

MATH 145 ANALYTICAL MATH

COURSE DESCRIPTION

Prerequisites: MAT 80 or MAT 122

Corequisites: None

This course is designed to develop problem solving and reasoning skills by the study of selected areas of mathematics. Topics include elementary and Boolean algebra, sets, logic, number theory, numeration systems, probability, statistics, and linear programming. Upon completion, students should be able to apply logic and other mathematical concepts. *This course has been approved to satisfy the Comprehensive Articulation Agreement for transferability as a pre-major and/or elective course requirement.* Course Hours Per Week: 3; Semester Hours Credit: 3.

LEARNING OUTCOMES:

1. Students will be able to perform conversions between different systems of numeration. Students will display proficiency by demonstrating the following competencies.
 - a. Count integers in non-decimal numbering systems such as binary, octal, and hexadecimal.
 - b. Convert decimal integers to binary, octal, and hexadecimal numbers.
 - c. Convert decimal fractions to binary, octal, and hexadecimal fractions.
 - d. Convert integers in binary, octal, and hexadecimal to decimal numbers.
 - e. Convert integers in binary, octal, and hexadecimal to decimal fractions.
 - f. Add numbers in binary, octal, and hexadecimal systems.
 - g. Subtract numbers in binary, octal, and hexadecimal systems.
 - h. Multiply numbers in binary, octal, and hexadecimal systems.
 - i. Divide numbers in binary, octal, and hexadecimal systems.
 - j. Understand codes based on binary numbers including BCD, Excess 3, Gray, Error Detecting Codes, ASCII code, and EBCDIC code.

2. Students will be able to use logical operators to perform operations on expressions and to evaluate logical expressions and arguments. Students will display proficiency by demonstrating the following competencies.
 - a. Understand logic operations such as: **AND, OR, NOT, NAND, NOR, XOR, and XNOR.**
 - b. Know Boolean postulates and DeMorgan's theorem.
 - c. Use truth tables in proving or disproving the equality of Boolean expressions.
 - d. Know the difference between sum-of-product and product-of-sum Boolean expressions.
 - e. Convert expressions between sum-of-product form and product-of-sum form.
 - f. Use Karnaugh maps to simplify Boolean expressions.

3. Students will be able to apply concepts of probability and statistics to solve practical problems. Students will display proficiency by demonstrating the following competencies.
 - a. Calculate simple probability as a ratio, fraction, decimal, or percentage.
 - b. Use statistical graphs to determine probability.

OUTLINE OF INSTRUCTION

- I. Non-decimal number systems
 - A. The need for non-decimal systems
 - B. Counting in non-decimal systems
- II. Conversion between different bases
 - A. Convert decimal integers to binary, octal, and hexadecimal numbers.
 - B. Convert decimal fractions to binary, octal, and hexadecimal fractions.
 - C. Convert integers in binary, octal, and hexadecimal to decimal numbers.
 - D. Convert integers in binary, octal, and hexadecimal to decimal fractions.
 - E. Direct conversions between binary, octal, and hexadecimal systems.
- III. Binary codes
 - A. 8421 code
 - B. 4221 code
 - C. 5421 code
 - D. XS3 code
 - E. Gray code
 - F. Error correcting code
- IV. Alphanumeric Codes
 - A. ASCII code
 - B. EBCDIC code
- V. Arithmetic operations in non-decimal systems
 - A. Add and subtract numbers in binary, octal, and hexadecimal systems.
 - B. Multiply and divide numbers in binary, octal, and hexadecimal systems.
- VI. Basic logic operations
 - A. AND
 - B. OR
 - C. NOT
 - D. NAND
 - E. NOR
 - F. XOR
 - G. XNOR
 - H. Flip Flops

- VII. Boolean laws and DeMorgan's theorem
 - A. Boolean Laws
 - B. DeMorgans Theorem
 - C. Reducing Boolean expressions using Boolean theorems
 - D. Use of truth tables in proving or disproving the equality of Boolean expressions

- VIII. Maxterm and minterm expressions
 - A. Definition of maxterm and minterm expressions
 - B. Converting between maxterm and minterm expressions

- IX. Karnaugh mapping
 - A. Entering data into a map
 - B. Looping
 - C. Reading Karnaugh maps to reduce Boolean expressions
 - D. Don't care conditions

- X. Statistics
 - A. Statistical graphs
 - B. Measures of central tendency

Text to be selected by instructor.

STATEMENT OF DISABILITIES ACCOMMODATION:

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 686-3652 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.