# Salisbury University Department of Mathematical Sciences

## MATH 406/516 : Geometric Structures
## Syllabus (Tentative)

**Description:** Axiomatic development of incidence, ordered incidence, affine and absolute geometries; investigation of Euclidean and non-Euclidean geometries; and the use of dynamic geometry software. 4 Hours Credit: Meets four hours per week. Meets General Education IVB or IVC.

**Prerequisites:** C or better in MATH 210.

**Intended Audience:** Mathematics majors who have earned a C or better in Math 210. This course is required for Secondary Education Mathematics majors.

**Objective:** To take a look at axiomatic systems on a finite number of points and spend time looking at highlights in Euclidean and Non-Euclidean Geometries through an axiomatic lens. Transformational geometry will be examined algebraically and used to motivate congruence. Geogebra will be used to examine various Euclidean results and constructions and models of the Hyperbolic Plane.

**Textbooks:** *Thinking Geometrically* by Thomas Q. Sibley, published by MAA Press A PDF of this text can be purchased at maa.org.

**Technology:** Geogebra will be used to examine various Euclidean results and constructions and models of the Hyperbolic Plane. Geogebra is free to download or use online from the Geogebra website.

| Topic | Weeks |
|---|---|
| **Euclidean Geometry** | 3 |
| Euclid's approach via parallel lines and congruence & constructions, similarity, the Taxicab metric. | |
| **Axiomatic Systems** | 1.5 |
| Finite point geometries and other simplified axiom systems (focused on incidence), SMSG Postulates and Hilbert's Axioms for Euclidean Geometry, neutral geometry, models and meta-mathematics. | |
| **Transformational Geometry** | 1.5 |
| Isometries-classifying and using for congruence, algebraic representations of transformations, similarities and affine transformations. | |
| **Non-Euclidean Geometries** | 3 |
| Models of Hyperbolic Geometry, Omega triangles, Saccheri Quadrilaterals and triangles, area, spherical geometry. | |
| **Geogebra labs** | 4 |
| Euclidean constructions, Taxicab experiments, Quadrilaterals, Triangles and points of concurrency, Transformations of the plane, inversions, Hyperbolic Half-plane and Poincare disk model investigations | |
| **Tests** | 1 |
| **Total** | **14** |

**Evaluation**

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|---|---|
| Homework, Labs, Project, & Participation | 5 – 50% |
| Tests | 30% |
| Final Exam | 20% |

- Graduate students will be assigned special homework/test problems or projects.

- Clear descriptions of thought processes, evidence of critical thinking, and effective communication must be demonstrated in written work.
- **Writing Across the Curriculum:** Students will be expected to communicate mathematics and mathematical ideas effectively in speech and writing. At the University Writing Center, trained consultants are ready to help you at any stage of the writing process. In addition to the important writing instruction that occurs in the classroom and during professors' office hours, the Center offers another site for learning about writing. **All students are encouraged to make use of these important services.**
- **NOTE:** Once a student has received credit, including transfer credit, for a course, credit may not be received for any course with material that is equivalent to it or is a prerequisite for it.