MMGF20   Multivariable Calculus, 7.5 credits
Flervariabelanalys, 7,5 högskolepoäng
First Cycle

Confirmation
This course syllabus was confirmed by Department of Mathematical Sciences on 2015-04-01 and was last revised on 2019-12-16 to be valid from 2020-01-20, spring semester of 2020.

Field of education: Science 100%
Department: Department of Mathematical Sciences

Position in the educational system
The course can be part of the following programmes: 1) Marine Science, Bachelor's Programme (N1MAV), 2) Bachelor of Science in Physics (N1FYS), 3) Marine Science, Master's Programme (N2MAV), 4) Computer Science, Bachelor's Programme (N1COS) and 5) Medical Physicist Programme (N1SJU)

Main field of studies	*Specialization*
Mathematics	G1F, First cycle, has less than 60 credits in first-cycle course/s as entry requirements

Entry requirements
In addition to general entry requirements, this course requires knowledge equivalent to the course *MMGF11 Analysis and linear algebra* or the courses *MMGD20 Linear Algebra D* and *MMGD30 Mathematical analysis D.*

Learning outcomes
On completion of the course, the student will be able to

- demonstrate some geometric understanding in several variables, for example by switching between treating surfaces as graphs, parameterised surfaces and level surfaces,

- calculate different types of limits and derivatives for functions of several variables, interpret these geometrically, and use them for example to decide continuity, find tangent planes, and use the implicit function theorem,
- solve optimization problems by locating and classifying critical points, and by means of Lagrange multipliers, if there are equality constraints,
- calculate multiple integrals with repeated single integrals and by changing variables, and use these to calculate areas and volumes,
- calculate line and surface integrals of vector fields, decide if a vector field is conservative, and use Gauss and Stoke's theorems,
- define basic concepts and prove certain theorems in the course.

Course content

Parametrization of curves and surfaces. Level curves and level surfaces. Limits in several variables. Partial derivatives, differentiability, gradients, directional derivative, functional matrices. Classification of stationary points. Chain rule in several variables. Something of partial differential equations. Optimization on compact sets, optimization with equality constraints, and simple optimization problems on non-compact sets. Implicit function theorem.

Integration in two and several variables, in terms of multiple integrals and repeated single integrals. Changes in coordinates, especially polar and spherical coordinates. Applications of integrals on areas, volumes, and center of mass. Generalized double integrals. Vector fields, especially conservative ones. Line and surface integrals. Green's, Gauss', and Stoke's theorems.

Form of teaching

Language of instruction: Swedish

Assessment

The examination consists of a written examination at the end of the course, and computer exercises. During the course, there may be optional assignments that give bonus points on the exam. Examples of such components are tests or written assignments. Information for the current course instance is given via the course homepage.

If a student, who has failed the same examination component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and it shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

Course evaluation is made with a questionnaire and/or conversation with student representatives.

Additional information

The course syllabus of MMGF20 was originally established 06/12/2007, when it replaced MAN230.

Earlier versions, i.e. current up to 30/06/2015, of the course syllabus of MMGF20 is not in Gubas syllabus database.