



UMEÅ UNIVERSITY

Discrete Modelling

Credit: 7.5 ECTS

Course coordinator:

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Course Period:

October 31 – November 29 2023

Main field of study and progress level:

Mathematics, PhD

Grading scale:

Pass/Fail

Prerequisites:

Students should have a basic knowledge of Computer Programming, Linear Programming, Integer Programming and Graph Theory.

Objective:

The objective of the course is to present theory for discrete modelling, from problem formulation and choice of the model via specific model formulation and implementation to evaluation of appropriateness and effectiveness of the model.

Contents:

This course contains complexity theory and the general theory of polynomial reduction from one problem to another: IP and SAT formulations for optimization problems, the Travelling Salesman Problem, the Hamiltonian Cycle Problem, the Eulerian Circuit Problem, the Linear Assignment Problem and the Marriage Problem. Artificial intelligence is treated by means of an introduction to genetic algorithms for the travelling salesman problem. The course covers both exact and heuristic methods regarding computational effectiveness.

Form of instruction:

The teaching consists of lectures, problem-solving sessions, a seminar session and lab supervision sessions.

Examination:

The examination consists of two lab assignments, a seminar and a written exam at the end of the course. Each of these elements is assigned: Fail (U) or Pass (G). To receive a passing grade on the course, all parts must be completed with a passing grade. An advanced bonus part is required for the labs, and the PhD student must work independently for both seminar and labs.

Literature:

Seminar papers will be provided during the course.