



NEW JERSEY CENTER
FOR TEACHING & LEARNING

**Progressive Mathematics Initiative® (PMI®)
MATH6435: Learning and Teaching Algebra II**

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Faculty Team:

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Course Credit: 4.0 NJCTL credits

Dates & Times:

This is a 4-credit, self-paced course, covering 9 modules of content. The exact number of hours that you can expect to spend on each module will vary based upon the module coursework, as well as your study style and preferences. You should plan to spend approximately 15 hours per credit working online, and up to 30 hours per credit working offline.

Graduate Student Handbook: www.njctl.org/graduate-handbook/

COURSE DESCRIPTION:

This course is designed for those who are learning to teach Algebra II to high school students. It provides teachers with an introduction to college-level algebra in preparation for calculus. This course includes topics taken from the high school Common Core State Standards for Mathematics (CCSS).

The focus is on understanding the connections among the numerical, algebraic, and graphical relationships of various nonlinear functions, as well as concepts of probability and statistics.

STUDENT LEARNING OUTCOMES/OBJECTIVES:

Upon completion of the course, the student will be able to:

1. Demonstrate an understanding of mathematics concepts of Algebra II, including how to teach them, detailed in the module learning outcomes below.
2. Integrate PMI materials (including presentations, labs, practice problems, etc.) to support student learning and deliver effective instruction.

3. Create a social constructivist learning environment through the use of formative assessment questions, interpreting the results of this assessment to effectively facilitate student-led discussions that support deeper understanding of the content.
4. Integrate multiple attempts to demonstrate student mastery of content knowledge, as encouraged/fostered by the PMI pedagogy.
5. Implement learning plans that are aligned to Common Core standards and allow for differentiation based on the needs of learners.

TEXTS, READINGS, INSTRUCTIONAL RESOURCES:

Required Texts:

- This course uses a free digital textbook accessible at:
<https://njctl.org/courses/math/algebra-ii/>
- Participants will download SMART Notebook presentations, homework files, labs, and teacher resources from the PMI Algebra II course

Recommended Readings:

- Related articles within discussion prompts

COURSE REQUIREMENTS:

In order to receive a Passing grade, the participant must complete the following course requirements:

1. **Activities:** A number of different learning activities will ensure participant engagement and learning in the course. These include:
 - Engage in video module lessons which demonstrate minimized direct instruction followed by frequent formative assessment.
 - Completion of formative assessments aligned to learning objectives which include detailed analysis when answered incorrectly.
 - Interaction with module discussion boards that allow conversation with peers and course instructors about the module's content, delivering that content to students. Discussion boards also serve as a place to ask and answer questions related to the module's content.
2. **Short Answer Assignment:** Each module requires one (1) original response to a given prompt. These prompts are typically based upon course lessons and require teachers to analyze, reflect, and make connections between the module's content and their own classroom practice.
3. **Mastery Exercises:** For each module, these multiple-choice question quizzes assess the content knowledge gained in a module. Participants have the opportunity to retake; random questions are pulled from a larger question bank on each attempt ensuring varied questions.
4. **Virtual Labs:** In each module, a virtual lab write-up will be submitted. Virtual labs are interactive lab simulations that promote discovery-based student learning through real-world applications and analysis.
5. **Module Exam:** One is completed at the end of each module. It is a culminating exam consisting of multiple choice and free response questions aligned to the standards and objectives of the module.

6. Reflection Paper: At the end of the course, participants are required to reflect on the knowledge taught in the course, make connections, and compare/contrast their current pedagogy with new strategies gained in this assignment.
7. Final Exam: At the end of the course, a comprehensive exam consisting of Multiple Choice and Free Response questions assesses the content knowledge learned throughout the course.

GRADE DISTRIBUTION AND SCALE:

Grade Distribution:

| | |
|--------------------------|-----|
| Module Exams | 70% |
| Final Exam | 10% |
| Labs | 6% |
| Short Answer Assignments | 6% |
| Mastery Exercises | 6% |
| Reflection Paper | 2% |

Grade Scale:

| | |
|----|---------------|
| A | 93 – 100 |
| A- | 90 – 92 |
| B+ | 86 – 89 |
| B | 83 – 86 |
| B- | 80 – 82 |
| C+ | 77 – 79 |
| C | 73 – 76 |
| C- | 70 – 72 |
| D | 60.0 – 69.9 |
| F | 59.9 or below |

GRADING RUBRIC:

The following rubric is used to score:

- Short Answer Assignment – 6% of grade
- Reflection Paper – 2% of grade

The minimum possible score for this rubric is 4 points, and the score will be converted to the minimum grade available in this module (which is zero unless the scale is used). The maximum score of 25 points will be converted to the maximum grade.

Intermediate scores will be converted respectively and rounded to the nearest available grade. If

a scale is used instead of a grade, the score will be converted to the scale elements as if they were consecutive integers.

| | Meets Expectation | Approaches Expectation | Below Expectation | Limited Evidence |
|------------------------------|--|---|--|---|
| | <i>7 points</i> | <i>5 points</i> | <i>3 points</i> | <i>1 point</i> |
| Content | <ul style="list-style-type: none"> ● Demonstrates excellent knowledge of concepts, skills, and theories relevant to topic. | <ul style="list-style-type: none"> ● Demonstrates fair knowledge of concepts, skills, and theories. | <ul style="list-style-type: none"> ● Demonstrates incomplete or insubstantial knowledge of concepts, skills, and theories. | <ul style="list-style-type: none"> ● Demonstrates little or no knowledge of concepts, skills, and theories. |
| Depth of Reflection | <ul style="list-style-type: none"> ● Content is well supported and addresses all required components of the assignment. | <ul style="list-style-type: none"> ● Content is partially supported; addresses most of the required components of the assignment. | <ul style="list-style-type: none"> ● Content contains major deficiencies; addresses some of the required components of the assignment. | <ul style="list-style-type: none"> ● Content is not supported and/or includes few of the required components of the assignment. |
| Evidence and Practice | <ul style="list-style-type: none"> ● Response shows strong evidence of synthesis of ideas presented and insights gained throughout the entire course. The implications of these insights for the respondent's overall teaching practice are thoroughly detailed, as applicable. | <ul style="list-style-type: none"> ● Writing is mostly clear, concise, and well organized with good sentence/paragraph construction. Thoughts are expressed in a coherent and logical manner. There are no more than five spelling, grammar, or syntax errors per page of writing. | <ul style="list-style-type: none"> ● Response is missing some components and/or does not fully meet the requirements indicated in the instructions. Some questions or parts of the assignment are not addressed. Some attachments and additional documents, if required, are missing or unsuitable for the purpose of the assignment. | <ul style="list-style-type: none"> ● Response excludes essential components and/or does not address the requirements indicated in the instructions. Many parts of the assignment are addressed minimally, inadequately, and/or not at all. |
| | <i>4 points</i> | <i>3 points</i> | <i>2 points</i> | <i>1 point</i> |
| Writing Quality | <ul style="list-style-type: none"> ● Writing is well-organized, clear, concise, and focused; no errors. | <ul style="list-style-type: none"> ● Some minor errors or omissions in writing organization, focus, and clarity. | <ul style="list-style-type: none"> ● Some significant errors or omissions in writing organization, focus, and clarity. | <ul style="list-style-type: none"> ● Numerous errors in writing organization, focus, and/or clarity. |

The following rubric is used to score:

- Labs – 6% of grade

The minimum possible score for this rubric is 2 points, and the score will be converted to the minimum grade available in this module (which is zero unless the scale is used). The maximum score of 14 points will be converted to the maximum grade.

Intermediate scores will be converted respectively and rounded to the nearest available grade. If a scale is used instead of a grade, the score will be converted to the scale elements as if they were consecutive integers.

| | Meets Expectation | Approaches Expectation | Below Expectation | Limited Evidence |
|---------------------|--|--|---|---|
| | <i>7 points</i> | <i>5 points</i> | <i>3 points</i> | <i>1 point</i> |
| Completeness | <ul style="list-style-type: none"> ● Lab write-up is complete with no missing fields. | <ul style="list-style-type: none"> ● Lab write-up has 1-2 missing fields. | <ul style="list-style-type: none"> ● Lab write-up has 3-5 missing fields. | <ul style="list-style-type: none"> ● There are more than 5 missing fields on the lab write-up. |
| Calculations | <ul style="list-style-type: none"> ● All answers are calculated correctly. | <ul style="list-style-type: none"> ● Most answers are calculated correctly, but there are 1-2 minor calculation errors. | <ul style="list-style-type: none"> ● Most answers are calculated correctly, but there are multiple minor calculation errors, or 1-2 gross miscalculations. | <ul style="list-style-type: none"> ● There are calculation errors throughout the lab. |

The remaining types of assignments are not scored using a rubric. These assignments are scored using percentage correct to assign a letter grade. The assignments in this manner are as follows:

- Mastery Exercises – 6% of grade
- Module Exams – 70% of grade
- Final Exam – 10% of grade

Mastery Exercises can be retaken as many times as desired to ensure a high score. Due to the nature of these assignments, each time they are taken, they will be composed of unique questions pulled randomly from a larger question bank.

Module and Final Exams are scored using a curve, which allows us to keep content exams rigorous. Module Exams can be retaken one time. Final Exams cannot be retaken.

ACADEMIC STANDING:

NJCTL has established standards for academic good standing within a student’s academic program. Students enrolled in any NJCTL online course must receive an 80 or higher to

successfully complete a course and receive credit for that course. An 80 is equivalent to a GPA of 2.7 or B-. Additionally, students in an endorsement program must receive a cumulative GPA of 3.0 for all courses combined in order to successfully complete the program.

ACADEMIC INTEGRITY:

Students must assume responsibility for maintaining honesty in all work submitted for credit and in any other work designated by the instructor of the course. Academic dishonesty includes cheating, fabrication, facilitating academic dishonesty, plagiarism, reusing /repurposing your own work, unauthorized possession of academic materials, and unauthorized collaboration.

CITING SOURCES WITH APA STYLE:

All students are expected to follow proper writing and APA requirements when citing in APA (based on the APA Style Manual, 6th edition) for all assignments.

DISABILITY SERVICES STATEMENT:

We are committed to providing reasonable accommodations for all persons with disabilities. Any student with a documented disability requesting academic accommodations should contact the Dean of Students, Melissa Axelsson, for additional information to coordinate reasonable accommodations for students with documented disabilities (melissa@njctl.org).

NETIQUETTE:

Respect the diversity of opinions among the instructor and classmates and engage with them in a courteous, respectful, and professional manner. All posts and classroom communication must be conducted in accordance with the student code of conduct. Think before you push the Send button. Did you say just what you meant? How will the person on the other end read the words?

Maintain an environment free of harassment, stalking, threats, abuse, insults or humiliation toward the instructor and classmates. This includes, but is not limited to, demeaning written or oral comments of an ethnic, religious, age, disability, sexist (or sexual orientation), or racist nature; and the unwanted sexual advances or intimidations by email, or on discussion boards and other postings within or connected to the online classroom.

If you have concerns about something that has been said, please let your instructor know.

CLASS SCHEDULE:

| Module | Module Learning Outcomes | Assignments |
|--|---|--|
| 1 – Overview of Functions | <ul style="list-style-type: none"> ● Identify the properties of functions such as domain, range, and continuity. ● Evaluate functions using function notation. ● Perform operations with functions. ● Combine functions and create composite functions. ● Recognize parent functions and perform simple transformations using a, h, and k. ● Find and identify inverse functions. ● Identify the symmetry of a function both graphically and algebraically. ● Differentiate between odd and even functions. ● Identify different lines of symmetry for functions. | <ul style="list-style-type: none"> ● Short Answer Assignment ● Lab ● Mastery Exercises ● Module Exam |
| 2 – Linear & Absolute Value Functions | <ul style="list-style-type: none"> ● Understand how to calculate the rate at which things change. ● Write the equation of a line in its three different forms. ● Solve real-world problems using linear functions. ● Solve systems of linear equations. ● Solve real-world problems by constructing and solving a system of linear equations. ● Write and solve inequalities in one variable. ● Write the solutions to inequalities using interval notation. ● Graph linear inequalities in two variables. ● Graph and solve systems of linear inequalities. ● Solve absolute value equations and graph the solution set on a number line. ● Solve absolute value inequalities and graph the solution set on a number line. ● Analyze the graphs of absolute value functions and identify its key aspects, such as domain, range, vertex, etc. ● Solve real-world problems by writing and solving absolute value equations. ● Solve real-world problems by writing and solving absolute value inequalities. | <ul style="list-style-type: none"> ● Short Answer Assignment ● Lab ● Mastery Exercises ● Module Exam |
| 3 – Quadratic Equations & Complex Numbers | <ul style="list-style-type: none"> ● Understand and graph key features of quadratic functions. ● Analyze the graphs of quadratic functions. ● Solve quadratic equations graphically. ● Solve quadratic equations algebraically (factoring, square roots, completing the square, and using the quadratic formula). ● State the number and nature of the roots of a quadratic using the discriminant. ● Apply the techniques for finding zeros of a quadratic to real-world problems. ● Break down square roots that have imaginary solutions. ● Perform the operations of addition, subtraction, and multiplication with imaginary and complex numbers. ● Solve quadratic equations with complex solutions. | <ul style="list-style-type: none"> ● Short Answer Assignment ● Lab ● Mastery Exercises ● Module Exam |

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| <p>4 – Quadratic Functions</p> | <ul style="list-style-type: none"> ● Graph quadratic functions in standard form, x-intercept form, and vertex form. ● Transform equations of quadratic functions into different forms (e.g. standard form to vertex form). ● Describe transformations of functions. ● Graph functions using transformations. ● Compare the graphs of 2 quadratic, absolute value, and square root functions to determine any transformations that map the original function to the new function. ● Recognize piecewise functions, graph them, and correctly evaluate them at given points. ● Calculate the average rate at which things change. ● Write quadratic functions to model real-world problems. | <ul style="list-style-type: none"> ● Short Answer Assignment ● Lab ● Mastery Exercises ● Module Exam |
| <p>5 – Polynomial Functions</p> | <ul style="list-style-type: none"> ● Combine polynomial functions using operations of addition, subtraction, multiplication, and division. ● Fluently factoring all types of polynomials. ● Apply the Remainder Theorem. ● Describe the characteristics of polynomials given equations, tables, and graphs. ● Find the zeros of a polynomial, both real and imaginary. ● Write polynomials from its given zeros, both real and imaginary. ● Solve polynomial inequalities and analyze various aspects of their graphs. ● Write and solve a polynomial function to model a real-world problem. | <ul style="list-style-type: none"> ● Short Answer Assignment ● Lab ● Mastery Exercises ● Module Exam |
| <p>6 – Rational Functions</p> | <ul style="list-style-type: none"> ● Solve variation problems. ● Simplify rational expressions. ● Add, subtract, multiply, and divide rational expressions. ● Solve rational equations and identify solutions as feasible or extraneous. ● Graph rational functions and analyze various aspects of the graph (e.g. domain, range, asymptotes, etc.). ● Compare the graphs and/or equations of 2 rational functions to determine any transformations that map the original function to the new function. ● Solve real-world problems using rational functions. | <ul style="list-style-type: none"> ● Short Answer Assignment ● Lab ● Mastery Exercises ● Module Exam |
| <p>7 – Radical Functions & Rational Exponents</p> | <ul style="list-style-type: none"> ● Simplify radicals and radical expressions. ● Perform arithmetic operations of addition, subtraction, and multiplication with radical expressions. ● Rationalize the denominator of radical expressions. ● Simplify radicals with an index other than 2. ● Convert rational exponents to and from radical form. ● Solve radical equations and identify extraneous answers. ● Graph square root functions and determine any transformations that map the original function to the new function. | <ul style="list-style-type: none"> ● Short Answer Assignment ● Lab ● Mastery Exercises ● Module Exam |

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| <p>8 – Probability & Statistics</p> | <ul style="list-style-type: none"> ● Use characteristics of problems, including unions, intersections and complement, to describe events with appropriate set notation and Venn Diagrams. ● Verify that two events are independent or dependent and calculate the conditional probability of the events. ● Translate their results using everyday language. ● Review mean, median, mode, range, and outliers. ● Calculate Interquartile Range and Standard Deviation of two or more data sets. ● Calculate the standard deviation of a data set and analyze a normal distribution. ● Recognize trends with and interpret different associations of data in a two-way frequency table. ● Graph a non-linear function of best fit for a given set of data and use the non-linear function of best fit to solve problems. ● Recognize appropriate uses and models for statistics, justify their results using data or experimentation, and calculate a margin error for sets of information. | <ul style="list-style-type: none"> ● Short Answer Assignment ● Lab ● Mastery Exercises ● Module Exam |
| <p>9 – Reflection & Final Exam</p> | <ul style="list-style-type: none"> ● N/A | <ul style="list-style-type: none"> ● Reflection Paper ● Final Exam |