Course Outline for MATH 71

APPLIED MATH FOR TECHNICIANS

Effective: Fall 2010

I. CATALOG DESCRIPTION:
MATH 71 — APPLIED MATH FOR TECHNICIANS — 3.00 units

This course provides a survey of mathematical techniques used in the technical trades including: Arithmetic, both by-hand and with calculator; ratios, rates and proportions; metric and U.S. systems of measurements; an introduction to linear equations; scientific notation; plane and solid geometry; and, triangle trigonometry. There is an emphasis on practical applications related to a variety of technical fields throughout.

3.00 Units Lecture

Grading Methods:
Letter or P/NP

Discipline:

	MIN
Lecture Hours:	54.00
Total Hours:	54.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

IV. MEASURABLE OBJECTIVES:
Upon completion of this course, the student should be able to:
   A. Accurately perform arithmetic calculations with whole numbers and fractions by hand;
   B. Demonstrate competence using a calculator to perform arithmetic calculations with integers, fractions and decimal numbers;
   C. Demonstrate a knowledge of the English and metric units of length, area, volume, mass, temperature and time;
   D. Solve applied problems involving arithmetic operations and measurement;
   E. Perform length, weight and capacity reductions and conversions between the English and metric systems;
   F. Evaluate and simplify formulas and expressions;
   G. Solve linear equations and formulas using the addition and multiplication principles of equality;
   H. Demonstrate a knowledge of ratios, proportions and percentages;
   I. Solve applied problems involving ratios, proportions and percentages;
   J. Apply principles of plane geometry to solve problems involving angles, areas and perimeter;
   K. Apply principles of solid geometry to solve problems involving surface area, lateral surface area and volume;
   L. Perform elementary calculations involving trigonometric ratios and radian/degree conversions;
   M. Solve triangle problems using right-triangle trigonometry, the Law of Sines or the Law of Cosines;
   N. Demonstrate an ability to accurately use measuring instruments.

V. CONTENT:
   A. Whole number arithmetic
       1. Addition, subtraction, multiplication and division of whole numbers
       2. Order of operations
       3. Applications
   B. Fraction arithmetic
       1. Addition, subtraction, multiplication and division of fractions
       2. Proper and improper fractions
       3. Mixed numbers
       4. Conversion between improper and mixed number forms
       5. Applications
   C. Decimal Arithmetic
       1. Place-value and reading and writing decimal numbers
       2. Addition, subtraction, multiplication and division of decimal numbers
       3. Fraction/decimal conversions
   D. Signed numbers and real number arithmetic
       1. Addition, subtraction, multiplication and division of signed numbers
       2. Exponents
       3. Square roots
   E. Calculator computations
       1. Arithmetic with signed real numbers (integers, fractions and decimals)
       2. Evaluating integer powers and square roots

3. Order of operations
F. Ratios, rates and proportions
   1. Writing, simplifying and interpreting ratios and rates
   2. Solving proportions
   3. Direct and inverse proportion and similar triangles
   4. Applications
G. Percentages
   1. Meaning of percent
   2. Fraction/decimal/percent conversions
   3. Solving percent equations
   4. Applications
H. Measurement
   1. Precision and accuracy of measurement figures
   2. Units of measure
   3. Addition, subtraction, multiplication and division of measurement figures to a specified degree of accuracy
   4. Accurate use of measurement scales and tools, including micrometers and calipers
I. English and metric systems of measurement
   1. English measurement system units of measure
   2. Conversions between units of measure in the English system
   3. Metric measurement system units of measure
   4. Conversions between units of measure in the metric system
   5. Converting between metric and English systems of measure
J. Introduction to algebra
   1. Evaluating and simplifying algebraic expressions
   2. Multiplication and division of algebraic expressions
   3. Linear equations
      a. Using the addition and multiplication principles of equality to solve linear equations
      b. Solving linear equations with grouping symbols
   4. Formulas
      a. Evaluation
      b. Solving a formula for a specified letter
   5. Solving applied problems by writing and solving equations
K. Scientific notation
   1. Interpreting and understanding scientific notation
   2. Converting between decimal form and scientific notation
   3. Computations in scientific notation
   4. Applications
L. Plane geometry
   1. Angles
      a. Classification
      b. Measurement
      c. Use of a protractor
      d. Angle relationships related to intersecting or parallel lines
      e. Angles in a triangle
   2. Regular and irregular polygons
      a. Area
      b. Perimeter
   3. Circles
      a. Area
      b. Circumference
   4. Applications
M. Solid geometry
   1. Surface area, lateral surface area and volume of
      a. Prisms
      b. Pyramids and frustums of pyramids
      c. Cylinders
      d. Spheres
      e. Cones and frustums of cones
   2. Applications
N. Triangle trigonometry
   1. Angle conversions
      a. Converting between degrees, minutes, seconds and decimal degrees
      b. Converting between degree and radian measure
   2. Linear and angular speed
   3. Pythagorean Theorem
   4. Trigonometric ratios
   5. Solving right triangles
   6. Solving oblique triangles
      a. Law of Sines
      b. Law of Cosines

VI. METHODS OF INSTRUCTION:
A. **Lecture** -
B. Assigned readings in the text
C. Web-based tutorials
D. Group and individual activities in class
E. Homework

VII. TYPICAL ASSIGNMENTS:
A. Homework
   1. Problems from the text should be assigned for each section covered. The number of problems assigned may vary from section to section and from instructor to instructor, but the homework assignments should include a sufficient number and variety of problems to develop both skill and conceptual understanding. A typical assignment should take an average student 1 to 2 hours for each hour in class.
   2. The majority of the problems assigned should be those for which answers are readily available (e.g., from the answer appendix in the text), so that students may obtain immediate feedback on their work.
   3. Homework assignments may include reading the text. Students may be asked to read sections in advance of the lecture and then to re-read them after the lecture, to reinforce important concepts and skills. An instructor may require written work in conjunction with the reading assignments (e.g., have students complete a Q & A sheet related to the assigned reading)

B. In-Class
1. Collaborative learning, done in small groups of 2-4 students, can be used to introduce new concepts, build skills, or teach problem solving. Students may be asked to present their results on the board.
2. Sample collaborative learning assignment: Using measurement tools such as protractors and calipers, students practice measuring a variety of objects and answer questions about precision and accuracy. Students compare answers to check the validity of their work and assist each other in using the tools.
3. Sample collaborative learning assignment: Given a to-scale drawing, students use measurement tools to determine the sizes of the figures drawn, then use ratios and proportions to convert the measurements to real-world dimensions.

VIII. EVALUATION:
A. **Methods**

1. Other:
   a. Examinations (in-class)
   b. Comprehensive final examination
   c. Any of all of the following at the discretion of the instructor
      1. Homework
      2. Quizzes (announced or unannounced, in-class or take home)
      3. Collaborative group activities
      4. Projects
B. **Frequency**

1. Recommend a minimum of four exams plus the final
2. Homework should be assigned for each section covered
3. Number of quizzes and collaborative activities are at the discretion of the instructor

IX. TYPICAL TEXTS:
1. Carman, Robert A., and Hal M. Saunders *Mathematics for the Trades.* 8th ed., Pearson-PrenticeHall, 2008.
2. Achatz, Thomas, and John G. Anderson *Technical Shop Mathematics.* 3rd ed., Industrial Press, Inc, 2005.

X. OTHER MATERIALS REQUIRED OF STUDENTS:
A. Scientific calculator, six-inch protractor-ruler