems in connection with the development of new systems, and develop new systems supporting future integration.
Learning objectives: *Knowledge* The student must have knowledge of: • Business considerations in relation to system integration • Standards and standards organisations • Storage, transformation and integration of data sources

- The concept of services and its tie to service-oriented architectures
- Technologies which can be used to implement a service-oriented architecture
- Tools for integration.

Skills

The student can:

- Use an object-oriented system in a service-oriented architecture
- Design a system that is easy to integrate with other systems, and uses existing services
- Transform or expand a system so that it can function in a service-oriented architecture
- Use patterns that support system integration
- Integrate generic and other systems
- Choose from various integration methods
- Translate elements in a business strategy into specific requirements for system integration.

Competencies

The student can:

- Choose from various integration techniques
- Acquire knowledge of developments in standards for integration
- Adapt IT architecture to take into account future system integration.

2.4. Testing

Testing
Scope: 10 ECTS
Content: The aim of the subject element is to train students in planning and conducting testing. The student must understand the place and significance of testing in methods for system development. The student must be able to design and carry out systematic testing for large systems, including the establishment of automated testing. The student must also master concepts and techniques for the design and construction of testable systems.
Learning objectives: *Knowledge* The student must have knowledge of: - Significant test strategies and models and their role in system development - Testing as an integral part of a development project - Various types of testing and their applications. *Skills* The student can: - Ensure traceability between system requirements and testing at all levels - Apply both black-box and white-box testing techniques - Apply various criteria for the degree of test coverage - Use techniques for verification and validation - Use techniques and tools for automated testing

- Build systems to manage testing and the fault rectification process in development projects.

Competencies
The student can:
- Define, plan and carry out testing in a development project that matches the project's quality requirements
- Plan and manage the implementation of internal and external testing of software systems.
- Design testable systems

2.5. The number of exams in the national subject elements

There are 4 exams in the national subject elements, as well as one further exam in the bachelor project. For the number of exams in the internship, please refer to section 3.

For a comprehensive overview of all the programme's exams, please refer to the institutional part of the curriculum, as the national subject elements described in this curriculum can be examined together with the subject elements specified in the institutional part of the curriculum.

3. Internship

Learning objectives for the programme's internship

Internship
Scope: 15 ECTS
Content: The internship is organised so that it contributes – in combination with the rest of the study programme – to the student developing practical competencies. The aim of the internship is to enable the student to apply the programme's methods, theories and tools by performing specific practical software development tasks.
Learning objectives: *Knowledge*   The student must have knowledge of: • Daily operations throughout the internship company.   *Skills*   The student can: • Apply versatile technical and analytical working methods linked to employment within the profession   • Evaluate practice-oriented issues and identify possible solutions   • Manage the structuring and planning of day-to-tasks within the profession   • Communicate practice-oriented issues and reasoned solution proposals.   *Competencies*   The student can:

• Handle development-oriented, practical and professional situations in relation to the profession. • Acquire new knowledge, skills and competencies related to the profession • Participate in academic and interdisciplinary collaboration with a professional approach.
Number of examinations: 1

4. Requirements for the bachelor project

The learning objectives for the bachelor project are identical to the programme's learning objectives listed above under section 1.

The bachelor's project must document the student's understanding of and ability to reflect on the practices of the profession and the use of theory and methods in relation to a real-life problem. The problem statement, which must be central to the programme and profession, is formulated by the student, possibly in collaboration with a private or public company. The Academy approves the problem statement.

Bachelor project
Scope: 15 ECTS
Content: In their bachelor's project, the student must document the ability to work with a complex and practice-oriented issue in relation to a specific IT project, using an analytical and methodological basis.
Learning objectives: The final bachelor project must demonstrate that the programme's graduation level has been reached, see chapter 1 of this document.
Assessment: • The exam is an oral and written examination with an external co-examiner. A combined mark is given based on the 7-point scale for the written project and the oral presentation.

5. Rules on credit

Passed programme elements are equivalent to similar programme elements taken at other educational institutions offering this programme.

Students are obliged to inform us of any completed educational elements from another Danish or foreign higher education programme or any jobs which are likely to provide credit.

The Academy approves credit, in each instance, on the basis of completed programme elements and any jobs which meet the objectives of the subjects, the educational part and the internship parts.

The decision is based on an academic assessment.

For prior credit approval of studies in Denmark or abroad, students are required to document each approved and completed programme element on the completion of these studies.

In connection with applying for prior credit approval, the students give the Academy permission to obtain the necessary information after the student's completion.

Following approval according to the above, the programme element is deemed to be passed if it was passed according to the rules of the programme in question.

6. Academic criteria for selecting candidates for top-up programmes

Having completed a computer science fulfils the formal admission requirements for the professional bachelor programme in software development.

If there are more applicants than student places, applicants will be according to the following criteria:

- Average grade from the qualifying study programme
- Grades and ECTS credits in programming and system development
- Relevant work experience

7. Commencement and transitional schemes

Commencement

All enrolled students will be transferred to this curriculum on 1 September 2017.

Simultaneously, previous joint national curricula are NOT valid from this date.

Software Development

Curriculum 2023 – Institutional Section

Table of contents

1. Curriculum framework

This is a translated version of the Danish curriculum. In case on any discrepancies between this curriculum and the Danish curriculum, the text in the Danish curriculum applies.

This curriculum is based on:

- Existing Ministerial Order on Academies of Professional Higher Education

- Existing Ministerial Order on Academy Profession Programmes and Professional Bachelor Programmes

- Existing Ministerial Order on Examinations and Tests on Professionally and Business Oriented Higher Education Programmes (the Examination Order)

- Existing Ministerial Order on Grading Scale and other Assessment for Education Programs at the Ministry of Higher Education and Science (the Grading Scale Order)

- Existing Ministerial Order on Technical and Commercial Academy Profession Programmes and Professional Bachelor Programmes

- Existing Ministerial Order on Admission to and Enrolment on Academy Profession Programmes and Professional Bachelor Programmes (the Admissions Order).

All can be found here: https://www.retsinformation.dk/

1.1. Effective date and transition period

This institution-specific section of the curriculum takes effect on 28.08.2023 and applies to all students enrolled on the programme on this date or later.

Current students at the Academy will complete their studies according to the curriculum valid at the initiation of their studies. With the exception of students on leave, they will continue their studies according to the curriculum valid at the time of resumption.

1.2. The graduates title in Danish and English

The programme gives the graduate the right to use the title Bachelor of Software Development. The Danish title is Professionsbachelor i softwareudvikling.

1.3. Scope of the programme

The scope of the programme is to qualify the graduate to be able to independently work as an IT specialist with focus on integration and architecture, and to participate in professional collaborations on the development of large data-intensive distributed IT systems in IT companies, IT consulting companies or internal IT development departments.

The programme is placed at level 6 in the qualification framework for higher education.

The programme is worth 90 ECTS-credits, which includes:

- ✓ Educational elements with a total scope of 60 ECTS-credits which are organized within the professional areas of the programme
- ✓ Internship with a total scope of 15 ECTS-credits
- ✓ Final examination project with a total scope of 15 ECTS-credits

2. The subject elements of the programme

The educational elements are organized within the following subject elements with a total scope of 60 ECTS-points and are mutually weighted in the ratio 1:1.

Development process: The subject element contains design, implementation, maintenance and quality assurance of large, distributed IT systems, where scalability is a central and important characteristic. Focus is on system development methods, techniques and technologies for continuous integration and delivery, including the work in distributed development teams as well as in quality assurance through design and implementation of tests of larger systems, including automated testing and techniques for the design and construction of testable system.

System interaction: The subject element contains technical integration of systems, including integration of existing systems, integration of existing systems in the development of new systems as well as the development of new systems which support future integration. More specifically the subject element includes different types of databases, the selection and use of databases based on different application domains, including analysis and development towards large datasets, as well as redesign and optimization of databases.

3. Overview of the programme

1st Year		2nd Year
Databases for Developers 10 ECTS	Testing 10 ECTS	INTERNSHIP 15 ECTS
System Integration 10 ECTS	Elective Educational elements 20 ECTS	
Development of Large Systems 10 ECTS		BACHELOR PROJECT 15 ECTS

3.1. National programme elements

Appears in the national part of this curriculum.

3.2. Local programme elements

In addition to the national part of this curriculum, the programme includes 20 ECTS local elements, organized as elective elements. Electives appear in the catalog on Moodle – recent electives appear in the appendix to this curriculum.

4. Teaching and working methods

At EASV, our learning approach is that business competencies are best developed when the study programme's study activities put practice and concrete issues at the heart of learning. Further we believe that that it is the work of creating value in practice that drives the motivation and commitment of our students.

EASV uses an education model that focuses on:

- Facilitating a motivating and engaging learning environment based on practice
- Transposing and disseminating relevant knowledge from research and industry in a concrete practice
- Supporting students' active participation and study intensity through relevant study activities
- Involving students' knowledge and work experience as a resource so that students are co-creators of learning
- Supporting learning through ongoing dialogue and a common feedback culture
- Flexible work, involving digital learning activities, focusing on using our resources and improving student-learning outcomes, independent of time and place.

5. Exams and prerequisites

Time Frame	Exam	ECTS credits	Internal/external	Evaluation
Within the first 2 month of studying	The Study Start Test	-	Internal	Approved/Not approved
1st Year	Databases for Developers	10	Internal	7-point grading
1st Year	Development of Large Systems	10	External	7-point grading
1st Year	Testing	10	Internal	7-point grading
1st Year	System Integration	10	External	7-point grading
1st Year	Elective Educational elements	20	Internal	7-point grading
2nd Year	Internship	15	Internal	7-point grading
2nd Year	Bachelor final project	15	External	7-point grading3

Information about time and place for the examinations will be posted on Moodle.

Joining the semester, the education element, etc. is also a registration for the corresponding exams.

All examinations are to be submitted/presented in understandable English or Danish. Students with other native languages can seek exemption from the fact that formulation and spelling skills can influence the evaluation of the final examination project or any exam for which the curriculum specifies that such skills are included in the evaluation. Application for the exemption should be sent to the head of department at least four weeks prior to the examination.

Prerequisites for the exam
In order to sit the exam, there may be one or more prerequisites that must be met. Prerequisites are described in the following at each exam.
Prerequisites can be several different things, e.g. submission of a written project, participation in class, a presentation, etc.
Note that if one or more of the prerequisites is not met you will not be allowed to sit the exam, and will have used one exam attempt.

5.1 Scope and criteria for examinations
In the following, exams in each of the national compulsory elements is described, including:
- Prerequisites for taking the exam
- Exam form
- Assessment criteria
- Formal requirements

5.1.1 The Study Start Test
According to the Executive Order on Examinations, the student must participate in and pass a study start test in order to continue on the study programme. The purpose of the study start test is to clarify: whether the student has actually started the programme.
The study start examination is held no later than two months after the commencement of the study programme.

Test form
The study start test in an individual, written test, based on the student's reflection on prior knowledge and motivation for the study programme.

Assessment criteria
The study start test is internal assessed and is assessed with "Approved" or "Not approved".

If the student does not fulfil the study start test requirement in the first attempt, the student has another attempt, which must be conducted no later than three months after the commencement of the study programme. If the student does not fulfil the test in the second attempt, the student cannot continue on the study programme and his/her enrolment will consequently be cancelled.

5.1.2 Delevopment of Large Systems

Prerequisites for the exam

There are two compulsory assignments that must be handed-in and approved in order to be qualified to do the exam.

Exam form

The exam is an individual oral exam (30 min.) without preparation time of already known questions. The student picks a random question and present a prepared presentation answering the question for approximately 15 minutes. The examiners may ask questions during the presentations as well as after in subjects according to the curriculum. More details will follow in an Exam info document that will be published at the end of the semester.

Assessment criteria

The evaluation criteria for the examination are based on the learning objectives of the educational element.

Evaluation is graded externally according to the 7-point grading scale based on an overall assessment of the oral presentation and examination.

5.1.3 Databases for Developers

Prerequisites for the exam

There are two compulsory assignments that must be handed-in and approved in order to be qualified to do the exam.

Exam form

This examination is an individual internal oral exam based on a written synopsis discussing a topic of interest, relevant for the course. The exam lasts for 20 minutes including assessment. It is assessed internally according to the 7-pointscale.

Assessment criteria

The evaluation criteria for the examination are based on the learning objectives of the educational element.

Formal requirements

The synopsis must contain both a theoretical part and a practical part covering issues related to the problem definition and a brief agenda for your exam presentation.

5.1.4 System Integration

Prerequisites for the exam

There are two compulsory assignments that must be handed-in and approved in order to be qualified to do the exam.

Exam form

This examination is an individual external oral exam based on a written synopsis discussing a topic of interest, relevant for the course. The exam lasts for 30 minutes including assessment. It is assessed externally according to the 7-pointscale.

Assessment criteria

The evaluation criteria for the examination are based on the learning objectives of the educational element.

Formal requirements

The synopsis must contain both a theoretical part and a practical part covering issues related to the problem definition and a brief agenda for your exam presentation.

5.1.5   Testing

Prerequisites for the exam

There are two compulsory assignments that must be handed-in and approved in order to be qualified to do the exam.

Exam form

This examination is an individual internal oral exam based on a written synopsis discussing a topic of interest, relevant for the course. The exam lasts for 20 minutes including assessment. It is assessed internally according to the 7-pointscale.

Assessment criteria

The evaluation criteria for the examination are based on the learning objectives of the educational element.

Formal requirements

The synopsis must contain both a theoretical part and a practical part covering issues related to the problem definition and a brief agenda for your exam presentation.

6. Internship

The learning objectives for the internship appear in the national part of this curriculum. The internship is worth 15 ECTS-credits.

Requirements and expectations

The internship allows you to work with relevant issues and gain knowledge about relevant job functions. During the internship you are linked to one or more companies. The internship can be organized flexibly and differentiated and can form the basis for your final examination project.

The relation between theoretical learning and actual practice forms the basis for your objectives for the internship period.

Based on the learning objectives for the internship (see the national section of the Curriculum), you, the internship company and the school supervisor collaborate to identify specific objectives for the internship period.

This then forms the basis for organizing your work during the internship period.

The internship can be compared to a full-time job, with demands regarding working hours, work to be done, involvement and flexibility that correspond to those that you can expect to meet in your first job. If, for documented health reasons, you cannot complete an internship for 37 hours per week, you can apply for a dispensation to organize your internship period appropriately.

Prerequisites for the exam

- You must have actively participated in the internship,
- internship report, on which the examination and the evaluation are based, must meet the requirements cf. below,
- the internship report must be handed in on time, cf. the exam schedule available on Moodle, and
- you must have completed your evaluation of the internship (questionnaire).

The Examination and assessment criteria

This examination is an individual internal exam based on the internship report. T

The assessment criteria will be the learning objectives for the internship.

Evaluation is graded according to the 7-point grading scale based on an overall assessment of the written internship report and the oral presentation.

You will present relevant parts of the internship report in approximately 10 minutes, followed by an examination dialogue where all parts of the internship can be included. The exam lasts for 20 minutes including evaluation.

The presentation can be held via video conference if approved by the head of department.

The exam is held at the 3rd semester after the internship. Further information regarding time and place and about handing in the internship report can be found on Moodle.

Requirements for the internship report

The following internship report requirements apply:
- Front page with student name, internship company, and internship period
- Introduction, including main issues, problem statement and approaches
- Reflection of the learning outcome
- Description of specific jobs done during the internship
- Conclusion
- Appendix: Statement from the internship company and the students diary/internship log
- Bibliography (including all sources referred to in the report)

- Other Appendices (including only those documents that are central to the report)

The maximum number of pages for the internship report is 10 standard pages. A standard page is defined as 2400 characters, including spaces and footnotes, but excluding the front page, table of contents, bibliography and appendices. Appendices are not included in the grading evaluation.

The internship report is submitted in English or Danish for Software Development.

7. Final bachelorproject

The final bachelorproject and the internship exam together with the other exams must document that the learnings objectives of the programme is met.

Requirements regarding the final bachelorproject as well as learning objectives can be found in the national section of this curriculum.

The examination is held at the end of 3rd semester. Further information regarding time and place for the examination can be found on Moodle.

Prerequisites for the exam

Failure to submit the written project correctly means that the student will not be allowed to attend the exam, the student will use one exam attempt.

The examination in the final project cannot be held until the internship exam and all other exams in the education have been passed.

The exam and organization

This examination is an individual external oral exam, based on the final project report.

The student presents relevant parts of the final project report in approximately 15 minutes, followed by an examination dialogue. The exam lasts for 30 minutes including assessment.

Assessment criteria

The evaluation criteria for the examination are based on the learning objectives for the final project in the national section of the Curriculum.

Formulation and spelling skills can influence the evaluation of the final examination project.

Requirements for the written report

The minimum number of pages is 15 standard pages. The maximum number of pages for the final project report is 50 standard pages. A standard page is defined as 2400 characters, including spaces and footnotes, but excluding the front page, table of contents, bibliography and appendices. Appendices are not included in the grading evaluation.

The examination will be in Danish or English for Software Development.

8.   Educational elements completed abroad

You can – with pre-approval – obtain credit for any of the educational elements that you complete abroad. In such cases you must, after completion of your studies abroad, document the educational elements that have been completed. In connection with pre-approval you must agree that the school is entitled to secure any necessary information about the educational elements.

With prior acceptance of credits, the specific educational element will be considered completed if you have passed the course according to existing and relevant rules for the programme.

9. Credits for local and elective educational elements

Any elective and local educational element that has been passed is considered to be equivalent to the corresponding educational element offered by other educational institutions offering the education.

The student is to apply for prior approval if credit is wished for educational elements that are not included in the education.

10.   Student activity and participation requirements

To facilitate the teaching forms used, students are required to participate actively in relevant activities, including the submission and presentation of assignments and projects.

Enrolment can be terminated for students who have not participated actively in their studies. Active participation is defined as follows.

The student has:
- Submitted the assignments, reports, etc. which are a prerequisite for an examination in accordance with the curriculum, with a trustworthy content. This includes not having submitted material for which others have copyright.

10.1   The consequences of absent student actitivty

10.1.1   Termination of state educational grant (SU)

Failure to meet one or more of the criteria for student activity can lead to termination of your state educational grant (SU).

Periods in which the student is not active due to leave of absence, maternity leave, adoption, documented illness, or military service are not included in the above. The student must, if so required, supply documentation for such conditions.

Exemption can be granted from the above requisites in the case of exceptional circumstances. Applications for exemption should be sent to the head of department.

10.1.2 Termination of enrolment

Failure to meet one or more of the criteria for student activity can lead to termination of enrolment in the programme.

Prior to termination of enrolment in the education, the student is to be sent a written notice that points out the above-mentioned rules. This notice also specifies that the student has 14 days in which to submit documentation for periods with a lack of student activity that the student claims should not lead to expulsion and specifies as well a deadline for seeking exemption. If the student has not reacted within this period of time, he/she is expelled from the programme.

If the student requests that he/she not be expelled, this request will have a delaying effect until the head of department as decided upon the matter. The student is entitled to submit a complaint to the head of department about a decision that has been made two weeks at the latest after being informed of the decision. This complaint will have a delaying effect. If the head of department maintains the decision, the student can complain to the Ministry of Higher Education and Science within two weeks after receiving the complaint, as far as legal issues are involved.

Exemption can be granted from the above requisites in the case of exceptional circumstances. Applications for exemption should be sent to the head of department.

11. Exam terms and conditions

Joining the semester, the education element, etc. is also a registration for the corresponding exams

Deregistration from an exam is only possible under special circumstances such as illness (documented with a medical certificate), death in the family or exceptional circumstances that influences your well-being. Exemption can be granted if you are an elite athlete. Deregistration shall be provided to the head of department before the beginning of the exam or as soon as possible. Documentation in writing need to be submitted before the attempt can be cancelled, cf. section 11.

11.1 Use of aids

Any rules for restrictions in the use of aids will be made clear in the specifications for the individual examination.

11.2 Special examination conditions

The student can apply for special examination conditions when warranted by physical or mental impairment. The application should be submitted to the head of department at least four weeks prior to the date of the examination. An exemption from this deadline can be given in the case of suddenly occurring health issues.

The application must be accompanied by a medical certificate, a statement from e.g. an institute dealing with speech, hearing or sight impairment or dyslexia, or other forms of documentation certifying serious health issues or relevant functional impairment.

11.3 Re-examinations due to illness, failing or non-attendance

11.3.1 Re-examination due to illness

If you have not been able to sit an examination due to documented illness or other unforeseen circumstance, you are given the opportunity to sit a re-examination as quickly as possible. In the case of an examination taking place at the end of the last examination period, you are given the opportunity to sit the examination in the same examination period or immediately thereafter.

This examination can be identical to the next ordinary examination. It is your responsibility to investigate when the re-examination will be held.
Information about time and place for these re-examinations can be found on Moodle.

Illness must be documented by a medical certificate received by the institution three days at the latest after the examination has been conducted. If you become acutely ill during an examination you must document that you have been ill on the day in question.

If illness is not documented according to the above rules, the examination will count as one examination attempt spent.

Any costs for the medical certificate are the responsibility of the student.

11.3.2 Re-examination due to failing or non-attendance

By not passing or by not attending the examination, you are automatically registered to sit the re-examination, provided that you have not spent all three examination attempts. The re-examination can be identical with the next ordinary examination.

It is your responsibility to investigate when the re-examination will be held. Information about time and place for these re-examinations can be found on Moodle.

Exemption from the above can be given in the case of extraordinary conditions, including documented disability.

12. Errors or omisssions during the exam

If errors and omissions are brought to attention during the exam, the head of department decides how the error or the omission can be remedied.

In the case of serious errors or omissions, or where it must be considered to be the most correct way to remedy the error, the head of department may cancel the exam in question and arrange a re-examination. In the case of a cancelled exam the assessment lapses.

In the case of other significant errors or omissions and extraordinary exam may be offered. The offer is given to all affected students. The student may choose to keep their original assessment even if they have participated in the extraordinary exam.

13. Cheating offences and disruptive behaviour

During any exam the student must behave considerately and follow the instructions given by the examination supervisor, examiner or censor.

Cheating on exams will be dealt with according to the rules in the existing Ministerial Order on Examinations on Professionally Oriented Higher Education Programmes (The examination order).

It is referred to as cheating offences when the student:

- plagiarizes cf. section 13.1,
- counterfeits,
- conceals or misleads about own efforts or results,
- takes part in an unauthorized collaboration,
- receives or tries to receive help during the exam, or helps other students when it is not a group exam,
- uses unauthorized aids,
- has wrongfully obtained prior knowledge of the examination assignment,
- provides wrongful attendance information, or
- seeks to circumvent, disable or otherwise obstruct the intent of EASV's use of monitoring programs.

When submitting written material, you must verify by your signature that the material has been produced without undue assistance.

13.1 Using one's own work and that of others - plagiarism

Cheating in exams through plagiarism comprises instances where a written answer appears to be completely or partially produced personally by the examinee or examinees, but:

1. Comprises identical or almost identical rendering of the wording or work of others, without clearly identifying this using quotation marks, italics, indentation or other clear indications stating the source of the material, cf. the educational institution's requirements to written work on Moodle.
2. Comprises major pieces of text with choice of words or formulations so close to that of another piece of writing that it is possible to determine through comparison that the text could not have been written without using the source in question.
3. Comprises the use of words or ideas of others without giving reference to the source in an appropriate manner.
4. Re-uses text and/or central ideas from own previously assessed answers (self-plagiarism) without observing the provisions laid down in items 1 and 3 above.

13.2   Investigation of cheating offences in exams, including plagiarism

The examinor must report suspicions of cheating offences and/or plagiarism as soon as possible to the head of department, including the available documentation. It must be disclosed, if it is a repeat case for one or more of the involved students.

Postponement of the exam

If the cheating offence concerns suspected plagiarism in a written report and/or answer that is to be used in the assessment of a subsequent oral exam, the head of department postpones the exam, unless the issue can be investigated prior to the date set for the exam.

Involving the student – hearing of the party/parties

The head of department decides whether the hearing of the student is to be oral, in writing, or a combination thereof.

For the oral hearing, the student is summoned to a clarifying interview, in which documentation substantiating the suspected cheating in the exam is presented to the student and in which the student is asked to present his/her point of view. The student has the right to be accompanied by a person of his/her own choice.

For the written hearing, the documentation substantiating the presumed cheating in the exam is sent to the student with a request for a written response to the accusation.

13.3   Disciplinary procedures

In case of cheating offences or disruptive behavior during the exams, the head of department, the person authorized by the head of department or the examiners in agreement may expel the student from the exam while it is taking place. In such cases the justification of the action is to be evaluated in connection with the subsequent decision. If the disruptive behaviour is of a less serious nature, the educational institution will initially issue a warning.

If clarification of the issue confirms the presumed cheating offence the student will not have the exam assessed and one examination attempt will have been spent. The student may also receive a written warning.

Aggravating circumstances or repeated offences could lead to temporary or permanent expulsion. The student cannot sit a re-examination and cannot sit the exam again until an exam is scheduled on ordinary terms as part of the degree programme. During the period of expulsion, the student is not allowed to attend classes or sit exams.

14.   Complaints about examinations and appeal decisions

Complaints about examinations will be dealt with according to the rules in chapter 11 in the existing Ministerial Order on Examinations on Professionally Oriented Higher Education Programmes (The examination order)

We recommend that you ask the student counsellor for information about complaint procedures and guidance on how to prepare a complaint.

14.1 Complaints about exams

You can submit a written complaint about legal matters or about academic issues; the scope of the exam, including the examination procedure and the assessment.

The complaint must be submitted to the head of department 2 weeks (14 calendar days) at the latest after the assessment of the exam concerned has been communicated. If the due date is on a public holiday, the due date will be the first workday following the public holiday.

The complaint is sent immediately to the original examiners, i.e. the internal examiner and the external examiner for the examination in question. Their statement of response forms the basis for the institution's decision regarding academic issues. Two weeks are normally allowed for this response, July is not included. As soon as the examiners' response is available, the student issuing the complaint is given an opportunity to comment on the statements, normally with a one-week deadline.

The decision is made by the institution on the basis of the complaint, the examiners response and the complainant's comments. The decision is to be communicated in writing and can:
1. Offer the possibility of a new assessment (re-assessment). This applies to written exams only.
2. Offer the possibility of a new exam (re-examination) with new examiners.
3. Reject the complaint.
4. A combination of 1-3 if the exam includes a written assignment with oral examination.

14.2 Appeals and complaints about appeal decisions

The complainant can appeal the institution's decision on a complaint. The appeal must be submitted two weeks at the latest after the decision has been communicated to the student.

Complaints about legal aspects of decisions made by the institution according to the rules laid down by the Examination Order (e.g. incapacity, hearings, correct or incorrect interpretation of the Examination Order) can be submitted to the Danish Agency for Higher Education and Science. The complaint must be submitted to the head of department. The institution issues a statement and the complainant is normally given one week in which to respond with his/her comments. The institution forwards the complaint, the statement and any comments the complainant may have to the Danish Agency for Higher Education and Science.

Complaints about the institutions decision on academic issues can be submitted to an appeals panel. The complaint must be submitted to the head of department.

The appeals panel consists of two authorised external examiners appointed by the chairman of the external examiners, a lecturer authorised to conduct examinations, and a student studying the subject area (the degree programme), both of which are appointed by the head of department.

The appeals panel makes decisions based on the material used by the educational institution in making its decision and the student's appeal, with reasons stated. The appeals panel must make its decision two months at the latest (in the case of spring semester exams three months) after the submission of the appeal.

The appeals panel can:
1. Offer the possibility of a new assessment with new examiners (re-assessment). This applies to written exams only.
2. Offer the possibility of a new exam with new examiners (re-examination).
3. Reject the appeal.
4. A combination of 1-3 if the exam includes a written assignment with oral examination.

The decision of the appeals panel is final, which means that the case cannot be brought before a higher administrative authority as far as the academic part of the complaint is concerned.

14.3   Re-assessment and re-examination
If the decision is to offer re-assessment or re-examination, the complainant must be informed of the fact that the re-assessment or re-examination may lead to a lower grade.

The student must accept the offer within a period of two weeks after the decision has been communicated. Acceptance can thereafter not be cancelled. If the student does not accept the offer within this period of time, there will be no re-assessment or re-examination.
The re-assessment or re-examination must take place as quickly as possible. If the diploma has been issued, it will be withdrawn until the assessment is final, after which a new diploma will be issued.

If the decision is to offer a re-assessment or re-examination, the head of department appoints new examiners. The chairman of the external examiners may appoint an external examiner. The new examiners notify the educational institution of the outcome of their re-assessment and enclose a written statement that specifies the assessment and the reasons for it.

If the decision is to offer re-assessment or re-examination, the decision applies to all students whose examination suffers from the same defects as those referred to in the complaint.

Exemption from this deadline can be given in the event of exceptional circumstances.

15. Exemptions
The institute can grant exemptions from rules in this institution-specific section of the curriculum in cases where such exemption is justified due to exceptional circumstances. The institutions offering this education cooperate to ensure a uniform exemption practice.

Appendix

Machine Learning
Timing: 1st year of study **Scope: 5** ECTS
Content: The purpose of the course is to introduce the student to Machine Learning, so that the student can develop applications by using some of the most common Machine Learning techniques and model architectures.

Learning objectives:

Knowledge
The student must have knowledge of:

- What Machine Learning is good for, and its limitations
- Several popular applications of Machine Learning
- Supervised, unsupervised and reinforcement learning
- The types of predictions that machine learning solutions can make, including regression as well as binary and multiclass classification
- A few of the most common Machine Learning model architectures, including artificial neural network
- The development process for Machine Learning applications
- Key issues after having trained a model, such as over- and underfitting

Skills
The student can:

- Develop Machine Learning applications that are based on supervised learning
- Develop a Machine Learning application using a deep learning neural network architecture, and at least one other model architecture that is not based on neural networks
- Can use basic techniques for validation and fine-tuning of trained models
- Can use basic techniques for data preparation
- Use at least one popular programming framework to develop Machine Learning applications

Competencies
The student:

- Can compare different model architectures, and reason about which one will be best suited to solve a specific problem

The examination:
Internal oral exam based on a mini project. The exam duration is 20 min.

Assessment:
7 point grading scale

Functional Programming

Timing: 1st year of study

Scope: 5 ECTS

Content: The purpose of the course is to give the student a comprehensive understanding of the fundamental concepts and techniques in functional programming. The student will be able to construct small to medium size programs using a programming language supporting the functional paradigm.

Learning objectives:

Knowledge

The student must have knowledge of:
- Mutability of functions
- The functional paradigm in programming
- Recursion and how to emulate iteration using recursion
- The scope of functional programming

Skills

The student can:
- Use a modern functional programming language
- Model a computation as a composition of functions
- Design and implement 2nd –order functions
- Design and implement functions working with different kind of collections
- Design and implement small to medium size programs using the functional programming language

Competencies

The student can:
- Choose and validate components of an IT-system that are suitable to implement using the functional paradigm
- Integrate the functional paradigm in a multi-paradigm IT-system

The examination:

The examination will be an internal individual oral exam of 20 min. duration

Assessment:

7 point grading scale

Parallel Programming

Timing: 1st year of study

Scope: 5 ECTS

Content: This subject element must help ensure that the student develops the competencies in assessing the applicability of parallelization of algorithms for solving a given problem, and to construct parallel algorithms that efficiently utilize the available logical cores of the underlying system.

Learning objectives:

Knowledge

The student must have knowledge of:
- Key concepts associated with parallel programming, including data parallelism, task parallelism, task synchronization and pipelines.
- Requirements for parallelizing algorithms.
- Calculating the optimal performance gains that can be achieved through the parallelization of an algorithm.
- Key concepts associated with concurrent programming, including critical section, deadlock, starvation, and synchronization primitives used for synchronization.
- Asynchronous programming.

Skills

The student can:
- Design and implement parallel algorithms for a given parallelizable problem in a concrete programming language.
- Use asynchronous programming for improved responsiveness of an application implemented in a concrete programming language.
- Use synchronization primitives for concurrent programming in a concrete programming language.

Competencies

The student can:
- Assess the applicability of parallelization for solving a given problem and implement the chosen solution so that it efficiently utilizes the available cores of the underlying system.

The examination:

The examination will be an internal individual oral exam of 20 min. duration.

Assessment:

7 point grading scale

Prerequisites for the course

Knowledge of the object-oriented paradigm, and skills in programming in an object-oriented programming language.

Internet of Things

Timing: 1st year of study

Scope: 10 ECTS

Content: The purpose of this course is to train the student to be able to develop IoT devices and integrate them with richer clients using current cloud technologies and asynchronous communication. The student will be able to setup and program basic IoT devices. Doing integration with servers for data collection and presenting the data using current web technologies.

Learning objectives:

Knowledge

The student must have knowledge of:

- Common IoT device hardware and software technologies
- Common network protocols for IoT device infrastructure
- Options/languages for programming IoT devices
- IoT device operating systems
- Basic electronics for IoT devices
- Sensors and actuators
- Relevant cloud-based communication technology for integration of IoT devices and web systems

Skills

The student can:

- Develop programs for publishing data from IoT devices to the cloud
- Develop IoT devices for collecting data from the surroundings
- Develop IoT devices that is able to manipulate the surroundings
- Enable IoT devices to react on requests from the web
- Implement current IoT network communication
- Implement data-visualization of data collected from IoT devices

Competencies

The student can:

- Analyze requirements of a specific IoT project
- Choose suitable network technologies for implementation of IoT in a specific project context
- Choose a suitable setup and programming language for implementation of IoT in a specific project context

The examination:

Internal oral exam based on final project.
The duration is 10 min. group presentation and 20 min. individual oral exam.

Assessment:

7-point scale