

# Course Specifications

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

## Mathematics I: Fundamental Methods (C001541)

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

Credits 5.0 Study time 150 h Contact hrs 50.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 1)	Dutch	lecture	25.0 h
		seminar: coached	25.0 h
		exercises	

Lecturers in academic year 2018-2019

Van Daele, Marnix WE02 lecturer-in-charge

Offered in the following programmes in 2018-2019

<a href="#">Bachelor of Science in Chemistry</a>	crdts	offering
	5	A

Teaching languages

Dutch

Keywords

Mathematics, algebra, geometry

Position of the course

In the first Bachelor year, distributed over two semesters, two courses in Mathematics are given. This course constitutes the first of these two.

Contents

After recalling the main topics from the 'vakantiecursus', the following new subjects are presented:

- Algebra: complex numbers; matrices; determinants; eigenvalues; characteristic polynomial; diagonalisation
- Plane Geometry: linear transformations in the plane; transformation matrices; change of basis; coordinate transformations; matrix congruence and diagonalisation
- Geometry in Three Dimensions: lines and planes in 3-space; parallelism and orthogonality of lines and planes; cross product; linear transformations; transformation matrices; basis change and coordinate transformations; matrix congruence
- Calculus: survey of various classes of functions; functions in several variables; partial derivation; sequences and series; integrals

Initial competences

The mathematical background of the incoming students varies from 3 or 4 hours to more than 6 hours per week. For some students, most of the topics are already known, for other many topics will be new. We expect the students to have understood the basic concepts taught in the 'vakantiecursus':

- Arithmetic: fractions and powers, order of computations, absolute value
- Algebra: factorisation, solving equalities and inequalities, rational functions, systems of linear equations
- Geometry: figures, congruence, vectors, equation of a line
- Trigonometry
- Limits: definitions, rules of computation
- Derivatives: definitions, geometric meaning, rules of computation
- Integrals: definite and indefinite integrals, geometric interpretation, substitution method
- Functions: domain and image, symmetries, asymptotes, using the first and second derivative, geometric representation

Exercises concerning these initial competences will be given during the first two weeks of the course, also by using the computer program Sage. Simultaneously, students will learn the necessary skills to solve mathematical problems with a computer.

#### Final competences

- 1 The student can formulate mathematically a wide range of elementary problems from algebra, geometry, and calculus.
- 2 When confronted with a mathematical problem, the students select and fluently apply suited mathematical techniques. The students know how to use the computer program Sage to assist them in solving a given mathematical problem.

#### 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, seminar: coached exercises

#### Learning materials and price

Lecture notes (in Dutch), exercises, and solutions in printed and/or electronic form. Also Sage-worksheets will be used. All of the course material is available at the electronic learning environment Minerva.

Each student disposes of their own computer.

#### References

#### Course content-related study coaching

Exercise classes

Individual coaching by lecturer/assistant: consultation by appointment

Coaching via Minerva.

#### Evaluation methods

end-of-term evaluation

#### 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, oral examination

#### Examination methods in case of permanent evaluation

#### Possibilities of retake in case of permanent evaluation

not applicable

#### Extra information on the examination methods

Form: Written (closed-book with list of formulas)

Content: Evaluation of the knowledge and insight in basic concepts and the ability to apply these concepts in problematic cases. Using Sage to solve problems.

#### Calculation of the examination mark

Theory (50%) and Exercises (50%)