HF2000 Queuing Theory 7.5 credits

Köteori

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 HF2000 valid from Autumn 2007

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Mathematics

Specific prerequisites

Basic knowledge in calculus, linear algebra and mathematical statistics.

Language of instruction

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

Intended learning outcomes

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

- Define and explain basic concepts in the theory Markov processes, M/M/m, M/M/m/K, and M/M/m/K/C queuing systems
- Derive and apply main formulas for some properties (such as stationary probabilities, average waiting and system time, expected number of customers in the queue, etc.) of M/M/m, M/M/m/K, and M/M/m/K/C queuing systems
- To calculate the traffic intensity, blocked traffic, and the utilization of some queuing systems
- Solve some simple problems on queuing networks
- Analyze and solve problems using computer aid (Maple, Matlab, or Mathematica)

Course contents

- Stochastic processes. Markov chains in discrete and continuous time. Chapman-Kolmogorov equations. Stationary probabilities. Poisson process. Birth-death processes.
- Basic concepts in queuing theory. Little's theorem.
- Arrival processes and service time. Queuing disciplines. Stationary probabilities. Offered load (traffic). Blocked load. Effective load. Utilization. Blocking probability.
- Markovian wait systems.
- M/M/m: Queuing systems with m servers, infinite number of waiting positions, and infinite number of customers.
- M/M/m/K: queuing system with m servers, limited number (=K) waiting positions, and infinite number of customers.
- M/M/m/K/C: queuing system with m servers, limited number (=K) waiting positions, and limited number of customers (=C).
- Markovian loss systems: Erlang's loss system, Engset's loss system, Binomial (Bernoulli's) loss system.
- Semi-markovian M/G/1 and G/M/l queuing systems. Pollacsek-Khinchin formula.
- Survey on open and closed Jackson queuing networks.

Course literature

To be announced at course start. Last time the following book was used:
Hock, Ng Cheee, Queuing Modelling Fundamentals, John Wiley & Sons Ltd.

Examination

- RED1 - Assignment, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 4.5 credits, grading scale: A, B, C, D, E, FX, F

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.

Other requirements for final grade

Passed exam (TEN1; 4.5 c.), grading A-F.
Passed lab work (RED1; 3 cr.), grading P/F.

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.