# COURSE OUTLINE

| Course Number | Course Title | Credits |
|---|---|---|
| MAT135 | Intermediate Algebra & Applications | 4 |

| Hours: lecture/Lab/Other | Co- or Pre-requisite | Implementation sem/year |
|---|---|---|
| 4 lecture hours | Completion of MAT037 (formerly MAT034) with a grade of C or better or MAT037A **and** MAT037B with a grade of C or better in both courses, successful completion of a course equivalent to MAT037, an appropriate score on the Higher Mathematics Placement Test, or permission of the department chairperson. | Fall 2009 |

**Catalog description (2009-2012 Catalog):**  This course is designed for students who demonstrate some proficiency in algebra but who need to develop additional algebraic skills for use in other college courses or in higher level mathematics courses. Topics include function notation; linear, quadratic, and absolute value functions and equations; rational expressions and equations; rational exponents and equations; radicals and radical equations; graphing of linear, quadratic, and polynomial functions; and inequalities. *4 lecture hours*

**Is course New, Revised, or Modified?**  Revised Spring 2009

**Required texts/other materials:**

1.  Algebra for College Students, Dugopolski

2.  Calculator:  A graphing calculator such as the TI-83 or TI-84 is recommended but not required. Students must have at least a scientific calculator.  No calculator with a symbolic manipulator is allowed.

**Revision date:**          **Course coordinator:**

Revised Spring 2009     Jamie Beth Fleischner    609.570.3807          fleischj@mccc.edu

**Information resources:**  The Mercer County Community College Library has close to 100 reference books that students may use and a collection of problems on CD. Students are also encouraged to utilize the Learning Centers for additional resources and/or tutoring.

**Other learning resources:** The following are additional resources that the publishers of the text have made available for instructors and students.


## Course Competencies/Goals:

Students will be able to demonstrate through tests, projects and quizzes/homework the ability to:

1. solve inequalities in one and two variables.

2. solve and graph both linear and quadratic equations.

3. factor a second degree polynomial and some special higher degree polynomials.

4. recognize and work with functions and function notation.

5. perform operations and solve equations involving polynomial, radical and rational expressions.

6. solve a system of two linear equations.

7. solve absolute value equations and inequalities

8  analyze graphs of polynomial functions.

9. recognize common graphs and graphing transformations

10. construct and/or analyze both linear and quadratic models of real life phenomenon and predict future data values from these models.

11. apply each of the above techniques in various real world applications.


## Course-specific General Education Knowledge Goals and Core Skills:


### General Education Knowledge Goals

**Goal 1. Communication.** Students will communicate effectively in both speech and writing.
**Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
**Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.


### MCCC Core Skills

**Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.
**Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.
**Goal D. Information Literacy.** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
**Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.

### Units of study in detail:

### Unit I – Linear Modeling: Equations, Inequalities, Slopes and Graphs (2.5 weeks)

The student will be able to:

- Define and solve linear equations in one variable.  (Course Goals 1 & 2, Gen Ed Goal 2, Core Skill B)
- Determine if a given number is a solution to a given linear equation. (Course Goal 2, Gen Ed Goal 2, Core Skill B)
- Define and solve linear inequalities in one variable.  (Course Goal  1, Gen Ed Goal 2, Core Skill B)
- Determine if a given number is a solution to a given linear inequality.  (Course Goal 1, Gen Ed Goal 2, Core Skill B)
- Graph solutions to linear inequalities on a real number line and express solutions in interval notation. (Course Goal 1, Gen Ed Goal 2, Core Skill B)
- Define, solve, and graph solutions to compound linear inequalities, as well as compound linear inequalities using "and" & "or" terminology. (Course Goal 1, Gen Ed Goal 2, Core Skill B)
- Plot points and identify quadrants on the coordinate plane. (Course Goal 1, Gen Ed Goal 2, Core Skill B)
- Define independent ($x$-variable) and dependent ($y$-variable) axes. (Course Goal 2, Gen Ed Goal 2, Core Skill B)
- Read, interpret, and explain trends in graphs which model applications. (Course Goals 10 & 11, Gen Ed Goals 1 & 2, Core Skills A& B)
- Define, calculate and interpret slope, especially as a rate of change. (Course Goals 2 & 11, Gen Ed Goals 1 & 2, Core Skills A&B)
- Determine relationship between slope and horizontal, vertical, parallel, and perpendicular lines. (Course Goal 2, Gen Ed Goals 1& 2, Core Skills A&B)
- Define and graph linear equations in two variables. (Course Goals 2 & 10, Gen Ed Goals 1& 2, Core Skills A&B)
- Identify and graph $x$- and $y$-intercepts of a graph, and interpret them in context. (Course Goals 2,10, & 11, Gen Ed Goals 1& 2, Core Skills A&B)
- Express and graph linear equations in slope-intercept form. (Course Goals 2 & 10, Gen Ed Goals 1& 2, Core Skills A&B)
- Use linear modeling to find the equation of a line through two given points, or a slope and $y$-intercept. (Course Goals 2,10, & 11, Gen Ed Goals 1 & 2, Core Skills A, B, & D)
- Find equations of lines that are horizontal, vertical, and parallel/perpendicular to given lines. (Course Goal 2, Gen Ed Goals 1& 2, Core Skills A&B)
- Analyze and interpret application problems from other disciplines and/or complete assigned project(s). (Course Goals 2,10, & 11, Gen Ed Goals 1, 2, & 4, Core Skills A,B,D, & E)

### Unit II – Functions, Systems of Linear Equations, and Polynomials (4.5 weeks)

The student will be able to:

- Define relations and functions. (Course Goal 4, Gen Ed Goal  2, Core Skill B)
- Use function notation to evaluate outputs for given inputs. (Course Goal 4, Gen Ed Goal 2, Core Skill B)

- Identify the domain and range of a function.  (Course Goal 4, Gen Ed Goal  2, Core Skill B)
- Graph simple functions; apply the vertical line test. (Course Goals 2&4, Gen Ed Goal  2, Core        Skill B)
- Determine from its graph intervals on which function is increasing, decreasing or constant. (Course Goal 8; Gen Ed Goal 2; Course Skill B)
- Determine relative maximum and minimum values of polynomial functions. (Course Goals 8&11, Gen Ed Goal 2: Course Skill B)
- Recognize and use vertical and horizontal shifts, reflections and non-rigid transformations to graph functions.  (Course Goals 8 & 9, Gen Ed Goal 2: Course Skill B)
- Solve linear systems of equations having solutions. (Course Goal 6, Gen Ed Goal  2, Core Skill B)
- Define monomial and polynomial (and its degree). (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Add and subtract polynomials. (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Multiply monomials and binomials (using FOIL) and special products (squares of binomials, etc.)  (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Divide polynomials. (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Factor the GCF from polynomials and expressions. (Course Goal 3, Gen Ed Goal  2, Core Skill B)
- Factor polynomials by grouping. (Course Goal 3, Gen Ed Goal  2, Core Skill B)
- Factor various trinomials. (Course Goal 3, Gen Ed Goal  2, Core Skill B)
- Analyze and interpret application problems from other disciplines and/or complete assigned project(s). (Course Goals 2,8,10,11, Gen Ed Goals 1, 2, & 4, Core Skills A,B,D, & E)


## Unit III – Special Factoring, Rational Expressions & Equations, Radical Expressions and Rational Exponents (3.5 weeks)

The student will be able to:

- Factor the difference of two squares, and the sum/difference of two cubes.  (Course Goal 3, Gen Ed Goal  2, Core Skill B)
- Define and solve quadratic equations by the zero product property. (Course Goals 2 & 5, Gen Ed Goal  2, Core Skill B)
- Define rational expressions and identify where they're undefined. (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Simplify rational expressions.  (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Multiply and divide rational expressions. (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Find the LCD (least common denominator) for given rational expressions.  (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Add and subtract rational expressions.  (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Solve rational equations.  (Course Goal 5, Gen Ed Goal  2, Core Skill B)
- Define and calculate square, cube, and $n$th root of a number.  (Course Goal 5, Gen Ed Goal 2, Core Skill B)
- Calculate and/or simplify expressions with radicals or rational exponents. (Course Goal 5, Gen Ed Goal  2 & 4, Core Skill B)
- Find the distance between two given points in the coordinate plane. (Course Goals 5 & 11, Gen Ed Goal 2, Core Skill B)

- Analyze and interpret application problems from other disciplines and/or complete assigned project(s). (Course Goals 5,10,& 11 , Gen Ed Goals 1, 2, & 4, Core Skills A,B,D, & E)

## Unit IV –Operations on Radical Expressions, Complex Numbers, and Quadratic Equations (4.5 weeks)

The student will be able to:

- Add and subtract radical expressions. (Course Goal 5, Gen Ed Goal 2, Core Skill B)
- Multiply and divide radical expressions. (Course Goal 5, Gen Ed Goal 2, Core Skill B)
- Define the imaginary number $i$ and complex number $a + bi$. (Course Goal 5, Gen Ed Goal 2, Core Skill B)
- Add, subtract, multiply, and divide complex numbers. (Course Goal 5, Gen Ed Goal 2, Core Skill B)
- Define and solve quadratic equations by completing the square and/or the quadratic formula to get both real and complex solutions. (Course Goals 2 & 5, Gen Ed Goal 2, Core Skill B)
- Use the discriminant to find the number of real and complex solutions to a quadratic equation. (Course Goal 2, Gen Ed Goals 1 & 2, Core Skills A & B)
- Graph quadratic equations, identifying the vertex, axis of symmetry, and the maximum/minimum value attained by the function. (Course Goals 2,5, & 8, Gen Ed Goal 2, Core Skill B)
- Identify the domain and range of a quadratic function. (Course Goals 2& 8, Gen Ed Goal 2, Core Skill B)
- Analyze and interpret application problems from other disciplines and/or complete assigned project(s). (Course Goals 2, 8,10,& 11, Gen Ed Goals 1, 2, & 4, Core Skills A,B,D, & E)

## Evaluation of student learning:

Students should receive regular feedback on their work through tests, projects, and quizzes/homework. The syllabus for this course should describe the schedule for classes and assessments. A suggested **day-to-day schedule** (based on a 30-class semester) and a list of **minimum suggested homework exercises** from the text are available from the course coordinator.

A minimum of 4 tests must be given per semester, as well as a comprehensive departmental final exam. Exams used by instructors must be submitted to the course coordinators in a timely fashion for review to determine appropriate content coverage and exam readability. Final exam reviews have been developed by the department and will be available to all instructors. A suggested grading scheme for the course is provided below, although the individual instructor can modify it, provided that the minimum requirements above are met.

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|---|---|
| Unit Tests (4) | 60% |
| In-class Quizzes, Assigned Homework, etc | 15% |
| Final Exam | 25% |

**<u>Academic Integrity Statement:</u>**

Under no circumstance should students knowingly represent the work of another as one's own. Students may not use any unauthorized assistance to complete assignments or exams, including but not limited to cheat-sheets, cell phones, text messaging and copying from another student. Violations should be reported to the Academic Integrity Committee and will be penalized. Please refer to the Student Handbook for more details.