LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Konstruktion av säkra system
Secure Systems Engineering

EITP20, 7,5 credits, A (Second Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED C/D
Date of Decision: 2023-04-18

General Information

Main field: Technology.
Elective for: C4-sec, D4-se, D4-ns, E4
Language of instruction: The course will be given in English

Aim

The goal of this course is to give insight in methodology and principles behind the design of secure software and hardware systems. In particular the course focuses on how to tackle security risks in the design process. The course intends to give understanding of the whole process from requirements gathering to design choice and analysis of a security critical system.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- analyse a computer system use case from security perspective
- narrate different threat analysis methods
- understand how to define and break down software and hardware system security requirements
- grasp how to describe computer security architectures
- narrate different principles for security protocol design and specification
- master a number of different security protocol analysis methods
- understand how design choices influence the system robustness with respect to security incidents as well as the possibilities for system upgrades at security breaches

Competences and skills
For a passing grade the student must

- make a threat analysis of a given computer system use-case
- identify high level system security requirements from a use-case and corresponding threat analysis
- compose a computer security architecture from a given use case and corresponding security requirements
- design a security protocol from a given security architecture and we able to implement the protocol
- analyse a security protocol, both theoretically and by using a protocol analysis tool
- perform performance evaluation of a security function
- make a penetration test of a security function

Judgement and approach
For a passing grade the student must

apply the acquired knowledge in a project that will be performed jointly with other students. In order to finalize the project requires the student must gather additional knowledge and insight. Quality of motivation in solution in depth and reflection on alternatives will be judged in the project, in the home exams as well as in the final written exam.

Contents

Introduction: Computer systems are becoming more complex and encompass more and more functions solving everyday problems as well as giving services for the society and enhancing our infrastructures. However, this trend comes with an increased risk for hacker or cyber-attacks. Hence, an important part of reducing this risk is knowledge and engineering skills in how to design more robust computer systems. The course focuses on methods and tools in secure systems engineering and how to apply the methods and tools to solve real life security problems.

The course is divided into three main blocks:

1) Security design methods and tools

2) Security and performance analysis of systems

3) Project

Security design methods and tools

- Identification of security needs in computer systems
- Threat analysis methods
- Security requirements specification and requirements break down
- Computer security architectures and trust models
- Design and specification of security functions
- Construction of security protocols

Security and performance analysis of systems

- Security architectures and trust models analysis
- Security evaluation of system components
- Methods and tools for protocol analysis
- Performance evaluation
- Penetration testing

Project

At the beginning of the course a list of project proposal will be given. Every project has as goal to make a security system design. The project group will consist of 2-4 people and the group will select one of the give projects in the proposal list. The group will make a complete security design including a protocol design for the chosen project problem. The group will also make a security analysis of a design made by another project group.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: For a passing grade, a passed project assignment (4.5 credits) and approved home assignments (3 credits) are required. The final grade is settled through a joint score based on the results on the home exams and the result of the project assignment.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts
Code: 0121. **Name:** Project.
Credits: 4,5. **Grading scale:** TH. **Assessment:** Project report, presentation and written individual analysis
Code: 0221. **Name:** Take-home Exam.
Credits: 3. **Grading scale:** TH. **Assessment:** Two take-home exams that will give the grades U, 3, 4 or 5

Admission

Admission requirements:

- EITA25 Computer Security

Assumed prior knowledge: EITF05 Web Security
The number of participants is limited to: No

Reading list

- PowerPoint slides and Lecture notes on the main course topics as well as articles.

Contact and other information

Course coordinator: Christian Gehrmann, christian.gehrmann@eit.lth.se
Further information: The course will give the student knowledge and skills in the security design and analysis of computer and communication systems.