



Curriculum 2014 – Joint national part

AP Degree in Computer Science

Datamatikeruddannelsen

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1. Programme structure

This is the joint national part of the curriculum for the Business Academy programme in information technology (computer scientist, AK), Executive order no. [641 of 12/06/2014](#).

| | | 1 st year | 2 nd year | 3 rd year |
|--------------------------|-----------------------------------|----------------------|----------------------|----------------------|
| Core area | Programming 40 ECTS | 30 ECTS | 10 ECTS | |
| | Systems development 25 ECTS | 15 ECTS | 10 ECTS | |
| | Technology 15 ECTS | 5 ECTS | 10 ECTS | |
| | The Business 10 ECTS | 10 ECTS | | |
| Elective elements | | | 30 ECTS | |
| Internship | | | | 15 ECTS |
| Main exam project | | | | 15 ECTS |
| | 90 ECTS | 60 ECTS | 60 ECTS | 30 ECTS |

The overview shows the interrelation of the core areas, optional programme elements, internship and the main exam project.

2. Core areas of the programme

The programme contains the following core areas:

1. Programming (40 ECTS)
2. Systems development (25 ECTS)
3. Technology (15 ECTS)
4. The Business (10 ECTS)

In total 90 ECTS

2.1. Content and learning objectives for the core area: Programming

Weight: 40 ECTS

Content

The core area must enable the student to develop skills for how to realise quality IT systems professionally and efficiently through the application of modern and contemporary programming techniques and tools for software construction.

Learning objectives

Knowledge and understanding

The student will gain knowledge about:

- Specification of abstract data types
- Criteria for programme quality

- Mechanisms of abstraction in modern programming languages
- Integration of heterogeneous components and platforms

Skills

The student will get the skills to:

- Specify and construct algorithms
- Apply the programming languages for the realisation of algorithms, design patterns, abstract data types, data structures, design models and user interfaces
- Assess qualitative and quantitative characteristics of algorithms and data structures
- Apply modern integration tools, including version management system
- Realise models in a database system and construct programmes that use a database interface
- Design and construct programmes as collaborating processes/threads
- Develop applications based on a layered software structure
- Apply software components/libraries
- Prepare documentation material in relation to valid de-facto standards within the profession
- Apply modern techniques and tools for the development of tests and quality assurance
- Apply techniques for the construction of programmes with several, concurrent users
- Design and construct programmes based on collaborative processes in a distributed architecture
- Construct programmes that make use of contemporary network technologies
- Apply design patterns for distributed software architecture
- Develop software components
- Develop web applications

Competencies

The student will learn to:

- Take part in development, integration and maintenance projects as a professional programmer
- Acquire new competencies within programming languages, development tools, programming techniques and programme design

2.2. Content and learning objective for the core area: Systems development

Weight: 25 ECTS

Content

The core area must ensure that students develop competencies that will allow them to take part in the development of relevant quality IT systems in a professional and efficient way.

Furthermore, the core area must ensure that students develop competencies to develop systems from initial idea to operational system, and systematically further develop and integrate IT systems through the application of situational, modern system development methods and techniques.

Learning objectives

Knowledge and understanding

The student will gain knowledge about:

- The importance of experiments as part of or supplementary to the system development method
- The importance of the quality criteria for the system development process and the final design of the system

Skills

The student will get the skills to:

- Model and design IT systems
- Apply an appropriate software architecture
- Document and communicate product and process – including traceability
- Assure product and process quality
- Apply appropriate design patterns
- Involve the user
- Design situational user interfaces and choose a process model and system development method
- Work systematically with a project through the application of a chosen system development method
- Plan, assess and modify a project
- Select and apply appropriate design patterns and components
- Design systems which are integrated with other systems

Competencies

The student will learn to:

- Take part in a development project as a competent participant
- Adapt a system development method to a project based on a given situation
- Acquire new process models and system development methods
- Reflect on and adjust process and method in practice

2.3. Content and learning objectives for the core area: Technology

Weight: 15 ECTS

Content

The core area must ensure that students develop competencies that will allow them to be instrumental in the choice and application of technology in connection with system development and programming of IT systems and give students basic knowledge of technological aspects.

Learning objectives

Knowledge and understanding

The student will gain knowledge about:

- Facilities in and construction of contemporary operating systems
- Facilities in and the functioning of contemporary database systems
- Multiple-user issues
- Principles for design and realisation of distributed systems
- Fundamental network concepts

Skills

The student will get the skills to:

- Apply mechanisms for process and thread synchronisation
- Apply central security concepts and threats
- Apply virtualisation
- Apply services and programming interfaces for communication
- Apply prevailing application protocols

Competencies

The student will learn to:

- Acquire knowledge of new operating systems and database systems
- Reflect on the choice of infrastructure in connection with the development of distributed systems

2.4. Content and learning objectives for the core area: The Business

Weight: 10 ECTS

Content

The core area must ensure that students develop competencies that will allow them to include relevant business aspects and understanding in connection with system development. Furthermore, the core area must ensure that students develop competencies that enable them to work in a system development organisation and take part in the development, further development and integration of IT systems for different types of organisations.

Learning objectives

Knowledge and understanding

The student will gain knowledge about:

- How IT can improve business processes and the business itself
- Systems used in the business, including organisational concepts
- Rationale for IT investments
- IT security

Skills

The student will get the skills to:

- Analyse and model business processes
- Take part in project work
- Apply innovative methods focussing on project work in real-life development projects
- Manage internal and external communication
- Take part in IT implementation and change management

Competencies

The student will learn to:

- Take part in and see the connection between design of business processes and design of IT systems
- Collaborate with representatives from the user organisation and the development organisation based on business understanding
- Acquire knowledge about new technologies from a business perspective

3. Compulsory programme elements

The compulsory programme elements are:

1. Programming, Systems development, Technology and the Business (60 ECTS)
2. Programming and Technology (20 ECTS)
3. Systems development (10 ECTS)

In total 90 ECTS

The three compulsory programme elements are completed with an exam.

3.1. Content and learning objective: Programming, Systems development, Technology and the Business

Weight: 60 ECTS

Of which:

- 30 ECTS from the core area Programming
- 15 ECTS from the core area Systems development
- 5 ECTS from the core area Technology
- 10 ECTS from the core area the Business

Content

The first compulsory programme element must ensure that students are qualified to:

- Implement IT systems with user interfaces efficiently and professionally and manage fundamental elements within computing
- Develop and further develop small database systems systematically from idea stage until they are operational through the application of a specific contemporary method and related system development tools
- Be instrumental in the choice and application of technology in connection with system development and programming of IT systems and give the student fundamental knowledge of technological aspects
- Include relevant business aspects and business understanding in connection with system development and work in a system development organisation, and take part in the development, further development and integration of IT systems for different types of organisations.

Learning objectives for the core area: Programming

Knowledge and understanding (Programming)

The student will gain knowledge about:

- Specification of abstract data types
- Criteria for programme quality
- Mechanisms of abstraction in modern programming languages

Knowledge and understanding (System development)

The student will gain knowledge about:

- The importance of experiments as part of or supplementary to the system development method
- The importance of quality criteria for the system development process and the final design of the system

Knowledge and understanding (Technology)

The student will gain knowledge about:

- Facilities in and construction of contemporary operating systems
- Facilities in and function of contemporary database systems
- Multiple-user issues

Knowledge and understanding (The Business)

The student will gain knowledge about:

- How IT can improve business processes and the business itself
- Systems used in the business, including organisational concepts
- Rationale for IT investments
- IT security

Skills (Programming)

The student will get the skills to:

- Specify and construct algorithms
- Apply the programming languages for the realisation of algorithms, design patterns, abstract data types, data structures, design models and user interfaces
- Apply a modern integrated development tool, including version management system
- Realise models in a database system and construct programmes that make use of a database interface
- Design and construct programmes as related processes/threads
- Develop applications based on a layered software structure
- Apply software components/libraries
- Prepare documentation in relation to valid de-facto standards within the profession
- Apply modern techniques and tools for testing and quality assurance
- Assess qualitative and quantitative characteristics of algorithms and data structures

Skills (System development)

The student will get the skills to:

- Model and design IT systems
- Apply an appropriate software architecture
- Document and facilitate product and process - including traceability
- Assure product and process quality
- Apply appropriate design patterns
- Involve users
- Design user interfaces

Skills (Technology)

The student will get the skills to:

- Apply mechanisms for the synchronisation of processes and threads

Skills (the Business)

The student will get the skills to:

- Analyse and model business processes
- Take part in project work
- Apply innovative methods focussing on project work in real-life development projects

- Communicate internally and externally
- Take part in IT implementation and change management

Competencies (Programming)

The student will learn to:

- Take part in development and maintenance projects as a professional programmer
- Acquire new competences within programming languages, development tools, programming techniques and program design

Competencies (System development)

The student will learn to:

- Take part in a development project as a competent participant
- Reflect on and adapt process and method to practice

Competencies (Technology)

The student will learn to:

- Acquire knowledge about new operating systems and database systems

Competencies (the Business)

The student will learn to:

- Take part in and see the connection between design of business processes and design of IT systems
- Collaborate with representatives from user organisations and development organisations on the basis of business understanding
- Acquire knowledge about new technology from a business perspective

The compulsory programme element is completed with an exam (1st year exam).

Assessment

The exam is assessed according to the 7-point scale and accounts for 60 ECTS.

The learning objectives for the programme element are identical to the learning objectives for the exam.

For information about examination form and organisation, etc. of the exam; see the institutional part of the curriculum.

3.2. Content and learning objectives for: Programming and Technology

Weight: 20 ECTS

Of which:

- 10 ECTS from the core area Programming
- 10 ECTS from the core area Technology

Content

This second compulsory programme element must ensure that students are qualified to do the following:

- Master a more advanced element within computing and realise distributed software systems

- Be instrumental in the choice and application of technology in connection with system development and programming of distributed IT systems and give the student an in-depth knowledge of technological aspects

Learning objectives for Programming

Knowledge and understanding

The student will gain knowledge about:

- Integration of heterogeneous components and platforms

Knowledge and understanding

The student will gain knowledge about:

- Principles for design and realisation of distributed systems
- Fundamental network concepts

Skills

The student will get the skills to:

- Apply techniques for the construction of programmes with several, concurrent users
- Design and construct programmes based on related processes in distributed architecture
- Construct programmes that make use of contemporary network technologies
- Apply design patterns for the distributed software architecture
- Develop software components
- Develop web applications

Skills

The student will get the skills to:

- Include relevant technological aspects in the development of distributed systems, including:
 - Central security concepts and threats
 - Application of virtualisation
 - Application of services and programming interfaces
 - Application of prevailing application models

Competencies

The student will learn to:

- Take part in integration projects as a professional programmer
- Acquire new competencies within programming languages, development tools, programming techniques and programme design

Competencies

The student will learn to:

- Reflect on the choice of infrastructure in connection with the development of distributed systems

The compulsory programme element is completed with an exam.

Assessment

The exam is assessed according to the 7-point scale.

The learning objectives for the programme element are identical to the learning objectives for the exam.

For information about examination form and organisation, etc. of the exam; see the institutional part of the curriculum.

3.3. Content and learning objectives for: Systems development

Weight: 10 ECTS

Content

This third compulsory programme element must ensure that students are qualified to carry out systematic development, further development and integration of distributed IT systems through the application of situational, modern system development methods and techniques.

Learning objectives

Knowledge and understanding

The student will gain knowledge about:

- Importance of quality criteria for the system development process and the final design of the system

Skills

The student will get the skills to:

- Choose a process model and system development method based on the situation in question
- Work systematically with a project in accordance with the chosen system development method
- Plan, assess and modify a project
- Document and facilitate product and process - including traceability
- Select and apply appropriate design patterns and components
- Design systems that are integrated with other systems

Competencies

The student will learn to:

- Adapt a system development method for a project on the basis of the situation in question
- Take part in a development project as a competent participant
- Acquire new process models and system development methods
- Reflect on and adapt processes and methods to practice

The compulsory programme element is completed with an exam.

Assessment

The exam is assessed according to the 7-point scale.

The learning objectives for the programme element are identical to the learning objectives for the exam.

For information about examination form and organisation, etc. of the exam; see the institutional part of the curriculum.

3.4. Number of exams for the compulsory programme elements

The three compulsory programme elements are each completed with an exam. See the overview of the programme exams in chapter 7.

Overview of ECTS distribution across core area, compulsory programme elements and the exam:

| Compulsory programme elements | Programming, Systems development, Technology and the Business | Programming and Technology | Systems development | In all |
|--------------------------------|---|----------------------------|---------------------|----------------|
| <i>Core areas</i> | | | | |
| The Business 10 ECTS | 10 ECTS | | | 10 ECTS |
| Systems development 25 ECTS | 15 ECTS | | 10 ECTS | 25 ECTS |
| Programming 40 ECTS | 30 ECTS | 10 ECTS | | 40 ECTS |
| Technology 15 ECTS | 5 ECTS | 10 ECTS | | 15 ECTS |
| In all 90 ECTS | 60 ECTS | 20 ECTS | 10 ECTS | 90 ECTS |

4. Internship

Weight: 15 ECTS

Content

The internship is planned so as to contribute to students' developing practical skills in combination with the other parts of the programme. The purpose of the internship is to enable the student to apply the methods, theories and tools of the programme to solve concrete, practical tasks within information technology.

Learning objectives

Knowledge and understanding

The student will gain knowledge about:

- Day-to-day management of the internship company

Skills

The student will get the skills to:

- Apply versatile technical and analytical working methods related to the business in question
- Assess real-life problems and come up with solutions
- Present real-life problems and well-founded solutions

Competencies

The student will learn to:

- Manage development-orientated practical and technical situations in relation to the business
- Acquire new knowledge, skills and competencies in relation to the business
- Take part in technical and interdisciplinary collaboration with a professional approach
- Manage the structuring and planning of the daily work of the business

The internship is completed with an exam.

The learning objective for the programme element is identical to the learning objective for the exam.

For information on examination form and organisation, etc. of the exam; see the institutional part of the curriculum.

5. Main project

Weight: 15 ECTS

Requirements for the main project

Through the use of analysis and methodology, the students must document their ability to solve a complex, real-life situation in relation to a concrete task within the IT area. The thesis statement must be essential to the programme and the business and should be outlined by the student, possibly in collaboration with a private or a public company. The educational institution approves the thesis statement.

Students must hand in a project report and a product, if required.

The project report, which is the written part of the exam, must include the following as a minimum:

- Front page with title
- Table of contents (TOC)
- Introduction including thesis statement
- Method
- Analysis
- Solution, if any
- Conclusion
- Bibliography (including all sources which have been referenced in the project)
- Appendices (only include documents central to the report)

The project report must not exceed 40 standard pages if a student is writing on his own + 20 standard pages per extra student.

Front page, table of contents, bibliography and appendix are not included in the required number of pages. Appendices will not be assessed.

A standard page consists of 2,400 characters including spaces and footnotes.

Spelling and formulation skills

Spelling and formulation skills form part of the main exam project. This is an overall assessment of the professional content as well as the student's spelling and formulation skills.

Students who can document a relevant, specific disability can apply for dispensation from the spelling and formulation requirements. The application must be sent to the educational institution no later than four weeks before the exam takes place.

Learning objectives

The exam project must document that graduation level has been obtained, c.f. Appendix 1 of the Executive Order for the Computer Science Programme.

The learning objectives comprise knowledge, skills and competences to be obtained during the computer science programme.

Knowledge and understanding

The graduate must have developed knowledge concerning:

- Common practice, theory and methods within software development
- Fundamental business matters in relation to system development
- The technological concepts and technological basis of IT systems in relation to programming, trouble shooting and implementation

Skills

The graduate must be able to:

- Systematically uncover requirements for IT systems, including the degree to which the requirements can be realised within the given frames
- Apply modern and contemporary programme techniques and tools for software construction and assure the quality of the product that has been developed
- Document that the work has been carried out in a way that the documentation can be used by the target group
- Apply relevant knowledge in connection with system development, programming and implementation
- Carry out systematic trouble shooting and remedying in connection with IT systems
- Assess real-life IT issues and list and select possible solutions
- Present real-life issues and possible solutions to partners and users

Competencies

The graduate has learnt to:

- Take part in the development of practice within software development
- Take part in project work as a competent contributor
- Take part in academic and inter-disciplinary collaboration in connection with software development as a competent and professional contributor
- Take part in a system development process through the application of modern methods, techniques and tools
- Acquire new knowledge, skills and competencies in relation to the IT business in a structured context, including knowledge of domain and technological knowledge as well as the application of new methods, techniques and tools

Assessment

The exam is external and is assessed according to the 7-point scale.

The exam consists of a written project and an oral part. The student receives one mark for both performances. The exam can only take place when the student has passed the main internship exam and the other programme exams.

For information on the examination form and organisation, etc. of the exam; see the institutional part of the curriculum.

6. Overview of examinations and their timing

Overview of all examinations and their timing:

| Exam | 150 ECTS distributed on the exams | Assessment |
|---|-----------------------------------|---------------|
| 1. Possible programme admission exam ¹ | - | Pass/fail |
| 2. 1 st year exam | 60 | 7-point scale |
| 3. Exam in Programming | 20 | 7-point scale |
| 4. Exam in Systems development | 10 | 7-point scale |
| 5. Exam for elective/s ² | 30 | 7-point scale |
| 6. Internship exam | 15 | 7-point scale |
| 7. Main exam project | 15 | 7-point scale |

7. Credit

Programme elements that have been passed are equivalent to similar programme elements at other educational institutions where the programme is offered.

Students are obligated to supply information about programme elements they have passed at other Danish or foreign institutions of higher education and any employment assumed to give credits. The educational institution approves credits individually on the basis of passed programme elements and employment that equals the subjects, programme parts and internship elements. The decision is based on an academic evaluation.

7.1. Credit for elective programme elements

Elective elements that have been passed are equivalent to similar programme elements at other educational institutions that offer the programme as well as other programmes.

7.2. Prior credit approval

1. The programme admission exam is described in the institutional curriculum.
2. Electives and accompanying exam(s) are described in the institutional curriculum.

Students can apply for prior credit approval. With prior credit approval of studies in Denmark or abroad, students are required to document each approved and completed programme element. In connection with applying for prior credit approval, the students give the institution permission to obtain the necessary information after completion.

Upon approval of the prior credit approval, the programme element is considered completed if it is passed according to the rules of the programme.

7.3. Credit schemes

See the institution website.

8. Admission to the programme

8.1. Admission requirements and/or distribution of subjects and admission exams, if any

Admission is in accordance with Executive Order no. 1486 of 16 December 2013 on the admission to Business Academy programmes and Academy Profession bachelor programmes. The order is available at retsinfo.dk (in Danish only).

9. Commencement of the curriculum

This is the joint national part of the curriculum for the Business Academy programme in information technology (computer science, AK), [Executive Order no. 702 of 03/07/2009](#). The curriculum is valid from 1 September 2014 and applies to the following institutions:

Business Academy Aarhus
www.baaa.dk

Københavns Erhvervsakademi
www.kea.dk

ErhvervsAkademi Sjælland
www.easj.dk

cph business
www.cphbusiness.dk

Erhvervsakademiet Lillebælt
www.eal.dk

Erhvervsakademi Sydvest
www.easv.dk

Erhvervsakademi MidtVest
www.eam.v.dk

Erhvervsakademi Dania
www.eadania.dk

*Professionshøjskolen University
College Nordjylland*
www.ucn.dk

9.1. Transitional scheme

This joint national part of the curriculum is valid from 1 September 2014 and applies to present and future students signing up for this programme and exams taking place on the mentioned date or later.

Transitional schemes for students enrolling before August 2014, if any, will be found in the institutional part of the curriculum.

This joint national part of the curriculum replaces the 2013 version, which will not be effective from 31 August 2014.

10. Rules of exemption

The educational institution can deviate from what the institution or the institutions themselves have stated in the curriculum if this is justified by exceptional circumstances.

11. Approval

This institutional part of the curriculum has been enacted and approved by the educational network for the software development programme.

On behalf of the network:



Head of Department Gert Simonsen
For Business Academy Aarhus