SYLLABUS

Name: ***Performance Evaluation of Computer Networks and Systems (InfAAu>SM1PEoCNaS19)***
Name in Polish:
Name in English: ***Performance Evaluation of Computer Networks and Systems***

Information on course:

Course offered by department: Faculty of Automatic Control, Electronics and Computer Science
Course for department: Silesian University of Technology

Default type of course examination report:

ZAL

Language:

English

Course homepage:

https://platforma2.polsl.pl/rau2/course/view.php?id=782

Short description:

Students learn to evaluate the performance of computer networks and systems using various methods, including simulations, mathematical modeling, and a software network analyzer. Specifically, they study the design and capabilities of discrete-event simulators, build several simulation models, and use them to assess the performance of systems and networks. They explore mathematical methods for performance evaluation, such as the theory of single-server queues, queuing networks, mean value analysis, and both discrete- and continuous-time Markov chains. Finally, students gain familiarity with a software tool that enables performance measurements during the normal operation of TCP/IP networks.

Description:

GENERAL INFO:

ECTS 3
Total workload: 120 hours (60 contact hours, 60 students' own work hours)
Forms of contact hours:
Lecture 30h
Laboratory 30h

PROGRAMME:

o Simulation of computer networks and systems:
- general design of discrete-event simulators
- detailed design of a selected simulator
- simulation of simple systems and queues
- simulation of network protocols
- statistical analysis of simulation results, rare events

o Mathematical methods of performance evaluation:
- selected topics of elementary probability theory
- single-server queueing models, Kendall's notation
- performance characteristics
- finite-buffer models, loss characteristics
- main theorems (Little's, Burke's, PASTA, average queue size, L vs p0)
- mean value analysis
- Jackson networks
- Markov chains with discrete time (DTMC)
- Markov chains with continuous time (CTMC)
- using DMTC and CMTC in the performance evaluation

o Software network analyzer
- design and operation of a selected analyzer
- performing measurements during a normal operation of a TCP/IP network

Bibliography:

Mor Harchol-Balter, Performance Modeling and Design of Computer Systems, Cambridge University Press, 2013
Raj Jain, The Art of Computer Systems Performance Analysis, Wiley, 1991
L. Kleinrock. Queueing Systems: Theory. John Wiley and Sons New York, 1975.
OMNET++: https://doc.omnetpp.org/omnetpp/manual/
https://www.wireshark.org/

Learning outcomes:

o Knowledge - student knows and understands:
- mathematical theory of digital models of continuous systems and discrete events, useful for formulating and solving advanced problems in the field of computer science (K2A_W01)
- in-depth subjects in modeling and analysis of information systems (K2A_W05)
- detailed problems in computer science and studied specialty (K2A_W06)

o Skills student can:
- use English at the B2+ level of the Common European Framework of Reference for Languages (CEFR) and at a higher level in the domain of specialized IT terminology (K2A_U04)
- plan and carry out experiments, including measurements and simulations of networks and systems; interpret the obtained results and

draw conclusions (K2A_U07)
- evaluate the usefulness and possibility of using new achievements (techniques and technologies) in the design of an IT system (K2A_U11)

Assessment methods and assessment criteria:

To pass the course, it is necessary to:
- carry out laboratory experiments
- submit reports from the experiments
- have all the reports accepted by the teacher
- obtain a positive grade from the final test

The final grade is the final test grade, if positive in the first attempt. Completing the test in the second or third attempt allows to obtain the final grade of 3. Attendance at the lecture is not mandatory. Attendance at laboratory classes is mandatory.

The syllabus is valid from the academic year 2025/2026 and its content is not subject to change during the semester.

Course credits in various terms:

Informatics, full-time master degree studies 3 sem. (InfAAu-SM3)

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	3	2020/2021-Z	