Course Specifications

Valid as from the academic year 2016-2017

Mathematics 1: Engineering Mathematics (O000095)

Course size

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>300 h</td>
<td>120.0 h</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Programme</th>
<th>credits</th>
<th>offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Science in Food Technology</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>Joint Section Bachelor of Science in Environmental Technology, Food Technology and Molecular Biotechnology</td>
<td>10</td>
<td>A</td>
</tr>
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<td>Bachelor of Science in Environmental Technology</td>
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<td>A</td>
</tr>
</tbody>
</table>

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.

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

(Approved)
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

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)