

# Syllabus and course information

## Differential Geometry II, Spring 2022

MTG 6257—Section 1958 (15943)

MAT 4930—Section 9401 (31980)

MWF 8th period, LIT 219

[Link to class home page](#)

**Changes may be made to this document, and linked pages or files, before the semester starts. Some links may not work until January 5, 2022.**

**Instructor :** [Dr. David Groisser](#)

- **Office Hours:** Tentatively, Tuesday 7th period (1:55-2:45), Wednesday 6th period (12:50-1:45), and Friday 9th period (4:05-4:55). Some of these may be virtual, in which case Zoom meetings will be posted in Canvas.

My office is Little Hall 308. Consistent with UF's current policy, *I require you to wear a mask at all times in my office, and expect you to wear one anywhere else in Little Hall.*

Please come early in the period or let me know to expect you later; otherwise I may not stay in my office for the whole period. See [my schedule](#) for updates. Students who can't make scheduled office hours may see me by appointment on most weekdays (but *never on a Thursday*).

**Textbook:** None.

*Tentative, approximate weekly schedule of lectures.* Click [here](#).

- **Lecture modality:** Barring a rule-change by UF after the writing of this document, this class will meet in person. I will not post my lecture notes (other than occasional handouts), and I do not plan to record my lectures. Since I'm **required** to give face-to-face lectures, allowing students to choose between remote and in-person participation would turn this class into a hybrid-delivery course, the worst of all modalities. **I will not teach in a hybrid format** unless legally forced to.

Consistent with UF's rules, I "expect" students to wear a mask at all times in this class, and hope that all are fully vaccinated against COVID-19. There will be about 19 of us in the classroom if everybody shows up, which will allow for *some* physical distancing, but not a ton. However, if everyone is vaccinated and masked, the risks of attending class should be minimal. I think there's a good chance that's what will happen here, so I won't spend time in advance making plans for any of a large number of hypothetical situations in which not all the students in this class are vaccinated and masked.

- **Syllabus (course content):** Integration on oriented manifolds; Stokes's Theorem; de Rham cohomology; flows and Lie derivatives; Riemannian metrics; introduction to Riemannian geometry (including geodesics and Riemannian curvature); vector bundles and tensor bundles; connections and curvature in greater generality. Depending on students' interests and how much time remains, we may cover additional topics, for which some possibilities are:

Surfaces in  $\mathbb{R}^3$  and the Gauss-Bonnet theorem

Principal bundles; connections on principal bundles and associated vector bundles

Further study in Riemannian geometry (conjugate points on geodesics, Hopf-Rinow Theorem, curvature-comparison theorems, Morse index, ...)

Lie groups and Lie algebras

Elliptic PDE on manifolds and Hodge Theory

Curvature and characteristic classes Introduction to complex and Kaehler manifolds

- **Course-grade components:** There will be no exams. Your final grade will be determined entirely by homework, assuming your attendance is good. If your attendance is poor a grade penalty may be imposed. (No such penalty will be imposed if your reason for poor attendance is COVID-19-related, and you keep up with the lectures and work conscientiously.)
- **Homework:** I expect to assign and collect from four to eight problem-sets over the course of the semester. The problem-sets will include some problems that are mandatory and some that are optional. I will grade some subset of the mandatory problems. The cardinality of that subset will depend on how many students handed in the assignment, how successful they were solving the problems, and how well-written their solutions are.

*Doing well on the graded subset of the mandatory homeworkk problems will be enough to earn an A in the class, and I don't think that you'll find the mandatory problems excessive (if you've met the [prerequisites](#) for the course). However, to get the *most* out of the course, you should do as many of the optional problems as you can. The more time you put in, the more you will learn. My intent is to give students who want to learn a great deal the *opportunity* to do so, without *requiring* any of you to do a lot more work than you'd have to do in other 6000-level courses in this department.*

See [More about homework](#) below.

- **How to get the most out of lectures:** To keep up with the lectures and to learn the material really well, my best recommendation—assuming you are comfortable attending class—is that you **go through your notes from each class** before the next class, filling in any gaps, trying figuring out anything you didn't understand at the time, and determining what you still don't understand and should ask me about. Time permitting, the best thing you can do is *rewrite* your notes. **Do not expect to understand everything I say in class at the time I say it.** I will sometimes make comments that are intentionally cryptic, will sometimes deliberately omit some steps in proofs, etc., to force you to think more about something. (Sadly, I will also no doubt make some comments that are *unintentionally* cryptic, and some mistakes that I can't claim are intentional ...) **The deepest understanding will come only when you think about the material on your own.** This will take you a good deal more time than the hours we spend together in class.
- **Prerequisite for MTG 6257:** MTG 6256, taken last semester.
- **More about homework:** Even when homework is well-written, reading and grading it is very time-consuming and physically difficult for your instructor. Please do not make this process more burdensome than it intrinsically needs to be. So:
  - **The homework you hand in must be neat, and must either be typed** (in which case LaTeX is preferred) **or written in pen (not pencil!).** Please do not turn in homework that is messy or that has anything that's been erased and written over (or written over without erasing), making it harder to read. Anything that is difficult for me to read will be returned to you ungraded.
  - **Leave plenty of space for me to write comments.**
  - **Use plain, white, unlined, printer paper with no holes..** You can buy a pack of 500 sheets for

\$7.00 or so, and it should be more than enough for the whole semester (probably the whole year). Do not use any other type of paper (e.g. notebook paper or looseleaf paper), and do not appropriate a pack of paper from one of the department's printer rooms.

- **Staple** the sheets together in the upper left-hand corner. Any other means of attachment makes more work for me. Learn how to use a stapler effectively. (This takes only seconds to learn, but appears to be unknown to most persons under 30 (40?) years old. The trick is to lean on the stapler with two hands and your *weight*, not squeeze it with your grip). The staple should be close enough to the corner that when I turn pages, nothing that you've written is obscured.
- **Write in complete, unambiguous, grammatically correct, and correctly punctuated sentences and paragraphs**, just as you would find in (most) pure math journals and textbooks.
- **Partial proofs.** If a problem is of the form "Prove this" and you've been unable to produce a complete proof, but want to show me how far you got, **tell me at the very start of the problem that your proof is not complete (before you start writing any part of your attempted proof)**. Do not just start writing a proof, and at some point say "This is as far as I got." Otherwise, when I start reading I will assume that you think you've written a complete and correct proof, and spend too long thinking about, and writing comments on, false statements and approaches or steps that were doomed to go nowhere.

I think the following points should be self-evident, and I apologize to anyone who agrees that they're self-evident and is offended by my stating them. But I've learned through experience that I need to say them explicitly, even in 6000-level classes:

- I assign homework problems because I want you to *figure them out*, not to send you on a treasure-hunt through the literature (offline or online). If I limit myself to assigning problems that I think are unlikely to have solutions or hints *somewhere* in *some* book or online resource, you will not be getting the best education I can give you. When I know that something is a worthwhile problem for you to work on, and even struggle with, I don't want to have to worry about whether a solution (in part or in whole) exists in some textbook or online resource.

That does not mean you are forbidden ever to look at textbooks or online resources. But solutions to hand-in homework problems should be worked out on your own. If you find yourself looking at a textbook or online resource while you are writing up a solution, that solution is not your own.

- You should first try all the problems yourself (alone). *After* attempting the problems, you may brainstorm with other students in the class for general ideas, but you may not completely work out hand-in problems together. You are also not permitted to split the workload with other students, with each student in a group writing up some solutions that all group-members hand in, or that all group-members work from in writing up what they're going to hand in.

**Student Honor Code.** UF students are bound by The Honor Pledge, which states:

We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*"

**Religious Holidays.** The following is part of the [University of Florida Policy on Religious Holidays](#).

"Students, **upon prior notification of their instructors**, shall be excused from class or other scheduled academic activity to observe a religious holy day of their faith."

**Accommodations for students with disabilities.** Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the

student who must then provide this documentation to the instructor when requesting accommodation.

**Teaching-evaluations.** Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

**U Matter, We Care initiative:** Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 911.

**Contact information for the Counseling and Wellness Center:**

<http://www.counseling.ufl.edu/cwc/Default.aspx>, 392-1575. For emergencies, call the University Police Department (392-1111) or 911.

**Goals of course:** For the student to master the course-content.