HOSTOS COMMYNITY COLLEGE
DEPARTMENT OF MATHEMATICS

MAT 160   PRE-CALCULUS

CREDIT HOURS: 4.0

EQUATED HOURS: 4.0

CLASS HOURS: 4.5

PREREQUISITE: MAT 030 or placement

REQUIRED TEXTS: Dugopolski: Pre-calculus, 3nd Edition, Addison Wesley, 2005

DESCRIPTION: This course provides essential concepts for the study of Calculus.
                     Topics: Concepts in algebraic and transcendental (exponential
                     logarithmic and trigonometric)functions; inverse functions,
                     graphs of functions. Equations, inequalities, theory of equations
                     and applications.

LEARNING OUTCOMES:

                     Students should understand the concepts of functions and be able to
                     apply their comprehension to solve mathematical and
                     application problems after they achieve proficiency in the
                     following:
   - Performing computations involving functions, inverse
     functions and relations.
   - Sketching graphs of algebraic and transcendental functions
     using transformations.
   - Using the graphs of algebraic functions to solve the
     corresponding equations and inequalities.
   - Understanding trigonometric relationships and be able to
     derive trigonometric identities.
   - Solving exponential, logarithmic and trigonometric equations.
   - Solving application problems including exponential,
     logarithmic and trigonometric functions.

EXAMINATIONS: A minimum of three partial tests and a comprehensive final
                    examination.

GRADES: A, A$^-$, B$^+$, B, B$^-$, C$^+$, C, D, I, F.

I.   RELATIONS AND FUNCTIONS   Sessions

1) Function   2
Definition of function. Function notation, Review linear,quadratic, rational, radical, absolute value. Domain and range in set and interval notations. Difference Quotient.

2) Graph of Relation & Functions   2
XY-Plane, Graph of linear, quadratic, radical, absolute value, step and piece-wise functions.Vertical line test.

3) Families of Function   1
Graphing by transformation: Reflexions, Translations, Vertical, Horizontal. Symmetry with respect to the x and y axis, emphasize odd & even functions.

4) Operation of Functions   1.5
Emphasize composite functions & decompose a composite function. Addition, subtraction Multiplication, Division.

5) Inverse Functions   1.5
Horizontal line test, finding inverse functions. Composite function of inverses ($f[g(x)]=x$) One to one functions.

6) Constructing Functions   1
   Review of variation. Application of functions: Physics, Economics, Geometry.

7) Quadratic Function, Inequalities and Equations.   2

Use the graph of $y=ax^2+bx+c$ to explain the solution of equation is the intersection point with x-axis (y=0) and the solution of inequality is actually finding when the graph lies above (y>0) or below (y<0) x-axis. The extreme is the y coordinate of the vertex.

III.   POLYNOMIAL AND RATIONAL FUNCTIONS

1) Polynomial Functions   2.5
Zeros of Polynomial, Theory of Equations, Emphasize application of Remainder and Rational Zero theorem.

2) Graph of Polynomial   2.5
Intercepts, symmetry, Asymptotes (vertical, & Rational Functions. horizontal, oblique). Use rough graph to solve Inequalities.

3) Rational Functions   1
Synthetic Division and Asymptotes

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IV.   EXPONENTIAL AND LOGARITHMIC FUNTIONS

1) Exponential Function   1
Definition, Properties, Graphs.

2) Logarithmic Function   2
Definition, Properties, Graphs. Emphasize for each exponential (logarithmic) expression
there exist equivalent logarithmic (exponential) expression.

3) Rules of Logarithm   1
$\log(a+b) \neq \log(a) + \log(b)$

4) Equations and Applications   2
Solving Exponential and Logarithmic Equations. Application of exponential & logarithmic
equations to solving, compound interest, growth and decay and other problems.

V.   Right Triangle Trigonometry & Eight Basic Identities

1) Introduce six trigonometry identities by ratios by three sides of a right triangle.   1

2) Measurements of Angles   1
Conversion of angles measured in degrees and Radians.

3) Definitions of Trig. Functions when angles are in standard position   3
Complementary and co-terminal angles. Signs of Trig. functions in different quadrants.
position. Values of Trig. functions of special angles.
Reference angles R(x). Trig(x)= ± Trig R(x).

4) Graphs of Trig. Functions. Inverse Trig. Functions   2
Emphasize sinx, cosx & tanx includes $y = A\,trig.(bx + c)$

5) Trigonometric Identities.   2
Requires students to know how to derive identities by using:
$\cos(x + y) = \cos x \cos y - \sin x \sin y$

6) More Identities, verifying identities and Trig. Equations   4
Trigonometric Functions of Sums and Differences of Angles
Solving First and Second Degree Trigonometric Equations
Laws of Sine and Cosine-   Application on Solving Triangles
Double Angle and Half Angle Formulas