**Summary**
Differentiable manifolds are a certain class of topological spaces which, in a way we will make precise, locally resemble $\mathbb{R}^n$. 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

Ressources en bibliothèque
• (electronic version)
• Introduction to smooth manifolds / Lee