

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: TRADE CALCULATIONS

CODE NO.: ASR 105

SEMESTER: 1

PROGRAM: AIRCRAFT STRUCTURAL REPAIR

AUTHOR: G. DISANO

DATE: JUNE 1997

PREVIOUS OUTLINE DATED: MAY 1996

APPROVED:


DEAN


DATE

TOTAL CREDITS: 2

PREREQUISITE(S): GRADE 12 GENERAL MATH

LENGTH OF COURSE: 17 WEEKS

TOTAL CREDIT HOURS: 34

I. **COURSE DESCRIPTION:** This course is intended to review and reinforce the elements of basic arithmetic, algebra, geometry and trigonometry that should prove useful and relevant to aircraft structural repair work. After reviewing and perhaps in some cases being introduced to the various topics, the student will be expected to apply the concepts by solving practical applied problems as they pertain to the trade.

II. **LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

Upon successful completion of this course the student will demonstrate the ability to:

- 1) define the terms used in basic arithmetic, state the 'order of operations' and apply the rules and procedures to problem solving.
- 2) use a hand held scientific calculator.

Potential Elements of the Performance:

- 1) List the symbols for the four basic operations of mathematics: addition, subtraction, multiplication and division.
- 2) List the common signs of grouping: parentheses, brackets and braces.
- 3) Define the following terms: integer, factor or divisor, prime number, composite number, common factor or common divisor, multiple, lowest common multiple, even number, odd number, product, quotient, dividend and divisor.
- 4) State the 'order of operations' to be used when more than one operation is present in a mathematical expression.
- 5) Apply the rules and procedures to solving problems as presented in the form of exercises distributed in class.

Upon successful completion of this course the student will demonstrate the ability to:

- 1) define the various types of **common fractions** and perform mathematical operations with **common fractions**.

Potential Elements of the Performance:

- 1) Write definitions for each of the following terms: proper fraction, improper fraction and mixed number.
- 2) Reduce a common fraction to its lowest terms.
- 3) Change a whole number or a mixed number to an improper fraction and vice versa.

- 4) Determine the lowest common denominator for two or more fractions.
- 5) Demonstrate an ability to perform the following mathematical operations involving fractions: addition, subtraction, multiplication, and division.
- 6) Demonstrate an ability to simplify mathematical expressions with fractions that involve addition, subtraction, multiplication and division, and signs of grouping.
- 7) Demonstrate a proficiency in the use of fractions by solving problems selected from Section 1, Units 1 to 7 in the text book. In addition, exercise sheets containing relevant problems may be distributed in class.

Upon successful completion of this course the student will demonstrate the ability to:

- 1) perform mathematical operations with **decimal fractions** and convert decimal fractions to common fractions and percents.

Potential Elements of the Performance:

- 1) Demonstrate an ability to perform the following mathematical operations involving decimal fractions: addition, subtraction, multiplication and division.
- 2) Given a decimal fraction, round it off to a specified degree of 'accuracy' and 'precision'.
- 3) Convert a common fraction to a decimal fraction and vice versa.
- 4) Use a table of decimal equivalents to determine the fractional equivalent of a given decimal fraction and the decimal equivalent of a given common fraction.
- 5) Apply the rules and procedures to solving problems as presented in the form of exercises distributed in class.
- 6) Demonstrate a proficiency in the use of decimal fractions by solving problems selected from Section 1, Units 8 to 16 and unit 18 in the text book. In addition, exercise sheets containing relevant problems may be distributed in class.

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Upon successful completion of this course the student will demonstrate the ability to:

- 1) work with ratios and proportions as they pertain to problems relating to aircraft structural repair work in addition to other applications such as density, specific gravity and the conversion of units of measure.

Potential Elements of the Performance:

- 1) Explain what is meant by a 'ratio'.
- 2) Explain what is meant by a 'proportion'.
- 3) Explain what is meant by and give several examples of 'direct proportions'.
- 4) Explain what is meant by and give several examples of 'inverse proportions'.
- 5) Write a verbal definition of, and a mathematical equation or formula for, the concept of 'density'.
- 6) Apply the principles of ratio and proportion to the solution of problems involving density.
- 7) Write a verbal definition of, and a mathematical equation or formula for, the concept of 'specific gravity'.
- 8) Use the principles of ratio and proportion to convert units of measure.
- 9) Demonstrate a proficiency in the use of ratio and proportion by solving problems selected from Section 6, Units 49 to 52 in the text book. In addition, exercise sheets containing relevant problems may be handed out.
- 10) Participate in a class discussion review of fractions, decimals, percentages and ratio and proportion.

Upon successful completion of this course the student will demonstrate the ability to:

- 1) solve problems involving units in the 'Imperial system of measurement'.
- 2) solve problems involving units in the 'S.I. metric system of measurement'.
- 3) convert units from the Imperial system of measurement to the S.I. metric system of measurement and vice versa making use of conversion tables and a knowledge of ratio and proportion.
- 4) distinguish between the two terms 'accuracy' and 'precision' when it comes to measurements.

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- 5) determine the accuracy and the precision of a given measurement.
- 6) add and subtract measurements keeping in mind the rules regarding accuracy and precision.
- 7) multiply and divide measurements keeping in mind the rules regarding accuracy and precision.

Potential Elements of the Performance:

- 1) List the 3 most commonly used systems of units in use in science, engineering and manufacturing.
- 2) Define 'base' quantities and list the 7 base quantities.
- 3) List the 3 "most common" base quantities.
- 4) State the units and the proper abbreviation for the 3 most common base quantities in each of the three systems of units.
- 5) Define 'derived' quantities and list at least a dozen examples of derived quantities.
- 6) List the S.I. metric prefixes along with their proper abbreviation and mathematical meanings in descending order from 'tera' to 'femto'.
- 7) Set up tables of metric length measurement, area measurement, "dry" volume measurement, "fluid" volume measurement and mass measurement. Each table will illustrate the unit, its abbreviation and meaning for the prefixes from 'kilo' to 'milli'.
- 8) Demonstrate an ability to perform the following mathematical operations involving measured quantities in both the S.I. metric system and the Imperial system of measurement: addition, subtraction, multiplication and division.
- 9) Given access to the proper conversion factors convert units of measurement in the S.I. metric system and the Imperial system and across the two systems.
- 10) Demonstrate a proficiency in the use of both S.I. metric and Imperial systems of measurement by solving problems selected from Section 2, Units 21 to 24 in the text book. In addition, exercise sheets containing relevant problems may be handed out.

Upon successful completion of this course the student will demonstrate the ability to:

- 1) add, subtract, multiply and divide 'signed numbers'.
- 2) deal with expressions containing 'exponents'.

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- 3) solve simple equations for a stated 'variable'.
- 4) apply the concepts above to the solution of formulas that are commonly encountered in the field of aircraft structural repair.

Potential elements of the performance:

- 1) Explain what is meant by a 'signed number'; the need for negative numbers; and how positive and negative numbers may be represented.
- 2) Demonstrate an ability to perform the following mathematical operations involving signed numbers: addition, subtraction, multiplication and division.
- 3) Explain what is meant by an 'exponent' and be able to perform mathematical operations involving expressions containing exponents.
- 4) Given a simple equation, demonstrate an ability to solve the equation for a specified variable in the equation.
- 5) Demonstrate a proficiency in the use of basic algebra by solving problems selected from Section 5, Units 39 to 48 in the text book. In addition, exercise sheets containing relevant problems may be handed out.

Upon successful completion of this course the student will demonstrate the ability to:

- 1) construct the various geometric surfaces that are used for layout exercises related to aircraft structural repair work.
- 2) solve for the 'perimeter' (or 'circumference'), area and volume of the following geometric shapes given the appropriate equation: circle, square, rectangle, triangle, trapezoid, cube, rectangular solid, cylinder, sphere and cone.
- 3) work with units of angular measure by making certain constructions using a 'protractor'.
- 4) explain the meaning of certain 'bend layout' terms and perform 'bend allowance' calculations.

Potential Elements of the Performance:

- 1) Given a certain geometric surface, using only ruler, compass and protractor, draw the surface.
- 2) Given the appropriate equations, solve for the circumference of circles, and the perimeter of squares, rectangles and triangles of stated dimensions.

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- 3) Given the appropriate equations, calculate the areas of circles, squares, rectangles, triangles and trapezoids of stated dimensions.
- 4) Given the corresponding equations, determine the volumes of cubes, rectangular solids, cylinders, spheres and cones of given dimensions.
- 5) Demonstrate a proficiency in using the protractor by working with units of angular measure in making certain constructions.
- 6) Perform bend allowance calculations.
- 7) Demonstrate a proficiency in the use of basic geometry by solving problems selected from Section 4, Units 31 to 38 in your text book. In addition, exercise sheets containing trade relevant problems may be handed out.

Upon successful completion of this course the student will demonstrate the ability to:

- 1) list and state the relationships between the different units for measuring angles.
- 2) list and state the meaning of the six trigonometric functions.
- 3) state the Pythagorean theorem.
- 4) solve 'right-angled-triangle' problems.
- 5) state the 'cosine law' for non right-angled triangles.
- 6) state the 'sine law' for non right-angled triangles.

Potential Elements of the Performance:

- 1) Apply the concepts listed above by solving problems from Section 11, Units 87 to 91 in the text book.
- 2) Apply the concepts listed above by solving trade related problems supplied on exercise sheets handed out in class.

- III. TOPICS:**
- 1) INTRODUCTION TO ARITHMETIC
 - 2) COMMON FRACTIONS
 - 3) DECIMAL FRACTIONS
 - 4) RATIO AND PROPORTION
 - 5) MEASUREMENT
 - 6) BASIC ALGEBRA
 - 7) GEOMETRY
 - 8) TRIGONOMETRY

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

- 1) Mathematics for Sheet Metal Fabrication. Delmar Publishers Inc. Albany, New York. 1970. ISBN 0-8273-0295-9
- 2) Scientific Calculator - available in the Sault College Campus Shop
- 3) Mathematical Set - available in the Sault College Campus Shop

V. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:

- 1) Palmer and Mrachek, Practical Mathematics, Seventh edition. McGraw-Hill Book Company. Toronto. 1986. ISBN 0-07-048254-3

VI. EVALUATION PROCESS/GRADING SYSTEM:

See attached sheet titled: GRADE REQUIREMENTS - Page 10

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VII. SPECIAL NOTES:

- Special Needs

If you are a student with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities), you are encouraged to discuss required accommodations with the instructor and/or contact the Special Needs Office, Room E1204, Ext. 493, 717, or 491 so that support services can be arranged for you.

- Retention of Course Outlines

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other post-secondary institutions.

- Disclaimer for Meeting the Needs of the Learners

Your instructor reserves the right to modify the course content and grading scheme as he/she deems necessary to meet the needs of the students and to respond appropriately to unforeseen circumstances.

- Substitute Course Information is available at the Registrar's Office

VIII PRIOR LEARNING ASSESSMENT

Students who wish to apply for advanced credit in the course should consult with the instructor. Credit for prior learning will be given depending upon the results of the successful completion of the following:

College Mathematics Placement Test.

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GRADE REQUIREMENTS

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(Aircraft Structural Repair)

Your final grade in ASR 105 will be determined on the basis of four tests to be administered during the semester. Each test will examine your knowledge of a number of topics and will be administered within one week of completing those topics. The topics covered in each of the four tests are as follows:

Test #1 ---- Topics Number I, Number II and Number III

Test #2 ---- Topics Number IV and Number V

Test #3 ---- Topics Number VI and Number VII

Test #4 ---- Topic Number VIII

The four tests are of equal weight (i.e. each of the four tests is worth 25% of your final grade). As a result, provided you have received a passing grade in each of the four tests, your final grade will simply be an average of the four test results. In order to obtain your letter grade the following percentage-letter grade equivalents will be used:

A+ : 90% - 100% (Consistently outstanding achievement)

A : 80% - 89% (Outstanding achievement)

B : 70% - 79% (Consistently above average achievement)

C : 55% - 69% (Satisfactory or acceptable achievement)

X or R : 0% - 54% ('Incomplete' or 'Repeat')

If your final average is below 55%, or if you have received a failing grade in one or more of the unit tests, whether you receive an 'X' (Incomplete) or an 'R' (Repeat) grade is entirely at the instructor's discretion. The decision will be based upon your **final average** (e.g. 32% would result in an R grade while 50% might result in an X grade); your **attendance** during the semester; your **attitude** while in the classroom; your **perceived level of effort** during the semester; etc..

In any case, should you find yourself with an X grade at the end of the semester, in order to upgrade your mark to a passing grade you will be required to write a "**make-up**" examination covering the entire course content. Should you receive a passing grade on the make-up examination (55% or higher) your X grade will be upgraded. **The best you can do after receiving an X grade as a result of a failing average is a C!** If your were required to write the supplemental examination as a result of having failed one test you may substitute the exam result for this test result.

Prior to administering any test you will be notified a full week in advance. Should you, for any reason, not be able to be in attendance on a day for which a test has been scheduled it is your responsibility to notify the instructor prior to the test! If your reasons are acceptable a date will be set during which you may write a **substitute** test for the one you have missed.

G. Disano, June 1997