Course Specifications

Valid as from the academic year 2016-2017

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 2016-2017

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

Lecturers in academic year 2016-2017

Rao, Shodhan	LA10	lecturer-in-charge
Van Messem, Arnout	WE02	co-lecturer

Offered in the following programmes in 2016-2017	crdts	offering
Bachelor of Science in Food Technology	10	A
Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology	10	A
Bachelor of Science in Environmental Technology	10	A
Bachelor of Science in 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, polynomials, equations, binomial theorem, proof techniques.
2. Trigonometry: trigonometric functions, formulae and equations, relations between sides and angles of a triangle, heights and distances, inverse functions
3. Two-dimensional analytical/coordinate geometry: Cartesian coordinates, 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, 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, eigenvalues, eigenvectors and diagonalization of matrices.

Semester 1
Week 1: Trigonometric ratios, graphs, identities
Week 2: Properties of a triangle, trigonometric equations
Week 3: Heights and distances, inverse trigonometric functions, locus, distance formula
Week 4: Straight lines, circles
Week 5: Functions, limits and continuity, derivatives
Week 6: Geometrical interpretation of derivatives, maxima/ minima
Week 7: Indefinite and definite integrals
Week 8: Techniques of integration

Week 9: Areas under curves, complex numbers
Week 10: Quadratic expressions, polynomials, theory of equations
Week 11: Binomial theorem, proof techniques
Week 12: Revision
Semester 2
Week 1: Formal definition of limits, Mean value theorem
Week 2: Inverse functions, inverse trigonometric and hyperbolic functions
Week 3: l'Hôpital's rules, concavity, asymptotes
Week 4: Linear approximation, Taylor polynomials, Riemann Integral
Week 5: Improper integrals
Week 6: Applications of Integration
Week 7: Systems of linear equations, row reduction algorithm
Week 8: Span and linear combinations, linear dependence/independence of vectors
Week 9: Balancing chemical equations, matrix inversion, rank, nullity
Week 10: Determinants
Week 11: Eigenvalues, eigenvectors and diagonalization
Week 12: Revision

Initial competences

High school knowledge of mathematics.

Final competences

Students develop scientific skills such as analytical reasoning, critical reflection and problem solving capability.

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.

References

Adams, R. A. & C. Essex (2010), Calculus: a Complete Course, Pearson.
James Stewart, Calculus, 7th Edition, International metric version, Brooks/Cole Cengage Learning, 2012.
David C. Lay, Linear Algebra and its applications, Fourth Edition, Addison-Wesley.
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

Examination methods in case of permanent evaluation

Participation

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible in modified form

Calculation of the examination mark

Non-periodic evaluation:
Participation 5%
Written exam with open questions - tests during the semesters 15%
Periodic Evaluation:
Partial Exam: Written exam with open questions 40%: Conducted at the end of

semester 1. If a student passes this exam, he/she is exempt from the first half of the Final exam
Final Exam: Written exam with open questions 40% (Sem 1)+ 40% (Sem 2)