GHENT UNIVERSITY

Mathematics (D012698)

Course Specifications

Valid in the academic year 2017-2018

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

Credits 6.0 Study time 180 h Contact hrs 45.0 h

Course offerings in academic year 2017-2018

A (semester 1) Dutch

Lecturers in academic year 2017-2018

Cornelis, Chris	WE02	lecturer-in-charge

Offered in the following programmes in 2017-2018	crdts	offering
Bachelor of Science in Biomedical Sciences	6	A

Teaching languages

Dutch

Keywords

basic concepts of mathematical calculus, matrix algebra, difference equations, growth models, population models, epidemic models

Position of the course

Many biomedical processes are modelled by means of mathematical and statistical methods. This introductory course focuses on a number of basic techniques necessary to understand the mathematical models of biomedical processes. The continuation course Data-Analysis II focusses further on statistical models. This course contributes to the following competences: B.3, B.7

Contents

- Real functions: basic concepts, polynomial functions, rational functions, power functions, exponential functions, logarithmic functions, logarithmic scale, goniometric functions, cyclometric functions, biological growth models, rate of a chemical reaction
- Limits and continuity: definitions and calculation rules
- Difference equations and discrete models: rows and series, recursion relations, equilibria, cob web method, linear and non-linear difference equations of first order, stability, limit cycles, deterministic chaos, logistic iterative processes, linear difference equations of second order, matrices, determinants, eigenvalues and eigenvectors, systems of coupled linear difference equations, linear predator-prey model, Leslie growth model
- Derivatives: definition, geometric interpretation, calculation rules, fundamental theorems of calculus
- Integrals: definition, geometric interpretation, calculation methods for basic integrals, computation of areas and means, Fourier series development of periodic functions.
- Differential equations and continuous models: method of separation of variables, relative growth rate, linear differential equations of first and second order, steady states, stability, continuous population models, Lotka-Volterra equation, epidemic models

Initial competences

mathematics from secondary school

Final competences

1 • Understand elementary mathematical models used to describe biomedical processes in the scientific literature.
2 • Use a logarithmic scale.
3 • Correctly use practical calculation rules w.r.t. real functions, their limits and derivatives.

4 • Solve basic difference equations.
5 • Determine stability of the equiblibria of a difference equation.
6 • Compute basic integrals.
7 • Solve basic differential equations.
8 • Construct, analyze and interprete discrete and continuous growth models, population models and epidemic models

Conditions for credit contract

Access to this course unit via a credit contract is unrestricted: the student takes into consideration the conditions mentioned in 'Starting Competences'

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, seminar: coached exercises

Extra information on the teaching methods

The theory is taught during the lectures. During the labs, the students solve exercises under the guidance of a teaching assistant.

Learning materials and price

A course text in Dutch and the slides used during the lectures are freely available on Minerva.

References

M. Nachtegael, J. Buysse. Wiskundig Vademecum: een Synthese van de Leerstof Wiskunde. Uitgeverij Pelckmans, 1995
C. Neuhauser. Calculus for Biology and Medicine (3rd edition). Pearson Education, 2010

Course content-related study coaching

Students actively process the learning material while making exercises in the presence of a teaching assistant. Furthermore students can submit their solutions for additional exercises to get feedback from the assistant or the instructor. The assistant and the instructor are also available to students for additional individual explanation outside of the scheduled class times. Students can freely participate in a mid-semester test.

Evaluation methods

end-of-term evaluation

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

Possibilities of retake in case of permanent evaluation

not applicable

Calculation of the examination mark

100% periodical evaluation (written exam)