Faculty of Health, Science and Technology
Mathematics

Syllabus

Non-linear optimization with applications

Course Code:	MAAD32
Course Title:	Non-linear optimization with applications *Icke-linjär optimering med tillämpningar*
Credits:	7.5
Degree Level:	Master's level
Progressive Specialisation:	Second cycle, has only first-cycle course/s as entry requirements (A1N)

Major Field of Study:
MAA (Mathematics)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2023-09-01, and is valid from the Spring semester 2024 at Karlstad University.

Prerequisites
90 ECTS credits completed with 60 ECTS credits in Mathematics or 2 years (120 ECTS credits) in a study programme, including Calculus in Several Variables, 7.5 ECTS credits, Linear Algebra, 7.5 ECTS credits, and 7.5 ECTS credits in either Programming methods or Scientific calculations, plus upper secondary level English 6, or equivalent

Learning Outcomes
Upon completion of the course, students should be able to:

Knowledge and understanding
- describe and explain the principles behind the algorithms treated in the course,
- define basic optimisation concepts,
- give an account of optimality conditions for continuous problems, with and without constraints,

- explain the main ideas of the optimisation methods covered in the course,

Competence and skills
- solve given optimisation problems, with and without constraints,
- formulate application problems as mathematical optimisation problems and select a suitable method for solving them,
- solve a given optimisation problem numerically through implementing a given optimisation algorithm, objective function, and constraint functions, and

Judgment and approach
- evaluate and compare theoretical as well as practical results and relate them to each other.

Content
The course treats theory and algorithms for non-linear optimisation based on problems that arise in operations research and in technical, scientific, and financial applications. Problem formulations with and without constraints are discussed.

The course comprises two components:
Component 1: Theory (5 ECTS cr)
Component 2: Practice (2.5 ECTS cr)

Instruction is mainly in the form of lectures. In addition to the scheduled activities, students work with individual hand-in assignments, which primarily involve practical problem-solving tasks.

Reading List
See separate document.

Examination
Assessment is individual and based on a written report and an oral presentation (Component 1) and written hand-in assignments (Component 2).

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades
One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course.

Quality Assurance
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate
A course certificate will be provided upon request.

Additional information
The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.