Basic Algebra
Course Structure
Text: Introductory Technical Mathematics, 6th Edition

Module #1 – Basic Mathematics and Algebra

Topic Unit 1:   Math and Related Symbols
a) Natural numbers, counting numbers, whole numbers, integers, "real" numbers and sets
b) Different number base systems
c) Place value
d) Convert words to numbers and numbers to words
e) Define (and use) roots and exponents
f) Use of: +, -, * or x, / or √ , x^y, !, | | and various types of brackets
g) Hand out sheet of alternate meanings

Lab/Test/Project:

Topic Unit 2: Introduction to Number Lines, Signed Numbers, Fractions, Mixed Numbers and Order of Operations
a) Number line
b) Signed numbers
c) Fractions
d) Mixed numbers
e) Order of operations
f) Scientific and Engineering Notations

Lab/Test/Project:

Topic Unit 3: Fractions, Decimals and Percentages
a) Define fractions, mixed numbers, decimals and percentages
b) Learn to convert between them
c) Arithmetic operations with fractions and mixed numbers
d) Arithmetic operations with decimals
e) Arithmetic operations with "signed numbers"
f) Arithmetic operations with percentages, including "increases" and "decreases"
g) Arithmetic operations with "taxes" and "commissions"

Lab/Test/Project:

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Topic Unit 4: Introduction to Algebra
   a) Definition and use of unknowns and variables
   b) Applications to problems
   c) "Order of Operations" of variables and equations
   d) Identify and use polynomials

   Lab/Test/Project:

Topic Unit 5: Solving Equations
   a) Combining "like terms"
   b) "One Step" Addition and Subtraction Equations – one variable
   c) "One Step" Multiplication and Division Equations – one variable
   d) "Multiple Step" combinations of the above – one variable
   e) Solve equations using Roots and Exponents – one variable
   f) Recognize and provide solutions to quadratic equations
   g) Learn how to solve two equations in two variables/unknowns

   Lab/Test/Project:

   Final Exam:

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Module #2 – Applications

Topic Unit 6: Measurement
  a) US measurement systems
   1) Length – area – volume
   2) Weight and mass
   3) Temperature
   4) Time
   5) Combinations such as speed (length / time), flow (volume / time), density
     1. (weight / volume), pressure (weight / area) (absolute and gauge) and others
   6) Miscellaneous such as viscosity, hardness, strength, very basic electrical,
     1. purities, etc.
  b) Metric measurement systems (including "prefixes")
   1) See 6.a.1-6 above

Lab/Test/Project:

Topic Unit 7: Conversions (to Industrial Problems)
  a) See 6.a.1-6 above

Lab/Test/Project:

Topic Unit 8: Accuracy of Measurements, Precision, and Tolerances
  a) Accuracy – potential sources of errors – exact numbers – measured numbers
  b) Significant digits (doubtful digit)
  c) Precision
  d) Adding (and subtracting) measured numbers
  e) Multiplying (and dividing) measured numbers
  f) Tolerances and their application to manufacturing

Lab/Test/Project:

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Topic Unit 9: Rulers, Calipers and Micrometers
   a) Rulers, measuring tapes, lasers
   b) Micrometers
   c) Pressure gauges
   d) Thermometers
   e) Voltmeters / Resistance (ohm) meters
   f) Different types of dial faces

Lab/Test/Project:

Topic Unit 10: Cartesian Graphing, Plane Geometry, and Graphs
   a) Cartesian coordinate system
   b) Locate points
   c) Graph linear equations
   d) Slope and intercept and defining an equation from the slope and intercept
   e) Calculating equations from two points
   f) Solving two linear equations graphically
   g) Types of graphs, charts and tables
   h) Reading graphs, charts and tables
   i) Making graphs, charts and tables

Lab/Test/Project:

Final Exam:

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Module # 3 – Word Problems

Topic Unit 11: Word Problems and Systems of Equations
a) Steps:
   a. Read entirely – carefully. Then re-read a second time
   b. Draw a picture, if possible
   c. Figure out what you have and what you need and make a list of each
   d. Assign names (variables) and descriptions to each
   e. Look for key words
   f. Convert keywords and numbers and variables into algebraic phrases
   g. Combine phrases into equations and then solve
   h. Verify (confirm) and check
b) Types of Problems
   a. Ages
   b. Area/Volume/Perimeter
   c. Ratios and Proportions
   d. Coins
   e. Distance
   f. Time
   g. Investment
   h. Mixtures
   i. Numbers
   j. Percents
   k. Quadratic
   l. Work
   m. Others

   Lab/Test/Project:

Topic Unit 12: Solving Various Types of Algebraic Word Problems (Ratios & Proportions, Quadratic Equations and Right Triangles)
a) See Unit 11 b) a. through m.   above

   Lab/Test/Project:

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Topic Unit 13: Rearranging, Substituting and Solving Complex Algebraic Formulas.
   a) Solving for the unknown
   b) Substituting values directly into equations
   c) Rearranging formulas
   d) Substituting values into rearranged formulas

Lab/Test/Project:

Topic Unit 14: Mathematical Application to Technical Problems
   a) Complex equations
   b) Special formulas
   c) Use of handbooks and the computer to obtain unusual kinds of data

Lab/Test/Project:

Final Exam:

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