Security and Cloud Computing (Security) 2018-2020

Code: SCI3084

Extent: Long (55–65 credits) or compact major (40–45 credits). Students taking a compact major take also a minor (20–25 cr). Students taking a long major may include an optional minor in their elective studies.

Responsible professor: Tuomas Aura

Other professors: N. Asokan, Mario Di Francesco, Keijo Heljanko, Antti Ylä-Jääski

Abbreviation: Security

School: School of Science

Study programme

Studies in the Security and Cloud Computing major give students a broad understanding of the latest and future technologies for secure mobile and cloud computing systems. Students will gain both practical engineering knowledge and theoretical insights into secure systems engineering, distributed application development, network and service architectures, and cloud and mobile platforms. We believe in combining theoretical knowledge and security expertise with product development skills. The studies are also closely linked with research at Aalto University. The graduates are well prepared for international industrial R&D jobs, security engineering and consulting, various expert roles, and doctoral studies at Aalto University and internationally.

The major combines three previous study modules: the Security and Mobile Computing (NordSecMob) Master's program, the Mobile Computing - Services and Security major, as well as the Secure Systems track.

Learning outcomes

Security-major aims to educate professional engineers who are able to take on the most demanding R&D tasks and drive the development of future products and services. More specifically, the learning outcomes are the following:

- Students have the theoretical understanding of information security and practical skills for designing and analyzing secure computing systems.
- Students understand the architectural principles of distributed services and applications. They are able to design, analyze and implement distributed, cloud and mobile computing systems.
- Students have in-depth knowledge of their chosen thesis topicand are able to apply it to solving technical and scientific problems.
- Students have strong software development skills and other technical and professional skills that enable them to take key roles in an industrial research and development environment, and they are qualified to continue to doctoral studies in academia.

Structure and content

The major covers fundamental concepts, methods and the latest technologies on secure systems engineering, distributed application development, ubiquitous computing, network and service architectures, ubiquitous computing, and cloud and mobile computing platforms. The studies are closely bound to the research done by the teachers, for example, on the Internet of Things, pervasive and ubiquitous computing, cloud platforms and services, mobile platform security, and network security. Special attention is paid to security and privacy issues as they are critical requirements in developing and deploying services in open networks and distributed systems. The teaching methods combine theory with hands-on exercises and software development on cloud platform and mobile devices. Students also practice writing and presentation skills and learn to follow the latest research.

Learning methods

Engineers must be able to apply theoretical knowledge to real world engineering tasks. Therefore, the program combines theoretical studies with continuous hand-on exercises and projects where the new knowledge is applied. Much of the students' time is spent on group and individual assignments that train problem solving, secure system design, and software engineering skills. In the courses that involve classroom teaching, it takes varied forms from traditional lectures and exercise sessions to discussion of group projects and student presentations. All students participate in a seminar course where students learn to write a technical or research article and present their own work.

The studies include opportunities for networking with local and European companies. Many of the teachers have industry background, and our partner companies contribute to some courses and projects. The partner companies also host summer interns, and majority of the master's thesis projects are done in industry in paid projects

Courses

Major compulsory courses

These courses are compulsory, unless already included in the student's previous studies. Students who have studied similar content at another university or have specific personal learning goals should contact the responsible professor of the major to discuss their personal study plan.

CODE	NAME	CREDITS	PERIOD
CS-C3130	Information Security	5	I/1st year
CS-E4100	Mobile Cloud Computing	5	I-II/1st year
CS-E4640	Big Data Platforms	5	II-III/1st year
CS-C3170	Web Software Development	5	II-III/1st year
CS-E4000	Seminar in Computer Science	5	III-V/1st year or I-II/2nd year

Major optional courses

Students should choose enough other master-level courses to meet the required number of credits for the major. The courses listed below are especially recommended. Please follow announcements about special courses with annually changing topics and teaching periods. Other master-level courses on relevant topics, including computer science, mathematics, communications technology and entrepreneurship may be included with prior agreement of the responsible professor of the major.

CODE	NAME	CREDITS	PERIOD/YEAR
CS-E4140	Applications and Services in Internet	5	I-II/1st year
CS-E4300	Network Security	5	II/1st or 2nd year
CS-E4160	Laboratory Works in Networking and Security	5	III-IV/1st year
CS-E4310	Mobile Systems Security	5	III-IV/1st year
ELEC-E7320	Internet Protocols	5	III-IV/1st year
MS-E1687	Advanced Topics in Cryptography	5	
CS-E4330	Special Course in Information Security	2–10	varies
CS-E4520	Computer Aided Verification and Synthesis	5	III-IV/1st year
CS-E3210	Machine Learning: Basic Principles	5	I-II/2nd year
CS-E4600	Algorithmic Methods of Data Mining	5	I-II/2nd year
CS-E4002	Special Course in Computer Science	1–10	varies
CS-E4003	Special Assignment on Computer Science	1–10	Agreed with the teacher