DIFFERENTIAL GEOMETRY
SMI PERUGIA
2026

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Syllabus: This course provides an introduction to differential geometry, emphasizing the topological and analytic structures underlying smooth manifolds. It is designed to bridge foundational point–set topology with the calculus of differential forms, highlighting their central role in geometry and topology. The fundamental theorems of multivariable calculus are unified in the general Stokes theorem, which holds for smooth manifolds in arbitrary dimensions. The course develops the theory and techniques needed to carry out concrete calculations in analysis and geometry. Local calculations are related to global topological invariants, as illustrated by results such as the Gauss–Bonnet theorem.

The goal of the course is to provide a rigorous introduction to differential geometry, preparing students for further study in Riemannian geometry, geometric analysis, and related fields.

Textbook: for the first part of the course I will use lecture notes by A. Hatcher "Notes on Introductory Point-Set Topology", the main part of the course will use the book of M.P. do Carmo "Differential Forms and Applications".

Prerequisites: A solid background in real analysis, multivariable calculus, and linear algebra. Prior exposure to topology or differential geometry of surfaces is desirable but not required.