

**University of California, Davis
Department of Mathematics**

**Spring Quarter 2020
MAT 180
Special Topics**

Course Title: Manifolds
Professor: Laura Starkston

Prerequisites:

Students are strongly recommended to have taken at least one course in geometry or topology such as MAT 147, MAT 141, or MAT 116.

Required Text:

The required text for this course is still to be determined.

Course Description:

This course is an introduction to the study of manifolds--spaces that look like our Euclidean world, but in a variety of dimensions. The course will focus on the topology of low-dimensional manifolds (surfaces, 3-dimensional spaces, and a peek at 4-dimensional spaces). This course gets at aspects of topology that are not typically covered in classes, but by the end we will reach topics which are used in active areas of current research. A great deal of the material will be very visual, and the goal is for students to learn methods to understand and visualize pieces of spaces which cannot be fully visualized in their entirety from our three-dimensional perspective. By the end of the course, students will begin to access topics that are used in active current research.

The following Course Topics are planned to be covered:

- Manifolds and dimension
- Surfaces and manifolds
- Cell decompositions and polygonal presentations
- Orientability
- Euler characteristic and covering maps
- Decompositions of the 3-sphere
- Handle decompositions

- Morse Theory
- 4-dimensional spaces

Course Grade:

30% Exercises: There will be problems associated with each topic that will be assigned and collected on a weekly basis.

20% Presentations: The class will form small groups of 4-5 students. One day each week, one of the groups will learn deeper aspects of the material for that week, have a reserved office hour with the instructor to discuss their explorations, and at the end of the week they will present on the examples and special topics they have worked out.

40% Journal: Students will be asked to maintain a written account of their understanding of the assigned readings and the class lectures and discussions.

10% Discussion: Students will receive credit by coming to class with questions on assigned readings, asking questions during lectures, answering questions in class, and engaging in class discussions.