

Math 647 Differential Geometry
Xavier 2000 F

Differentiability of maps, the inverse function theorem, local forms of immersions and submersions; Sard's theorem, existence and uniqueness of solutions to systems of ordinary differential equations. Submanifolds of Euclidean space. Abstract manifolds, the tangent bundle, vector fields, transversality. Whitney's embedding theorem.

Riemannian metrics, Connections, geodesics. Curvatures, Jacobi fields, conjugate points. Complete manifolds, The theorems of Hopf-Rinow and Hadamard. Variations of energy, Theorems of Bonnet-Myers and Synge-Weinstein. The Rauch comparison theorem and applications. The Morse index theorem. The Laplace-Beltrami operator. Basics of spectral theory. Minimal surfaces, the Plateau problem. The Weierstrass representation of minimal surfaces in 3-space; connections with complex analysis. Some global theorems in the theory of complete minimal surfaces.

References: Hirsch: Differential Topology

Do Carmo: Riemannian Geometry

Chavel: Riemannian Geometry: A Modern Introduction

Osserman: A Survey of Minimal Surfaces