



IK2219 Performance Evaluation for Network Engineering 7.5 credits

Prestandautvärdering för Nätverkskonstruktion

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 IK2219 valid from Autumn 2012

Grading scale

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

Education cycle

Second cycle

Main field of study

Information and Communication Technology

Specific prerequisites

Language of instruction

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

Intended learning outcomes

Even with a large amount of baroque queuing theory literature, it is still unclear how to answer practical questions arising as to (i) how to process simulation/experimental data and (ii) how to model a network/communication system and analyse its performance. Also, there are so many theories that one can hardly distinguish the applicable ones from the rest. More importantly, it is unethical to make a wrong and hasty conclusion only because of ignorance of the right technique. In this course, students will learn a practical collection of theories and techniques which have been widely used in the field over the past decades, some of which are rarely introduced in the classical books and made much more accessible only in this course.

To be more specific, upon completion of the course, students are expected to learn how to:

- **Compute** confidence interval and prediction interval
- **Derive** a suitable model from your data
- **Decide** whether your assertion on a model is true or false
- **Forecast** what can be forecast with a quantified accuracy
- **Internalize** theoretical framework in order to run simulations correctly
- **Explain** why other queues are always faster when you are shopping
- **Comprehend** queuing theory from a fresh angle
- **Utilize** software packages in conducting simulations and validating analyses

Overall, students will be able to evaluate the performance of communication networks and master the theoretical foundations of performance evaluation and corresponding software packages.

Course contents

This course focuses on broadly applicable methodologies in the field of communication networks, putting special emphasis upon the evaluation of performance therein. A distinctive feature of this course lies in its combination of questions in everyday life and practical problems in communication networks with selected topics in methodologies.

Disposition

In order to help students to gain a better understanding of the methodologies and its applications, the course contains a set of homework assignments and a project. In addition to serving as a well-organized compilation of selected topics in performance evaluation, the main textbook can be referred to throughout the careers of students for tackling out various problems in the field.

§ Content of Lectures (90-minute lecture×12)

In order to achieve the abovementioned learning outcomes, there will be about 12 lectures primarily based on the main textbook. The lectures will cover various topics in performance evaluation of communication networks: Summarizing Data (Topic 1), Model Fitting (Topic 2), Tests (Topic 3), Forecasting (Topic 4), Discrete Event Simulation (Topic 5), Palm Calculus (Topic 6), Queuing Theory for Dummies (Topic 7).

§ Homework Assignments (No laboratory work)

Assignment 1 - Introductory homework to familiarize students with useful software packages

Assignment 2 - Congestion collapse in Wi-Fi networks using a simulator (Topic 1)

Assignment 3 - Random waypoint simulation using Matlab (Topics 5 & 6)

Assignment 4 - Web server simulation using Matlab (Topics 5 & 7)

§ Project Assignment (Group work)

Each group will define a performance evaluation problem in their thesis projects or ongoing research projects and apply methodologies in the course to analyse the problem. Otherwise, each group will be assigned one of the advanced topics in queuing theory and explores the topic. There will be a presentation session comprised of their talks.

Course literature

Jean-Yves Le Boudec, "Performance Evaluation of Computer and Communication Systems", 2010, 1st Edition, EPFL Press. ISBN: 978-2-940222-40-7.

The textbook was published in 2010 by EPFL Press.

Examination

- PRO1 - Project Assignment, 2.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Exam, 2.5 credits, grading scale: A, B, C, D, E, FX, F
- UPG1 - Home Assignment, 2.5 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.

Homework Assignments: 2.5 hp, Project Assignment: 2.5 hp, Written Final Exam: 2.5 hp, Grade scale: A-F

Other requirements for final grade

The final grade is based on the weighted average of the three examination parts when each part has received a passing grade: homework assignment (0.35), project assignment (0.35), and closed exam (0.30).

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.