Poznan University of Technology
**Faculty of Electrical Engineering**

**E**uropean **C**redit **T**ransfer **S**ystem

| Title (Technologie sieciowe) | Code **1010331461010330653** |
|---|---|
| Field **Computer Science** | Year / Semester **3 / 6** |
| Specialty **-** | Course **core** |
| Hours    Lectures: **3**    Classes: **-**    Laboratory: **2**    Projects / seminars: **-** | Number of credits **6** |
| | Language **polish** |

**Lecturer:**

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**Status of the course in the study program:**

Obligatory course belonging to the core of the study programme

**Assumptions and objectives of the course:**

The main objective of the course is to present advanced network technologies ? not only those already widely used in computer networks, but also those that have recently gained popularity as potentially effective solutions to already identified problems to be faced by so-called Future Internet. In particular, the course provides knowledge in the area of new wireless network technologies, including wireless mesh, mobile ad-hoc networks (MANET) and wireless multi-hop networks (large networks without or with little fixed infrastructure), as well as technologies enabling effective operation of multi-service heterogeneous networks, in particular dynamic routing protocols, social collaboration and fairness enforcement frameworks, Quality of Service (QoS) management techniques.

**Contents of the course (course description):**

The topics of the course include:
- Distributed and semi-distributed queuing management techniques for IP networks
- Quality of Service (QoS) management techniques
- Fully dynamic routing (including Optimized Link-State Routing)
- Network-layer resource optimization techniques (multi-path routing and its influence on QoS, Max Weight Scheduling technique, backpressure principle, IntServ and DiffServ models, RSVP protocol)
- Effectiveness of transport-layer protocols (new versions of TCP: Reno2, Vegas, FAST, TCP delayed reordering technique)
- Network resource optimisation from application-layer perspective (differences between file transmission and audiovisual streaming, TCP flow control vs UDP/RTP+RTCP flow control, adaptive streaming, application-layer flow control)
- Various fairness models (reverse engineering of TCP utility, delay-aware Network Utility Maximization, multi-service fairness)
- Interdependence of transport-layer and network-layer functions and protocols
- Cross-layer network functions and protocols optimisation, interdependence of MAC-sublayer algorithm and queuing management in fixed and wireless networks
- IP network operation stability
- Design and implementation of network protocol stacks

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- New types of wireless networks (wireless mesh networks, mobile ad-hoc networks (MANET), wireless multi-hop networks, heterogeneous networks, fully dynamic routing in wireless multi-hop networks, Optimized Link-State Routing)
- Selected important research activities conducted in EU and USA in the area of Future Internet technologies

Topics of laboratory exercises:
1. Network services configuration
2. Protocol implementation in MIT Click Modular Router environment
3. Static routing in a multi-path network
4. Dynamic routing ? RIP protocol
5. Dynamic routing ? OSPF protocol
6. Multicast addressing and routing - PIM-SM protocol
7. Effectiveness of TCP ? configuration of logical connection
8. Effectiveness of TCP ? flow control optimisation
9. Quality of UDP transmission: QoS parameters, comparison to TCP
10. Text-based application-layer protocols - Telnet, FTP
11. HTTP protocol, virtual sessions
12. DNS system
13. Transport protocols for audiovisual streaming systems (RTP, RTCP)
14. Session setup and control protocols for 3G systems (SIP, RTSP)
15. Advanced firewall with QoS functionalities

Backup topic: SOAP ? protocol for inter-application communication

## Introductory courses and the required pre-knowledge:

The course is a continuation of the course on the 5th semester.

## Courses form and teaching methods:

Presentation of network technologies (in particular network protocols) follows a comparative, analytical approach [1]. Topics of laboratory exercises closely correspond to key contemporary IP networking technologies that are being referred to during the lectures (so called Future Internet technologies are selectively represented by the laboratory exercises? issues). Advanced application of operating system virtualization technology and availability of many preconfigured advanced Linux system installations enable each student to work independently on configuration and analysis of her/his individual network.

## Form and terms of complete the course - requirements and assessment methods:

Lecture: exam (written) - theoretical and conceptual knowledge assessment
Laboratory: evaluation of experiments and reports

## Basic Bibliography:

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## Additional Bibliography:

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