**CS GENERAL**

- **CS CORE**: [Computer Ethics](#) (5EC, 1B)
- **CORE SPECIALIZATION COURSES (20 EC)**: 4 mandatory courses
- **ADVANCED SPECIALIZATION COURSES (15 - 20 EC)**: Choice 3 or 4 out of 6 or 7
- **PROFILING SPACE (30 EC)**: Elective courses from other specializations or related Master’s programmes, Internship, Exchange. Some specializations have additional requirements, e.g. socio-technical courses, orientation.
- **GRADUATION (10 + 30 EC)**
  - Research Topics (10EC) (preparation)
  - Final project (30EC) (research project)

---

### SPECIALIZATION SOFTWARE TECHNOLOGY

**Mandatory core (20 EC)**

- **ADSA-Model driven engineering**
- **Software Testing and Risk Assm.**
- **Principles of programming, processes and patterns**
- **System Validation**

**Advanced (4 courses out of 7)**

- **Advanced Logic**
- **Advanced Algorithms and Computational Complexity**
- **Software Management**
- **Requirements Engineering Processes and Methods**
- **Design of Software Architecture**
- **Service-oriented Architecture with Web services**
- **Modeling and Analysis of Concurrent Systems**

**Design orientation (10 EC)**

- **Industrial Software Engineering project**

**Research orientation (10 EC)**

- **Software Science**
- **Capita selecta ST**

---

### SPECIALIZATION CYBER SECURITY*

**Mandatory core (20 EC)**

- **Internet security**
- **Software Security**
- **Security & cryptography**
- **Cyber risk management**

**Advanced (3 courses out of 9)**

- **Secure Data Management**
- **Secure Cloud Computing**
- **Security Services for the Internet of Things**
- **Security Verification**
- **System Security**
- **System Validation**
- **Cyber Data Analytics**
- **Privacy Enhancing Technologies**
- **Intr. to Biometrics**

**Socio-Technical (3 courses out of 4)**

- **Cyber-crime science**
- **E-Law**
- **Economics of security**
- **Capstone Cyber security**
- **Cyber security management**

---

### SPECIALIZATION DATA SCIENCE AND TECHNOLOGY

**Mandatory core (20 EC)**

- **Managing big data**
- **Data science**
- **Machine learning 1***
- **Information theory and statistics**

**Advanced (4 courses out of 6)**

- **Machine Learning 2***
- **Foundations of Information Retrieval**
- **Service-oriented Architecture with Web services**
- **Architectures of Information Systems**
- **REDI**
- **Probabilistic programming**

---

### SPECIALIZATION INTERNET SCIENCE AND TECHNOLOGY

**Mandatory core (20 EC)**

- **Internet security**
- **Performance evaluation**
- **Mobile and wireless networking**
- **Internet of Things**

**Advanced (4 courses out of 7)**

- **Advanced Networking**
- **Service-oriented Architecture with Web services**
- **Cloud Networking**
- **Ad-Hoc Networks**
- **Internet Management and Measurement**
- **Ubiquitous Computing**
- **Distributed Systems**

---

Quartiles: 1 (Sep-Nov), 2 (Nov-Feb), 3 (Feb-Apr), 4 (Apr-Jul); Year = can be started anywhere during the year; Sem = runs over a semester

*Simplified version due to the shared nature of the programme, visit [www.4tu.nl/cybsec](http://www.4tu.nl/cybsec) for a complete overview

**Previously Testing Techniques

***Previously called Basic/Advanced Machine Learning