# Graph Theory

Programme course

6 credits

Grafteori

TATA64

Valid from: 2017 Spring semester

**Determined by**
Board of Studies for Computer Science and Media Technology

**Date determined**
2017-01-25

# Main field of study

Mathematics, Applied Mathematics

# Course level

Second cycle

# Advancement level

A1X

# Course offered for

- Computer Science and Software Engineering, M Sc in Engineering
- Mathematics, Master's programme
- Computer Science, Master's programme
- Mathematics
- Information Technology, M Sc in Engineering
- Computer Science and Engineering, M Sc in Engineering

# Specific information

The course is only offered every second year. It will be offered during 2015.

# Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

# Prerequisites

Elementary courses in linear algebra and discrete mathematics.

# Intended learning outcomes

To give good knowledge of graph theoretical concepts. And to practice how to use them

in mathematics, natural science and computer science. After completing the course, students should:

- know important classes of problems in graph theory
- be able to formulate and prove fundamental theorems on trees, matchings, connectivity, colorings, plane and hamiltonian graphs
- be able to describe and apply some basic algorithms for graphs
- have a knowledge on elementary Ramsey theory
- be able to use graphs as a tool to model real-life problems

## Course content

- Trees: Cayley's formula, spanning trees and Edmonds's algorithm for isomorphism of trees,
- Connectivity and Menger's theorem,
- Hamilton cycles and colorings of graphs,
- Matchings and coverings, Tutte's theorem on perfect matchings, Egervary's algorithm
- Elementary Ramsey theory
- Plane graphs: Euler's formula, the five-color theorem, Grinberg's formula
- Some applications of graphs in natural science, timetabling and computer science.

## Teaching and working methods

Lectures and problem sessions.
The course runs over the entire spring semester.

## Examination

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|---|---|---|---|
| TEN1 | Written examination | U, 3, 4, 5 | 6 credits |

## Grades

Four-grade scale, LiU, U, 3, 4, 5

# Department

Matematiska institutionen

# Director of Studies or equivalent

Jesper Thorén

# Examiner

Armen Asratian

# Education components

Preliminary scheduled hours: 48 h
Recommended self-study hours: 112 h

# Course literature

J.A.Bondy and U.S.R. Murty, Graph theory with applications (tillgänglig vid internet) R. Diestel, Graph Theory, 4th ed., 2010 (tillgänglig vid internet) Samt kompletterande material som utdelas under kursens gång.

# Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.