

## **Program Cover Document MTT 390: Methods of Teaching Mathematics II**

### **I. Basic Course Information**

MTT 390: Methods of Teaching Mathematics II has prerequisites MAT 200, MAT 205, MAT 229 and MTT380. It is the second course in a two-course sequence of professional courses designed for mathematics education majors. MTT 390 has co-requisites SED 399 and SPE 323 (RAL 328 as of Spring 2019). This block of 3 courses will constitute Clinical Practice I.

### **II. Learning Goals**

The content and performance goals for MTT 380 and MTT 390 directly address the goals of the Math Secondary Education program. In these courses, students make connections between the higher-level mathematics courses they have taken/are taking and the K-12 mathematics curriculum. In MTT 390, they will focus their attention on the sequence of high school mathematics courses for grades 9 –12.

Students in MTT 390 will relate their subject matter knowledge to the content and pedagogy appropriate for teaching high school mathematics. They will enhance their familiarity with national and state standards and they will examine standards-based teaching and curricula in light of mathematics education research. Specifically, students will realize that problem solving is central to all of mathematics and that it is to be incorporated as a central theme in their own teaching. Both a standards-based and a research perspective will permeate the course and form the basis for discussion of appropriate instructional strategies.

### **III. Student Assessment**

The assessment in MTT 390 is a crucial part of the assessment plan for the Math Secondary Education program. As in MTT 380, the student will be assessed on the pedagogical goals for the program. Evidence of student progress will be collected and feedback given as students take part in Clinical Practice I where he/she will be teaching mathematics to middle or high school grade students.

The tests, homework, presentations and projects in MTT 390 are designed as learning activities as well as methods of assessment. For example, a unit plan will be developed, part of which will be taught during the field experience.

Student performance on these assessment instruments and the performance of students in their future professional courses, such as SED 498 and MTT 490 (Clinical Practice II), will be used to assess the success of MTT 390 in achieving its learning goals and its contribution to the fulfillment of the Math Secondary Education program goals.

### **IV. Learning Activities**

The study of standards-based teaching explored in MTT 380 will continue in MTT 390 and will focus on high school curricula. Students will have to “teach” a standards-based lesson and be evaluated by their peers. The exploration of mathematics education research followed by the writing of a unit plan will also provide the students with an appreciation of standards-based teaching. Learning activities will be situated in high school content and a variety of strategies and methods of instruction will be used to model effective teaching of mathematics. Learning activities will consist of a combination of lectures, demonstrations, explorations, group work, readings of research articles, written assignments, and a unit plan.

Any syllabus for MTT 390 should include the points listed below.

**I. Basic Information**

- A. Purpose statement: In addition to subject matter knowledge, an effective teacher needs to have pedagogical content knowledge. MTT 390 is the second in a two-course sequence of professional courses designed to prepare mathematics education majors to teach mathematics effectively.
- B. Course description: This course is the second in a two-course sequence of professional courses for mathematics education majors. Students will be familiar with the standards for 9-12 mathematics, and will engage in exploring topics from Discrete Math., Algebra, Geometry, Pre-Calculus and Calculus. These topics will be examined with a perspective gained from MTT 380 along with that gained from research. Manipulatives, models, software and calculators will be used to explore appropriate topics from each area. Classroom organization and management will also be explored. The course will be taken as part of a Clinical Practice I.
- C. Course prerequisites: MAT 200 (Discrete Math), MAT 205 (Linear Algebra), MAT 229 (Multivariable Calculus) and MTT 380 (Methods of Teaching Mathematics I) are prerequisites for this course. Students need to be majoring in mathematics to take this course. They need a strong foundation in higher level mathematics so that subject matter pedagogy can be examined and related to their content knowledge. The co-requisites are SED 399 and SPE 323 (RAL 328 as of Spring 2019). This block of 3 courses will constitute Clinical Practice I.

**II. Learning Goals**

- A. Content goals: Students will have the ability to evaluate and model their teaching from the perspective of the standards and from research. They will develop a global view of the content of high school mathematics as well as a variety of methods and strategies designed to motivate and engage students in learning that content.
- B. They will know what it means to teach through problem solving and the central role it plays in all of mathematics teaching. Many students believe that teaching mathematics can be successfully accomplished as a narrative exercise rather than it being guided by the process of problem solving. They will learn that the mathematical process of problem solving is central to mathematics and its teaching.
- A. Performance goals: The successful student completing this course should be able to do all of the following:
  - Demonstrate understanding and use of problem solving as a teaching method.
  - Select and use appropriate methods for teaching topics in high school mathematics.
  - Demonstrate use of appropriate calculators and computer software in teaching mathematics.

- Utilize effective strategies, based on research, for teaching various mathematical topics.
- Demonstrate knowledge of print and electronic resources available to them.

### **III. Student Assessment**

- A. Assessment plan:** Students will be assessed and receive regular feedback on their work through some combination of homework, written and oral communication, group and/or individual projects, presentations, and in-class examinations. A unit plan will be developed as a common assessment in the three courses in the block. Written feedback will also be given in their field experience.
- B. Rationale:** A variety of methods of assessment are needed to assess the performance goals. In-class examinations, which normally preclude the use of books and the practice of group discussion, enable the professor to assess the knowledge an individual student has readily available.
- C. Methods and criteria:** A syllabus should coincide with the assessment plan in Part A and clearly describe the schedule for these assessment tools, the criteria that will be used to evaluate student performance, and how grades will be calculated.

### **IV. Learning activities**

- A. Summary of learning activities:** Learning activities will consist of a combination of lectures, demonstrations, explorations, group work, participation in class discussions and field experience, readings of research, written homework assignments, group or individual projects, and the development of a unit plan.
- B. Outside of class,** students are expected to do a significant amount of individual or group homework to achieve the learning goals.
- C. Calendar or outline:** A guide to the organization of the course, a schedule of assessment tools, and a plan for the coverage of topics should be provided to the students.
- D. Students will develop a unit plan and teach a mini-unit during Clinical Practice I.**
- E. Students will produce a unit plan incorporating current research.** The plan will require a thorough demonstration of knowledge of the topic, as well as methods and strategies for teaching that topic.

**THE COLLEGE OF NEW JERSEY**  
**Department of Mathematics and Statistics**

**Course Syllabus:** MTT 390 Methods for Teaching Mathematics II

**Textbook:** Teaching Mathematics through Problem Solving - grades 6-12, editor H.L. Schoen-National Council of Teachers of Mathematics, published 2003.

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**Course Goals:** MTT 390 Methods for Teaching Mathematics II has as its primary goal to develop students who realize that problem solving is central to all of mathematics and who will incorporate it as a central theme in their own teaching. While problem solving is a process for doing mathematics, it also refers to a corresponding method for teaching mathematics. Teaching mathematics as problem solving should be the ultimate goal of all mathematics teachers and is a process that may require years to develop and master. An additional goal of this course is to explore and implement a variety of methods and strategies designed to motivate and engage students in learning the content of school mathematics.

**Course Content and Overview:** Students will engage in exploration of topics from Pre-algebra, Algebra, Geometry, Pre-calculus, Trigonometry, and Calculus. These topics will be examined along with rationales for developing methods for teaching based on the NCTM standards, as well as research. In addition, a unit plan will be developed involving one of these areas. Physical materials, models, and software will be used to explore appropriate topics from each area. This course includes a shared field experience with other methods courses in which a mini unit will be taught.

**Performance Goals:** The student will be required to reason mathematically, solve problems, and communicate mathematics effectively at different levels of formality, using a variety of representations of mathematical concepts and procedures. These goals will be demonstrated in the construction of the unit plan and during the teaching of a mini-unit. These activities are consistent with the five School of Education conceptual themes, the readings, assignments, activities and assessments in this course are designed to provide the students with the knowledge, skills and understanding of: 1.) Knowledge and Inquiry 2.) Multiculturalism, Diversity, Inclusion 3.) Multiple Contexts and Communities 4.) Leadership and Advocacy 5.) Excellence in Practice

**Student Assessment:** The final grades will be based on class participation and preparation, two tests, a unit plan and observations during the field experience. Students will be invited to participate in class by taking notes, assisting peers and the instructor during class, explaining their reasoning and problem solving methods, and making brief presentations based on their explorations.

**Learning Activities:** These activities will include a combination of lectures, participation in class discussions and demonstrations, tests, a unit plan, readings and homework assignments, as well as field observations.

## Tentative COURSE OUTLINE

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Week 1	Expectations, assignments, & NCTM's Standards
Week 2	Pre-algebra Models for Mathematics Education Reading: Developing Understanding through Problem Solving Mathematics as Sense Making
Week 3	Algebra I Reading: Mathematical Habits of the Mind
Week 4	Algebra I - continued Reading: Teaching Mathematics through P.S.: A historical perspective
Week 5	<b>TEST I</b> , Geometry Reading: Selecting Quality Tasks from Problem Based Teaching
Week 6	Geometry – continued Reading: Problem Posing as a Tool for Teaching Mathematics Teacher Story 1
Week 7	Geometry – continued Reading: Using Technology to Foster Mathematical meaning through P.S.
Week 8	Data Analysis and Probability Reading: Planning to teach Statistics through P.S. Teacher Story 2
Week 9	Pre-calculus Reading: The Teacher's Role in Teaching Mathematics through P.S.
Week 10	<b>TEST II</b> , Calculus Reading: Social and Sociomathematical Norms in the Mathematics Classroom & Teacher Story 3
Week 11	Calculus – continued & Technology Reading: The Sound of P.S. & Classroom Assessment Issues related to Teaching & Teacher Story 4 Reading: Phasing Problem- Based Teaching into a Traditional Educational environment
Week 12	Assessment & evaluation Reading: Teaching Low-SES Students Mathematics through P.S. Teacher Story 5
Week 13 -14	Field experience