



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Trådlösa nätverk och applikationer - Systemdesign och prestanda Wireless Networks and Applications - System Design and Performance

ETSN11, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED C/D

Date of Decision: 2023-04-18

General Information

Main field: Communication Systems.

Compulsory for: C3

Elective for: C4-ks, D4-ns, E4-ks, I4-pvs, MWIR2

Language of instruction: The course will be given in English

Aim

The course gives a deep understanding of the principles of system design of wireless networks and applications, with regards to performance aspects. The course mainly focuses on network systems for Internet of Everything (IoE). The course goal is to go beyond "ordinary" Internet applications. The course includes topics as cellular networks, wireless LANs, self-organizing network architectures, sensor networks, and data communication and networks for outer space and underwater. Also, the course covers resource-constrained networking and delay-tolerant applications. Furthermore, the course covers functions, models, and mechanisms for performance analysis. The application of theory is mainly performed using complex reality-based scenarios, which are treated in discussions, seminars, and a project.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- Understand the different network systems and protocols covered in the course

- Explain the models covered in the course, and describe key results drawn from these models, such as fundamental performance bounds
- Give reasons for the design choices made in reality-based scenarios, with reference to system performance requirements and user perspectives
- Describe current research and development in different network systems

Competences and skills

For a passing grade the student must

- Describe and explain fundamental theory for the network systems and applications covered in the course
- Design suitable network systems based on a specified reality-based scenario with specified performance requirements
- Perform correct performance analysis and modelling of network system
- Analyse network performance using theoretical tools covered in the course, such as stochastic processes and queueing theory
- Find information in the scientific literature within the course's field of knowledge

Judgement and approach

For a passing grade the student must

- Compare different network systems, algorithms and protocols, and give their relative advantages and disadvantages in a specified scenario
- Evaluate network systems and identify their performance goals and constraints
- Evaluate the advantages, disadvantages and limitations of different methods for modelling, analysing, and testing network performance
- Critically evaluate information in the scientific literature within the course's field of study

Contents

The course gives a deep understanding of principles, functions and techniques that form the foundation of wireless communication networks and applications. The course includes distributed architectures, cellular networks, wireless LANs, self-organizing networks, sensor networks, and data communication and network architectures for outer space and underwater. Also, the course covers resource-constrained networking and delay-tolerant applications. Furthermore, the course covers functions and mechanisms for performance analysis. The course covers both theoretical aspects through modelling as well as practical studies through complex reality-based scenarios and a project.

The course structure contains lectures, exercises, and system design seminars. Further, students will complete a group-based project with focus on system design.

The following systems and technologies are covered:

- Basic functions and paradigms for wireless networks
- Network architectures for time-critical applications
- Self-organizing network architectures
- Sensor networks
- Resource-constrained networking
- Delay-tolerant networking
- Data communication and networking in outer space

- Underwater data communication and networking
- Performance analysis and modelling of the above network systems

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: The course assessment is divided in two sections, a written exam and a project assignment. The grade of the course is based on the written exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0123. **Name:** Exam.

Credits: 5. **Grading scale:** TH. **Assessment:** Approved exam **Contents:** Written exam

Code: 0223. **Name:** Project.

Credits: 2,5. **Grading scale:** UG. **Assessment:** Approved project **Contents:** Project

Admission

Assumed prior knowledge: Assumed prior knowledge: Basic knowledge in Internet protocol corresponding to EITF45 Computer Communication, ETSF15 Communication systems and networks, or EITA55 Communication Systems. Basic knowledge in statistics and probability theory corresponding to FMSF20/FMSF80/FMSF55 Mathematical Statistics, Basic Course.

The number of participants is limited to: No

The course overlaps following course/s: ETSN10

Contact and other information

Course coordinator: Maria Kihl, maria.kihl@eit.lth.se