



# IK2227 Network Systems with Edge or Cloud Datacenters 7.5 credits

Nätverkssystem med kant- eller molndatacenter

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

## Establishment

The official course syllabus is valid from the spring semester 2025 in accordance with the decision by the head of school: J-2023-2248. Date of decision: 2023-10-20

## Grading scale

A, B, C, D, E, FX, F

## Education cycle

Second cycle

## Main field of study

Computer Science and Engineering

## Specific prerequisites

## Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

## Intended learning outcomes

After passing the course, the student should be able to:

- explain and analyse methods for interconnect networks and end host devices in a data center including emerging aspects of topology, technologies for link layer and protocols
- explain and analyse methods to operate virtualized multi-tenant networks in data centers.
- explain and analyse methods and concepts related to programmable networks including aspects of Software-Defined Networking, routing, packet forwarding and congestion control.
- explain and analyse concepts and applications related to in network computing and support for machine learning applications
- explain and analyse aspects related to energy efficiency of different data center technology.
- analyse scientific papers in a critical manner
- program advanced data center network systems that support massive I/O workload (e.g. machine learning)

in order to

- gain a comprehensive view of the modern data center evolution and understand its drivers, as well as the challenges ahead
- gain the skills in data center technology that the industry requires

## Course contents

- The development of data centre including network speeds, scale, geographic spread, multitenancy, and tongue I/O applications.
- Increase of data transfer speeds from 1Gbps to 400Gbps and over.
- Link layer technology for the data center of the next generation with a focus on Ethernet products compared with specialised Infiniband.
- The complexity of managing networks of geographically dispersed data centers and their related energy consumption aspects.
- The balance between compact edge data centers and their expansive cloud counterparts, designed to optimize latency.
- The bases of the software defined the paradigm and protocol-independent programmable networks.
- Relating the above infrastructure aspects to concrete workloads focusing on new machine learning applications with heavy I/O requirements.
- How these applications are shaping data center design and operation, pushing the boundaries of what is possible.
- Aspects of data center networking related to multitenancy, its requirements, and the role of virtualization technologies in mitigating potential disruptions.

## Examination

- PRO1 - Project Assignments, 2.5 credits, grading scale: A, B, C, D, E, FX, F
- SEM1 - Paper summaries, 2.5 credits, grading scale: P, F
- TEN1 - Written Exam, 2.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

## Other requirements for final grade

Knowledge in advanced Internet technique, 7.5 higher education credits, equivalent completed course IK2215.

## Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.