Faculty of Technology and Science
Mathematics

Syllabus

Course Approval
The syllabus was approved by the Faculty Board of Technology and Science on 29 May 2007, and is valid from the Autumn semester of 2007 at Karlstad University.

Course Code: MAGA45
Mathematics for GIS Engineers II, 7.5 ECTS Credits
(Matematik för GIS-ingenjörer II, 7.5 Swedish credit points)
Degree Level: Bachelor
Progression Level: A

Language of Instruction
The language of instruction is Swedish.

Prerequisites
Mathematics for Engineers I, 7.5 ECTS, or the equivalent.

Major Field of Study
Mathematics

Learning Outcomes

The aim of the course is that students acquire the basic mathematical knowledge and skills required for studies in the technological and science fields included in the engineering programme.

Upon completion of the course a student should be able to

differentiate products, fractions, and compositions of the elementary functions.

apply derivatives for graph constructions, extreme value problems, and related rates problems.

use the Mean Value Theorem and Taylor's Formula to draw conclusions concerning the behavior of functions in the neighborhood of a given point.

make linear least-squares approximations.

calculate partial and directional derivatives, and the gradient of a given function in several variables; describe the geometrical meaning of these concepts; use them to solve extreme value problems in several dimensions, and problems concerning tangent lines to level
curves and tangent planes to level surfaces.

generalize Taylor's Formula to functions of several variables and use the formula as an alternative way of finding tangent planes and to determine the behavior at stationary points.

apply the Chord Theorem, the Bisector Proposition, and Heron's Formula in connection with the geometry

from upper secondary school to solve problems where these propositions have an application.

apply vector geometry to solve problems regarding distances and angles on a spherical surface and problems on the intersections of planes and lines with such surfaces.

combine concepts, theorems, and experiences from examples, find analogies, make generalizations and simplifications.

choose an appropriate model to solve problems in given situations within the areas mentioned above.

Content and Form of Instruction

Single-variable calculus: Differentiation of products, quotients and compositions of elementary functions. Applications, such as construction of curves, extreme value problems, and related rates.
Mean Value Theorem and Taylor's Formula. Least-squares approximations.

Multi-variable calculus: partial derivative, directional derivative and
gradient, extreme value problems and Taylor's Formula.

Plane geometry: Chord Theorem, Bisector Proposition, Heron's Formula and repetition of upper secondary school geometry. Conic sections.

Spherical geometry: Polar coordinates in three dimensions and vector
geometry applied on the surface of the earth viewed as an idealized sphere.

Reading List

See separate document.

Examination

Examination is in the form of a written exam. The number of examination opportunities for earning a Pass grade is limited to three per academic year.

Grades

One of the grades U (Fail), 3 (Pass), 4 (Pass not without distinction), or 5 (Pass with distinction) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course assessment is based on student views and experiences as reported in written course evaluations and/or group discussions. Students will be informed of the result of the evaluation and of the measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional Information

Students who enrolled before 1 July 2007 will complete their studies in accordance with the requirements of the earlier admission. Upon completion students may request degree and course certificates to be issued under the current ordinance if they meet its requirements.

The local regulations for studies at the Bachelor’s and Master’s levels at Karlstad University, ref. C2007/368, stipulate the obligations and rights of students and staff.

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