92.427/92.527 Geometry
Summer 2009

Marvin Stick, Olney 428 G, (978)934-2441, *Marvin_Stick@uml.edu*

Overview

This course is designed for current and prospective geometry teachers. Most of the term will be devoted to a technical and instructive development of Euclidean geometry. There will also be a brief introduction to non-Euclidean geometries. The interrelationship between the geometry topics and higher-level mathematics material will be discussed whenever appropriate. In particular, we will discuss 3D surfaces and angle measurements and relate them to Spherical geometry, and we will perform calculus based derivations of area and volume for surfaces and solids and relate them to Euclidean geometry. Discovery through the use of technology will be an integral part of the course. Students will become familiar with geometry applications in Geometer's Sketchpad software, and to a lesser degree with Maple (and/or Mathematica). Technology projects will be assigned and competence in the geometry tools is expected. Students will also be exposed to the use of Cabri for a graphing calculator environment that will include use of TI Connect capability.

Evaluation

Evaluation will be based on projects worth 45% of the grade, a take home examination worth 30% of the grade, classroom participation and announced homework based quizzes worth the remaining 25% of the grade. It is expected that participants will frequently present in class problem and project solutions. Grading will be consistent with University established guidelines for undergraduate and graduate students. The minimum passing grade for 92.527 is 70%.

Text

Alexander and Koeberlein, *Elementary Geometry for College Students*, 4th edition, Houghton Mifflin Company, 2007 and accompanying student solution manual. There will also be handouts and online files to address material dealing with Spherical geometry, transformations in geometry, and explorations with Euclidean geometry.

Tools

In addition to the textbook, all should be familiar with the use of a compass and protractor since attention will be given to construction problems with and without the use of technology. The geometry software that will be used is:

- Geometer's Sketchpad: student edition in both a PC and Mac platform (approximately $40). This is the primary tool to be used throughout the course.
- Maple: geometry component of Maple software available at the UMass Lowell computer lab in Olney 521.

Cabri for the TI-89 can be downloaded from *education.ti.com*. Cabri Jr. is an application provided with the TI-84 Plus Silver Edition. Also a PC or Mac demo version of Cabri can be downloaded from the same site. It is suggested that students wait to discuss in class the pros and cons of these packages before making any purchase.

Links

A few links that should prove to be helpful are:

- Massachusetts Department of Education MCAS material at *www.doe.mass.edu/mcas*
- Cabri geometry reference material can be found at a Texas Instrument's web site *education.ti.com*
- Course material at 92.427/92.527

Section	Topic	Homework
Chapter 1	Line and Angle Relationships	
1.1	Statements and Reasoning	p.8/1-23 odd
1.2	Informal Geometry and Measurement	p.17/1-13 odd, 17-27 odd
1.3	Early Definitions and Postulates	p.27/9-31 odd
1.4	Angles and Their Relationships	p.36/1-13 odd, 17-39 odd
1.5	Introduction to Geometric Proof	p.43/7-15 odd,21,22,23
1.6	Relationships: Perpendicular Lines	p.50/3-15 odd,29
1.7	The Formal Proof of a Theorem	p.57/1-13 odd,21,23,25
Chapter 2	Parallel Lines	
2.1	The Parallel Postulate and Special Angles	p.78/5-19 oldd,31,33
2.2	Indirect Proof	p.84/1-17 odd
2.3	Proving Lines Parallel	p.91/7-21 odd,29,31
2.4	The Angles of a Triangle	p.96/11-19 odd,23,27,29,31,39,41
2.5	Convex Polygons	p.105/1-13 odd,20,27,29,31,37
2.6	Symmetry and Transformations	p.115/1-31 odd
Chapter 3	Triangles	
3.1	Congruent Triangles	p.134/1-17 odd,21-29 odd
3.2	Corresponding Parts of Congruent Triangles	p.142/1-15 odd,23,25
3.3	Isosceles Triangles	p.151/13-33 odd
3.4	Basic Constructions Justified	p.157/3-11 odd,15,21,23,29,31
3.5	Inequalities in a Triangle	p.165/1-9 odd,13,19-27 odd,31,33
Chapter 4	Quadrilaterals	
4.1	Properties of a Parallelogram	p.184/3-13 odd, 21,23,33
4.2	The Parallelogram and Kite	p.192/3-13 odd,19,23,25,27
4.3	The Rectangle, Square, and Rhombus	p.201/1-5 odd,9,19,23
4.4	The Trapezoid	p.208/1,3,6,11,15,17,37
Chapter 5	Similar Triangles	
5.1	Ratios, Rates, and Proportions	p.224/3-9 odd,15-27 odd
5.2	Similar Polygons	p.230/7-17 odd,21-35 odd
5.3	Proving Triangles Similar	p.238/11-27 odd,31,33,37,39
5.4	The Pythagorean Theorem	p.248/7,11-19 odd,27-35 odd,39,41
5.5	Special Right Triangles	p.254/5,9,21,24,25,27,31
5.6	Segments Divided Proportionally	p.263/1,7,15,17,19,29,31,32,33,35
Chapter 6	Circles	
6.1	Circles and Related Segments and Angles	p.283/1-5 odd,9-27 odd,35
6.2	More Angle Measures in the Circle	p.293/1,3,6,7,9,13,23,27,29,34,39,45
6.3	Line and Segment Relationships in the Circle	p.302/1,26,27,31,33,35,40
6.4	Some Constructions and Inequalities for the Circl	p.310/9,11
6.5	Locus of Points	p.317/2-9 odd,13,23
6.6	Concurrence of Lines	p.325/7-21 odd,27,29,31
Chapter 7	Areas of Polygons and Circles	
7.1	Area and Initial Postulates	p.343/1,5,11,13,15,19,21,22, 25-29 odd,33,35,41,47,49
7.2	Perimeter and Area of Polygons	p.354/1,3,5,9,13,15,21,23,27,38,41,42
7.3	Regular Polygons and Area	p.364/15,17,25,29
7.4	Circumference and Area of a Circle	p.370/1,5,7,9,15,21,27,33,34,35
7.5	More Area Relationships in the Circle	p.377/1-13 odd,17,23,27
Chapter 8	Surfaces and Solids	
8.1	Prisms, Area, and Volume	p.397/1,7,9,14,17,31,34
8.2	Pyramids, Area, and Volume	p.406/19,20,27,29,31,34,35
8.3	Cylinders and Cones	p.417/11,19,21,29,36,41,42
8.4	Polyhedrons and Spheres	p.426/10,13,15,17,18,21,26,34,35,37,39

Chapter 9	Analytic Geometry	p.475/46
Chapter 10	Introduction to Trigonometry	
10.1	The Sine Ratio and Applications	p.488/21,23,27,29,33,34
10.2	The Cosine Ratio and Applications	p.495/1,17,31,33,36,40
10.3	The Tangent Ratio and Other Ratios	p.503/37,40,41,46
10.4	Applications with Acute Triangles	p.511/29,31,37,38