

MATH_V 425/525 101 2025W1 Differential Geometry I

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 Edit

Instructor: The instructor for the course is me, [Jim Bryan \(https://personal.math.ubc.ca/~jbryan/\)](https://personal.math.ubc.ca/~jbryan/).

Description: This is an introduction to Differential Geometry, but it will focus on the underlying differential topology needed for differential geometry. The course will focus on smooth manifolds, vector fields and differential forms, and will end with De Rham cohomology. This course feeds into Math 526 (Differential Geometry II).

TA/Grader: The TA/Grader for the course is [Mihai Marian. \(https://personal.math.ubc.ca/~mihmar/\)](https://personal.math.ubc.ca/~mihmar/).

Lectures: The class meets MWF at 12pm in MATH 202.

Office Hours: Day and time TBA. My office is Math 226.

References: The first 17 chapters of John Lee's book, Introduction to smooth manifolds is a general reference and my lectures may loosely follow the material there. A beautiful book which a great place to learn about De Rham cohomology is Bott and Tu, Differential Forms in Algebraic Topology.

Assessment: There will be two in class midterms (tentative dates in schedule below) and a final. Your grade will be 25% MT1 + 25% MT2 +50% Final .

Practice Homework problems: I will assign practice problems from the book. The midterms will draw heavily from the practice problems.

Schedule of Topics:

Here is our expected progress through the course laid out in weeks. Corresponding sections of the texts are listed. This is a very rough outline and is subject to change!

Weeks 0 and 1 (Sept 3th- Sept 12th): Topological and smooth manifolds, smooth maps, diffeomorphism. Lee Chapter 1 and 2

Week 2 (Sept 15th-19th): Tangent Vectors, tangent bundle, differential of a map. Lee Chapter 3.

Week 3 (Sept 22nd-Sept 26th): Submersions, Immersions, Embeddings. Lee Chapter 4.

Week 4 (Sept 29th -Oct 3rd): Sub-manifolds, manifolds with boundary. Lee Chapter 5.

Week 5 (Oct 6th-10th): Lie Groups. Lee Chapter 7.

Week 6 (Oct 13th-17th): Vector Fields. Lee Chapter 8. **First midterm in class on October 17th.**

Week 7 (Oct 20th-24th): Vector Bundles. Lee Chapter 10.

Week 8 (Oct 27th-31st): Cotangent bundle, tensors. Lee Chapters 11 and 12.

Week 9 (Nov 3rd - 7th): Differential Forms. Lee Chapter 14.

Week 10 (Nov 14th): **(Reading week)** Differential forms continued.

Week 11 (Nov 17th - 21st): Orientation, Integration on manifolds. Lee Chapters 15 and 16. **Second midterm in class Nov 21st.**

Week 12 (Nov 24th -Nov 28th): De Rham cohomology, Lee Chapter 17.

Week 13 (Dec 1st -Dec 5th): De Rham cohomology continued. Lee Chapter 17.

Final exam: TBA

Course Summary:

Date	Details	Due
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