University of Gdańsk

Subject card

Subject name and code	Differential geometry, PG_00210358						
Field of study	Mathematics						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2026/2027			
Education level	Master's studies		Subject group	Obligatory subject group in the field of study Optional subject group			
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	5.0			
Learning profile	academic		Assessment form	credit			
Conducting unit	Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Andreas Zastrow, prof. UG				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study		SUM
	Number of study hours	60		3.0	62.0		125
Subject objectives	The aim of this subject is to familiarize the students with the terminology, theorems and methods of geometry while making use of differential and integral calculus of functions of several variables. The student should learn the precise definition of curvature, and obtain some mathematical intuition of the two-dimensional space that surrounds him.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATMU2_W01] knows and understands in depth the theory of selected areas of mathematics or related fields, the complex relationships between them and their development trends	In the area of those parts of Differential Geometry, that can be presented in the course of one semester (in part curvature of surfaces and the basis of Riemannian geometry, including the corresponding definitions, examples, and most important proofs or proof-sketches) the student knows and understands in-depth the relevant theory. Especially in this field he/ she can communicate about basic definitions and formulae, knows examples and counterexamples of defined objects, and correctly formulates and proves basic theorems.	[SW4] test/exam - oral or written
[MATMU2_U05] is able to apply new or adapt existing methods and tools from a selected field of mathematics and information and communication technologies in related fields	The student is able to solve practical problems in the field of the lecture, (in particuar concerning the tangent space, the curvature of curves, the moving n-hedral, the curvature of surfaces, Gauss' Theorema Egregium, and his first and second quadratic forms).	[SU4] test/exam - oral or written

Subject contents

Making the student aquainted with
1. the elements of the theory of curves,
the Frenet-Seret-frame, and the curvature of curves,
2. The terminology of surfaces, the tangent space, Riemannian metrics,
isometries and geodesics.
3. geodesic equations, the Gauss map and Gauss' curvature
4. Gauss' Theorema Egregium, first and second quadratic forms.
5. the angle-sum in triangles and the description of geodesics
in the euclidean plane, the hyperbolic plane and on the sphere.
6. Some facts from Riemannian geometry: covariant derivative, parallel transport, connection

Prerequisites and co-requisites

the standard lectures on Analysis, Linear Algebra and metric Topology
from the prior years of mathematical studies

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
activity and test-results in the example classes	51.0%	50.0%
observation of the attitude of the student	51.0%	0.0%
final assessment	51.0%	50.0%

Recommended reading

Basic literature	1. W. Klingenberg - A course of differential geometry, Springer 19782.) 2. J. Oprea, Geometry and its applications, Prentice-Hall Inc., Upper Saddle River (New Jersey, USA), 1997 3.. L. W. Tu, Differential Geometry, Graduate Texts in Mathematics 275, Springer International Publishing, Cham (Switzerland)
Supplementary literature	n/a
eResources addresses	

Example issues/ example questions/ tasks being completed

none

Work placement

Not applicable

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