

## Mathematics Department Suggested Syllabus for MAT 090

### Course Description:

**MAT 090 College Algebra**  
**(Fall and Spring)**

**3 credits**

An introduction to fundamental algebraic laws and concepts with an emphasis on the manipulative skills of elementary algebra. Topics include the coordinate plane, linear and quadratic equations, higher order polynomials, inequalities, rational expressions and the properties of exponents. Three lecture hours per week. Note: The main purpose of this course is to satisfy the Basic Mathematics Competency requirement. This course does not give degree credit. Three lecture hours per week.

**Global Goals:** The student will

1. Achieve the competency performing arithmetic necessary to successfully study college level mathematics.
2. Achieve the competency manipulating expressions involving variables necessary to successfully study college level mathematics.

**Student Learning Outcomes:** The student will

### Arithmetic

1. Understand addition as moving to the right on the number line.
2. Understand subtraction as moving to the left on the number line.
3. Convert among fractions, decimals, and percents with and without a calculator.
4. Add, subtract, multiply, and divide fractions with and without a calculator.
5. Compute arithmetical expressions involving addition, subtraction, multiplication, division, absolute value, exponentiation, and grouping symbols both with and without calculators.
6. Recognize scientific notation when it appears on a calculator. Express numbers in scientific notation.

7. Factor integers of reasonable size. Given two factored integers  $m$  and  $n$ , compute  $GCD(m, n)$  and  $LCM(m, n)$ .
8. Understand the equivalence of  $\sqrt[n]{x}$  and  $x^{1/n}$  for positive integers  $n$ . Be able to compute  $n^{th}$  roots on a calculator and by hand for easy evaluations.
9. Understand the equivalence of  $\sqrt[n]{x^m}$  and  $x^{m/n}$  for positive integers  $m$  and  $n$ . Be able to compute  $x^{m/n}$  on a calculator and by hand for easy evaluations.
10. Compute areas and perimeters of circles, rectangles, and triangles using appropriate geometric formulae.

### Algebra

1. Solve inequalities of the form  $|ax + b| < c$ , graph the solution set, and express the solution set using interval notation.  
Given two of the three positive numbers  $a, b$ , and  $c$ , compute the third to make the statement "a is b percent of c" correct.
2. Simplify expressions by identifying and combining like terms in polynomials with one or more variables.
3. Express products and quotients involving terms with a variable  $x$  of the form  $Cx^p$  for  $p \in \mathbb{Q}$ .
4. Solve linear equations in one variable.
5. Plot points in the  $xy$ -plane. Graph linear equations and linear inequalities in two variables in the  $xy$ -plane.
6. Find the intersection point of two lines.
7. Solve linear inequalities in one variable.
8. Solve an equation of the form  $\frac{a}{b} = \frac{c}{d}$ , where three of the four unknowns are given.
9. Apply the distributive property to the product of a monomial and a polynomial, e.g.  $3x(x^2 - 5x + 2)$ .
10. Expand the product of two binomials.
11. Expand the product of two polynomials in many variables.

12. Express the sum or difference of two simple rational expressions in a single variable as a single rational expression.
13. Solve quadratic equations in one variable.
14. Factor quadratic polynomials in one variable that factor easily.
15. Given the roots of a polynomial, produce its factorization. Given the factorization of a polynomial, produce its roots.
16. Translate mathematical phrases like “seven more than twice  $x$  is five” into mathematical notation.

### Department Educational Goals

1. Use mathematics to solve problems requiring creativity and insight, as well as those using algorithms. (Goal 1)
2. Communicate mathematics clearly, both verbally and in writing. (Goal 5)

### Course Outline:

<b>Week 1</b>	<ul style="list-style-type: none"> <li>• Integer addition, subtraction, and absolute value on the number line.</li> <li>• Factorization of integers, least common multiple, and greatest common divisor.</li> <li>• Meaning of a fraction, arithmetic of fractions.</li> <li>• Converting among fractions, decimals, and percents.</li> </ul>
<b>Week 2</b>	<ul style="list-style-type: none"> <li>• Meaning of integer exponents, laws of exponents, arithmetic involving exponents.</li> <li>• Scientific notation.</li> <li>• Order of operations, computing compound expressions, <math>+</math>, <math>-</math>, <math>\times</math>, <math>\div</math>.</li> <li>• Using a calculator to do arithmetic with special attention to use of parentheses.</li> </ul>

<b>Week 3</b>	<ul style="list-style-type: none"> <li>• Meaning of roots, <math>\sqrt[n]{\cdot}</math> and <math>(\cdot)^{1/n}</math> notation.</li> <li>• Fractional powers.</li> <li>• More practice with laws of exponents.</li> </ul>
<b>Week 4</b>	<ul style="list-style-type: none"> <li>• Computing simple areas and perimeters, substituting for variables in formulas.</li> <li>• Translating simple mathematical phrases into mathematical notation.</li> </ul>
<b>Week 5</b>	<ul style="list-style-type: none"> <li>• Percents, understanding the statement <math>a</math> is <math>b\%</math> of <math>c</math>.</li> <li>• Solving proportions.</li> </ul>
<b>Week 6</b>	<ul style="list-style-type: none"> <li>• Variables, solving linear equations and inequalities, interval notation</li> <li>• Solving inequalities of the form <math> ax + b  &lt; c</math> and representing the solution.</li> </ul>
<b>Week 7</b>	<ul style="list-style-type: none"> <li>• Power functions, algebraic manipulation of terms, including terms with multiple variables.</li> <li>• Addition and subtraction of polynomials in two variables.</li> </ul>
<b>Week 8</b>	<ul style="list-style-type: none"> <li>• Distributing a term across a polynomial and extracting common factors from polynomials (multiple variables)</li> <li>• Multiplication of binomials (multiple variables).</li> </ul>
<b>Week 9</b>	<ul style="list-style-type: none"> <li>• Expressing the sum, difference, product, or quotient of simple rational expressions in one variable as a rational expression in one variable.</li> </ul>

<b>Week 10</b>	<ul style="list-style-type: none"> <li>• The <math>xy</math>-plane, plotting points</li> <li>• Graphs of linear equations and inequalities.</li> </ul>
<b>Week 11</b>	<ul style="list-style-type: none"> <li>• More on linear equations (slope, horizontal, vertical, parallel, and perpendicular lines).</li> <li>• Two-by-two systems of linear equations</li> </ul>
<b>Week 12</b>	<ul style="list-style-type: none"> <li>• Graphs of quadratics</li> <li>• Solving quadratic equations using the quadratic formula</li> <li>• Relationship between roots and factorization.</li> </ul>

**Possible Grading Scheme:**

- Quizzes (50%)
- Midterm Exam (25%)
- Final Exam (25%)

**College Policy Statement:**

Salem State College is committed to providing equal access to the educational experience for all students in compliance with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act and to providing all reasonable academic accommodations, aids, and adjustments. Any student who has a documented disability requiring an accommodation, aid or adjustment should speak with the instructor immediately. Students with disabilities who have not previously done so should provide documentation to and schedule an appointment with the office for Students with Disabilities and obtain appropriate services.

**Bibliography**

1. Ching, K. Basic Algebra. Salem State College, 2007.
2. Gelfand, I. & Shen, A. Algebra. Birkhauser, 2004.

3. Lial, Hornsby, & McGinnis. *Introductory Algebra, Seventh Edition*. Addison-Wesley, 2002.