UNIVERSITY OF SKÖVDE

TRANSLATION FROM SWEDISH

COURSE SYLLABUS

Single Variable Calculus

7.5 credits

Course code: MA03XG
Version number: 1
Valid from: 1 July 2027
Ratified by: Curriculum Committee for Engineering Science
Date of ratification: 12 November 2026

1. General information about the course

The course is provided by the University of Skövde and is named Single Variable Calculus (Envariabelanalys). It comprises 7.5 credits and is a first-cycle course. The level of progression is GXX.

The course is a part of the subject of Mathematics. The disciplinary domain of the course is Natural Sciences.

2. Entry requirements

General entry requirements.
Additional requirements: Physics 2, Mathematics 3c or Mathematics D
Or:
Physics level 2, Mathematics Further level 1c.

3. Course content

This is an introductory course in single-variable calculus, covering the following core topics:

Mathematical language and inference

Formulating mathematical arguments and problem-solving in a correct and comprehensible manner, adhering to established conventions and logical rigor.

Algebra and features

Complex numbers. The concept of a function. Definitions and properties of elementary functions, such as trigonometric, exponential, and logarithmic functions. Increasing and decreasing functions; inverse functions.

Number sequences and series

The concepts of sequences, series, and convergence, including various convergence criteria. Power series.

Limits and Continuity

Rules for calculating limits. The concept of continuity. Theorems concerning continuous functions.

Derivative

The concept of the derivative. Differentiation rules: how they work and why. The Mean Value Theorem; implicit differentiation. L'Hôpital's rule; tangent lines; and the use of derivatives to analyze growth, extreme values, and curve sketching. Linear approximation and Taylor series.

Integration

The concepts of indefinite and definite integrals. The Fundamental Theorem of Calculus. Techniques for analytical integration, such as substitution, integration by parts, and partial fraction decomposition. Basic numerical methods for approximating integrals. Modeling using integrals.

Ordinary differential equations

The concept of a differential equation. Formulating and interpreting ordinary differential equations (ODEs) based on a model description. Determining solutions to separable ODEs. via integration; first-order linear ordinary differential equations (ODEs) using an integrating factor; and higher-order linear ODEs with constant coefficients. Determining solutions that satisfy initial or boundary conditions. Basic numerical methods for solving initial-value problems.

4. Objectives

After completion of the course, the student shall be able to:

Knowledge and understanding

- describe the significance and properties of concepts such as derivatives and integrals,
- connect physical models to mathematical descriptions within the scope of the course,
- demonstrate an understanding of, and correctly use, mathematical terminology within the scope of the course,
- demonstrate familiarity with fundamental numerical methods for integration and the solution of differential equations,

Skills and abilities

- assimilate, present, and discuss mathematical and logical reasoning in an intelligible manner, using appropriate terminology and rigor,
- apply algebraic and analytical properties and methods within the scope of the course,
- analytically evaluate integrals and solve specific types of differential equations,

Judgement and approach

- evaluate the validity of mathematical reasoning and mathematical models.

5. Examination

The course is graded 5 (Excellent), 4 (Good), 3 (Satisfactory) or U (Fail).

The examinations of the course consist of the following modes of assessment:

- **On-campus supervised written examination**
  6.5 credits, grades: 5/4/3/U (determines the final grade)
- **Written assignment with report**
  1 credit, grades: G/U

Students with a permanent disability who have been approved for directed educational support may be offered adapted modes of assessment.

6. Types of instruction and language of instruction

The teaching is comprised of lectures and exercises.

The teaching is conducted in English.

7. Course literature and other educational materials

Stewart, J., Clegg, D., & Watson, S. (2020). *Calculus: Early Transcendentals, Metric Edition* (9th ed). Cengage. ISBN 9780357113516.

8. Student influence

Student influence in the course is ensured by means of course evaluation. The students are informed about the results of the evaluation and potential measures that have been taken or are planned, based on the course evaluation.

9. Additional information

Further information about the course, as well as national and local governing documents for higher education, is available on the website of the University of Skövde.