GHENT UNIVERSITY

Course Specifications

From the academic year 2017-2018 up to and including the

Scientific Computing (C001521)

Course size (nominal values; actual values may depend on programme)

Credits	6.0	Study time	180 h
Contact hrs	60.0 h		

Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	Dutch	lecture	30.0 h
		seminar: coached exercises	7.5 h
		seminar: practical PC room classes	20.0 h

Lecturers in academic year 2018-2019

Van Daele, Marnix	WE02	lecturer-in-charge

Offered in the following programmes in 2018-2019	crdts	offering
Bachelor of Science in Computer Science	6	A

Teaching languages

Dutch

Keywords

Numerical algorithms, conditioning, stability, accuracy, complexity

Position of the course

To show to students
- what the consequences are of the finite representation of numbers
- that, in the formulation of a problem, sensitivity, conditioning, stability, ... play an important role.
- that, to solve a mathematical problem with a computer, it is not sufficient to program any previous learned mathematical recipe but that on the contrary new (often iterative) algorithms are needed (and then the issue of convergence is important).
- some well-known numerical algorithms for several numerical problems.
- some professional state-of-the-art software and interactive environments for scientific computing.

Contents

Essential items in numerical computation : well posed problems, errors, conditioning, floating point representation, ... (with attention for some standards)
A selection of the most important numerical algorithms for e.g. the following subjects.
- solving systems of linear equations
- least squares problems
- eigenvalue problems
- roots of nonlinear equations
- optimisation
- interpolation
- numerical integration and differentiation

At the start of the semester, some lessons on Taylor series expressions are given.

Initial competences

In the first two Bachelor years the students have gained the necessary mathematical experience to understand the mathematical formulation of the different problems and on the other hand they also have the necessary skills (with data structures, algorithms, complexity analysis, programming, etc.) to implement the algorithms.

Final competences

1 The students will have gained insight in and will pay attention to the desirable characteristics of numerical software such as reliability, robustness, accuracy,

efficiency, etc.
2 The students will be able to apply numerical techniques for a wide variety of subjects (such as solving systems of linear equations, nonlinear problems, interpolation, numerical integration and differentiation, ...) in numerical analysis and scientific computing.
3 The students will behave as intelligent users of state-of-the-art software for numerical problems.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, project, seminar: coached exercises, seminar: practical PC room classes

Learning materials and price

Lecture notes and exercises in printed and/or electronic form (price of printed version : approximately 10 euro).The lecture notes fit with the book of Heath (see references, price : approx.66 euros)
Also use will be made of Matlab-files, Maple-worksheets and Java applets.
Also the electronic learning platform Minerva and the ILONA program (http://ilona.UGent.be) will be used.
All the material will be available via the learning platform Minerva. Cost: 76 EUR

References

Micheal T. Heath, Scientific Computing, An introductory survey, Second Edition, Mc Graw Hill (2002), ISBN 0-07-239910-4.

Course content-related study coaching

Individual coaching by lecturer/assistants : appointment
Interactive coaching via minerva.

Evaluation methods

end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

Written examination with open questions, open book examination

Examination methods in case of periodic evaluation during the second examination period

Written examination with open questions, open book examination

Examination methods in case of permanent evaluation

Assignment

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

Written exam in closed book form for theory and open book form for exercises

Calculation of the examination mark

Project 4/20 and exam 16/20
Exam: Theory (50 %, 8/20) and exercises (50 %, 8/20)