

COURSE NUMBER: MA1700

COURSE TITLE: Mathematics

COURSE DESCRIPTION:

This is a course in pre-calculus mathematics designed to help alleviate specific weaknesses in students' mathematical skills and thereby increase their chances for success in other technical courses.

PREREQUISITES: None

CO-REQUISITES: None

CREDIT VALUE: Four (4)

COURSE HOURS PER WEEK: Three (3)

LAB HOURS PER WEEK: Two (2)
Three (3) Qatar Only

SUGGESTED TEXT:

Washington, A.J. (2010). *Basic technical mathematics with calculus, SI version with SSM and My Math Lab/My Stat Lab Value pack access card* (9th ed.). Pearson Education Canada; and Washington, A.J. (2009). *Student solutions manual for basic technical mathematics with calculus* (9th ed.). New York: Addison-Wesley. ISBN-10: 0133077128; ISBN-13: 9780133077124 (This is a package prepared by Pearson)

LEARNING RESOURCES: To be determined by instructor

MAJOR TOPICS:

- 1.0 Review of Basic Algebraic Operations
- 2.0 Trigonometric Functions (Right Angle)
- 3.0 Trigonometric Functions (Any Angle)
- 4.0 Oblique Triangles
- 5.0 Systems of Linear Equations; Determinants
- 6.0 Factoring and Fractions
- 7.0 Quadratic Equations
- 8.0 Exponents and Radicals
- 9.0 Exponential and Logarithmic Functions

LEARNING OBJECTIVES:

The expected learning outcome is that the student will be able to:

1.0 Review of Basic Algebraic Operations

- 1.1 Real numbers and properties
 - 1.1.1 Define and give examples of natural numbers, integers, rational numbers, real numbers and complex numbers
 - 1.1.2 State and use the properties of real numbers
- 1.2 Signed numbers: Variable expressions
 - 1.2.1 Perform the four basic operations with signed numbers
 - 1.2.2 Evaluate expressions involving exponents and the four basic operations
 - 1.2.3 Evaluate variable expressions
- 1.3 Exponential laws
 - 1.3.1 Simplify expressions by using the laws of exponents
 - 1.3.2 Evaluate exponential expressions
- 1.4 Addition and subtraction of algebraic expressions
 - 1.4.1 Add and subtract like terms
 - 1.4.2 Simplify algebraic expressions by removing grouping symbols and collecting like terms
 - 1.4.3 Add and subtract algebraic expressions
- 1.5 Linear equations and formulas
 - 1.5.1 Solve a linear equation in one unknown
 - 1.5.2 Solve literal equations and rearrange formulas
- 1.6 Word problems
 - 1.6.1 Translate English phrases into algebraic expressions
 - 1.6.2 Solve word problems involving one unknown
 - 1.6.3 Express several unknowns in terms of one variable
 - 1.6.4 Solve word problems involving several unknowns
- 1.7 Units of measurement
 - 1.7.1 Use the metric system (SI)
 - 1.7.2 Change units (dimensional analysis)

2.0 Trigonometric Functions (Right Angle)

- 2.1 The six trigonometric functions--definitions
 - 2.1.1 Identify pairs of complementary angles and pairs of supplementary angles
 - 2.1.2 Classify angles as right, acute, obtuse or straight
 - 2.1.3 Classify triangles as scalene, equilateral, right or isosceles and state their

- properties
- 2.1.4 Use the Pythagorean Theorem to calculate the unknown length of a side in a right triangle
- 2.1.5 Classify angles as to quadrantal angles
- 2.1.6 Find the length of the radius vector to a given point
- 2.1.7 Define the six trigonometric functions for angles in standard position
- 2.1.8 Find the value of trigonometric functions of angles whose terminal side passes through a given point
- 2.2 Solution of right triangles
 - 2.2.1 Use a calculator to determine values of the sine, cosine and tangent function of angles between 0° and 90°
 - 2.2.2 Use a calculator to determine the size of an acute angle when the value of its sine, cosine or tangent function is given
 - 2.2.3 Solve right triangles
 - 2.2.4 Solve word problems involving right triangles

3.0 Trigonometric Functions (Any Angle)

- 3.1 Trigonometric functions of any angle
 - 3.1.1 Determine the signs of trigonometric functions for each quadrant
 - 3.1.2 Find the reference angle of any given angle in the coordinate system
 - 3.1.3 Evaluate trigonometric functions for any angle
 - 3.1.4 Find angle(s) θ between 0° and 360° when values of trigonometric functions are given
 - 3.1.5 Find values of trigonometric functions of the quadrantal angles 0° , 90° , 180° , 270° and 360°
- 3.2 Radian measure
 - 3.2.1 Define a radian
 - 3.2.2 Convert degrees to radians
 - 3.2.3 Convert radians to degrees
 - 3.2.4 Find values of trigonometric functions of angles in radians
 - 3.2.5 Find angle(s) θ in radians between 0 and 2π when values of trigonometric functions are given
 - 3.2.6 Use radian measure to solve problems involving arc length, area of a sector, linear and angular velocity for uniform circular motion

4.0 Oblique Triangles

- 4.1 The Sine Law
 - 4.1.1 Use the sine law to solve oblique triangles
 - 4.1.2 Use the sine law to solve applied problems involving oblique triangles
 - 4.1.3 Interpret the intercepts and the slope of a given straight line graph
- 4.2 The Cosine Law

- 4.2.1 Use the cosine law to solve oblique triangles
- 4.2.2 Use the cosine law to solve applied problems involving oblique triangles

5.0 Systems of Linear Equations; Determinants

- 5.1 Graphing linear equations
 - 5.1.1 Graph linear equations by finding the coordinates of three points
 - 5.1.2 Find the x- and y-intercepts of a straight line graph
 - 5.1.3 Find the slope of a straight line graph
 - 5.1.4 Interpret the intercepts and the slope of a given straight line graph
 - 5.1.5 Find the equation corresponding to a given straight line graph
- 5.2 Systems of linear equations in two variables
 - 5.2.1 Solve a system of linear equations in two variables using the following methods:
 - 5.2.1.1 The graphing method
 - 5.2.1.2 The substitution method
 - 5.2.1.3 The addition-subtraction method
 - 5.2.1.4 Determinants (Cramer's Rule)
- 5.3 Systems of linear equations in three variables
 - 5.3.1 Solve a system of linear equations in three variables by determinants
- 5.4 Solve word problems involving systems of equations in two and three unknowns

6.0 Factoring and Fractions

- 6.1 Factoring
 - 6.1.1 Factor multinomials with common monomial factors
 - 6.1.2 Factor certain trinomials into the product of two binomials
 - 6.1.3 Factor a "difference of two squares" into the product of two binomials
 - 6.1.4 Factor a "sum or difference of two cubes" into the product of a binomial times a trinomial
 - 6.1.5 Solve for equivalent fractions
 - 6.1.6 Multiply and divide algebraic fractions
 - 6.1.7 Add and subtract algebraic fractions
 - 6.1.8 Solve equations involving algebraic fractions
 - 6.1.9 Solve word problems involving algebraic fractional equations

7.0 Quadratic Equations

- 7.1 Solve quadratic equations by the following methods
 - 7.1.1 Factoring
 - 7.1.2 Completing the square
 - 7.1.3 Quadratic formula

7.2 Solve word problems involving quadratic equations

8.0 Exponents and Radicals

8.1 Simplify expressions with exponents

8.1.1 Use the laws of exponents to simplify algebraic expressions involving integral exponents

8.1.2 Use the laws of exponents to simplify algebraic expressions involving fractional exponents

8.2 Operations with radicals

8.2.1 Use the laws of radicals to reduce a radical to its simplest form

8.2.2 Add and subtract radicals

8.2.3 Multiply and divide radicals

8.2.4 Simplify expressions containing radicals, including "rationalizing the denominator"

9.0 Exponential and Logarithmic Functions

9.1 Definitions of exponential and logarithmic functions

9.1.1 Change expressions from exponential to logarithmic form and vice versa

9.2 Apply properties of logarithms

9.3 Evaluation of logarithmic expressions

9.3.1 Use the calculator to find common and natural logarithms

9.3.2 Check answers obtained by use of a calculator

9.3.3 Use the calculator to find antilogarithms

9.4 Solution of exponential and logarithmic equations

9.4.1 Solve certain exponential and logarithmic equations

9.4.2 Solve word problems involving exponential and logarithmic equations

EVALUATION:

Semester Examinations: 35%

Assignments: 10%

Final Examination: 55%

DATE DEVELOPED: June 1997

DATE REVIEWED: February 2014

REVISION NUMBER: 5

DATE REVISED: April 2013

Note to instructor: Check PIRS to ensure this outline is the most current version.