

MATH 599 Mathematics Teaching Techniques

Course Description: principles of Mathematics teaching and learning; focus is on the pedagogical challenges and technical aspects of teaching Mathematics to undergraduate students (mostly first and second year students). This course is mandatory *only* for graduate students who wish to teach in the Mathematics Department.

Learning Outcomes: At the end of this course, students should be able to

- articulate their teaching philosophy,
- gain expertise in basic principles of student-centred approaches to pedagogy,
- develop competence in designing and delivering a standard first-year lecture.

Course structure: The class meets three times a week. Classes are cancelled in week 7-8 to 10, they resume in week 11 to the end of term. In week 1 to 7-8, classes are organized as follows (this schedule is subject to change): discussion and group activities on Mondays, class observations/mini presentations on Wednesdays, mini presentations/guest speakers on Fridays. In week 11 to 13, class discussions are scheduled on Mondays and Wednesdays and guest speakers on Fridays. In week 7-8 to 10, students prepare and deliver a lecture in a first-year course.

There is no textbook for this course. Readings from various sources will be distributed.

Homework: In the early part of the term, every week there are assigned readings and students are required to prepare and deliver mini-presentations. Students are also required to submit a teaching statement by the end of the term.

Assessment: The course is graded on a pass/fail basis. Passing the course is based on the following:

- attendance to at least 90% of class meetings,
- participation to in-class discussions and activities,
- completion of teaching presentations and teaching philosophy statement,
- design and delivery of a “guest lecture” (arranged by the instructor).

Each student is required to deliver a full lecture (“guest lecture”) in a first-year Calculus course, as arranged by the instructor; arrangements to give a lecture in a different course must be discussed with, and approved by the instructor. For students who wish to teach in the Math department, the guest lecture will provide the grounds for evaluation of their suitability to teach. There is no final exam in this course.

Week	Topics	Readings
1	Introduction	
2	Classroom Presence	<p>“The six psychological secrets to public speaking”, by Michael Hyatt https://michaelhyatt.com/public-speaking-psychology.html</p> <p>“Half a minute: Predicting Teaching evaluations from thin slices of nonverbal behavior and physical attractiveness”, N. Ambady, R. Rosenthal, <i>Journal of Personality and Social Psychology</i>, Vol. 64, No. 3, 431—441, (1993)</p>
3	Learning outcomes and students’ prior knowledge	<p>“What are Learning Objectives?”, Appendix D of “How Learning Works”, S.A. Ambrose, M. di Pietro, M. W. Bridges, M. K. Norman, M. C. Lovett,</p> <p>“What is the value of course-specific learning goals?”, B. Simon, J. Taylor, <i>Journal of College Science Teaching</i>, Vol. 39, No. 2 p52-57, (2009)</p> <p>“Rote vs Meaningful Learning”, R. E. Mayer, <i>Theory into Practice</i>, Vol. 41, No. 4, pp 226-232 (2002)</p> <p>“How Learning Works?”, Chapter 1, S.A. Ambrose, <i>et al.</i></p>
4	What drives students’ motivation to learn	<p>“Adding it Up”, Chapter 9, section on Motivation (page 339), https://www.nap.edu/read/9822/chapter/11#339</p> <p>Section 1.4 from Teaching Mathematics – a guide for postgraduate and teaching assistants http://www.birmingham.ac.uk/Documents/college-eps/college/stem/additional/Teaching-Mathematics.pdf</p> <p>“How Learning Works”, Chapter 3, page 79-82</p>
5	How learning works	<p>“How People Learn”, Chapter 1, page 6 to 13, National Research Council, <i>the National Academies Press</i> (2000), https://www.nap.edu/catalog/6160/how-people-learn-brain-mind-experience-and-school</p> <p>“Learning Theory and Online Instruction”, Tomorrow’s Professor newsletter</p>
6	Lecture structure	“Designing and delivering effective lectures”, Tomorrow’s Professor newsletter
7	Classroom interaction	No readings
8		Guest Lectures
9		Guest Lectures
10		Guest Lectures
11	Role of feedback and homework	<p>“Beyond Plug and Chug: An Analysis of Calculus I Homework”, J. Ellis, K. Hanson, G. Nunez, C. Rasmussen, https://www.maa.org/sites/default/files/pdf/cspcc/beyond_plug.pdf</p> <p>“Assessments that support Student Learning”, summary by C. Wieman http://www.cwsei.ubc.ca/resources/files/Assessment_That_Support_Learning.pdf</p>
12	Problematic cases	No readings
13	The teaching statement	No readings