

**Module Description, available in: EN**

## Advanced Network Security

### General Information

**Number of ECTS Credits**

3

**Module code**

TSM\_AdvNetSec

**Valid for academic year**

2025-26

**Last modification**

2023-07-03

**Coordinator of the module**

Gürkan Gür (ZHAW, gueu@zhaw.ch)

**Explanations regarding the language definitions for each location:**

- Instruction is given in the language defined below for each location/each time the module is held.
- Documentation is available in the languages defined below. Where documents are in several languages, the percentage distribution is shown (100% = all the documentation).
- The examination is available 100% in the languages shown for each location/each time it is held.

	Lausanne			Lugano	Zurich		
<b>Instruction</b>					X E 100%		
<b>Documentation</b>					X E 100%		
<b>Examination</b>					X E 100%		

**Module Category**

TSM Technical scientific module

**Lessons**

2 lecture periods and 1 tutorial period per week

### Entry level competences

**Prerequisites, previous knowledge**

- Understanding of the TCP/IP protocol stack including routing protocols and DNS.
- Basic understanding of secure protocols such as WPA, IPSec and TLS.
- Basic understanding of network security appliances such as firewalls and proxies.

### Brief course description of module objectives and content

This course aims to provide students with an in-depth understanding of current network security technologies and their application in solving technical security challenges. Upon completion of the course, students will be able to analyze, design and implement secure network infrastructures, using state-of-the-art security technologies and best practices. They will also develop an understanding of emerging network security techniques and solutions.

## Aims, content, methods

### Learning objectives and competencies to be acquired

The students

- are able to identify threats for a given network and are able to reason about the security properties of their networks.
- know important concepts of network security in the areas of DDoS protection, BGP security, DNS security, IPv6 security and HTTP/3.
- know the relevant key concepts to build secure network architectures and can develop a secure network architecture for different scenarios.
- are able to undertake an investigation into the course topics and report on their findings.

### Module content with weighting of different components

This course is split into three parts:

#### Part 1: Network Threats and Monitoring

In Part 1 we talk about network threats and mitigation techniques as well as network monitoring. We cover topics such as common network attacks (e.g., Distributed Denial of Service (DDoS) attacks) as well as the challenges and solutions for monitoring network traffic (e.g., analysis of encrypted traffic flows).

#### Part 2: Network Protocols and Security

In Part 2 we focus on network protocols and security. This includes but is not limited to Border Gateway Protocol (BGP) security, Domain Name System (DNS) security, IPv6 security and HTTP/3.

#### Part 3: Securing Advanced Network Architectures

Part 3 covers several advanced approaches to securing network architectures from a forward-looking perspective. This includes but is not limited to topics such as Software Defined Networking (SDN), Network Function Virtualization (NFV), Zero Trust Architecture (ZTA), Machine Learning (ML) for network security, network security in containerized environments, and cloud network security.

As network security is a very dynamic and constantly evolving field, the course content will be adapted to current trends and emerging topics in network security.

### Teaching and learning methods

Lectures with a mix of practical and theoretical exercises.

### Literature

The following material is provided:

- Slides (with notes, where appropriate)
- Selected technical publications

## Assessment

### Additional performance assessment during the semester

The module does not contain an additional performance assessment during the semester

### Basic principle for exams

**As a rule, all standard final exams are conducted in written form. For resit exams, lecturers will communicate the exam format (written/oral) together with the exam schedule.**

### Standard final exam for a module and written resit exam

Kind of exam

Written exam

Duration of exam

120 minutes

Permissible aids

*Aids permitted as specified below:*

Permissible electronic aids

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Other permissible aids

cheat sheet

**Exception: In case of an electronic Moodle exam, adjustments to the permissible aids may occur. Lecturers will announce the final**

permissible aids prior to the exam session.

**Special case: Resit exam as oral exam**

**Kind of exam**

Oral exam

**Duration of exam**

30 minutes

**Permissible aids**

*Aids permitted as specified below:*

**Permissible electronic aids**

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**Other permissible aids**

cheat sheet