

**15 254 548****Technology in Mathematics Teaching****Fall 2015****Course details**

Meets: Thursday, 4:50-7:30, in GSE, Room 233  
Instructor: Dr. Keith Weber  
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**Technology Background**

Contemporary mathematics classrooms strive to teach conceptual understanding, moving away from algorithms and computations and towards exploratory activities, open-ended investigations, and sense making. Second, educational technology has advanced rapidly, to the point where sophisticated educational software is available in many school mathematics classrooms. This has both made many of the algorithms taught in previous mathematics classes (e.g., calculating square roots by hand) obsolete and many previously impractical activities (e.g., graphing exponential equations) possible. As a result of these two developments, technology now plays a prominent role in many school mathematics classrooms.

In 2000, the National Council of Teachers of Mathematics (NCTM) has published an influential book entitled *Principles and Standards for School Mathematics*. In this volume, the NCTM describes principles that all mathematics classrooms should meet. For the reasons described above, they list the use of technology as one of their six principles, and declare that all school mathematics courses should regularly and meaningfully employ technology.

**Course Objectives**

The central goal of this course is to help you use technology as an effective pedagogical tool in the mathematics courses that you teach. More specifically, after this course, you should:

- Be comfortable using various types of technology found in school mathematics classrooms.
- Develop an arsenal some classroom activities that incorporate technology.
- Be aware of the psychological and educational principles that make technology an effective teaching tool.
- Be able to design lessons that incorporate technology and be able to critically evaluate these lessons and others that are presented to you.

## Class Meetings

During the class meetings, we will spend most of our time engaged in one of four activities, each of which can be linked to the course objectives described on the previous page.

- Each class meeting will begin with a student presenting a technology idea that they have either used, observed, or read about. You should describe the activity and say why you think it can be useful. The class will then discuss it.
- You will be given activities that let you explore the use of a particular technology, such as a graphing calculator (TI-83), Geometer's Sketchpad, Microsoft Excel, and the Smart Board. These activities should make you well acquainted with the software.
- You will complete and evaluate activities for the classroom that employ technology in a thoughtful manner. These activities will serve as examples of the types of activities that you can use in your own classroom.
- Articles from the mathematics education literature discussing learning and technology will be read and discussed at the beginning of each course. These readings will explain why (in the eyes of mathematics education researchers) technology is an effective teaching tool and teaching principles for how it should be employed. It is important that you understand the principles behind the use of technology, but these readings will be of less importance than activities that use technology.

## Grade

*Critical examination paper (20%)*- In the middle of the course, I will present a technology activity and you will be asked to evaluate the strengths and weaknesses of this activity. This assignment is due **October 22**

*Technology lesson plan (30%)*- As a group assignment, you will design a lesson plan that incorporates technology in a meaningful way, and you will present this lesson plan to your peers. This lesson plan will be consistent with the Rutgers lesson plan format. (Masters students must work on this individually for their portfolios). This assignment is due **November 19**.

*Final examination (20%)*- In the last course meeting, you will be given a final exam in which you will be asked to solve mathematical problems with the use of technology in the ways that we discussed in class. This test will be similar to "mastery" tests given in some introductory mathematics and science courses. Being competent with technology requires knowing how to use technology to accomplish a variety of specific and well-defined tasks. You will have to demonstrate this competence on the final examination. This exam will be given on **December 10**.

*Technology presentation (10%)*- In the beginning of each class lesson, we will have students present a technology activity that they have used, observed, or researched.

*Homework and class participation (20%)*- For about half the weeks, you will be given a short technology homework assignment. Your grade on this assignment ( $\sqrt{+} = 100$ ,  $\sqrt{=} = 80$ ,  $\sqrt{-} = 60$ , missing = 0) will constitute 10% of your grade. The other 10% is based on class participation given the blogs.

## **Classroom Discussion**

Your classroom discussion grade is a subjective grade that takes many factors into account. Obviously, the comments you make in class and your participation in our in-class activities will play a central role in determining your classroom discussion grade. These two factors will also be taken into account. Also, once a week you are asked to write a *reaction paper*. By Saturday, I would like you to submit to sakai describing your general impressions of the course. These papers do not need to be long, nor proofread carefully. I only want to have a sense of how the course is progressing for you.

## **Academic Integrity and Academic Honesty Policy:**

In this course, the standard Academic Integrity Policy and Academic Honesty Policy of Rutgers University will be strictly enforced. The relevant regulations can be found at the following locations:

- For the Academic Integrity Policy for Rutgers undergraduate and graduate students available, please see <http://academicintegrity.rutgers.edu/integrity.shtml>.
- 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.html](http://catalogs.rutgers.edu/generated/gse_current/pg32.html).

For some assignments, you are permitted to use material from other sources. When this occurs, you should specify which material was referenced and to provide a citation for this. If you are not sure whether some type of reference is permitted on an assignment, please send me a note asking if what you are planning to do is okay.

## Course outline

<u>Meeting</u>	<u>Activity</u>	<u>Reading</u>
9/3	Excel- Introduction	
9/10	Excel- Families of functions	NCTM, Cuoco
9/17	Sketchpad- Basic commands	Bethell & Miller
10/1	Sketchpad- Modeling and Optimization	Manhoucheri et al
10/8	Sketchpad- Activities	Tamblyn
10/15	TI-83- Commands and graphs	Goldenberg
10/22	TI-83- Statistics	Dion, Piez & Voxman
10/29	TI-83- CBR	McCullough, Tabor
11/12	Smartboard	Pilipczuk, Stohl
11/19	Lesson Plan presentations	
12/10	Final Exam	

(NOTE: Class will not meet in person on 9/24, 11/5, and 12/3 as I will be attending academic conferences on those days. 11/26 is Thanksgiving. We will have on-line discussions on 9/24 and 11/5 in lieu of the class meetings).