Division: _____ACADEMIC_____     DATE: __September 1, 1998__

B: Department: __SCIENCE & MATHEMATICS__     New Course: ____

Revision of Course
Information form: __X__

DATED: __February 1993__

C: _____MATH 110_____    D: _____PRECALCULUS_____    E: _____4_____

Subject & Course No.        Descriptive Title        Semester Credit

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**F: Calendar Description**

This is a one semester course for students who wish to prepare for MATH 120. Emphasis is placed on the graphing and solution of equations involving polynomial, rational, circular, trigonometric, logarithmic and exponential functions.
This course is taught using a graphing calculator.

Summary of Revisions: Sept. 1998

Revisions to items F, H and N

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**G: Type of Instruction:** Hours Per Week/ Per Semester

| | |
|---|---|
| Lecture | _6_ Hrs. |
| Laboratory | ____ Hrs. |
| Seminar | ____ Hrs. |
| Clinical Experience | ____ Hrs. |
| Field Experience | ____ Hrs. |
| Practicum | ____ Hrs. |
| Shop | ____ Hrs. |
| Studio | ____ Hrs. |
| Student Directed Learning | ____ Hrs. |
| Other | ____ Hrs. |

TOTAL   __6__ HOURS

L: College Credit Transfer   __X__

College Credit Non-Transfer ____

**H: Course Pre-requisites:**
MATH 101 with a B- or equivalent

**I: Course Co-requisites:** None

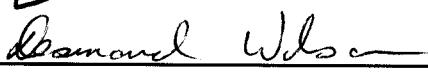**J: Course for which this course is a pre-requisite:**
MATH 120

**K: Maximum Class Size:**
35

**M: Transfer Credit:**
Requested ____
Granted __X__
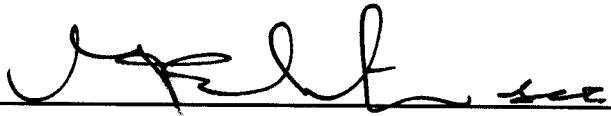Specify Course Equivalents or Unassigned Credit as Appropriate:

U.B.C.     MATH 110/120=Math 111
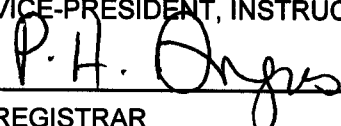S.F.U.     Math 100(3)
U. Vic.    Math 012(0)
OTHER:

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_____
COURSE DESIGNER(S)

_____
DEAN

_____
VICE-PRESIDENT, INSTRUCTION

_____
REGISTRAR

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N:  Textbooks and materials to be purchased by students
    (Use Bibliographic Form):

     Larson, Hostetler, Edwards; <u>Precalculus Functions and Graphs</u>, 2nd Edition, Houghton Mifflin.

    A graphing calculator is also required.

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O.    Course Objectives:

Upon completion of MATH 110 the student should be able to:

-----------------------------------------FUNCTIONS-----------------------------------------------------

- understand the concept of function and be able to determine which relations are functions by an examination of the equation and/or the graph of the relation.

- find the domain of any function and the range of functions for which the inverse can be determined or for which the graph can be easily sketched.

- extract the functional rule from a 'word problem'.

- determine if a function is odd or even and understand the graphical implication of the property.

- sketch the graphs of the following functions:

$$y = x^2, \quad y = x^3, \quad y = |x|, \quad y = \sqrt{x}, \quad y = \frac{1}{x}, \quad y = \frac{1}{x^2}, \quad y = \sqrt{a^2-x}$$

  and the graphs of the following variations of the above functions

$$y = f(x) + c, \quad y = f(x + c), \quad y = -f(x), \quad y = cf(x).$$

- apply the above transformations to any given graph or function.

- sketch the graph of simple piece-wise defined functions.

- sketch the graph of any quadratic function and be able to determine all intercepts and the vertex using the quadratic formula and/or completing the square.

- determine the equation of a quadratic form its graphical properties.

- solve maximum-minimum 'word problems' involving a quadratic function.

- add, subtract, multiply and divide functions and be able to determine the domains of the resulting functions.

O.      Course Objectives (continued):

-       determine the composite of several functions and its domain.

-       determine the inverse of a given one-to-one function and the domain and range of the inverse function.

-       prove that a given function is the inverse of another given function.

-       sketch the graph of the inverse of a given one-to-one function when the inverse functional rule cannot be determined.

-----------------------------------POLYNOMIAL AND RATIONAL FUNCTIONS-----------------------------------

-       find the quotient and remainder when a polynomial is divided by a second polynomial.

-       use the remainder theorem.

-       use the factor theorem to find the real roots of polynomial equations and the zeal zeros of polynomial functions.

-       determine the multiplicity of zeros.

-       use the rational root test to determine all possible rational roots.

-       factor and graph any polynomial of degree **n** provided that the polynomial has at least **n-2** rational roots.

-       obtain the functional rule for a polynomial when given certain information about the roots and a value that satisfies the function and graph the function.

-       sketch the graph of proper and improper rational functions that have a most one horizontal asymptote or an oblique asymptote.

-       solve 'word problems' that involve polynomial or rational functions.

-----------------------------------EXPONENTIAL AND LOGARITHMIC FUNCTIONS-----------------------------------

-       find the exact value of logarithmic and exponential expressions.

-       use a calculator to approximate the logarithm of a number to any base.

-       use a calculator to approximate the solutions to exponential and logarithmic equations for all bases.

-       find the inverse of a given exponential or logarithmic function and the domain and range of the inverse function.

-       demonstrate an understanding of the rules of logarithms by rewriting given expressions.

-       sketch the graph of exponential and logarithmic functions determining the value of all intercepts and the equation of the asymptote.

-       solve 'word problems' which require the use of logarithms and/or exponentials; i.e. growth and decay problems and compound interest problems.

O.       Course Objectives (continued):

--------------------------------THE TRIGONOMETRIC FUNCTIONS--------------------------------

- convert radians to degrees, minutes and seconds and vice versa.

- solve problems that demonstrate an understanding of the relationship between the central angle, the arc length and the radius of a circle.

- solve problems that demonstrate and understanding of the relationship between the angular velocity, the linear velocity and the radius of a wheel or similar object.

- determine the area of a circular sector.

- demonstrate an understanding of the six trigonometric functions relative to a right triangle and to the unit circle.

- recall and apply the fundamental trigonometric identities, the cofunction formulas and the formulas and the formulas for negatives.

- sketch the graphs of the six basic trigonometric function and recognize which functions are odd and which functions are even.

- find the exact values of the remaining trigonometric functions given the values of two trigonometric functions or the value of one trigonometric function and the quadrant.

- find the exact values of the trigonometric functions for an angle in standard position given a point on the terminal side.

- find the reference angle of any angle in degrees and/or radians.

- express any trigonometric function as a function of a given trigonometric function.

- recall the exact values of the trigonometric functions for reference angles of 30°, 45°, and 60° and the axis angles.

- use a calculator to approximate the value of the trigonometric function of any real number.

- use a calculator to approximate the reference angle given the value of the trigonometric function.

- determine the amplitude, period and the phase shift of any trigonometric function and sketch its graph showing all intercepts and turning points.

- demonstrate an understanding of the terms 'angle of depression' and 'angle of elevation' and solve 'word problems' involving right triangles.

--------------------------------ANALYTIC TRIGONOMETRY AND APPLICATIONS--------------------------------

- recall or derive and demonstrate an understanding of the addition and subtraction formulas, the double angle formulas and the half-angle identities for sine, cosine and tangent.

- demonstrate an understanding of the product-to-sum and sum-to-product formulas when given the formulas.

O.      Course Objectives (continued):

Upon completion of MATH 110 the student should be able to:

-       combine a sine function and a cosine function of the same period into a single cosine function when given the formula.

-       verify trigonometric identities.

-       find all the solutions of trigonometric equations and find solutions on a restricted interval.

-       sketch graphs of the six inverse trigonometric functions and state the domain and range of each function.

-       sketch the graph of simple inverse trigonometric functions.

-       find the exact value of inverse trigonometric expressions.

-       simplify given composites of trigonometric and inverse trigonometric functions.

-       solve 'word problems' that require the use of the inverse trigonometric functions.

-       verify inverse trigonometric identities.

-       solve 'word problems' that require the use of the Law of Sines and/or Law of Cosines.

------------------------------PARABOLAS, ELLIPSES AND HYPERBOLAS------------------------------

-       find the vertex, focus and directrix of a parabola and sketch its graph.

-       find the vertices and foci of an ellipse and sketch its graph.

-       find the vertices and equations of the asymptotes of a hyperbola and sketch its graph.

-       find an equation of a parabola or ellipse that satisfies given conditions.

------------------------------SYSTEMS OF EQUATIONS------------------------------

-       solve non-linear systems of equations in two unknowns.

-       solve consistent, inconsistent and dependent systems of linear equations.

-       decompose a rational fraction into partial fractions where the denominator can be factored into linear factors of any multiplicity.

P.     Course Content:

1.     FUNCTIONS
       - definition
       - graphing
       - the quadratic function
       - combining functions
       - inverse functions

2.     POLYNOMIAL AND RATIONAL FUNCTIONS
       - division of polynomials
       - the remainder theorem and factor theorem
       - zeros of polynomials
       - graphing polynomial functions
       - graphing rational functions

3.     EXPONENTIAL AND LOGARITHMIC FUNCTIONS
       - the exponential functions and their graphs
       - the logarithmic functions and their graphs
       - properties of the logarithmic functions
       - exponential and logarithmic equations
       - applications

4.     THE TRIGONOMETRIC FUNCTIONS
       - the trigonometric functions of angles and real numbers
       - trigonometric graphs
       - right triangle problems

5.     ANALYTIC TRIGONOMETRY AND APPLICATIONS
       - trigonometric identities
       - trigonometric equations
       - the addition and subtraction formulas
       - the multiple angle formulas
       - the product-to-sum and sum-to-product formulas
       - the inverse trigonometric functions
       - the Law of Sines and the Law of Cosines

6.     PARABOLAS, ELLIPSES AND HYPERBOLAS

7.     SYSTEMS OF EQUATIONS
       - non-linear systems of equations
       - linear systems of equations in more than two variables
       - partial fractions

Q.    Method of Instruction:

Lectures, problem sessions and assignments

R.    Course Evaluation:

Evaluation will be carried out in accordance with Douglas College policy.  The instructor will present a written course outline with specific evaluation criteria at the beginning of the semester.  Evaluation will be based on some of the following:

| | | |
|---|---|---|
| 1. | Weekly quizzes | { 0 - 40%} |
| 2. | Tests | {20 - 70%} |
| 3. | Assignments | { 0 - 15%} |
| 4. | Attendance | { 0 - 5%} |
| 5. | Class participation | { 0 - 5%} |
| 6. | Final Examination | {30%} |