

Differential Geometry

Title	Differential Geometry
Semester	E2023
Master programme in	Mathematical Bioscience / Physics and Scientific Modelling
Type of activity	Course
Teaching language	English
Study regulation	Read about the Master Programme and find the Study Regulations at ruc.dk Læs mere om uddannelsen og find din studieordning på ruc.dk

REGISTRATION AND STUDY ADMINISTRATIVE

Registration	Sign up for study activities at stads selvbetjening within the announced registration period, as you can see on the Studyadministration homepage. When signing up for study activities, please be aware of potential conflicts between study activities or exam dates. The planning of activities at Roskilde University is based on the recommended study programs which do not overlap. However, if you choose optional courses and/or study plans that goes beyond the recommended study programs, an overlap of lectures or exam dates may occur depending on which courses you choose.
Number of participants	
ECTS	5
Responsible for the activity	Carsten Lunde Petersen (lunde@ruc.dk)
Head of study	Jesper Schmidt Hansen (jschmidt@ruc.dk)
Teachers	
Study administration	INM Registration & Exams (inm-exams@ruc.dk)
Exam code(s)	U60169

ACADEMIC CONTENT

Overall objective	The overall objective of the course in Differential Geometry is to give the student an understanding of its construction and formalism, which
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	enables the student to apply differential geometry in the critical analysis of other mathematical contexts.
Detailed description of content	• The course starts with a general discussion of curves in R^n and their representations. • The course then continues into a discussion of regular surfaces in R^3. • Starting from the very definition of a regular surface we discuss methods of constructing regular surfaces and prove that the change of coordinates on a regular surface is smooth. This naturally leads to a discussion of • The tangent space to a regular surface at a point of the surface, the differential of a differentiable mapping between two regular surfaces, the first fundamental form on a regular surface, the notion of curve-length, area and integration on a regular surface and notions of curvature of regular surfaces
Course material and Reading list	The exact curriculum will be announced on the Moodle site for the course
Overall plan and expected work effort	The course is a 5 ETCS credit course, corresponding to an expected student work-load of 135 hours. The stipulated workload distribution is: Pre-class 40 hours Classes 40 hours Post classes 40 hours Exam preparation 15 hours.
Format	
Evaluation and feedback	The course includes formative evaluation based on dialogue between the students and the teacher(s). Students are expected to provide constructive critique, feedback and viewpoints during the course if it is needed for the course to have better quality. Every other year at the end of the course, there will also be an evaluation through a questionnaire in SurveyXact. The Study Board will handle all evaluations along with any comments from the course responsible teacher. Furthermore, students can, in accordance with RUCs 'feel free to state your views' strategy through their representatives at the study board, send evaluations, comments or insights from the course to the study board during or after the course.
Programme	The course will consist of lectures and exercises. The students are required to show active participation in the course and give 1-2 short presentations to the rest of class of a selected part of the curriculum as well as presenting solutions to 2-4 exercises to the rest of the class.
ASSESSMENT	

Overall learning outcomes	After the course the student will be able to • construct, examine and analyse curves and surfaces in $\mathbb{R}^3$. • apply mathematical analysis and linear algebra in differential geometry. • describe the notion and power of chart invariance. • demonstrate in-depth understanding of the relation between manifolds, synthetic differentiability, tangent space, Riemannian metrics and the metric structure of manifolds. • demonstrate in-depth understanding of the relation between ODE's on manifolds and vector fields on manifolds. • operate with concepts and ideas from differential geometry in other mathematical contexts.
Form of examination	Individual oral exam based on a portfolio. The character limit of the portfolio is 1,200-120,000 characters, including spaces. Examples of written products are exercise responses, talking points for presentations, written feedback, reflections, written assignments. The preparation of the products may be subject to time limits. The character limits include the cover, table of contents, bibliography, figures and other illustrations, but exclude any appendices. Time allowed for exam including time used for assessment: 30 minutes. The assessment is an assessment of the oral examination. The written product(s) is not part of the assessment. Permitted support and preparation materials for the oral exam: All. Assessment: 7-point grading scale. Moderation: Internal co-assessor
Form of Re-examination	Samme som ordinær eksamen / same form as ordinary exam
Type of examination in special cases	
Examination and assessment criteria	The portfolio consists of a written presentation of the oral presentation which the student gives during the course on a topic assigned by the course organizer. During the oral examination the student should be able to • construct, examine and analyse curves and surfaces in $\mathbb{R}^3$. • apply mathematical analysis and linear algebra in differential geometry. • describe the notion and power of chart invariance. • demonstrate in-depth understanding of the relation between manifolds, synthetic differentiability, tangent space. • demonstrate in-depth understanding of the relation between ODE's on manifolds and vector fields on manifolds. • operate with concepts and ideas from differential geometry in other mathematical contexts. The assessment of the oral exam is based on the student's ability to meet the criteria mentioned above and their ability to

- clearly present and communicate the scientific content of the course
- engage in a scientific dialogue and discussion with the assessors

Exam code(s) Exam code(s) : U60169

Course days:

Hold: 1

Differential Geometry (MATHBIO)

time 11-09-2023 08:15 til
 11-09-2023 10:00

location 27.1-052 - lokale 2 (20)

Teacher Jesper Schmidt Hansen (jschmidt@ruc.dk)

Differential Geometry (MATHBIO)

time 14-09-2023 12:15 til
 14-09-2023 16:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 18-09-2023 08:15 til
 18-09-2023 10:00

location 27.1-052 - lokale 2 (20)

Differential Geometry (MATHBIO)

time 21-09-2023 12:15 til
 21-09-2023 16:00

location 27.2-054 - lokale 3 (40)

Differential Geometry (MATHBIO)

time 25-09-2023 08:15 til
25-09-2023 10:00

location 27.1-052 - lokale 2 (20)

Differential Geometry - Exercises (MATHBIO)

time 25-09-2023 10:15 til
25-09-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 28-09-2023 12:15 til
28-09-2023 16:00

location 27.2-054 - lokale 3 (40)

Differential Geometry (MATHBIO)

time 02-10-2023 08:15 til
02-10-2023 10:00

location 27.1-052 - lokale 2 (20)

Differential Geometry - Exercises (MATHBIO)

time 02-10-2023 10:15 til
02-10-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 05-10-2023 12:15 til
05-10-2023 16:00

location 27.2-054 - lokale 3 (40)

Differential Geometry (MATHBIO)

time 09-10-2023 08:15 til
09-10-2023 10:00

location 27.2-054 - lokale 3 (40)

Differential Geometry - Exercises (MATHBIO)

time 09-10-2023 10:15 til
09-10-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 12-10-2023 12:15 til
12-10-2023 16:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 16-10-2023 08:15 til
16-10-2023 10:00

location 27.2-054 - lokale 3 (40)

Differential Geometry - Exercises (MATHBIO)

time 16-10-2023 10:15 til
16-10-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 19-10-2023 12:15 til
19-10-2023 16:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 23-10-2023 08:15 til
23-10-2023 10:00

location 27.2-054 - lokale 3 (40)

Differential Geometry - Exercises (MATHBIO)

time 23-10-2023 10:15 til
23-10-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 26-10-2023 12:15 til
26-10-2023 14:00

location 27.1-052 - lokale 2 (20)

Differential Geometry (MATHBIO)

time 30-10-2023 08:15 til
30-10-2023 10:00

location 27.2-054 - lokale 3 (40)

Differential Geometry - Exercises (MATHBIO)

time 30-10-2023 10:15 til
30-10-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 02-11-2023 12:15 til
02-11-2023 14:00

location 27.1-052 - lokale 2 (20)

Differential Geometry (MATHBIO)

time 06-11-2023 08:15 til
06-11-2023 10:00

location 27.2-054 - lokale 3 (40)

Differential Geometry - Exercises (MATHBIO)

time 06-11-2023 10:15 til
06-11-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 09-11-2023 12:15 til
09-11-2023 14:00

location 27.1-052 - lokale 2 (20)

Differential Geometry (MATHBIO)

time 13-11-2023 08:15 til
13-11-2023 10:00

location 27.2-054 - lokale 3 (40)

Differential Geometry - Exercises (MATHBIO)

time 13-11-2023 10:15 til
13-11-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 16-11-2023 12:15 til
16-11-2023 14:00

location 27.1-052 - lokale 2 (20)

Differential Geometry (MATHBIO)

time 20-11-2023 08:15 til
20-11-2023 10:00

location 27.2-054 - lokale 3 (40)

Differential Geometry - Exercises (MATHBIO)

time 20-11-2023 10:15 til
20-11-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 23-11-2023 12:15 til
23-11-2023 14:00

location 27.1-052 - lokale 2 (20)

Differential Geometry (MATHBIO)

time 27-11-2023 08:15 til
27-11-2023 10:00

location 27.1-052 - lokale 2 (20)

Differential Geometry - Exercises (MATHBIO)

time 27-11-2023 10:15 til
27-11-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 30-11-2023 12:15 til
30-11-2023 16:00

location 27.1-052 - lokale 2 (20)

Differential Geometry (MATHBIO)

time 04-12-2023 08:15 til
04-12-2023 10:00

location 27.1-052 - lokale 2 (20)

Differential Geometry - Exercises (MATHBIO)

time 04-12-2023 10:15 til
04-12-2023 12:00

location 27.2-064 - pc lokale (40)

Differential Geometry (MATHBIO)

time 07-12-2023 12:15 til
07-12-2023 16:00

location 27.1-052 - lokale 2 (20)

Differential Geometry - Hand-in of portfolio

time 21-12-2023 10:00 til
21-12-2023 10:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

Differential Geometry - Exam (MATHBIO)

time 03-01-2024 08:15 til
03-01-2024 18:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

location 27.2-054 - lokale 3 (40)

Differential Geometry - Hand-in of portfolio (reexam)

time 31-01-2024 10:00 til
31-01-2024 10:00

forberedelsesnorm ikke valgt

forberedelsesnorm D-VIP ikke valgt

Differential Geometry - Reexam (MATHBIO)

time 19-02-2024 08:15 til
19-02-2024 18:00