GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2018-2019

Mathematical Analysis I: Functions of One Variable (E001131)

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

Credits	5.0	Study time	150 h
Contact hrs	69.0 h		

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	Dutch	guided self-study	22.5 h
		lecture: plenary exercises	8.75 h
		lecture	18.75 h
		seminar: coached exercises	7.5 h
		seminar: practical PC room classes	11.25 h

Lecturers in academic year 2018-2019

De Schepper, Hennie	TW16	lecturer-in-charge

Offered in the following programmes in 2018-2019	crdts	offering
Bachelor of Science in Civil Engineering	5	A
Bachelor of Science in Computer Science Engineering	5	A
Bachelor of Science in Chemical Engineering and Materials Science	5	A
Bachelor of Science in Electrical Engineering	5	A
Joint Section Bachelors of Science in Engineering	5	A
Bachelor of Science in Engineering Physics	5	A
Bachelor of Science in Electromechanical Engineering	5	A
Preparatory Course Master of Science in Biomedical Engineering	5	A

Teaching languages

Dutch

Keywords

Derivative, differential equation, integral, sequence, series

Position of the course

The aim of the course is to provide insight in the basic concepts of the theory of functions of one real variable and the application of the corresponding analysis techniques. Moreover the student acquires skills in using these techniques and applying them, as well in the mathematical modelling of basic problems from physics and chemistry courses.

Contents

- ***Differential calculus:*** continuity, higher order derivatives and Taylor's formula, approximation and error estimates, differential equations in an open interval, initial value problems, conditions for existence and uniqueness of a solution
- ***Integral calculus:*** integration, improper integration, Fourier and Laplace transform, Gamma function, Beta functions
- ***Sequences and series:*** sequences and series of real and complex numbers, sequences and series of functions, power series expansion, Taylor series, Laurent series, Z-transform, Fourier series

Initial competences

Basis Mathematics Tools

Final competences

1 To have acquired insight in the mathematical, geometric and physical interpretation of the notions derivative, differential, integral, improper integral, differentiability and integrability.
2 Being able to solve extremum- and approximation problems by means of Taylor's formula.
3 To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems.
4 Being able to construct and manipulate power series and Fourier series.
5 Being able to perform integral transforms and having acquired insight in their respective properties.
6 Being able to assess the convergence of numerical series and series of functions.

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

Guided self-study, lecture, lecture: plenary exercises, seminar: coached exercises, seminar: practical PC room classes

Extra information on the teaching methods

During classroom lectures important concepts and properties are introduced and further trained during classroom problem solving sessions, where basic methods are taught for standard applications.
Computer-assisted problem solving in small groups aims at the application of the learned methods to new problems. Additionally, theoretical exercises, tackled during special group sessions, aim at enhancing the insight in the theoretical concepts.

Learning materials and price

Lecture notes; additional learning material available electronically (Minerva).
Cost: ca 10 euro.

References

- M R Spiegel: Theory and problems of advanced calculus, Schaum's Outline Series, McGraw-Hill, New York
- W Boyce & R DiPrima: Elementary differential equations and boumdary value problems, J Wiley, New York

Course content-related study coaching

The lecturer is available before and after classroom lectures. Personal coaching by the lecturer as scheduled. Interactive support (Minerva-forum). Additional tutoring services are available.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination

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

Written examination

Examination methods in case of permanent evaluation

Written examination, open book examination

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Extra information on the examination methods

- During semester / permanent evaluation: two mandatory written tests with open book (exact dates will be announced at the start of the semester).
- During examination period: written closed-book examination in the PC-room (Maple available). The examination consists of exercises and applied theory.

Calculation of the examination mark

Continuous assessment:
The scores on the two tests T1 and T2 (both marked out of 20), form a weighted score of respectively 40% and 60%, thus T' = 0.4 T1 + 0.6 T2

The total result of the permanent evaluation T, is determined as follows:
- if $T' < 10$ then $T = T'$
- if $10 \leq T' < 17$ then $T = T' + 3$
- if $T' \geq 17$ then $T = 20$

End-of-term evaluation: written examination (marked out of 20, score E)

Calculation of the final mark in the first examination period:
- If $E \geq 8$ then the final mark equals $\max(0.25\ T + 0.75\ E;\ 0.1\ T + 0.9\ E) - 2A$
- If $E < 8$ then the final mark equals $E - 2A$

A sets the number of tests (T1 and T2) for which the student was illegitimately absent (A = 0, 1 or 2). For each test in which the student did not participate, two points will be deducted from the final mark (2A = 0, -2 or -4).

Calculation of the final mark in the second examination period (=resit):
- If $E \geq 8$ then the final mark equals $\max(0.25\ T + 0.75\ E;\ E)$
- If $E < 8$ then the final mark equals E