

**Course Syllabus:**

## **Computer Engineering MA, TCP/IP Internetworking, 6 credits**

### **General data**

<b>Code</b>	DT052A
<b>Subject/Main field</b>	Computer Engineering
<b>Cycle</b>	Second cycle
<b>Orientation (name)</b>	
<b>Credits</b>	6.0
<b>Progressive specialisation</b>	A1N , Second cycle, has only first-cycle course/s as entry requirements
<b>Answerable institution</b>	Information Systems and Technology
<b>Adapted</b>	2018-02-15
<b>Established</b>	2018-04-23
<b>Date of change</b>	2020-06-01
<b>Valid from</b>	2020-07-01

### **Aim**

The goal of the course is to provide theoretical and practical knowledge about the TCP/IP networking, which are fundamental to understand the architecture of the Internet. Concepts like switching, multiplexing, naming, addressing, routing, quality of service (QoS), queueing theory, performance metrics, wireless networks, network security, multimedia transport, flow and congestion control are explored through their implementation in TCP/IP protocol suite.

## Course objectives

After the completion of the course the student should be able to:

- analyze, apply and evaluate the TCP / IP family protocols
- explain and evaluate routing protocols used for unicast and multicast on the Internet
- describe methods and categorize problems related to reliable transport, time delay, flow control and traffic congestion management
- design and evaluate a simpler network
- explain and apply the principles of queue theory related to QoS and switching
- independently utilize and account for knowledge from research
- calculate and measure performance, such as: throughput, delay and jitter
- evaluate and compare methods for distributing multimedia on the Internet and related protocols
- evaluate and compare security solutions for communication based on the internet model
- describe and reflect on technologies for wireless communication on the Internet

## Content

- Internet core and edge structure, delays and losses, TCP/IP protocol suite
- Application layer: HTTP, SMTP, DNS
- Network architecture: client server, P2P
- Transport protocol: UDP, TCP, congestion control
- Network layer: Routers, switching, IPv4, IPv6, SDN, Open Flow, NAT, Link-State, Distance-Vector, BGP, CDN, DHCP
- Link layer: CRC, access protocols, ARP, Ethernet, VLAN, MPLS
- Wireless networks: CDMA, WiFi, Bluetooth, 3G, 4G, Mobile IP
- Network security: Digital signatures, certificates, PGP, SSL/TLS, IPsec, 802.11i
- Multimedia networking: Streaming, DASH, VoIP, QoS, diffserv
- Queuing theory, M/M/1, Little's law, Pareto
- Performance metrics, throughput, delay, jitter

## Entry requirements

Computer Engineering BA (AB), 45 credits, including: Computer Networks, 7.5 credits. Mathematics BA (A), 15 credits, including: Discrete Mathematics.

## Selection rules and procedures

The selection process is in accordance with the Higher Education Ordinance and the local order of admission.

## Teaching form

The course consists of approximately 30 hours (19%) lectures and 24 hours (15%) laboratory exercises. The rest of 106 hours (66%) is devoted to studying without supervision. This includes the time necessary for preparing for the lectures and laboratory exercises, working on assignments and reports from the laboratory work, as well as the study time for the exam.

## Examination form

**L101:** Laboratory Exercises , 1,5 credits

**Grading:** Fail (U) or Pass (G)

**T101:** Exam , 4,5 credits

**Grading:** Seven-grade scale, A, B, C, D, E, Fx and F. Fx and F represent fail levels.

Grading criteria for the subject can be found at [www.miun.se/gradingcriteria](http://www.miun.se/gradingcriteria).

The examiner has the right to offer alternative examination arrangements to students who have been granted the right to special support by Mid Sweden University's disabilities adviser.

If examination on campus cannot be conducted according to decision by the vice-chancellor, or whom he delegated the right to, the following applies: Exam T101, will be replaced with two parts, online examination and follow-up. Within three weeks of the online examination, a selection of students will be contacted and asked questions regarding the examination. The follow-up consists of questions concerning the execution of the on-line exam and the answers that the student have submitted.

## Grading system

Seven-grade scale, A, B, C, D, E, Fx and F. Fx and F represent fail levels.

## Course reading

### Required literature

**Author:** Kurose J, Ross K  
**Title:** Computer networking - a top-down approach  
**Edition:** Seventh edition or later  
**Publisher:** Addison Wesley