

Modern High School Mathematics

05:300:341:01

3 Credits

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Office Hours: Monday, 1:00pm – 2:20pm, or by appointment	Prerequisites or other limitations: Preq: 01:198:111 or equivalent, 01:640:250 and 01:640:251 Coreq: 01:198:107
Mode of Instruction: <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Hybrid <input type="checkbox"/> Online <input type="checkbox"/> Other	Permission required: <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes Directions about where to get permission numbers: from the instructor

Learning goals

The primary goal of this course is for you to develop a deep understanding of concepts of high school mathematics. At the end of this course, you should be able to understand and explain why the procedures learned in high school mathematics work, describe different ways of representing important concepts, and explain the relationships different mathematical concepts.

Secondary goals of this course include: recognizing the importance for students and teachers to have a conceptual understanding of mathematics; thinking deeply about what it means to understand a mathematical concept; discussing what type of teaching can help students understand concepts and what type of teaching might be counterproductive to this goal; recognizing when your understanding of a concept is not as strong as you'd like it to be and seeing the need to remedy this situation; and gaining a general familiarity with main ideas of mathematics education (such as the NCTM's Principles and Standards, the Common Core State Standards, and the NJ Core Content Standards).

Course catalogue description

In-depth study and concentration of some key ideas in the high school mathematics curriculum. Viewing of mathematics in terms of the ideas built up in the minds of students.

Class materials:

There are no required textbooks for this course. Students will be responsible for reading various articles, research papers, and other selected materials. These resources will be available on the Sakai course site under *Resources*.

Course Background:

Since the National Council of Teachers of Mathematics (NCTM) published their *Standards for School Mathematics* in 1989 and the country-wide acceptance of the *Common Core State Standards for Mathematics* (CCSSM) since 2010, there has been a significant change in the way that mathematics courses have been taught. Previously, mathematics courses were centered around giving students a *procedural understanding* of mathematics – that is, the goal of these classes was for students to recognize situations when a procedure (e.g. adding fractions, solving a linear equation) would be useful and apply

the procedure correctly. Recently, the emphasis shifted to teaching for *conceptual understanding* – students are now expected to:

- know why the rules they are applying work
- be able to *represent* and think about math concepts in meaningful ways
- see connections between the concept they are studying and other mathematical topics

Achieving these goals puts new and challenging demands on teachers. They now not only need to know the collection of mathematical procedures that students will learn, but also why the procedures work, how the relevant concepts can be represented, and how to help students learn these things. Many teachers lack this knowledge. For instance, most mathematics teachers are familiar with the fact that $\log_b x + \log_b y = \log_b xy$. However, these teachers cannot design lessons to help students understand why rules like this are true because the teachers do not understand why themselves. *Modern High School Mathematics* is designed to address this gap by looking at high school mathematics in a deeper way.

Grading and Activities

Your grade for the course will be composed of the following:

I. Class participation/attendance	10%
II. Bi-Weekly Journal Entries	10%
III. Quizzes	10%
IV. Class assignments	40%
V. Lesson plan	10%
VI. Unit plan	10%
VII. End of Class Reflection Paper	10%

I. Class Participation (10%)

You are expected to participate in class. Each week you will have readings and you will need to be prepared to discuss the content of the readings and ask questions in class. Aside from the readings, we will be engaging in discussions, group work, and individual activities in class. Your engagement in the course determines how successful the class will be and how much you will learn. You can earn a maximum of 2 points each class for in-class participation, individual assignments, completing the readings, and completing group work. **If you miss a class for an excused absence, you can make up the points by doing out of class activities.** Use of cell phones, laptops, and other electronic devices is **strictly prohibited** during class sessions; non-compliance will result in a reduction of Class Participation credit.

II. Bi-Weekly Journal Entries (10%)

Students will submit 1 bi-weekly journal entry via the Forums feature of the Sakai course site, for a total of 7 entries in all. Additionally, during this time, each student should respond to at least two journal entries of their peers. Each student should strive to connect their personal thoughts about teaching and learning of mathematics to a specific reading, specific content standards, a specific class discussion, or a specific activity in class. You will receive points for your postings if they are thoughtful and relate to specific class topics and readings.

no minimum length, quality, not quantity

To maintain high quality discussions, here are some guidelines:

- Post in a timely manner. Do not save course reading or postings until the last minute. Because part of your responsibilities will include responding to your peers' posts, a late post can jeopardize your peers' contributions and grades.

- Provide thoughtful, detailed responses to questions and your peers' posts. It is necessary to support your opinions and ideas with material from our class readings and discussions.
- Use academic language (not "texting language" you might use on a cell phone with friends) for your on-line contributions. Make sure you cite material/text/concepts from other sources.

III. Quizzes (10%)

There will be a variety of readings required for the class. These readings are essential to helping you build your philosophy about teaching and to provide you with a strong foundation for practice. To ensure that you fully engage with the readings, a short quiz may be given the day the readings are due. The quizzes will be designed such that if you completed the readings, you will successfully complete the quiz. Quizzes may also be given on content and your own conceptual understanding of the concepts we cover in class.

IV. Class Assignments (40%)

There will be a variety of class assignments during the semester. These assignments will range from small group projects to in-class quizzes that evaluate conceptual understanding of mathematical ideas. A brief explanation of selected assignments is provided below. Further details and due dates will be given during the semester.

Class assignments:

- *District Math Tracking Exploration:* Research the math tracking system of your home district. Make notes about how students are tracked, the math classes that are available, how placement in "tracks" are determined. Compare your findings with a partner.
- *Standards Exploration:* In a small group, research a concept and compare it across NCTM, Content Core, and NJ Core standards. Prepare a brief presentation that explains the concept and the associated standards.
- *Conceptual/Concrete Activity:* Choose a topic found in HS mathematics courses and research how to teach it conceptually/concretely. Write a descriptive summary of your idea and present it to the class.

V. Lesson Plan (10%) (portfolio item)

Prepare a high school mathematics lesson plan that is consistent with the Rutgers GSE lesson plan template in the *Teacher Education Portfolio* on Sakai. All lesson plan topics will be pre-determined. The lesson's primary objective is to "teach for conceptual understanding"; in other words, all planned lesson activities and assignments should strategically expose high school students to the underlying connections and reasoning behind a mathematical concept or procedure. You can use the conceptual idea you developed as the basis for your lesson plan.

VI. Group/Individual Unit Plan (10%) (portfolio item)

Prepare a unit plan that is consistent with the Rutgers GSE unit plan template in the *Teacher Education Portfolio* on Sakai. The unit plan will be developed as a group. Then a unique subset of that unit plan will be handed in by each student as an individual unit plan.

VII. End of Course Reflection Paper (10%)

Prepare a 1 to 2 page paper reflecting on your work in this course. You should reflect on your knowledge of the mathematics, how students learn, and implications for teaching with regard to the standards. You may review your postings on the course web site and notes from problem solving and sharing of solutions as you develop your reflective assessment.

Teaching portfolio: At the end of the course you will upload all of the documents that are required for your teaching portfolio. These include your individual lesson and unit plans.

Attendance (*this policy is separate from the participation grade*)

You are allowed ONE absence, which I will assume is for a good reason. Beyond that, your final grade will be reduced as indicated (unless, of course, you have a doctor's note or other documentation indicating a bona fide reason): 2 absences—reduction of a half grade; 3 absences—reduction of 1 full grade; 4 absences—failing grade in course. Again, if it is an excused absence, you are responsible for contacting me, getting the course materials, and making up for the class in order to receive the participation points.

Grading policy:

The grading will be as follows-

A = 100-90%	B+= 89-87%
B = 86-80%	C+= 79-77%
C = 76-70%	D = 69-60%
F < 60%	

Academic Integrity Policy:

Please refer to the Academic Integrity Policy for Rutgers undergraduate and graduate students available at <http://academicintegrity.rutgers.edu/integrity.shtml>. This policy will be strictly enforced in the *Modern High School Mathematics* course.

Academic Honesty:

- The Rutgers University Code of Student Conduct can be accessed at <http://policies.rutgers.edu/PDF/Section10/10.2.11-current.pdf>
- For further information about the university's Academic Integrity Policy, please visit <http://studentconduct.rutgers.edu/academic-integrity>
- Related regulations may also be found under the Academic Policies and Procedures section of the Rutgers Graduate School of Education catalog found at http://catalogs.rutgers.edu/generated/gse_current/pg32.htm

For any and all assignments and class activities, including in-class quizzes, take-home quizzes, tests, papers, field projects, PowerPoint presentations, and any other class-related work, no copying of any kind is allowed, unless copied text is placed within quotations and the author/source is appropriately cited. Clear evidence of extensive plagiarism will likely result in a grade of F for the assignment and course.

While using the internet and curricula to research ideas for activities, lesson plans, assessments, etc., is encouraged, any ideas that are taken from these resources must be cited properly to prevent plagiarism. However, any resource that is picked up from the internet or curricula and used word for word or problem for problem, even if cited properly, will NOT satisfy the requirements for this class. All handed in work must be original.

Tentative Weekly Course Outline
****Syllabus Subject to change****

Week/Dates of Classes	High School Content Area	Assignments Due
<u>Week 1</u> - Wed., Sept. 4 th	Introduction	
<u>Week 2</u> - Mon., Sept. 9 th - Wed., Sept. 11 th	Number & Numerical Operations <ul style="list-style-type: none"> • District Math Tracking Activity assignment 	<i>Relational Understanding and Instrumental Understanding, Skemp</i>
<u>Week 3</u> - Mon., Sept. 16 th - Wed., Sept. 18 th	Patterns & Algebra	Wed: Journal Entry #1 Wed: District Math Tracking Exploration
<u>Week 4</u> - Mon., Sept. 23 rd - Wed., Sept. 25 th	<i>Representation</i> <ul style="list-style-type: none"> • http://nlvm.usu.edu/en/nav/topic_t_1.html 	<i>Understanding Algebra through Graphing Calculators, Cates</i>
<u>Week 5</u> - Mon., Sept. 30 th - Wed., Oct. 2 nd	<i>Reasoning & Proof</i> <ul style="list-style-type: none"> • Standards Activity assignment 	Ma Intro and Chapter 1 Wed: Journal Entry #2
<u>Week 6</u> - Mon. Oct. 7 th - Wed., Oct. 9 th	<i>Reasoning & Proof</i> <ul style="list-style-type: none"> • Conceptual/Concrete Activity assignment 	Wed: Standards Activity
<u>Week 7</u> - Mon., Oct. 14 th - Wed., Oct. 16 th	Measurement <ul style="list-style-type: none"> • Standards sharing 	Wed: Journal Entry #3
<u>Week 8</u> - Mon., Oct. 21 st - Wed., Oct. 23 rd	<i>Communication</i> http://www.crewtonramoneshouseofmath.com/completing-the-square.html	Ma Chapter 2 Wed: Final Standards Activity

<p><u>Week 9</u> - Mon., Oct. 28th - Wed., Oct. 30th</p>	<p><i>Technology</i></p> <ul style="list-style-type: none"> • Teacher Portfolio • Activity Sharing • Lesson Plan assignment 	<p>Mon: Conceptual/Concrete Activity Wed: Journal Entry #4</p>
<p><u>Week 10</u> - Mon., Nov. 4th - Wed., Nov. 6th</p>	<p>Advanced Algebra</p> <ul style="list-style-type: none"> • Activity sharing 	
<p><u>Week 11</u> - Mon., Nov. 11th - Wed., Nov. 13th</p>	<p>Data Analysis, Probability & Discrete Mathematics</p> <ul style="list-style-type: none"> • Unit Plan assignment 	<p>Wed: Journal Entry #5</p>
<p><u>Week 12</u> - Mon., Nov. 18th - Wed., Nov. 20th</p>	<p>Pre-Calculus</p>	<p>Mon: Lesson Plan <i>Calculational and Conceptual Orientations in Teaching Mathematics</i>, Thompson</p>
<p><u>Week 13</u> - Mon., Nov. 25th - NO CLASS: WED. 11/27 (Friday classes)</p>	<p>Trigonometry</p>	<p><i>Teacher Questioning to Promote Justification and Generalization in Mathematics: What Research Practice has Taught Us</i>, Martino, Maher Wed: Journal Entry #5</p>
<p><u>Week 14</u> - Mon., Dec. 2nd - Wed., Dec. 4th</p>	<p>Calculus</p>	<p>Wed: Unit Plan</p>
<p><u>Week 15</u> - Mon., Dec. 9th - Wed., Dec. 11th</p>	<p>Calculus</p>	<p>Wed: Journal Entry #6</p>
<p><u>Reading Days</u> Thurs., Dec. 12th Fri., Dec. 13th Dec. 16 – Dec. 23 GOOD LUCK ON EXAMS! ☺</p>		<p>Before Wed. Dec. 18: Reflection paper</p>

****Syllabus subject to change****