

## Numerical Analysis (E731034)

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

**Credits 3.0**

**Study time 90 h**

### Course offerings and teaching methods in academic year 2023-2024

A (semester 1)

Dutch

Gent

lecture

seminar

### Lecturers in academic year 2023-2024

Van Hecke, Tanja

TW05

lecturer-in-charge

### Offered in the following programmes in 2023-2024

Bachelor of Science in Engineering Technology(main subject Electronics and ICT Engineering Technology)  
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject Electronics Engineering)  
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject Embedded Systems)  
Linking Course Master of Science in Electronics and ICT Engineering Technology(main subject ICT)

**crdts**

**offering**

3

A

3

A

3

A

3

A

### Teaching languages

Dutch

### Keywords

Algorithms, mathematical approximation methods, numerical analysis, numerical algebra

### Position of the course

During this course the student acquires the insight into the basic techniques of numerical mathematics. He experiences the strengths and weaknesses of these numerical techniques by theoretical considerations and by implementations in Maple where these methods are applied on real problems.

### Contents

During the theoretical lessons the following items are treated: propagation of errors, interpolation, root finding methods, numerical solution of non-linear systems, numerical derivation and integration, numerical integration of ordinary differential equations, numerical integration of partial differential equations, linear programming, solving linear systems, eigenvalues and eigenvectors. Numerical approximation solutions are considered for these topics.

### Initial competences

Mathematical basic knowledge, differentiation, integration, series, linear algebra

### Final competences

- 1 Being able to compare the analytical and numerical solution of a mathematical problem.
- 2 Having knowledge about the type of problems popular numerical methods can be used for.
- 3 Being able to analyze an easy problem form numerical mathematics.
- 4 Being able to write computer algorithms for a problem from numerical mathematics.
- 5 Being able to think critically about the solution offered by numerical algorithms.
- 6 Being able to compare different numerical methods.
- 7 Being able to communicate orally and in writing about applied scientific subjects.

(Approved)

**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**

Seminar, Lecture

**Extra information on the teaching methods**

During the colleges numerical methods are discussed. The concepts are illustrated with examples in Matlab. During the exercise classes the students have the opportunity to implement and evaluate the numerical algorithms

**Learning materials and price**

Lecture notes in Dutch 'Numerieke Analyse' (6 euro)

Powerpoint slides used during the lessons will be available by means of the electronic learning environment.

**References**

R.L. Burden en J.D. Faires, "Numerical Analysis", Brooks/Cole Cengage Learning (2010)  
J. Stoer en R. Bulirsch, "Introduction to Numerical Analysis", Springer (2002)  
A. Bultheel, "Inleiding tot de numerieke wiskunde", Centraal Boekhuis (2006)

**Course content-related study coaching**

Possibility to consult the teacher during the lessons or by appointment.

**Assessment moments**

end-of-term and continuous assessment

**Examination methods in case of periodic assessment during the first examination period**

Written assessment with open-ended questions

**Examination methods in case of periodic assessment during the second examination period**

Written assessment with open-ended questions

**Examination methods in case of permanent assessment**

Presentation, Assignment

**Possibilities of retake in case of permanent assessment**

examination during the second examination period is possible

**Extra information on the examination methods**

Written exam, closed book  
Case study (report + oral presentation), partly peer assessment  
If desired by the student, the case study can be resubmitted in the second examination period.

**Calculation of the examination mark**

$\text{Score } (/20) = 2/3 \text{ PE } (/20) + 1/3 \text{ NPE } (/20)$

PE=Written exam

NPE= case study with report and presentation

If the score for the examination or the case study equals 7 or less and if the global score is at least 10, a final score of 9 will be contributed.