GÖTEBORG UNIVERSITY

Faculty Board of Science

MMA510 Project Course in Optimization

7.5 higher education credits

Second Cycle

This syllabus is the binding document.

1. Confirmation

The syllabus was confirmed by the Department of Mathematical Sciences on June 15, 2007 to be valid from July 1, 2007. Field of education: Science. Responsible department: Mathematical Sciences.

2. Position in the educational system

The course Project Course in Optimization, 7.5 higher education credits, is one of several single subject courses included in the two-year Masters Program in Mathematical Sciences. The course is also open for eligible students outside the program.

3. Entrance qualifications

The prerequisite for the course Project Course in Optimization is the equivalent of the course MMG620 Optimization.

4. Course content

Large scale optimization problem almost always have inherent structures that can and should be exploited in order to solve them efficiently. The course deals with some such principles through which large scale optimization problem can be attacked. A common name for such techniques is decomposition-coordination; convexity theory and duality underlies much of its development. Part of this material was covered in the basic course but are covered here in more depth. The course includes two practical parts: an exercise in the modelling and solution of a problem in VLSI design by the use of Matlab, and a project assignment where large scale set covering problems are to be solved through the use of Lagrangian duality and primal feasibility heuristics.

Contents in brief: complexity, unimodularity and convexity, minimal spanning trees, knapsack problems, location problems, generalized assignment, travelling salesman problems, network design, set covering. Decomposition/coordination, restriction, projection, variable fixing, neighbourhood, relaxations (Lagrange, SDP), linearization, line search, coordinating master problem. Cutting planes, Lagrangian heuristics, column generation, Dantzig-Wolfe decomposition, Benders decomposition, local search, modern tree search methods.

5. Learning outcomes

After completing the course, the student should

- be able to analyze and suggest method principles for a variety of optimization problems, and
- have sufficient background knowledge to utilize them successfully in practice through the use of optimization software tools.

6. Required reading

List of required reading enclosed.

7. Assessment

To pass the course the student must take active part in the lectures, and in the two course projects. The projects are to be presented in the form of written reports as well as orally presented during seminars. Each group also acts as opponents/discussants on another group's projects, and each student must take active part in all these activities.

In order to reach a better mark than "pass" the student can take an oral exam, based on the lecture material of the course and the projects.

8. Grading scale

The grades are Fail (U), Pass (G), and High Pass (VG).

Students who are contractually entitled to ECTS grades should inform the examiner about this no later than one week after the start of the course.

Students without such entitlement will not be awarded ECTS grades. Grades will be converted into ECTS terminology according to a standard model approved by the University President.

9. Course evaluation

Oral and/or written course evaluation will be performed. The results of the evaluation will be communicated to the students and will serve as a guide for the development of the course.

10. Additional information

The language of instruction is English unless all involved are Swedish speakers.