FIL3013 Network Calculus 7.5 credits

Nätverkskalkyl

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

Course syllabus for FIL3013 valid from Autumn 2013

Grading scale

Education cycle

Third cycle

Specific prerequisites

- IL2217 Digital Design using HDL or IL2452 System Design Languages (SystemC/C++)

- IL2226 Embedded Systems Design, or IL2207 SoC Architectures is preferable but not required.

Language of instruction

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

Intended learning outcomes

After studying the course, the students shall achieve the following learning outcomes:

- Understand the fundamental network calculus concepts and master the main results of network calculus;

- Be able to apply the theory to solve defined analytic problems in finding delay, backlog, and throughput bounds in macro- and micro- networks;

- Be able to apply the concepts and methods to build proper analytical models to analyze the QoS guarantees in communication networks;

- Beyond hand derivation of closed-form formulas, be able to build simulation models in VHDL/Verilog or C++/SystemC to validate the correctness and tightness of the analytic results.

Course contents

The course presents network calculus, which is a fundamental theory for quality-of-service provision and guarantees in communication networks such as ATM and Internet, and its latest application to emerging on-chip communication networks in advanced computing devices and systems.

The course is given in the form of lectures and seminars. It consists of three modules as follows:

Module I: Network Calculus basics and its application to macro-networks (6 Lectures/seminars)

This module introduces the quality-of-service problem and the basic network calculus concepts and results. Then its application to macro-networks such as ATM and Internet is presented.

Module II: Network Calculus applied to micro-networks (4 lectures/seminars)

This module applies the knowledge in Module I, shifting the focus from macro-networks to micro-networks, i.e. networks on chip. At first, on-chip router will be introduced together with xMAS (eXecutable Micro-Architecture Specification), a latest formal communication fabric modeling framework proposed by Intel researchers. Then the NoC quality-of-service analysis methodology will be presented with case studies.

Module III: Advanced topics (2 lectures/seminars)

This module is optional. It presents advanced topics in deterministic network calculus, looking into stochastic network calculus and energy calculus.

The course content is subject to improvement reflecting latest research developments in the area.

Disposition

The course is offered depending on demand, once a year or every other year.

Course literature

- Jean-Yves Le Boudec, Patrick Thiran, "Network Calculus: A Theory of Deterministic Queuing Systems for the Internet". Lecture Notes in Computer Science, Springer, 2004.

- Rekommenderade forskningsrapporter

Examination

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.

Written examination or project-based/report-based examination.

Grading scale: Pass/Fail

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.