# MAT 515: Fall 2017



## Welcome to MAT 515 Geometry for Teachers

**Place and time:** Earth & Space 181, Monday and Wednesday 4:00 pm - 5:20 pm

**Lecturer:** Jozef Bodnar, `jozef.bodnar at stonybrook.edu`

**Office hours:** Monday 12:30 - 1:30 pm, Thursday 11:00 - 12:00 or by appointment (please write a mail). Usually I will be available on Monday 1:30 - 2:30 pm and Thursday 10:00 - 11:00 am as well.

**Grader:** Xuntao Hu

**Course description:** This is a course covering the basics of planar Euclidean geometry, intended for future and practicing teachers. It is to help you understand the subject and issues in the subject well enough that you can teach the course.

**Exams:** First midterm: 10/02 M 4:00-5:20 pm, Second midterm: 11/13 M 4:00-5:20 pm, Final exam: 12/12 Tu 8:30-11:00 pm

**Information for students with disabilities**
If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services at (631) 632-6748 or http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.sunysb.edu/ehs/fire/disabilities.shtml

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**Academic Integrity:** Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/.

**Critical Incident Management:** Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.

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## General Information

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**Grades policy**

Please make sure you can attend the exams below. Makeups will be given only in exceptional situations: documented medical issues or documented emergencies only.

| | Date and time | Weight |
|---|---|---|
| **First midterm** | **10/02 M 4:00-5:20 pm** | **25%** |
| **Second midterm** | **11/13 M 4:00-5:20 pm** | **25%** |
| **Final exam** | **12/12 Tu 8:30-11:00 pm** | **30%** |
| **Homework** | **Ten through the semester** | **20%** |

**Homework information:** There will be 10 sets of homeworks during the semester. Usually, the homework problems will appear on Monday on this course page, under the Schedule section, in the last column of the table about scheduled topics. The due date will be indicated, but usually it will be Wednesday of the following week. I will collect them on the lecture. You can also leave your homework (before the due date) in the envelope on my office door Math Tower 2-120.

Discussing the problems with each other is okay, but you should always come up with your own solutions. Please do not share complete solutions with others before the deadline. The experience you gain in problem solving by working on homework is way more useful than the points you get for it.

If you found some resource on the internet or some book which you used for the solution, or if the solution is a result of a discussion with someone, please indicate it in your work.

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# MAT 515: Fall 2017



## Syllabus

**Course description:** This is a course covering the basics of planar Euclidean geometry, intended for future and practicing teachers. It is to help you understand the subject and issues in the subject well enough that you can teach the course.

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**Other possibly useful resources:**

While it is not necessary or required, I think gaining some experience with actual precise geometric constructions is very useful. Most of the time I will do only sketchy pictures on the lectures, and sketchy pictures are fine on the exams as well - as long as they clearly reflect the main ideas and you write down the precise construction by words and appropriate notation.

However, I suggest to try out geometric constructions by pencils, rulers, compass, and sometimes protractors, on paper sheets, to really see how things work in practice.

A very nice and free software tool for making constructions and visualize geometry is **Geogebra**. You can use its **online version** without installing anything, or you can **download** and install it.

Both physical constructions by pencil, ruler, compass, and software geometry have certain advantages and disadvantages. On paper, it is easier to see what happened, how the picture was created, and it helps to build confidence and understanding of the main concepts, but if you want to change something, you have to make a new picture. Using a software, it is very easy to change the picture by changing the position of the input parameters (and in general, a software is a great tool to trace a position of points with certain properties), but sometimes the pictures are overcomplicated: the entire circle or entire infinite line is present, not just their relevant arcs or segments, and making a picture more clear requires extra effort.

I strongly suggest to play a bit with pencils, rulers, compasses as well as software tools to experience geometry and see the nice and less nice sides of both methods.

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Syllabus
Schedule


## Schedule

| Date | Topics | Homework and additional material |
|---|---|---|
| 08/28 M | Introduction, basic concepts and notions (Chapter Intro) Angles (Chapter 1: Section 1) | **1st HW Due Wed 09/06** |
| 08/30 W | Perpendicular lines (C1:S2) Propositions in Mathematics (C1:S3) | - |
| 09/04 M | *NO CLASS: Labor Day* | - |
| 09/06 W | Triangles, polygons (C1:S4) | **2nd HW Due Wed 09/13** |
| 09/11 M | Isosceles triangles, symmetry (C1:S5) | **3rd HW Due Wed 09/20** |
| 09/13 W | Congruence of triangles (C1:S6) | - |
| 09/18 M | Inequalities in triangles (C1:S7) | **4th HW Due Wed 09/27, problems 7, 8 extended until Fri 09/29** |
| 09/20 W | Right triangles (C1:S8) | - |
| 09/25 M | Segment and angle bisectors (C1:S9) | No homework due first midterm week. Sample exams **one** and **two** |
| 09/27 W | Discussion of homeworks, review for midterm | **Shortest bouncing path** and **Minimal perimeter triangle** exercises |
| 10/02 M | **FIRST MIDTERM (in class)** | **Midterm 1** and **Solutions with partial scores** |
| 10/04 W | Construction problems (C1:S10) | **5th HW Due Mon 10/16**, **False proof** on Numberphile, **False proof** explanation |
| 10/09 M | Parallel lines (C1:S11) | **6th HW Due Mon 10/23** |
| 10/11 W | Angle sum of polygons (C1:S12) | - |

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|---|---|---|
| 10/16 M | Parallelogram, trapezoid (C1:S13) | **7th HW Due Mon 10/30** |
| 10/18 W | Construction and symmetries (C1:S14) | **Extra HW Extended until Wed 11/08** - Practice for Mid 2 |
| 10/23 M | Circles and chords (C2:S1) | **8th HW Extended until Wed 11/08** |
| 10/25 W | Mutual position of lines and circles (C2:S2) | - |
| 10/30 M | Mutual position of two circles (C2:S3), Inscribed angles (C2:S4) | **Review for Mid 2** |
| 11/01 W | Constructions: circles, chords, tangents, angles (C2:S5) | - |
| 11/06 M | Construction problems: review for the midterm | - |
| 11/08 W | Homework discussion, review for the midterm | - |
| 11/13 M | **SECOND MIDTERM (in class)** | **Midterm 2** and **Solutions with partial scores** |
| 11/15 W | Constructions and problem solving involvolving tangencies (C2:S5) | - |
| 11/20 M | Polygons and circles (C2:S6), Concurrency points (C2:S7) | **9th HW Due Wed Nov 29** |
| 11/22 W | *NO CLASS: Thanksgiving* | **Translation** decomposition, **rotation** decomposition |
| 11/27 M | **Isometries** (**Notes** by Oleg Viro and Olga Plamenevskaya) | **Sample final,** Due Wed Dec 6, **Solutions with** and **without** figures |
| 11/29 W | Similarities (**Notes** by Oleg Viro and Olga Plamenevskaya) | **10th HW Extended Tue Dec 12** |
| 12/04 M | **Pythagorean theorem** | **Two rotations** |
| 12/06 W | Review for the final | **Survival kit** for the final |
| *12/12 Tu* | **FINAL EXAM** | **Solutions and scoring** |