

## **Program Cover Document --- MTT 202: Teaching Mathematics in the Early Childhood and Elementary School Classroom**

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

MTT 202: Teaching Mathematics in the Early Childhood and Elementary School Classroom is primarily a second semester sophomore/junior level course. It is scheduled for one 3-hour meeting each week. In addition, a 3-hour per week field experience is a critical component of the course. Its prerequisites are Introduction to Education/Introduction to EC & Child Development, Child and Adolescent Development, and MAT 105 (Mathematical Structures and Algorithms for Educators I) or MAT 106 (Mathematical Structures and Algorithms for Educators II). MST 202, Methods of Teaching Science, Health, and the Environment is a co-requisite.

### **II. Learning Goals**

MAT 105 and MAT 106 study the fundamental principles that underlie elementary school mathematics from an advanced viewpoint. The knowledge and understandings that students gain in those courses will be expanded in MTT 202 as they explore various methods and strategies for teaching the elementary mathematics curriculum. MTT 202 and its co-requisite, Methods of Teaching Science, Health, and the Environment, must be taken together before the Junior Professional Experience. This arrangement will provide for a focus on math and science, which are traditionally areas of weakness, and a field experience with exemplary teachers of these subjects. This will also help prepare students for the Junior Professional Experience where they will have a longer field experience and do more teaching.

The learning goals for MTT 202 directly address the goal of the Department of Elementary and Early Childhood Education that relates to subject matter. That goal states that students should “have a deep understanding of the academic content of the subjects they teach [including mathematics] and can use research-based, discipline specific strategies to teach these subjects”. Another goal states that students should “use a variety of teaching and assessment strategies to encourage all children to imagine, to create, to think critically, to solve problems, and to meet and/or exceed state and national standards”. MTT 202 directly addresses this goal as well.

### **III. Student Assessment**

Students will be assessed using the methods they should use with their students. This will serve as a model for the students’ future teaching. All of the homework and projects in MTT 202 are designed as learning activities as well as methods of assessment. For example, creating a final portfolio is a culminating experience where the student must choose certain pieces of work from the semester to meet various criteria. In this process, the student reflects on his/her learning in the course. The field experience will provide an opportunity to assess students’ progress in the program by requiring and observing the teaching of mathematics lessons, before they go on to the Junior Professional Experience.

Student performance on these assessment instruments and the performance of students in future professional courses and the student teaching experience will be used to assess the success of MTT 202 in achieving its learning goals and its contribution to the fulfillment of the Elementary and Early Childhood Education program goals.

### **IV. Learning Activities**

Students must experience standards-based teaching and learning in order to understand how to implement it. Learning activities will consist of a combination of lectures, explorations,

group work, participation in class discussions, readings, written homework assignments, student-led demonstrations, and hands-on activities. It is important that a variety of strategies and methods of instruction should be used to model effective teaching of mathematics. In addition, the accompanying field placement will provide an opportunity for the student to experience what they are learning in the college classroom in a real elementary classroom setting and be mentored by an exemplary math and science teacher.

This course combined with the mathematics content courses MAT 105 and MAT 106 will form a strong foundation in elementary mathematics and mathematics teaching for the student and build their confidence as they go on to the Junior Professional Experience, where they will focus on how to integrate all subjects in lesson planning. They will be expected to teach all subjects, including mathematics, in the Junior Professional Experience and Senior Student Teaching. The experiences they have in MTT 202 and the field placement will help prepare them to do that.

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

**Departmental Course Syllabus**

**MTT 202: Teaching Mathematics in the Early Childhood and Elementary School  
Classroom (4 s.h.)**

A sample syllabus for MTT 202 follows this department syllabus. Any syllabus for MTT 202 should include the points listed below and use the suggested outline found in Part IV as a basis for decisions on course content.

**I. Basic Information on Course and Instructor**

Purpose Statement

This course examines the purposes, scope, sequences, materials, and methodology of teaching mathematics in early childhood and elementary schools. It develops skill in planning, instructing, and assessing understanding of content. It links instruction and assessment in mathematics. College class instruction, and observation and teaching in an early childhood or elementary school classroom is provided.

Course Description

This course examines the early childhood and elementary school mathematics curricula, how children learn mathematics, methods and strategies appropriate for teaching the many topics in mathematics. Students will be introduced to national and state standards for preK-6 mathematics, and learn how to teach according to these standards. Topics include the use of manipulatives and technology in teaching mathematics, learning theories, adaptations for diverse learners, and the investigation of standards-based curricula. A field experience is a critical component of this course. The student will observe and participate in the early childhood or elementary school classroom of an exemplary mathematics teacher 3 hours per week. The professor arranges the placement through the STEP Office. Transportation to the field site will need to be arranged by the student.

Course Prerequisites and Co-requisites

MAT 105 or MAT 106 (Mathematical Structures and Algorithms for Educators I or II). MST 202, Methods of Teaching Science, Health, and the Environment is a co-requisite.

**II. Learning Goals (*Content and Performance*)**

**A. Classroom Practice**

Learning Environment

- To create an environment that supports inquiry-based instruction
- To create a well-managed classroom with multiple resources for mathematics teaching

- To address the issue of math anxiety and provide strategies for handling it
- To create an environment in which the teacher facilitates learning by encouraging questions and providing adequate “wait time” for responses
- To utilize tools, such as manipulative materials, calculators, computers, pictorial representations, etc., appropriately for concept development

#### Communication

- To communicate mathematical concepts and ideas to a diverse student population.
- To foster communication among students in order to enhance the learning of mathematics.

#### Diverse Learners

- To learn strategies that address multiple intelligences, different learning styles, second language learners, and that provide multiple learning experiences that are compensatory, as needed

#### Special Needs

- To adapt mathematics lessons for learners with special needs

## **B. Learning Design**

#### Instructional Planning

- To plan standards-based units, lessons, and projects
- To adapt lessons for diverse learners and students with special needs
- To incorporate age-appropriate exploration of mathematical concepts
- To incorporate appropriate tools, such as manipulative materials, calculators, computers, pictorial representations, etc., necessary for concept and skill development
- To embed a variety of assessments
- To analyze and adopt standards-based instructional materials
- To develop scaffolded question sequences that lead to conceptual understanding
- To integrate subject areas, including science, language arts, and social studies
- To understand vertical and horizontal curriculum articulation
- To create mathematical learning experiences that focus on developing students’ problem solving abilities

#### Assessment

- To develop and use both traditional methods and alternative assessment strategies such as performance tasks and portfolios
- To develop rubrics and understand different grading techniques

- To use assessment results to inform and improve instruction
- To distinguish criterion- and norm-referenced tests
- To understand diagnostic, formative and summative assessment
- To learn about national and state testing requirements, including NCLB, ESPA and GEPA

### **C. Professional Knowledge**

#### Content Knowledge

- To understand the NCTM and NJCCC Standards in mathematics and have a working knowledge of these mathematical concepts.
- To identify your own misconceptions and alternate frameworks
- To identify students' misconceptions and use experiential-based learning activities to challenge them
- To understand conceptual learning theory

#### Human Growth and Development

- To understand developmentally appropriate practice
- To understand constructivism and brain-based learning

### **D. Professional Relationships**

#### Collaboration

- To understand the importance of external partnerships and activities to support educational goals (i.e., with community organizations, mathematics education organizations, etc.).
- To learn about lesson study and action research
- To engage in team teaching
- To work with teachers of other subject areas, such as science, language arts, and social studies teachers
- To use cooperative learning strategies
- To develop a positive relationship with the cooperating teacher

#### Professional Development

- To be aware of professional organizations, such as NCTM and AMTNJ, as resources for professional development
- To read mathematics education journals and keep up with the literature
- To develop the concept of lifetime learning
- To know the NJ and NCTM Professional Teaching Standards
- To ascribe to the high ethical and moral standards of good teaching practice, such as avoidance of plagiarism, fairness, and mutual respect.

### **III. Student Assessment**

#### Assessment Plan

In this course students learn about how to assess students in the mathematics classroom. They will be assessed using the methods they will use with their students. This includes:

- Using both traditional methods and alternative assessment strategies such as performance tasks and portfolios
- Developing rubrics and understanding different grading techniques
- Understanding how the professor uses assessment results to inform and improve instruction

#### Rationale

Effective teacher educators model best practice. In this course students will be assessed using the most current assessment methods for mathematics teaching.

#### Methods and Criteria

An individual syllabus should include the following methods and clearly describe a schedule for these assessment tools, the criteria that will be used to evaluate student performance, and how grades will be calculated.

- A final mathematics teaching portfolio will be a collection of the student's work, which represents and documents their accomplishments, together with their assessment of that work and their reflections of themselves as doers and teachers of mathematics.
- Students will design, implement, evaluate, and reflect on at least three mathematics lessons in the field placement.
- Students will stay current in readings and actively participate in class. They will help make the class lively and interesting, attend all classes, and be on time.
- A final exam scheduled during final exam week.
- Students will also be assessed through some combination of homework, written and oral communication, group and/or individual projects, presentations, and in-class examinations.

### **IV. Learning Activities**

#### Summary of Learning Activities

This course takes place in the college classroom and in an early childhood, elementary or middle school classroom. The students will spend part of the time learning about mathematics instruction in the college classroom. They will experience a variety of teaching strategies including small-group activities, pairs of students working together, whole class discussions, instructor and student-led demonstrations, lecture, and numerous hands-on, minds-on activities. They will observe an exemplary mathematics teacher three hours per week and begin to teach mathematics under her guidance. They'll receive feedback and guidance from the professor, their mentor teacher, and their partner.

#### Calendar or Outline

The following is a suggested guide to the organization of course topics:

- 1 General overview of the course; Introduction to NCTM and Common Core Standards.
- 2 Learning theory applied to mathematics, problem solving, inquiry-based instruction
- 3 Strategies and planning for effective instruction; examining exemplary curriculum materials
- 4 Linking performance-based assessment to instruction
- 5 Developing number concepts (Note that weeks 5 - 14 should address the needs of diverse learners, integrating technology [manipulatives, calculators, etc.] with mathematics instruction, and integrating mathematics across the curriculum.)
- 6 Meaning of Operations and Computation (two weeks)
- 8 Developing Geometric and Measurement Concepts (two weeks)
- 10 Developing and Extending Concepts of Common and Decimal Fractions (two weeks)
- 12 Developing Concepts of Data and Chance
- 13 Developing Algebraic Thinking: Patterns & Functions

#### Rationale

Students must experience standards-based teaching and learning in order to understand how to implement it. Learning activities should be situated in grade-appropriate content and a variety of strategies and methods of instruction should be used to model effective teaching of mathematics.

**MTT 202 Teaching Mathematics in the Early Childhood and Elementary School Classroom**  
Spring, 2005

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Office Hours: Monday 11:30 – 12:30  
Tuesday 1:00 – 3:00  
Other hours by appointment

**Description of course:**

This course examines the early childhood and elementary school mathematics curricula, how children learn mathematics, methods and strategies appropriate for teaching the many topics in mathematics. Students will be introduced to national and state standards for preK-6 mathematics, and learn how to teach according to these standards. Topics include the use of manipulatives and technology in teaching mathematics, learning theories, adaptations for diverse learners, and the investigation of standards-based curricula. Prerequisite is MAT 105 or 106. Co-requisite is MST 202. A field experience is a critical component of this course. The student will observe and participate in the middle school classroom of an exemplary mathematics teacher 1 day per week for 10 weeks. This is a shared field placement with the science methods course. The professors arrange the placement through the STEP Office. Transportation to the field site will need to be arranged by the student.

**Resources:**

1. Text: *Elementary and Middle School Mathematics: Teaching Developmentally*, 5<sup>th</sup> ed., by John Van de Walle, with accompanying Field Experience Guide by Jamar Pickreign
2. Common Core State Standards

**Learning Goals**

Content goals: You will become familiar with the national and state standards relating to mathematics instruction, know how to teach according to these standards, and become familiar with standards-based curricula. You will understand learning theories and how they apply to the teaching and learning of mathematics. You will know what it means to teach through problem solving. You will understand the mathematical content of the elementary and middle school mathematics curricula and become familiar with the manipulatives and technology that are available for teaching it.

Many of you will enter the course with the misconception that doing mathematics is merely doing computation. You will learn that the mathematical processes of problem solving, reasoning, communicating mathematically, making connections between mathematical ideas, and representing these ideas should be a focus of the entire K-12 curriculum, according to national and state standards. You will come to a new understanding of what it means to “do mathematics” at any level.

Performance goals: The successful student completing this course should be able to do all of the following:

- Demonstrate understanding of national and state standards.
- Select and use appropriate concrete manipulative materials, activities, performance tasks, textbooks, and other representations to develop mathematical concepts and skills.



- Demonstrate use of appropriate calculators and computer software in teaching mathematics.
- Utilize effective strategies, based in theory of learning, for teaching various mathematical topics in the elementary and middle school curriculum.
- Demonstrate knowledge of various methods of assessment and evaluative criteria.
- Reflect on his/her own growth as a doer and teacher of mathematics.
- Demonstrate knowledge of print and electronic resources available to them.
- Adapt mathematics lessons for diverse learners and students with special needs

### **Course Requirements**

Your final grade will be based on the following:

Midterm	20%
Final	30%
Field experience	20%
Presentation	10%
Lesson plan	10%
Other assignments and participation	10%

Class policies:

1. Grade will be lowered for late assignments.
2. Additional assignments for extra credit will not be given.
3. The instructor must be contacted prior to any due date to negotiate alternative arrangements if necessary.
4. Students are responsible for any work that is missed.
5. Make-up exams will be given for excused absences in which case I must be notified within 24 hours of the missed exam. Make-up exams will generally be harder.

### **Additional resources:**

The following video series can be found in the media center in our library:

*Teaching Math: A Video Library, K-4, 5-8, & 9-12*

*Marilyn Burns Middle School Mathematics*

*Mathematics for Middle School (Grades 6-8)*

*Mathematics Assessment: A Video Library, K-12*

*Mathematics: What's the Big Idea? For K-8 Math Educators*

*Teaching Moments*

All of these tapes contain vignettes of actual classroom teaching and would serve as a good resource for you. I invite you to view these tapes.

### MTT 202 Tentative course outline

<u>Date</u>	<u>Chapters</u>	<u>Topic</u>	<u>Field assignment</u>
1/17	1, 9	Intro to Standards, math ed reform Introduction to field & Activity log Early number concepts and number sense	
1/24	2, 15	What it means to “do math” Developing Fraction concepts	1/27 First impressions
1/31	3, 10, 11	Learning theory Meanings for operations Mastery of Basic facts	2/3 Observing the mathematical Environment
2/7	4, 16	Teaching through problem solving Computation with fractions	2/10 Observing an activity Teaching via problem solving
2/14	5, 12, 17	Building Assessment into Instruction Place Value Development Decimal and Percent concepts	2/17 Observing students to inform Instruction
2/21	6, 13, 17	Planning in the Problem-based classroom Strategies for Whole-number computation Decimal computation	2/24 Simple lesson observation
2/28	7, 14	Teaching All Children Mathematics Computational Estimation with Whole numbers	3/3 Observing students with special needs
3/14	18	Mid-term exam Cooperative learning strategies Developing concepts of ratio & proportion	3/17 Observing & assessing group work
3/21	8, 19	Technology and School mathematics Developing Measurement concepts	3/24 Observing Manipulatives in the classroom
3/28	20	Geometric Thinking & Concepts TI-73 graphing calculator	
4/4	21	Data Analysis & Probability	4/7 Observing Student-teacher Interaction
4/11	22	Algebraic Reasoning	4/14 Complete Activity Log
4/18	23	Exploring Functions	4/21 Make-up day
4/25	24	Developing Concepts of Exponents, Integers, and Real Numbers Exploring Standardized tests	
Week of 5/2 – 5/6		Final exam	