UNIVERSITY
OF SKÖVDE

COURSE SYLLABUS

Industrial Optimization: Models and Methods, Third-cycle level

5 credits

Course code: IT0939F
Version number: 2.0
Valid from: 2020-07-01
Ratified by: Education Commitee for Third-cycle Studies in Informatics
Date of approval: 2020-05-04

1. General about the course

The course is provided by the University of Skövde and is named Industrial Optimization: Models and Methods (Industriell optimering: modeller och metoder). It comprises 5 credits. The course is at third cycle.

The course is a part of the third-cycle subject area of Informatics.

2. Entry requirements

In order to fulfil the specified entry requirements the applicant must have completed academic courses of at least 60 credits, including independent thesis writing of at least 15 credits at advanced level, within the field Informatics, applicable areas of a similar kind or other fields which are directly judged as relevant for the Licentiate or PhD thesis.
Furthermore, a passing grade in the high school course English B or the equivalent is required. This is normally demonstrated by means of an internationally recognized test, e g IELTS or TOEFL or the equivalent.

3. Course content

This course studies scientific strategies to support decision making through mathematical modeling. It seeks to design, improve, and operate complex systems through mathematical modeling and has various applications in business, engineering, health care, and industry. The emphasis will be on industrial optimization problems, but problems from other domains will also be discussed in the course.

In industrial optimization, heuristic methods are sometimes used in cases when analytic methods that always find an optimal solution could easily be applied. This course provides the student with a good background in analytic optimization methods to cope with a variety of industrial problems. The course provides knowledge about different forms of mathematical optimization models as well as exact solution approaches. The course contains both a theoretical and a practical part. The theoretical part focuses on learning and developing different types of mathematical optimization models as well as learning and applying certain exact solution methods for solving industrial optimization problems. In the practical part, through a hands-on approach supported by computer software, the student will learn how to solve the mathematical optimization models using an appropriate method for each model type.

4. Objectives

After completed course the doctoral student should be able to:

- Develop mathematical models and exact algorithms for industrial and combinatorial optimization problems
- Understand the function and use of the commonly used computer software for solving

mathematical optimization models

- Describe and apply certain exact solution methods for solving industrial optimization problems
- Understand and discuss the importance of exact solution approaches and mathematical optimization
- Compare and contrast exact and approximation solution approaches for their advantages and disadvantages in dealing with different optimization problems
- Read, understand and effectively communicate the related scientific papers.

5. Examination

The course is graded Pass (G) or Fail (U).

To receive the grade Pass on the course, all examination parts have to be graded Pass.

The course has the following examination parts:

- **Written assignment**
  2 credits, grades: G/U
- **Laboratory assignment**
  2 credits, grades: G/U
- **Project presentation**
  1 credit, grades: G/U

Doctoral students with a permanent disability who have been approved for directed educational support may be offered adapted or alternative examinations.

6. Forms of teaching and language of tuition

The teaching comprises lectures, laboratory sessions, project work, supervision and presentations.

The teaching is conducted in English.

7. Course literature and other educational materials

Reading material, handouts, and research papers as provided by the instructor.

References

Gärtner, B. & Matoušek, J. *Understanding and Using Linear Programming.* Springer. ISBN 9783540307174.

Hamdy, A. T. (2013). *Operations Research: An Introduction* (9th ed.). Pearson. ISBN 933251822X.

Hillier, F. S. & Lieberman, G. J. (2014). *Introduction to Operations Research* (10th ed.). New York: McGraw-Hill. ISBN 1259162982.

Korte, B. and Vygen, J. *Combinatorial Optimization* (6th Ed.). Berlin: Springer. ISBN 9783662560389.

Snyman, J. A. & Wilke, D. N. *Practical Mathematical Optimization: Basic Optimization Theory and Gradient-Based Algorithms* (2nd Ed.). Springer International Publishing AG. ISBN 9783319775852.

Williams, H.P. *Model Building in Mathematical Programming* (5th Ed.). Wiley. ISBN 9781118443330.

8. Doctoral student influence

Doctoral student influence in the course is ensured by course evaluation. The students are informed about the result of the evaluation and potential measures that have been made or are planned, based on the course evaluation.

9. Additional information

Further information about the course, as well as national and local governing documents for higher education, is available on the University's website.