

# DIFFERENTIAL GEOMETRY – MAT367S

Spring 2020

Th 4-5 in GB 120; Fr 12-2 in MP 134

**Instructor:** Boris Khesin  
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**Office:** BA 6228  
**Office hours:** Friday 2-3:30pm (tentative)

## Course description:

Manifolds, submersions and immersions, vector fields, vector bundles, tangent and cotangent bundles, foliations and Frobenius' theorem, multilinear algebra, differential forms, Stokes' theorem, Poincaré-Hopf theorem.

## Textbooks:

Main: Lecture notes based on a book in progress by Prof. E. Meinrenken and G. Gross:  
<http://www.math.utoronto.ca/~mein/teaching/MAT367/DiffGeomNotes.pdf>

Additional: “An introduction to differentiable manifolds and Riemannian geometry” by William M. Boothby, Academic Press.

## Course Website:

The website for the course is  
<http://www.math.toronto.edu/khesin/teaching/diffgeom20-367.html>

## Homework Assignments:

There will be 6 assignments, which you will receive via Quercus. The solutions are to be submitted electronically, using Quercus. It can be a jpeg file (e.g., take picture with your cellphone) or pdf file (e.g., scan your handwritten file, or use LaTeX to create the file).

**No late assignments will be accepted.**

**Note: You must write your solutions yourself, in your own words. If your solution is aided by information from textbooks or online sources, you must properly quote these references.**

## Term Tests:

There will be 2 term tests, taking place during class time on tentatively on Thursdays Feb. 27 and Mar. 26, 2020, in the usual class room GB 120. Confirmation and more details about the term test will be given later. You must bring your student card to each term test.  
**No aids will be allowed.**

### Missing Term Work:

If you cannot show up for a test because of illness or any other special reason, you MUST submit the official UofT medical certificate, which can be downloaded from this link: <http://www.illnessverification.utoronto.ca>

There will be NO make-up tests. The marking scheme will be adjusted appropriately for students who have missed a test because of illness or any other (approved) legitimate reason. (If a student missed both tests, no adjustment can be made.)

### Final Exam:

The final exam will take place during the examination period, and will be 3h long. It will cover all the material presented in the lectures. **No aids are permitted.**

### Marking Scheme:

Your final grade is determined in the following way:

Homework (best 5 out of 6) – 20 %

Term Test 1 – 20 %

Term Test 2 – 20 %

Final Exam – 40 %

### Code of Behaviour / Plagiarism:

Students should become familiar with and are expected to adhere to the Code of Behaviour on Academic Matters which can be found at:

<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>

### Course Outline:

The following is a tentative outline of the material to be covered.

The week # / The week of / Topics

1 / Jan 6 / Definition of manifolds

2 / Jan 13 / Examples of manifolds

3 / Jan 20 / Smooth maps, submanifolds

4 / Jan 27 / Submersions, immersions

5 / Feb 3 / Tangent vectors, tangent maps

6 / Feb 10 / Vector fields and flows, tangent bundle

/ Feb 17 / **Reading week – no classes**

7 / Feb 24 / Lie brackets; Test 1 on Feb. 27

8 / Mar 2 / Frobenius' Theorem

9 / Mar 9 / Differential forms

10 / Mar 16 / Cartan calculus

11 / Mar 23 / Applications of differential forms; Test 2 on Mar. 26

12 / Mar 30 / Integration, Stokes' theorem