

# MAT 110 Precalculus

## Suggested Syllabus

**Course Description** A study of functions and their graphs which is intended to prepare the student for calculus. Topics include properties of the real number system, linear, quadratic, exponential, logarithmic, rational, trigonometric and composite functions, as well as transformations and inverses of functions. Three lecture hours per week. Not open to those students who received credit for MAT 202N. **Prerequisite:** Satisfaction of the Basic Mathematics Competency Requirement.

**Suggested Equipment:** A TI-series graphing calculator is recommended. A TI-83 or TI-84 is suggested.

**Global Goals :** The student will

- Apply methods of algebra to simplify expressions and solve equations.
- Model changing quantities using functions.
- Communicate solutions using a variety of methods.
- Use mathematics to solve problems requiring creativity and insight, as well as those using algorithms.
- Assess the reasonableness of their solutions.

**Course Objectives :** The student will

- Use functional notation.
- Model periodic behavior using trigonometric functions.
- Model populations using exponential and logarithmic functions.
- Recognize the properties and graphs of linear, exponential, quadratic and trigonometric functions.
- Discuss the effects of transformations on these functions.

Course Outline	
Week	Topics
1	<ul style="list-style-type: none"> <li>• Review of algebraic concepts and arithmetic, especially fractions</li> <li>• Functions and function notation</li> <li>• Domains of functions, graphically and by considering singularities</li> <li>• Ranges of functions graphically</li> <li>• Algebra of functions, especially composition</li> </ul>
2	<ul style="list-style-type: none"> <li>• Points and the cartesian plane</li> <li>• Slopes and average rates of change</li> <li>• Finding equations of lines</li> <li>• Parallel and perpendicular lines</li> <li>• Intersections of lines</li> <li>• Applications of linear functions</li> </ul>
3	<ul style="list-style-type: none"> <li>• Quadratic functions</li> <li>• Roots of quadratics</li> <li>• Graphs of quadratic functions</li> <li>• Optimization problems involving quadratics (min/max problems)</li> <li>• Relationship between roots and factorization</li> </ul>
4	<ul style="list-style-type: none"> <li>• Vertical and horizontal shifts of functions</li> <li>• Stretching and shrinking of functions</li> </ul>
5	<ul style="list-style-type: none"> <li>• Angles and radians</li> <li>• Trigonometric functions and the unit circle</li> <li>• Sine, cosine and tangent functions</li> <li>• Graphs of trigonometric functions</li> </ul>
6	<ul style="list-style-type: none"> <li>• Transformations of trigonometric functions</li> <li>• Inverse and reciprocal trigonometric functions</li> </ul>
7	<ul style="list-style-type: none"> <li>• Applications of trigonometric functions</li> <li>• Laws of sines and cosines (optional)</li> </ul>
8	<ul style="list-style-type: none"> <li>• Laws of exponents</li> <li>• Introduction of <math>e</math></li> <li>• Modeling with exponential functions</li> </ul>
9	<ul style="list-style-type: none"> <li>• Definition of a logarithm, including the natural log</li> <li>• Properties of logarithms</li> <li>• Solving exponential equations using logarithms</li> <li>• Modeling with logarithmic functions</li> </ul>
10	<ul style="list-style-type: none"> <li>• Horizontal line test</li> <li>• 1-1 functions</li> <li>• Solving algebraically for inverses</li> <li>• Graphical relationship between functions and their inverses</li> </ul>
11	<ul style="list-style-type: none"> <li>• Higher order polynomials</li> <li>• Relationship between roots of and factorization for higher polynomials</li> <li>• End behavior of polynomials (optional)</li> <li>• Increasing and decreasing intervals from graphs</li> <li>• Relationship of degree to maximum number of roots and “turning points” of a polynomial (optional)</li> </ul>
12	<ul style="list-style-type: none"> <li>• Graphs of rational functions</li> <li>• End behavior (horizontal asymptotes) (optional)</li> <li>• Zeros of rational functions (roots and vertical asymptotes)</li> </ul>

## Note to the instructor:

The week-by-week course outline included herein is only a suggestion; you may feel free to rearrange as you see fit the order in which you present the material and to increase or decrease the amount of time you spend on a given topic. However, the Department feels that the following topics are absolutely essential and should be covered thoroughly, possibly at the expense of other topics:

- A conceptual understanding of functions, including proper notation, graphs of functions, domain and range, composition of functions, function inverses, and the importance of functions in mathematical modeling.
- Exponential functions, including the algebra of exponential functions, the number  $e$ , and modeling with exponential functions.
- Logarithms, including their definition, algebraic properties, and use in solving exponential equations.
- Trigonometric functions, including a detailed study of sine and cosine and their graphs, transformations of trigonometric functions, and the use of trigonometric functions in modeling.

Your outline should provide ample time to cover these topics while trying to cover as many of the other topics as possible.

## Suggested Texts

1. Blitzer, R. Algebra & Trigonometry: An Early Functions Approach, 3<sup>rd</sup> edition. Prentice Hall, 2006.
2. Blitzer, R. Precalculus, 3<sup>rd</sup> edition. Prentice Hall, 2006.
3. Connally, E., Hughes-Hallet & Gleason. Functions Modeling Change : A Preparation for Calculus, 3<sup>rd</sup> edition. John Wiley & Sons, Inc., 2007.
4. Faires and DeFranza, Precalculus, 4<sup>th</sup> edition. Brooks Cole, 2006.

Course syllabi should also include the following :

- **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.
- Grading Scheme
- Contact Information