COLLEGE OF THE ROCKIES

Mathematics, Provincial Level – MATH 090
Access Education/Upgrading for Academic and Career Entry

Course Outline

COURSE IMPLEMENTATION DATE:	**Pre 1998**
OUTLINE EFFECTIVE DATE:	**September 2020**
COURSE OUTLINE REVIEW DATE:	**March 2025**

GENERAL COURSE DESCRIPTION:

This course helps prepare students with the algebra and trigonometry skills necessary to enter academic, technical or vocational programs including those requiring a Pre-Calculus 12 or Principles 12 prerequisite.

Program Information: This course exceeds the math requirement for the BC Adult Graduation Diploma.

Delivery: This course is delivered face-to-face and in a directed studies format.

ABE Credits: 3

Hours for this course: 112.5 hours

Typical Structure of Instructional Hours:

Instructional Activity	Duration
Lecture Hours	90
Seminars / Tutorials	
Laboratory / Studio Hours	
Practicum / Field Experience Hours	
Other Contact Hours	22.5
Total	112.5

Practicum Hours (if applicable):

Type of Practicum	Duration
On-the-job Experience	N/A
Formal Work Experience	N/A
Other	N/A
Total	

Other Contact Hours:
- Guided Practice

Course Outline Author or Contact:

Deb Heal, BEd

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Signature

APPROVAL SIGNATURES:

Department Head
Joy Brown
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Dr. Jack Moes
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Department Head Signature

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EDCO

Valid from: September 2020 – March 2025

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Education Council Approval Date

COURSE PREREQUISITES AND TRANSFER CREDIT:

Prerequisites: Either MATH 080, Pre-Calculus 11, or equivalent.

Corequisites: None

Flexible Assessment (FA):

Credit can be awarded for this course through FA   ☑ Yes   ☐ No

Learners may request formal recognition for flexible assessment at the College of the Rockies through one or more of the following processes: External Evaluation, Worksite Assessment, Demonstration, Standardized Test, Self-assessment, Interview, Products/Portfolio, Challenge Exam. Contact an Education Advisor for more information.

Transfer Credit: For transfer information within British Columbia, Alberta and other institutions, please visit http://www.cotr.bc.ca/Transfer.

Students should also contact an academic advisor at the institution where they want transfer credit.

Prior Course Number: N/A

Textbooks and Required Resources:

Textbook selection varies by instructor and may change from year to year. At the Course Outline Effective Date the following textbooks were in use:

Blitzer, R. (2014). *Algebra and trigonometry* (5th ed.). Pearson Prentice Hall.

Please see the instructor's syllabus or check COTR's online text calculator http://go.cotr.bc.ca/tuition/tCalc.asp for a complete list of the currently required textbooks.

LEARNING OUTCOMES:

Upon the successful completion of this course, students will be able to

1. Algebra Review

    *   recognize subsets and identify properties of real numbers;
    *   use interval notation to write a set of numbers;
    *   evaluate absolute value of a real number and find the distance between two real numbers;
    *   use rules for order of operations and properties of exponents to simplify expressions;
    *   add, subtract, and multiply polynomials and factor a polynomial completely;
    *   determine the domain of a rational expression, simplify rational expressions, perform operations with rational expressions and simplify complex rational expressions;
    *   use properties of exponents to simplify radical expressions;
    *   rationalize the denominator or numerator in a rational expression;
    *   use properties of radicals to simplify and combine radicals;
    *   define imaginary and complex numbers, express them in standard form, and perform operations with complex numbers;
    *   solve linear equations, equations with absolute value, quadratic equations, radical equations, and equations reducible to a quadratic form;
    *   solve linear inequalities, combined inequalities, and absolute value inequalities and graph the solutions on a number line;
    *   solve applied problems using linear and quadratic equations;
    *   solve equations of variation and applied problems involving variation;
    *   solve systems of linear equations in two variables;
    *   distinguish between consistent/inconsistent and dependent/independent systems;
    *   use systems of linear equations to solve applied problems;

2. Functions and Graphs

    *   find the distance between two points in the plane and find the midpoint of a segment;
    *   apply the distance formula and mid-point formula to solve problems;
    *   recognize graphs of common functions: linear, constant, quadratic, cubic, square root, absolute value, reciprocal;
    *   use the vertical line test to identify functions;
    *   graph functions and analyze graphs of functions, identifying: domain and range; intervals on which the function is increasing, decreasing or constant;
    *   write formulas or functions to model real life applications;
    *   determine whether a graph is symmetric with respect to the x-axis, y-axis, and the origin;

- identify even or odd functions and recognize their symmetries;
- graph transformations of functions: translations, reflections, stretchings and shrinkings
- graph functions defined piecewise;
- find the sum, difference, product and quotient of two functions and determine their domains;
- find the composition of two functions f and g, finding formulas for f(g(x)) and g(f(x)), identifying the domain of the composition and evaluating the composite function;
- given an equation defining a relation, write an equation of the inverse relation;
- given a graph of a relation or function, sketch a graph of its inverse;
- use the horizontal line test to determine if a function is one-to-one and therefore has an inverse that is a function;
- find a formula for the inverse of a function;
- find $f^{-1}(f(x))$ and $f(f^{-1}(x))$ for any number x in the domains of the functions when the inverse of a function is also a function;

3. Polynomial and Rational Functions

- graph quadratic functions and analyze graphs of quadratic functions identifying the vertex, line of symmetry, maximum/minimum values, and intercepts;
- solve applied problems involving maximum and minimum function values;
- determine the behaviour of the graphs of polynomial functions of higher degree using the leading coefficient test;
- determine whether a function has a real zero between two real numbers;
- recognize characteristics of the graphs of polynomial functions including real zeros, y-intercept, relative maxima and minima, domain and range;
- divide polynomials using long division;
- use synthetic division to divide a polynomial by x – r;
- use the remainder and factor theorems to find function values and factors of a polynomial;
- list the possible rational zeros for a polynomial function with integer coefficients;
- factor polynomial functions and find the zeros;
- find a polynomial with specified zeros;
- solve polynomial and rational inequalities;
- determine and analyze complex roots of a polynomial;

4. Exponential and Logarithmic Functions

- evaluate exponential functions including functions with base e;
- recognize the inverse relationship between exponential and logarithmic equations;
- graph exponential and logarithmic functions including transformations and analyze the graphs in terms of: x- or y-intercepts, asymptotes, increasing or decreasing, domain and range;
- convert between exponential and logarithmic equations;
- find common and natural logarithms using a calculator;
- use basic and inverse properties of logarithms: $log_b b = 1, \ log_b 1 = 0, log_b b^x = x, \ b^{log_b x} = x$;
- use the product rule, quotient rule and power rule to expand or condense logarithmic expressions;
- use the change of base property to find a logarithm with base other than 10 or e;
- solve exponential and logarithmic equations;
- use exponential and logarithmic equations to model and solve real-life applications including exponential growth and decay;

5. Trigonometric Functions

- identify angles in standard position, positive and negative angles, co-terminal angles and reference angles;
- convert between degree and radian measures of angles;
- find the length of an arc, radian measure of central angle, or radius of a circle using the formula $s = r\theta$;
- identify special angles on a unit circle;
- determine the six trigonometric functions of an angle in standard position given a point on its terminal side;
- find the exact values of the trigonometric functions of special acute angles 30° ($\pi/6$), 45° ($\pi/4$), and 60° ($\pi/3$) or any angles that are multiples of these special angles;
- graph the six trigonometric functions and state their properties;
- graph transformations of the sine and cosine functions and determine period, amplitude, and phase shift;
- recognize and use the reciprocal, quotient and Pythagorean identities;
- apply the sum or difference formulas and double angle formulas to find exact values and to verify trigonometric identities;
- recognize and use inverse trigonometric function notation;
- use a calculator to evaluate inverse trigonometric functions;
- find exact values of composite functions with inverse trigonometric functions;
- solve trigonometric equations over the interval (0, 2π);
- use trigonometric functions to model and solve real-life problems;
- use the Law of Sines and the Law of Cosines to solve oblique triangles;
- solve applied problems using the Law of Sines and the Law of Cosines;
- find the area of a triangle given the lengths of any two sides and the measure of the included angle: Area = (bcsin A) = (ac sin B) = (ab sin C);
- convert between linear speed and angular speed of an object moving in circular motion using the formula $v = r\omega$;
- use half-angle formulas to find exact values;

6. Sequences and Series

- find terms of sequences given the general or nth term;
- find a formula for the general or nth term of a given sequence;
- use summation notation to write a series and evaluate a series designated in summation notation;
- construct the terms of a sequence defined by a recursive formula;
- recognize and write terms of arithmetic and geometric sequences;
- use nth term formulas for arithmetic and geometric sequences to find a specified term, or to find n when an nth term is given;
- find the sum of the first n terms of arithmetic and geometric sequences;
- find the sum of an infinite geometric series, if it exists;
- use sequences and series to model and solve real-life problems;

7. Optional Topics

Conic Sections
- recognize the equations of two basic conics: circles, and parabolas;

- write the standard forms of equations of circles with centre at origin and translated centre (h, k);
- given the general form of a circle, convert to standard form by completing the square, find the centre and radius and sketch the graph;
- given the general form of a parabola, convert to standard form by completing the square, find the vertex and sketch the graph; and
- solve nonlinear systems of equations.

COURSE TOPICS:

- Prerequisites
- Equations and Inequalities
- Functions and their Graphs
- Polynomial and Rational Functions
- Exponential and Logarithmic Functions
- Trigonometric Functions
- Analytic Trigonometry
- Law of Sines and Cosines
- Systems of Equations and Inequalities
- Conic Sections
- Sequences and Series

This course meets the required outcomes for Provincial Level – Algebra and Trigonometry as stated in the ABE in BC 2019/2020 Articulation Handbook

See instructor's syllabus for the detailed outline of weekly readings, activities and assignments.

EVALUATION AND ASSESSMENT (Face-to-Face Delivery):

Assignments	% Of Total Grade
Assignments and Quizzes	30%
Unit Exams	30%
Final Exam	40%
Total	100%

EVALUATION AND ASSESSMENT (Directed Studies Delivery):

Assignments	% Of Total Grade
Assignments	30%
Unit Exams	30%
Final Exam	40%
Total	100%

Please see the instructor's syllabus for specific classroom policies related to this course, such as details of evaluation, penalties for late assignments and use of electronic aids.

EXAM POLICY:

Students must attend all required scheduled exams that make up a final grade at the appointed time and place.

Individual instructors may accommodate for illness or personal crisis. Additional accommodation will not be made unless a written request is sent to and approved by the appropriate Department Head prior to the scheduled exam.

Any student who misses a scheduled exam without approval will be given a grade of "0" for the exam.

COURSE GRADE:

Course grades are assigned as follows:

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Mark (Percent)	≥ 95	94-90	89-85	84-80	79-75	74-70	69-65	64-60	59-55	54-50	< 50

A grade of "D" grants credit, but may not be sufficient as a prerequisite for sequential courses.

ACADEMIC POLICIES:

See www.cotr.bc.ca/policies for general college policies related to course activities, including grade appeals, cheating and plagiarism.

COURSE CHANGES:

Information contained in course outlines is correct at the time of publication. Content of the courses is revised on an ongoing basis to ensure relevance to changing educational, employment and marketing needs. The instructor will endeavour to provide notice of changes to students as soon as possible. The instructor reserves the right to add or delete material from courses.