



Programme syllabus

Organisational Committee

Faculty of Technology

Nätverkssäkerhet, 180 högskolepoäng

Network Security Programme, 180 credits

Level

First Level

Date of Ratification

Approved by Faculty of Technology 2009-12-15

Revised 2021-12-10

The programme syllabus is valid from autumn semester 2022

Prerequisites

General entry requirements + Mathematics 3c.

Description of Programme

The degree programme will provide students with a good knowledge of the computer science field with a focus on network and data security. Studies prepare the student for work in computer intensive environments where security requirements are high. In addition, the programme will prepare the student for further study at second (advanced) level in computer science.

The programme will provide the student with the theoretical and practical knowledge of how computer networks are structured, how networks are managed and administered and how to work with security-related problems associated with computers and networks.

Network security primarily focuses on computer science, but also incorporates some elements from Mathematics. Subjects included are information security, computer security, encryption and security in distributed systems.

Objectives

Central exam objectives according to the Higher Education Ordinance

Knowledge and understanding

For a Degree of Bachelor students must

- demonstrate knowledge and understanding in their main field of study, including knowledge of the scientific basis of the field, knowledge of applicable methods

in the field, in-depth knowledge of some part of the field and a general sense of current research issues.

Skills and abilities

For a Degree of Bachelor students must

- demonstrate an ability to seek, gather and critically interpret information that is relevant to a problem and to critically discuss phenomena, issues and situations;
- demonstrate an ability to independently identify, formulate and solve problems and to perform tasks within specified time limits;
- demonstrate an ability to present and discuss information, problems and solutions in dialogue with different groups, orally and in writing; and
- demonstrate the skills required to work independently in the field that the education concerns.

Judgement and approach

For a Degree of Bachelor students must

- demonstrate an ability to make assessments in their main field of study, taking into account relevant scientific, social and ethical aspects;
- demonstrate insight into the role of knowledge in society and into people's responsibility for how knowledge is used; and
- demonstrate an ability to identify their need of further knowledge and to upgrade their capabilities.

Programme-specific objectives

Knowledge and Understanding

Upon completion of the degree programme, students should be able to demonstrate:

- a good knowledge of various computer security threats and how these can be handled,
- a good knowledge of the structure and composition of computer networks, and
- a good knowledge of concepts, methods and tools in the field of software engineering and computer security

Skills and abilities

Upon completion of the degree, the student should be able to:

- collect, summarize and present technical material,
- examine, evaluate and implement security solutions in complex computing environments and
- implement and document software development projects (individually and in groups).

Judgement and approach

Upon completion of the degree, the student should be able to:

- evaluate and respond to ethical and moral problems in connection to computer crime, surveillance and privacy.

Content

Programme Overview

The study programme comprises 180 credits and includes a final degree dissertation

project of 15 credits.

The programme consists primarily of courses in Computer Science. These are divided into general introductory courses, advanced courses in key areas and courses in the study programme's specialization, network security.

In addition to courses in computer science there are also courses in other subjects, mainly Mathematics. These courses aim to prepare students for in-depth courses in Computer Science and to provide students with a solid background as a basis for their future professional role.

The study programme's objectives are fulfilled in varying degrees by individual courses given within the study programme. Knowledge of software engineering is for instance given in a variety of courses, while skills in security are provided in network security courses. For all objectives, there are several different courses meeting these objectives.

The programme is offered in two versions, one entirely in English and one where you mix courses taught in English and in Swedish. The mixed version requires eligibility in Swedish.

Courses in the programme

The exact placement of courses in year and study period may vary slightly from year to year. The courses in the program can also be exchanged for other courses within the program's direction, in agreement with the program manager. In exchange for courses, the program manager checks that the program's goals and requirements are still met. The prerequisites for courses as well as the local rules for the Linnaeus University degree must always be met.

The programme courses are divided into levels G1N, G1F, G2E, and G2F. Courses on G2 level usually have courses on level G1 as a prerequisite.

- G1N undergraduate level, has only secondary school prerequisites
- G1F undergraduate level, have less than 60 credits in course prerequisites
- G2F undergraduate level, have at least 60 credits in course prerequisites
- G2E undergraduate level, have at least 60 credits in course prerequisites

Year 1

- **Introduction to Programming** (G1N), 7.5 credits * – An introductory programming course focusing on programming skills and common programming language constructs and data structures.
- **Basic Mathematics for Computer Scientists** (G1N), 7.5 credits - Introductory in mathematics which deals with numbers, algebraic expressions, equations, functions, trigonometry, exponential functions, logarithm, prime numbers, divisors, combinatorics and complex numbers.
- **Computer Security** (G1F), 7.5 credits * - Introduction in IT Security. Concepts like risks, threats and security services are introduced and exemplified. Focus is on security for a stand-alone computer system.
- **Technical Information and Communication** (G1F), 7.5 credits * - Focus is on the student's ability to create an academic report and present it orally. The course contains literature search, how to make references, structures of a report and tools to create it.
- **Database Technology** (G1F), 7.5 credits * - A course that covers modelling of

data, storing and retrieving data from Databases. SQL and relation Databases are in focus but other types of Databases is also introduced. The course also cover how programs can connect to Databases.

- **Object-oriented Programming** (G1F), 7.5 credits * - Program development based on object-oriented concepts, such as classes, inheritance and polymorphism. The concepts are concretized with the help of some common design patterns. The course requires that students have knowledge of basic programming.
- **Project course in Computer Science** (G1F), 7.5 credits * - Continuation course improving both programming and team working skill. Provides an introduction to the software development process and related tools.
- **Discrete Mathematics** (G1F), 7.5 credits - The course will introduce basic concepts and methods of discrete mathematics, with areas like number theory, induction, relations, combinatorial and graph theory.

Year 2

- **Object Oriented Analysis and Design using UML** (G1F), 7.5 credits * - Object oriented analysis and design focusing on frequently occurring design problems and practical examples.
- **Computer Technology 1** (G1F), 7.5 credits - Computer Technology aims at giving an understanding on the connection between hardware and software. Computer organization and low-level programming are important modules.
- **Operating Systems** (G1F), 7.5 credits * - Provides an overview of the structure of operating systems and the resources that it manages.
- **Elective course**, 7.5 credits - Recommended course is **Linear Algebra** (G1F).
- **Cryptography and Coding Theory** (G1F), 7.5 credits – A course giving the basics in encryption and code theory. Focus is on encryption algorithms and their properties.
- **Computer Networks - an introduction** (G1F), 7.5 credits * - Provides theoretical knowledge about computer communication and computer networks, and practical skills in network programming.
- **System administration** (G1F), 7.5 credits * - The course introduces the work of planning and managing networks and server operating systems with different services.
- **Internet Security** (G2F), 7.5 credits * This is a course in IT security with a special emphasis on Network Security. The idea is to give a good coverage of threats against computers on a network and the methods to thwart them.

Year 3

- **Elective course**, 7.5 credits
- **Mobile and Wireless Security** (G2F), 7.5 credits * - The course covers standards for access control, authentication and encryption for mobile devices and wireless networks. A major part of the course is practical work.
- **Digital Forensics** (G2F), 7.5 credits * - The course cover techniques, methods, laws and regulations for forensic extraction and analysis of data from digital devices related to security incident response or crime investigations.
- **Web programming** (G1F), 15 credits * - Construction of full stack web applications with a focus on the browser's construction, APIs and its communication with server-based web technologies.
- **Elective course**, 7.5 credits - Recommended course is **Introduction to Machine Learning** (G2F) *.

- **Degree Project at Bachelor Level (G2E), 15 credits ***

* Courses in the main subject area of Computer Science

All courses except elective courses are obligatory.

Detailed descriptions of the courses are given in separate course syllabuses.

When choosing elective courses, it is important to make sure the student select at least one course that is not in the main subject area Computer Science to make sure the requirement of having at least 30 credits outside the main subject area.

The sequence in which courses in the programme are offered may vary from time to time.

Societal relevance

The Department of Computer Science has contacts with a large number of companies in the region. About 200 of these companies are part of the DIGITRI network initiated by Computer Science. DIGITRI has a large number of activities annually, on which the students of the program are offered to participate. During the programme, students will meet representatives from working life at regular intervals. Several courses involve the participation of guest speakers in teaching. In a couple of courses projects are carried out together with companies or other organizations. Degree project work can be conducted in cooperation with a company.

Internationalization

Swedish and international students meet in most of the courses in the programme. Part of the teaching staff also has an international background. This gives many opportunities for internationalisation at home. During the third year of the programme, studies abroad can be arranged over one or two terms within the framework for the degree programme. Course selection is carried out in consultation with the programme director to ensure future validation within the degree programme.

Scope of Programme

Computer science, the main subject in this study programme, is largely about developing and adapting new technologies for use by persons. The target audience for this is increasingly international. Ethical and legal questions around IT security are present in many of the programme's courses. Concepts like usefulness, user experience, target group adaption, availability, etc. are common in many courses. Thus, the concepts of sustainable development, gender and equal opportunities, diversity and internationalization constitute natural parts of the degree programme.

Quality Development

Course evaluations are carried out for all courses in the programme. Every year there is also an annual programme evaluation. It is predominantly the programme council that monitors quality assurance and ongoing development of programme. Students are represented in all these bodies and participate in course and programme evaluations. Both the programme and course evaluations are filed and are available for inspection at the University.

Degree Certificate

After completing programme studies, corresponding to the requirements expressed in the Higher Education Ordinance Degree Ordinance as well as Linnaeus University Local Degree Ordinance, the student may apply for a degree.

Students who have completed the Network Security Programme may obtain the following degree:

Filosofie kandidatexamen med inriktning mot nätverkssäkerhet (Huvudområde: Datavetenskap)

Bachelor of Science with specialisation in Network Security. Main field of study: Computer Science.

The degree certificate is bilingual (in Swedish/English). The Degree Certificate is accompanied by a Diploma Supplement (in English).

Other Information

For the student to be admitted to further studies within the programme the following requirements for totals of completed higher education credits within the program have to be met:

- to begin term 3: At least 45 credits in total of which at least 22.5 credits should be in Computer Science.
- to begin term 5: At least 90 credits in total of which at least 45 credits should be in Computer Science

Students who do not meet these requirements must obtain an agreement for an individual programme of study drawn up by the programme manager.

In some courses excursions or practical training that may require travelling to various organizations is part of the programme. The student will normally bear the costs of these trips themselves.