MATH-322 **Introduction to differentiable manifolds**

Kiesenhofer Anna

Cursus	Sem.	Type
Mathematics	BA5	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Differentiable manifolds are a certain class of topological spaces which, in a way we will make precise, locally resemble R^n. We introduce the key concepts of this subject, such as vector fields, differential forms, integration of differential forms etc.

Content

- topological and differentiable manifolds
- vector bundles
- tangent space and tangent bundle
- vector fields, integral curves
- differential forms, tensors, exterior derivative
- orientation, integration of differential forms
- Stokes's theorem (and applications)

Keywords

differentiable manifold, tangent space, vector field, differential form, Stokes

Learning Prerequisites

Required courses

Espaces métriques et topologique, Topologie, Analyse III et IV

Important concepts to start the course

Topological spaces, multivariate calculus (implicit function theorem etc.)

Learning Outcomes

By the end of the course, the student must be able to:

- Define and understand the key concepts (differentiable structure, (co)tangent bundle etc.)
- Use these concepts to solve problems
- Prove the main theorems (Stokes etc.)

Transversal skills

- Continue to work through difficulties or initial failure to find optimal solutions.
- Demonstrate a capacity for creativity.
- Access and evaluate appropriate sources of information.
- Demonstrate the capacity for critical thinking
- Assess one's own level of skill acquisition, and plan their on-going learning goals.

Teaching methods

2h lectures + 2h exercises

Expected student activities

Attend classes and solve exercises, revise course content / read appropriate literature to understand key concepts.

Assessment methods

Written exam.
Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés

Resources

Bibliography

John M. Lee: Introduction to Smooth Manifolds (e-book: https://link.springer.com/book/10.1007%2F978-1-4419-9982-5)

Ressources en bibliothèque

- (electronic version)
- Introduction to smooth manifolds / Lee