Mathematics 1: Engineering Mathematics (O000095)

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

Credits 10.0	Study time 300 h	Contact hrs	120.0 h

Course offerings and teaching methods in academic year 2019-2020

A (year)	English	lecture	60.0 h
		seminar: coached exercises	60.0 h

Lecturers in academic year 2019-2020

Rao, Shodhan	KR01	lecturer-in-charge
Van Messem, Arnout	KR01	co-lecturer

Offered in the following programmes in 2019-2020

	crdts	offering
Bachelor of Science in Environmental Technology	10	A
Bachelor of Science in Food Technology	10	A
Bachelor of Science in Molecular Biotechnology	10	A
Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology	10	A

Teaching languages

English

Keywords

Trigonometry, coordinate geometry, one-variable calculus, linear algebra, linear equations, eigenvalues and eigenvectors

Position of the course

This course is basic course in engineering mathematics. It will acquaint students with the mathematical techniques and methods that are mandatory in the framework of advanced engineering courses.

Contents

1. Basic algebra: complex numbers, Euler's formula, polynomials, equations, binomial theorem, proof techniques, mathematical induction, AM - GM inequality.
2. Trigonometry: trigonometric functions, formulae, graphs and equations, relations between sides and angles of a triangle, heights and distances, inverse functions
3. Two-dimensional analytical/coordinate geometry: Cartesian coordinates, distance formula, locus, equation of a straight line, equation of a circle.
4. Differential calculus: functions of a real variable, limits and continuity, derivatives, geometrical interpretation of the derivative, formal definition of limits, mean value theorem, transcendental functions, inverse functions and applications of differentiation.
5. Integral calculus: indefinite and definite integrals, integration techniques, Riemann integral, improper integral applications of definite integrals.
6. Linear algebra: systems of linear equations, row reduction algorithm, linear combinations, span and linear independence of vectors, matrix inversion, rank, nullity, determinants, eigenvalues, eigenvectors and diagonalization of matrices.

Initial competences

High school knowledge of mathematics.

Final competences

1 Possess in-depth knowledge, insight and skills with regards to the foundation and applications of basic engineering mathematics.
2 Appreciate and understand abstract concepts in linear algebra.
3 Identify the right mathematical technique for solving problems in 2-dimensional

geometry commonly encountered in engineering.

4 Analyse and apply the right mathematical technique to solve simple problems in related fields including mechanics and chemistry.

5 Abstract relevant information from a given real life problem description.

6 Apply relevant methods from one-variable calculus and/or linear algebra to solve real life engineering 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, seminar: coached exercises

Learning materials and price

A combination of notes provided in the class and power point slides available on Minerva.

References

R. A. Adams & C. Essex, "Calculus: a Complete Course", Eighth Edition, Pearson.
David C. Lay, "Linear Algebra and its applications", Fourth Edition, Addison-Wesley.
James Stewart, "Calculus", 7th Edition, International metric version, Brooks/Cole Cengage Learning, 2012.
L.E. Spence, A.J. Insel, S.H. Friedberg, "Elementary linear algebra", Second Edition, Pearson, 2008.

Course content-related study coaching

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

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

Written examination with open questions

Examination methods in case of permanent evaluation

Written examination with open questions, participation

Possibilities of retake in case of permanent evaluation

examination during the second examination period is not possible

Calculation of the examination mark

Participation: 5%
Non-periodic evaluation-Written exam with open questions: 15%
Partial Exam - Written exam with open questions: 40%. It is conducted at the end of semester 1. If a student passes this exam, he/she is exempt from the Semester 1 half of the Final exam
Final Exam: 40% (Semester 1) + 40% (Semester 2)