Policies / Syllabus

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Contact Information: If concerns arise about any aspect of the administration of this course, please contact one of
• yours truly (I need to know about it!);
• our graduate assistant, Deborah Logan (DLogan3@uwyo.edu);
• Sylvia Parker, SMTC Coordinator, UW (SParker@uwyo.edu); or
• Professor Jodie Novak, UNCo (Jodie.Novak@unco.edu).

Class Meets: MTWR 9–11:45 am, locations (at UW and UNCo) to be announced. A 15-minute break will be held in the middle of each class period.

Resources: There is no required textbook; however you are expected to read any course-related handouts which may be made available throughout the course.

Attendance and Participation: Attendance will be taken at each class meeting. Please let me know ASAP if a situation arises that requires you to be elsewhere during class time. A portion of the final grade (10%) is designed to reflect your attendance, punctuality and participation in the class. Most participants will have no trouble earning 10% if they arrive on time, and are clearly present intellectually as well as physically, as will be evident by their engagement in class discussion.

Homework: Homework will be assigned, usually at the end of each class, and should be submitted at the beginning of the next class. (Contact me if the submission deadline is a problem. A little late is better than being distracted during class while trying to put finishing touches on homework while the rest of us are covering a new topic. On the other hand, I want to post solutions online ASAP and I don’t accept homework after solutions are posted.) You may discuss homework problems with other individuals, including course participants; but your submitted work should be your own. Homework is typically handwritten (not typed or typeset unless you believe this suits you better).
distance, the most likely arrangement is for homework to be scanned to pdf and sent to me by email; I can also scan homework of students here if we choose to have more than one set of eyes grading homework. For this reason, please use 8.5″×11″ paper and avoid writing within 0.5″ of the edges of the page. Homework counts for 90% of the final grade.

**Progress toward Final Grade:** The final course grade will be based on the criteria listed above (whose point values add to 100%). I do not use predetermined cutoffs for letter grades. I encourage you to discuss with me at any time during the course your progress and anticipated final grade.

**Goals of Math 5490:** Our aim first and foremost is to learn some geometry, and to have fun learning it! Along the way, of course, we hope that you will catch a fresh vision of geometry, so that in turn you will be more confident and better equipped to teach and to inspire your own students. Our course will survey selected topics in modern geometry that should be relevant to the teacher of middle school and high school geometry. We do not expect our content or presentation to simulate directly the middle school or high school classroom—typically we hope to take more of a bird’s-eye view; and to discuss philosophical issues arising in geometry at a level that will not always be appropriate to share with younger students. Yet whatever aspects of modern geometry we consider will have some relevance to Euclidean geometry of 2 and 3 dimensions.

Our goals are not set in stone. Participants are encouraged to suggest topics of a geometric nature that they would like to see discussed during the course.

**MATH 5490 Website:** Copies of course-related materials including homework assignments and solutions, course handouts, links to websites mentioned in class, announcements and reminders, etc. will be posted electronically at the course website

http://math.uwyo.edu/moorhouse/courses/5490/

Bookmark it and check it regularly for the duration of the course. Any other online features (such as a course gradebook) relevant to this class, if and when we use them, will be accessible through links on the course website.

**Tentative Schedule of Topics:** The following list of topics is not set in stone; we will adapt as necessary. This list is organized around themes, not theorems or specific factoids.

- Prelude: Pascal’s Theorem
- Conic sections: definitions, basic properties, their role in nature and in mechanical systems, etc.
• Three approaches to geometry: analytic/algebraic, synthetic, axiomatic
• Euclidean plane geometry: axioms, relevance, inherent subtleties and difficulties... this is not the ‘one true geometry’!
• The role of duality in plane geometry: some examples of point-line duality
• Affine versus projective plane geometry
• Finite geometry versus infinite geometry
• A little theory of plane curves, particularly algebraic curves. If time permits, we will see an elliptic curve.
• Transformations of the Euclidean plane, including (but not only) isometries; symmetries of plane figures
• A couple of geometric paradoxes. How do we resolve these?
• Straightedge-and-compass constructions; some impossibility results (angle trisection)
• Inversive plane geometry
• An introduction to hyperbolic geometry of 2 and 3 dimensions.
• Tilings in the plane; the 17 types of wallpaper patterns; non-periodic tilings; the computational universality of the general tiling problem.
• A smidgen of topology of surfaces: Euler characteristic, genus and orientability of a surface.
• A sample of elementary but difficult problems set in the Euclidean plane, including some open problems. Our intent is simply to recognize and appreciate that such problems exist. Even the most familiar setting for geometry (the Euclidean plane) affords the full range of difficulty, from straightforward to difficult to unsolved (or unsolvable).
• Euclidean geometry of $n$ dimensions; its meaning and interpretation; and some problems set in Euclidean $n$-space.