



FEP3360 Algorithms for Networks - Complexity and Approximations 8.0 credits

Algoritmer för nätverk - Komplexitet och approximationer

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for FEP3360 valid from Autumn 2016

Grading scale

G

Education cycle

Third cycle

Specific prerequisites

PhD student

Language of instruction

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

Intended learning outcomes

After the course the students should be able to:

- Correctly define computational complexity classes and analyze the complexity of algorithms;
- Discuss basic problems in areas of graph theory, sets and partitions, storage and scheduling;
- Formulate network design problems as decision or discrete optimization problems;
- Present procedures of proving NP-completeness and NP-hardness, and be able to provide proofs for basic examples;
- Use approximation algorithms to cope with NP-hard problems.

Course contents

1. Problems, algorithms and complexity, polynomial time, NP-complete and NP-hard problems
2. Examples of polynomial time problems on graphs, greedy algorithms, networking examples
3. Famous NP-complete problems, proof of NP completeness, problems beyond NP,
4. Polynomial-time reduction, NP-hard problems, networking examples
5. Approximation methods and algorithms – greedy strategy, restriction, partition
6. Approximation methods and algorithms – relaxation, primal-dual schemes and local ratio
7. Proof of complexity and algorithm design for networking problems based on recent literature

Disposition

8 lectures, 2 seminars with student presentations, 3 home assignments, final exam.

Course literature

- J. Kleinberg, É. Tardos, “Algorithm Design” Pearson Education, 2014
- Ding-Zhu. Du Ker-I Ko; Xiaodong Hu, “Design and Analysis of Approximation Algorithms”, Springer Optimization and Its Applications vol 62
- Extracts of M.R. Garey and D.S.Johnson, “Computers and Intractability,” W. H. Freeman, 1979
- Relevant journal papers with networking applications, provided before course start.

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.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

- Active participation on the lectures
- 30 min oral presentation on one of the seminars
- 80% on homework problems
- 80% on the final exam

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.