

**Contact Details:** Dr. Vaughn Climenhaga

*Office:* PGH Room 665

*Email:* [climinha@math.uh.edu](mailto:climinha@math.uh.edu)

*Website:* [www.math.uh.edu/~climinha/math7352.html](http://www.math.uh.edu/~climinha/math7352.html)

**Course times:**

- *Lectures:* MWF 12:00-12:50pm, C 102
- *Office hours:* Monday 10-10:50am, Wednesday 1-1:50pm

**Prerequisites:** I will expect students to be familiar with the following.

- (1) Vector calculus, including the inverse function theorem and implicit function theorem.
- (2) Linear algebra from the abstract point of view: axiomatic treatment of vector spaces and linear maps.
- (3) Basic point-set topology: continuity and compactness in metric spaces, and more generally in topological spaces. Quotient space constructions.

A little bit of abstract algebra would also be helpful since we will occasionally mention groups and group actions, but this is less essential than the above elements.

**Textbook:** Differential Geometry and Topology: With a View to Dynamical Systems, by Keith Burns and Marian Gidea.

**Course Description:** This course is an introduction to the theory of smooth manifolds, with an emphasis on their geometry. The first third of the course will cover the basic definitions and examples of smooth manifolds, smooth maps, tangent spaces, and vector fields. Later in the semester we will use Euclidean, spherical, and hyperbolic geometry to introduce the notion of a Riemannian metric; we will study parallel transport, geodesics, the exponential map, and curvature. Other topics will include Lie theory and differential forms, including exterior differentiation and Stokes' theorem.

As the subtitle suggests, the textbook we will use discusses some applications and examples in dynamical systems that are connected to Riemannian geometry. While these connections may occasionally be mentioned in lectures, they will not be the focus of the course: this is first and foremost a course in Riemannian geometry, which is targeted towards the associated preliminary exam for our PhD program.

**Grading:**

Homework	40%	Due in class as announced
Midterm test	30%	In class, date TBA
Final exam	30%	Date and time TBA

**Attendance and homework:** You are expected to attend every lecture, and are strongly encouraged to participate by asking questions when something I say is not clear to you. I may cover some material in lectures that does not appear in the textbook, and the tests and exams will draw on all material covered in lectures and homework. There will be regular homework assignments, due as announced in class. **Late homeworks will not be accepted.**

**Tests and exams:** All tests and exams are closed-book, closed-notes, and no calculators are permitted. **If you miss a test or exam, you will receive a score of zero, and no make-up work will be given.** Exceptions may be made in the case of extreme circumstances, which must be documented. If such circumstances force you to miss a test or exam, you must contact me as soon as possible (*before* the test/exam if at all possible) to notify me of the situation, provide me with documentation, and make alternate arrangements. All such arrangements must be made via email (even if we discuss the matter first) in order to keep a written record.

**Email communications:** When the need arises to contact students individually or as a group, I will do so via the email addresses recorded in the official class list; typically this a “@uh.edu” address, unless the student has changed it to something else. I will send a test message to these addresses during the first week of class, and thereafter will assume that any email I send to these addresses has been received by the student. Thus, you are responsible for the content in emails sent to your UH account, regardless if your external (non-UH) email provider filters or blocks them. Emails lost to external providers shall not be used as a justification to claim faculty are unresponsive, to appeal grades, etc.

**Other policies:** No special consideration will be given for students who register for a course late; all students are responsible for meeting the course requirements and for all course content. All coursework (assignments, exams, etc.) will be graded and returned in-class within 10 days of when it is submitted; if you are not present when I attempt to return a piece of coursework, I will attempt to return it at each subsequent class meeting, or you can come to my office hours and retrieve it. Any requests for reconsideration of grades on individual pieces of coursework must be made within 15 days of the **first** class meeting at which I attempt to return it to you.

**Academic honesty and dishonesty:** You are expected to follow the Academic Honesty Policy in the Student Handbook. In particular, the following are expected in this course.

- You are permitted and encouraged to work collaboratively with your classmates on homework assignments to discover and understand solutions – working together and teaching each other is one of the best ways to fully learn the material. However, the final write-up of the solutions must be in your own words.
- Academic dishonesty on exams includes but is not limited to copying work and using prohibited materials such as notes, calculators, or cell phones. Cheating on tests or exams will result in disciplinary action both in this course and at the department and college levels.

**Special needs:** If you have a disability or condition that requires special accomodation, please see me as soon as possible to discuss what steps may be taken.

**UH CAPS Statement:** Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to the demands of a professional program, or feeling sad and hopeless. You can reach CAPS ([www.uh.edu/caps](http://www.uh.edu/caps)) by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. No appointment is necessary for the “Let’s Talk” program, a drop-in consultation service at convenient locations and hours around campus. [http://www.uh.edu/caps/outreach/lets\\_talk.html](http://www.uh.edu/caps/outreach/lets_talk.html)