Master in Computer Engineering (MEI)
Integrated Master in Informatics Engineering (MiEI)

Specialization Profile **CSI**: Cryptography and Information Security

Engenharia de Segurança

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Introductions

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- Introduction of the students and expectations for the discipline.

Engenharia de Segurança

Engenharia de Segurança

The Security Engineering course focuses on **the methodologies and processes for developing secure software**. It aims to equip students with **skills** that include

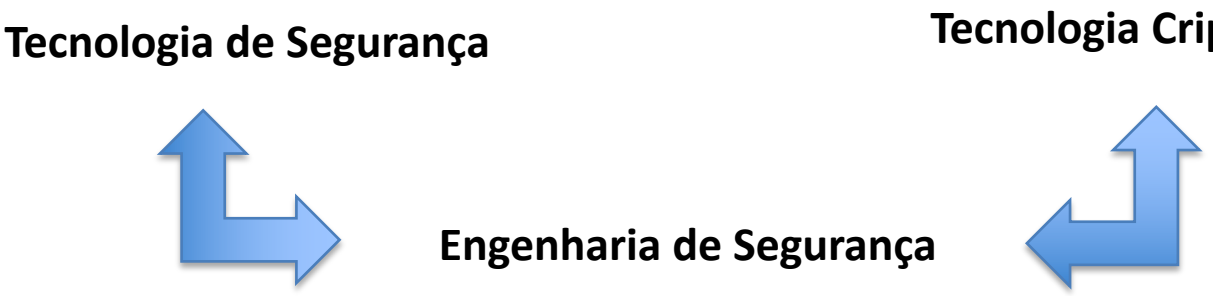
- Identification of risks and assessment of safety requirements of systems,
- Methodologies and tools to support development, and
- Experience with security standards and their implementations.

Goals

Primary Objectives

- Understand the types of vulnerabilities most common in applications, and know how to overcome them.
- Understand and apply software testing methodologies.
- Know the various components of a software development infrastructure.
- Adopt the best software and application security practices.
- Use of secure software development methodologies in the software development lifecycle.

Relation with the other CSI disciplines (first semester):



Goals

Secondary Objectives

- Use of cryptographic primitives in protocols, cryptographic applications and electronic identification documents;
- Understand the complexity in the development (and the security features imposed) of software platforms / applications, in relation to the EU Regulations, national laws and standards that must be followed. As a case study, the following will be used:
  - EU Regulation 910/2014 (eIDAS),
  - Law 32/2017 and respective regulatory ordinances,
  - DL 89/2017 and its regulatory ordinances,
  - Regulation EU 2016/679 (General Regulation on Data Protection - RGPD).

Relation with the other CSI disciplines (first semester):

Tecnologia de Segurança

Tecnologia Criptográfica

Engenharia de Segurança

Organization of the course

- Datas:
  - Every Monday from 14h00 – 17h00, from 04/Fev to 31/Mai – Edificio 7, room 0.04

- Doubts & Queries
  - Before or after classes, by prior appointment, during the class period.

- Copy of slides, exercises, notifications, ...
  - Github (**https://github.com/uminho-miei-engseg-18-19/EngSeg**)

Rating

- A. Theoretical (25%)
  - Written exam (minimum grade: 8 points) <date: students' suggestions accepted>
- B. Practical(75%)
  - Projects (minimum grade: 8 points) made by the working group, which will include:
    - B1 Worksheet in practical classes.
    - B2 Software development project **or** Research on a topic, with / without oral presentation

- Final Grade: 0,25 * A + 0,75 * (B1 * 2 + B2 * 3)/5
  - Successful completion of the course, if Final Grade >= 9,5 points

- The working group will have a maximum of 3 elements.

Program

- Software Vulnerabilities, Attacks and Intrusions:
  - Software Vulnerabilities;
  - Web Application Vulnerabilities (according to OWASP)
  - Vulnerability Classification Systems (CWE, CVE, CVSS, OVAL, CVRF)
- Software Testing:
  - Threat / attack models;
  - Blackbox testing;
  - Whitebox testing;
  - Static analysis (including Lint)
  - Dynamic analysis
  - Hybrid analysis
- Infrastructure for quality software development:
  - IDE;
  - Version control system;
  - Repository manager;
  - Source code quality manager;
  - Documentation generator;
  - Continuous integration tools.
- Secure Software Development Life Cycle (S-SDLC):
  - Life-cycle models of software development;
  - Risk analysis;
  - Standards and Methodologies for Safe Software Development;
  - (Rational) Unified Process applied to participants in the software development process of an SME;
  - Maturity Model.

Program

- Applied Cryptography:
  - Algorithms and key size - Legacy, Future;
  - Random / pseudo-random number generator
  - Secret sharing/splitting – Shamir
  - Authenticated encryption
- Cryptographic protocols / applications
  - SSL/TLS
  - SSH
  - TOR
  - Electronic Vote
- Electronic identification documents
  - Citizen Card
  - E-Passport
  - Dematerialized identification documents
- Steganography
- Regulation 910/2014 (eIDAS)
  - qualified providers
  - qualified trusted services
  - eIDs notification
- Law 32/2017 (Chave Móvel Digital - server-side signature)
- DL 89/2017 (SCAP - Sistema de certificação de atributos profissionais)
- Regulation 2016/679 (General Regulation of Data Protection)

Program

- Guests
  - Data Protection/RGPD (date to be set)
  - Citizen's Card and Electronic Passport (date to be set)
  - Security Considerations in Software Development (date to be set)
  - Innovation and security (date to be set)
  - … (to be set)

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Tools

- WebGoat (Warning: Machine becomes vulnerable)
- PMD
- FindBugs
- FindSecurityBugs
- FlawFinder
- Atom
- Eclipse
- …

- Available in virtual machine
  - In this case, as it will be a virtual machine that will be changed during the course, students should store what they are doing in the (shared) directory of the host machine.

Software development project **or** Research on a topic, with / without oral presentation

- To be delivered by June 15.
- Proposals from students for projects or research are accepted, provided that they can be included in the scope of the subject taught in Engenharia de Segurança.
- Part of the practical classes should be used to discuss the project with the teacher of the course.
- Projects to be defined up to Feb / 15.