SYLLABUS

Code: **MATH 145**   **Title**: **ALGEBRAIC MODELING**

Institute: **STEM**   **Department**: **MATHEMATICS**

Course Description: This course is an intermediate algebra course in which examples are drawn from real life and skills are learned in the context of these applications. Topics include functions and their properties and associated algebra skills, and modeling using linear, exponential, logarithmic, quadratic, rational, and radical functions. Problems are approached from a variety of perspectives, including graphical, numerical, verbal, and algebraic. A graphing calculator is required – the specific model is determined by the department. The course may be used as a prerequisite for MATH 156 but NOT MATH 152 or MATH 153.

Section Information: All tests will be proctored in person.

Prerequisites: MATH 021 or MATH 025 or satisfactory completion of the college's foundational studies requirement in algebra.

Credits: 4   **Lecture Hours:** 4   **Lab:** 0

REQUIRED TEXTBOOK/MATERIALS:

1. **Textbook:** MATH 145 – Algebraic Modeling Student Workbook, 3rd Edition, by Brookdale Community College Mathematics Faculty. This custom text book is sold only in the College Bookstore and is binder-ready with 3-hole punch.

   Note:
   - For textbook information in online and hybrid sections, see Instructor Addendum.

   - Online homework will be completed using the My Open Math platform, which is free to students.

2. **Graphing Calculator:** The calculator for this course is the TI-83 (any version) or TI-84 (any version). The use of any other calculator should be discussed with the instructor. The TI-89 and or higher (such as the TI-92 or N-spire) may not be used for testing.

ADDITIONAL TIME REQUIREMENTS:

You will need to allow some on-campus time during each unit to meet with your group to work on the unit project. Some discussions can be done via email, but you will need some group meeting time and your group may need to meet with your instructor to discuss parts of the project.

OTHER TIME COMMITMENTS:

- In addition to the regular class hours, you will need to set aside time each week for homework. The weekly time will vary by topic and level of difficulty, but as an estimate, you should expect two homework hours for *each* class hour per week. For example, if your class meets for four hours per week, you should expect to spend about *eight* hours per week on homework. Your instructor may require you to submit assignments using My Open Math, an online practice and tutorial system.
- If you are having any difficulty with the course material, you may need to allow time

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to see your instructor during office hours or to get help in the Math Lab.

COURSE LEARNING OUTCOMES:

Upon completion of this course, students will be able to:

- Identify and distinguish among the following functions: linear, exponential, quadratic, rational, and radical by interpreting graphical, symbolic, numerical and/or verbal representations. (M)
- Demonstrate the mathematical skills appropriate to this course. (M)
- Use the appropriate function model to analyze and solve application problems. (M)
- Use a graphing calculator to understand concepts and to explore and solve problems. (M)
- Explain how a function model relates to an applied situation and interpret problem solutions in the context of the situation. (M)

    Learning Outcome(s) support the following General Education Knowledge Areas:

    ➢ (M) Mathematics

GRADING STANDARD: In this course, you will be evaluated by means of tests, quizzes (and possibly homework), and projects.

A. TESTS

There will be three tests, one after each unit. All supporting work must be shown on tests in order for your instructor to properly assess your understanding of the material. Graphing calculators are used on these tests, although there may be non-calculator parts. Students may not use any type of calculator on the non-calculator parts of the three tests. The tests will be given in class and it is expected that you will be in class to take the test on the day it is given. If you are very ill (verifiable with a doctor's note) or you have some other emergency, you *must* contact your instructor immediately.

Note: All tests will be proctored in person, see Instructor Addendum for more information.

B. LABS/QUIZZES/HOMEWORK

There are daily labs in this course. They are done in groups but handed in individually. The labs contain problems that reinforce the concepts and skills learned in class. There are also periodic quizzes and your instructor may also choose to use certain homework assignments for evaluation.

C. PROJECTS

There is one group project for each unit of the course, to be done outside of class. In the project, you will apply the concepts and skills learned in class to a problem situation, present the mathematics, write careful explanations, and interpret your results. Specific guidelines for the projects will be handed out with Project 1.

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GRADING

Your final course average is determined by a weighted average as follows:

Test I	25%
Test II	25%
Test III	25%
Labs/Quizzes/Homework	15%
Project	10%

FINAL GRADE

Your final grade is determined as follows:

If your final course average is	Your final grade is
90 – 100	A
88 – 89	A-
86 – 87	B+
80 – 85	B
78 – 79	B-
76 – 77	C+
70 – 75	C
60 – 69	D**
Below 60	F

** To use this course as a prerequisite for another mathematics course, you must have a grade of C or better.

Incomplete

INC is only given at the discretion of your instructor. This may occur in documented cases of hardship or emergency. In this case, you must meet with the instructor to discuss the work that must be completed to earn a grade in the course. All work must be completed within 21 days after the end of the term, exclusive of official college closings.

Withdrawal

You may withdraw from the course, without penalty, up to a date set by the College. If you do not withdraw from the course but stop attending, your grade at the end of the semester will be F.

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COURSE CONTENT: (TEXT SECTION)

Unit 1: In this unit, you will begin your study of functions, learn function notation, and study linear functions and systems of linear equations in depth.

Unit 1 Outcomes: You will:
o   Interpret a qualitative graph (1.1)
o   Draw a qualitative graph from a description (1.1)
o   Know the definition of a function (1.1)
o   Use function notation (1.1)
o   Determine and interpret the average rate of change of a function on an interval (1.2)
o   Determine whether a table represents a linear function by examining the average rates of change (1.2)
o   Determine the slope, intercepts and equation of a linear function (1.2, 1.3)
o   Interpret the slope and intercepts of a linear function (1.2)
o   Solve application problems involving linear functions (1.3)
o   Interpret the results in the context of the problem (1.3)
o   Use a graphing calculator to create a scatterplot of data and find the equation of the line of best fit. (1.4)
o   Interpret the slope and vertical intercept of the linear regression equation and use the linear regression equation to answer questions about the problem situation (1.4)
o   Set up a system of linear equations and solve the system numerically, graphically, and algebraically (1.5)
o   Interpret the solution to a system of equations in the context of the applied situation (1.5)
o   Determine whether a graph represents a function (1.6)
o   Determine the domain and range of a function (1.6)
o   Determine the practical domain and practical range of a function that represents a problem situation (1.6)

Unit 2: In this unit, you will study exponential functions and their properties and applications.

Unit 2 Outcomes: You will:
o   Know the properties of exponents and apply them to expressions with positive integer exponents, negative integer exponents, and rational exponents (2.1, 2.2)
o   Convert numbers between standard notation and scientific notation and recognize a graphing calculator's use of scientific notation. (2.2)
o   Know the definition of an exponential function and the properties of its graph (3.1)
o   Determine whether a table represents a linear or an exponential function by examining rates of change and common ratios (3.1, 3.2)
o   Determine the growth or decay factor of an exponential function from a table (3.2)
o   Determine the doubling time of an exponential growth function (or the half-life of an exponential decay function) numerically and graphically (3.3)
o   Solve equations related to an exponential growth or decay situation graphically (3.3)
o   Find the growth or decay rate of an exponential function given its growth or decay factor and vice versa (3.2)
o   Write an exponential function to represent a problem situation and use the function to answer questions about the situation (3.2)
o   Use a graphing calculator to create a scatterplot of data and find the exponential regression equation (3.4)
o   Interpret the growth or decay factor and initial value of the exponential regression equation and use the exponential regression equation to answer questions about the

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problem situation (3.4)
- o Apply the formulas for compound interest and continuous compounding (3.5)
- o Understand where the number e comes from (3.5)
- o Solve continuous growth and decay problems using the given function rule. (3.5)
- o Solve exponential equations by writing both sides with the same base (3.6)
- o Convert equations from exponential to logarithmic form and vice versa (3.6)
- o Use common and natural log notation (3.6)
- o Use a calculator to evaluate logs (3.6)
- o Know and apply the properties of logarithms (3.7)
- o Use logs to solve exponential equations (3.7, 3.8)
- o Write an exponential function to represent a problem situation, write an exponential equation to answer a question about that situation, and solve the exponential equation graphically and also by using logarithms (3.8)

Unit 3: In this unit, you will study quadratic, rational, and radical functions and their properties and applications.

Unit 3 Outcomes: You will:
- o Know the definition of a quadratic function and the properties of its graph (4.1)
- o Find the vertex of a parabola (4.1)
- o Recognize a polynomial expression (4.3)
- o Add and subtract polynomials (4.3)
- o Multiply polynomials (4.3)
- o Factor trinomials (4.4)
- o Solve quadratic equations graphically and by using factoring and the zero-product principle (4.2, 4.4)
- o Know and use the quadratic formula (4.5)
- o Use a quadratic function that represents a problem situation to write a quadratic equation to answer a question about that situation, and solve the quadratic equation graphically and also by using either factoring or the quadratic formula (4.5)
- o Use a graphing calculator to create a scatterplot of data and find the quadratic regression equation (4.6)
- o Interpret the vertex and intercepts of the quadratic regression equation and use the quadratic regression equation to answer questions about the problem situation (4.6)
- o Know the definition of a rational function (5.1)
- o Find the domain and the asymptotes of a rational function (5.1)
- o Add, subtract, multiply, and divide rational expressions (5.3)
- o Solve rational equations (5.2)
- o Use a rational function that represents a problem situation to write a rational equation to answer a question about that situation, and solve the rational equation graphically and algebraically (5.4)
- o Find the domain of a radical function (6.1)
- o Use the multiplication property of radicals to rewrite radical expressions (6.1)
- o Solve radical equations graphically and algebraically (6.2)
- o Use a radical function that represents a problem situation to write a radical equation to answer a question about that situation, and solve the radical equation graphically and algebraically (6.2)

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The Math Department wants you to be successful in this course. Because of this, we have compiled a list of strategies and behaviors.

Attendance and class participation
- If you want to be successful in this course, attend every class.
- Come to class on time, and stay for the entire class period. If you are late or leave during class, you will miss important class material and you will also distract your classmates and your instructor. (See the Student Conduct Code)
- Turn off your cell phone during class. You and your classmates need to be free from distractions. (See the Student Conduct Code)
- Bring your book and calculator to every class.
- Respect your classmates and your instructor. Listen carefully to questions asked and answers given. Treat all questions with respect.
- Participate fully in class. Volunteer answers, work problems, take careful notes, and engage in discussions about the material. Above all, stay on task.
- Contribute your share to your in-class group work and to your group project and do your best to make the group experience a positive one for all members.
- Do your own work on tests and quizzes. Cheating will not be tolerated. (See the Academic Integrity Code.)

Homework
- Homework is the way you practice the ideas and skills that are introduced in class. To be successful on the tests, you must do the homework. Homework may be collected and homework questions may be included on quizzes or tests. Homework may be online (see Required Materials) and may be graded.
- When you do the homework, write down all supporting work. Using the correct process is at least as important as getting the correct answer, so your work and steps are very important.
- Remember to check your answers. They will be in the back of the text or in the back of the homework packet.
- If there are questions you can't get or don't understand, ask about them at the beginning of the next class. If you have trouble with more than a few problems, try starting your homework in the Math Lab, where help is available.

Absence
- If you are sick and an absence is unavoidable, please call or email your instructor. You are still responsible for all material that was covered during your absence. You are expected to read the textbook and do the homework.
- Make time to see your instructor when you return so that you can get any papers you missed.
- You will not be able to make up labs and quizzes.
- Remember that you are expected to be in class for the tests.

Getting Help

After you have tried the homework, there are ways to get help:
- Look in your text and your class notes for examples similar to the problems you are finding difficult.
- See your instructor during office hours or make an appointment. Bring the work you have done.

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- Go to the **Math Lab** to get extra help on your homework or simply go and do your homework there. Someone will be there if you get stuck. You don't need an appointment to use the Math Lab.
- Form a **study group** with other class members. Working with other students can be a great way to learn. If you have a group to work with, consider meeting and working together in the Math Lab.
- Your textbook may have a complete solutions manual available in the Math Lab, which can be used in the Math Lab.
- You can use the computers in the computer lab within the Math Lab to do work related to your math course.
- In the Math Lab, you can get help on how to use your calculator.

Visit the **Math Lab website** to view hours and other useful information about the Math Lab.

COLLEGE POLICIES:

As an academic institution, Brookdale facilitates the free exchange of ideas, upholds the virtues of civil discourse, and honors diverse perspectives informed by credible sources. Our College values all students and strives for inclusion and safety regardless of a student's disability, age, sex, gender identity, sexual orientation, race, ethnicity, country of origin, immigration status, religious affiliation, political orientation, socioeconomic standing, and veteran status. For additional information, support services, and engagement opportunities, please visit www.brookdalecc.edu/support.

For information regarding:
- Brookdale's Academic Integrity Code
- Student Conduct Code
- Student Grade Appeal Process

Please refer to the **BCC STUDENT HANDBOOK** AND **BCC CATALOG.**

NOTIFICATION FOR STUDENTS WITH DISABILITIES:

Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify must contact the Disabilities Services Office at 732-224-2730 (voice) or 732-842-4211 (TTY) to provide appropriate documentation of the disability, and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.

MENTAL HEALTH:

- Mental Health Crisis Support: From a campus phone, dial 5555 or 732-224-2329 from an external line; off-hours calls will be forwarded to BCC police (2222 from a campus phone)
- Psychological Counseling Services: 732-224-2986 (to schedule an appointment during regular hours)

The syllabus is intended to give student guidance in what may be covered during the semester and will be followed as closely as possible. However, the faculty member reserves the right to modify, supplement, and make changes as the need arises.