Stony Brook University	**WELCOME TO MAT 515** **Geometry for Teachers** **Fall 2018**

Time and place: Monday, Wednesday at 5:30 PM in Math, room 4130

Introduction: The course will be concerned with plane geometry, and some related subjects, from both an axiomatic and intuitive point of view. The goal will be to give the students the necessary background to be good teachers.

Text Book: Parts of a three volume manuscript by H. Wu. A special binder of the relevant material has been prepared and will be passed out in class. It is entitled, *Geometry of the Secondary School Curriculum.*

Instructor:

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Assistant: Apratim Chakraborty, Office hours at 12:30-2:00 and 5:30-7:00 PM on Tuesdays in Math Tower 3-105

Student Lecture: Each student will be required to give a lecture on a topic chosen through consultation with the instructor. Also students will be expected to participate in class discussions.

Homework: Homework will be assigned every week. There may be both problem and reading assignments Doing the homework is a *fundamental* part of the course work. Problems should be handed in in lecture, and reading assignments should be completely in time for the appropriate lecture to facilitate class discussions.
1st assignment: Reading and problem assignment due Sept. 5 : Read pages 209 -216 (briefly) and read 216 to 235. Do problems 3,4,6 and 8 on page 235.

2nd assignment: Page 235, problems 9, 10, 11, 12; Page 257, problems 1, 2, 4 due Sept. 12

3rd assignment: page 257, problems 3, 5, 6 and 7 due Sept. 19

4th assignment: page 258, problem 4; page 278, problem 1, 2 and 3 due Sept. 26

5th assignment: page 278, problems 4, 6, 8, 10; page 295, problems 1, 2 due October 3
6th assignment: page 295, problems 4, 5; page 305, problems 3, 4, 5, 6 due October 10
7th assignment: page 305, problem 7; page 322, problems 1, 3, 4, 5, 6, 8 due October 17
8th assignment: page 322, problem 2, 7 due October 24
9th assignment: page 343, problems 1, 3, 4, 5, 6 , 10 due October 31

10th assignment: page 343, problems 7, 10, 12; page 359, problems 1, 4, 5 due November 7

11th assignment: page 359, problems 7, 8, 10, 11; page 376, problems 2, 4, 8, 9 due November 14

12th assignment: page 296, problems 1, 2, 4, 6, 7, 9, 10, 13, 14, 16 due November 26

13th (and last) assignment: page306, problems 1, 3, 6, 10; page 316, problems 2, 6 due December 5

Grading Policy: The overall numerical grade will be computed by the formula **20% Homework + 20 % Student Lecture + 20% class participation + 40% Final Exam**

Final Exam: Monday, December 17, 5:30-8:00 PM

FINAL EXAM REVIEW: Exam Review
N. B. Use of calculators is not permitted in any of the examinations.

Special Needs: If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge you to contact the staff in the Disabled Student Services office (DDS), Room 113, humanities, 632-6748/TTD. DSS will review your concerns and determine, with you, what accommodations are necessary and appropriate. All information and documentation of disabilities is confidential.

Review sheet for MAT515, Fall 2018

Know the eight axioms, L1-L8.

Define the basic isometries. Are they all bijections? Is the inverse of a basic isometry also a basic isometry?

State the fundamental theorem of Similarity and prove it for the case that the scale factor is 1/2.

Define a convex set and a convex angle.

Let F and G be transformations of the plane. Is it necessarily true that $F \circ G = G \circ F$? Is it true if F and G are both rotations?

Define an equivalence relation, and equivalence classes. Explain how an equivalence relation on a set S gives a decomposition of a S into disjoint subsets – a partition of S.

Define parallel lines as lines that coincide or do not intersect. Prove that "parallel" is an equivalence relation

State and prove the Pythagorean theorem.

State and prove SAS, ASA and SSS for triangles. Prove ASS or give a counterexample.

Let Λ be a reflection about a line l. What is its inverse?

Let $ABCD$ be a quadrilateral, and let P, Q, R and S be the midpoints of its four sides. Prove that $PQRS$ is a parallelogram.

Prove that the diagonals of a parallelogram bisect each other.

Prove that the sum of the angles of a triangle is a straight angle.

Define a dilation and prove that a dilation takes line segments into line segments and takes lines into themselves or into parallel lines. Prove that it also takes a convex set into a convex set.

Prove that a dilation maps an angle into an angle and preserves the degree of an angle.

Define alternate interior angles and opposite angles.

Define similarity and show that it is an equivalence relation.

Prove or disprove: All squares are similar. All triangles are similar. All rectangles are similar.

Prove that all triangles with two equal angles are similar.

Prove that if a triangle has sides of length a, b and c and $a^2 + b^2 = c^2$, then the angle opposite side c is a right angle.

State and prove Ceva's theorem for triangles.

Define a congruence and prove that every congruence is an isometry.

Prove the triangle inequality: the sum of the lengths of two sides of a triangle is strictly larger than the length of the third side.