### Specialization Software Technology

**Mandatory core (20 EC)**
- Design of Software Architecture
- Software Testing and Risk Assm.
- Principles of programming, processes and patterns
- System Validation

**Advanced (at least 4)**
- Advanced Logic
- Graph Algorithms and Complexity
- Software Management
- Interactive Theorem Proving
- ADSA-Model driven engineering
- Service-oriented Architecture with Web services
- Modeling and Analysis of Concurrent Systems
- Software Evolution

**Design orientation (10 EC)**
- Industrial Software Engineering project

**Research orientation (10 EC)**
- Software Science (13, 14, 15, 16)

**Socio-Technical (3 courses out of 4)**
- Cyber-crime science
- E-Law
- Economics of security
- Capstone Cyber security
- Cyber security management

**Graduation (10 + 30 EC)**
- Research Topics (10EC) (preparation)
- Final project (30EC) (research project)

### Specialization Cyber Security

**Mandatory core (20 EC)**
- Internet security
- Software Security
- Security & cryptography
- Cyber risk management

**Advanced (at least 3)**
- Secure Data Management
- Secure Cloud Computing
- Security Services for IoT
- Security Verification
- System Security
- System Validation
- Cyber Data Analytics
- Privacy Enhancing Technologies
- Intr. to Biometrics
- Blockchain and distr. ledger tech

**Socio-Technical (3 courses out of 4)**
- Cyber-crime science
- E-Law
- Economics of security
- Capstone Cyber security
- Cyber security management

**Graduation (10 + 30 EC)**
- Research Topics (10EC) (preparation)
- Final project (30EC) (research project)

### Specialization Data Science and Technology

**Mandatory core (20 EC)**
- Internet security
- Data science
- Machine learning 1
- Information theory and statistics

**Advanced (at least 4)**
- Machine Learning 2
- Foundations of IR or Natural Language Processing
- Image Processing and Computer Vision
- Deep Learning – theory to practice
- DST Architectures of IoT
- DST Probabilistic programming
- SDS Adv. Techniques for Signal Analysis
- SDS Time Series Analysis
- SDS Sports Interaction Technology

**SDS profiling courses: at least 27 EC**

### Specialization Internet Science and Technology

**Mandatory core (20 EC)**
- Internet security
- Performance evaluation
- Mobile and wireless networking
- Internet of Things

**Advanced (at least 4)**
- Advanced Networking
- Service-oriented Architecture with Web services
- Cloud Networking
- Ad-Hoc Networks
- Internet Measurements
- Ubiquitous Computing
- Distributed Systems
- Security Services for IoT
- Empirical Security Analysis and Engineering

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**NOTE!** This is a Simplified overview. For a more complete overview and info on additional courses and requirements visit

- Cyber Security: [www.4tu.nl/cysec](http://www.4tu.nl/cysec)

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