KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI
Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego
UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ SPOŁECZNY

Course title	ECTS code
Calculus on manifolds	11.1.0429

Name of unit administrating study

null

Studies

faculty	field of study		
Faculty of Mathematics, Physics and Informatics	Mathematics	type	second tier studies (MA)
		form	full-time
		specialty	financial mathematics, mathematics – teacher education
		specialization	all

Teaching staff

prof. UG, dr hab. Jacek Gulgowski; dr Poj Lertchoosakul; prof. UG, dr hab. Andreas Zastrow; dr Aleksandra Nowel

Forms of classes, the realization and number of hours

Forms of classes

Auditorium classes, Lecture

The realization of activities

classroom instruction

Number of hours

Lecture: 30 hours, Auditorium classes: 30 hours

ECTS credits

5

The academic cycle

2022/2023 winter semester

Type of course

an elective course

Language of instruction

- english
- polish

Teaching methods

- problem solving
- problem-focused lecture

Form and method of assessment and basic criteria for eveluation or examination requirements

Final evaluation

- Graded credit
- Examination

Assessment methods

- (mid-term / end-term) test
- oral exam

The basic criteria for evaluation

Method of verifying required learning outcomes

Required courses and introductory requirements

A. Formal requirements

No formal requirements.

B. Prerequisites

Classical multivariate calculus.

Aims of education

The basic concepts and tolls of the theory of differential manifolds will be presented. The most important theorems of the theory will be stated - for some of them proofs will be given.
Students should be able to understand abstract problems stated in the theory of differential manifolds and apply this theory to the mathematical scientific work.

Course contents

1. Topological and differentiable manifolds, charts, atlas and differential structure.
2. Maps between manifolds, the rank of the map.

3. Submanifolds.
4. Immersions, submersions, embeddings.
5. Tangent space and tangent bundle, the derivative of the map between manifolds.
6. Transversality.
7. Orientation of manifold.
8. Manifolds with boundary.
9. The degree of the map.
10. Forms on manifolds, integration on manifolds and Stoke's theorem.

Bibliography of literature

1. Morris W. Hirsch, "Differential Topology", Springer
2. John Milnor, "Topology from the differentiable viewpoint"
3. Michael Spivak, "Calculus on manifolds"

The learning outcomes (for the field of study and specialization)

Knowledge

Student who completed the course:

- knows basic definitions and formulate of calculus (analysis) on manifolds; knows examples and counterexamples of defined objects; correctly states and proves basic theorems of calculus on manifolds.

M2_W01, M2_W02, M2_W03

Skills

Student who completed the course:

- is able to solve basic problems stated by calculus on manifolds by means of standard methods of calculus, algebra and topology, as well as definitions and theorems presented during the course.

M2_U01, M2_U03, M2_U04, M2_U05, M2_U06, M2_U07

Social competence

Contact

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