

MATHEMATICS 205C

TOPOLOGY III

Spring, 2003

Text: *Differentiable Manifolds, Second Edition*, by L. Conlon

TOPICS

Topological background

(§§ 1.1–1.4)

Topological manifolds, partitions of unity, constructions.

Local theory of smooth functions

(§§ 2.1–2.4, 2.6–2.8)

Smooth functions of several variables, nonsingularity, tangent vectors, bump functions, vector fields and integral flows.

Global theory of smooth manifolds and mappings

(§§ 2.5, 3.1–3.5, 3.7–3.8)

Basic definitions and examples, tangent spaces, vector bundles, smooth submanifolds.

Vector fields and Lie groups

(§§ 4.1–4.4, 5.1–5.2 and some material from §§ 2.2, 2.7, 2.8)

Completeness, Lie brackets, definitions and examples of Lie groups, the exponential map.

Cotangent spaces and tensor algebra

(§§ 6.1–6.4, 7.1–7.2, 7.4–7.5)

Definitions, line integrals, topological interpretations, tensor and exterior products, constructions for tensor fields.

Differential forms

(§§ 8.1–8.6, material from earlier sections, and supplements)

Exterior differential calculus, Poincaré Lemma, Stokes' Theorem, de Rham cohomology, special cases, orientability.