



Course Number
MAT 120

Course Title
Math for Liberal Arts

Credits
3

Hours:
Lecture/Lab/Other
3 Lecture

Co- or Pre-requisite
MAT 037 or MAT 042 or Multiple Measures Placement

Implementation Semester & Year
Spring 2022

Catalog description:

Primarily for students in non-scientific/non-technical majors, emphasizes mathematical systems, reasoning, and mathematical structures. Includes sets, symbolic logic, numeration systems, number systems in other bases, growth models, and geometric structures.

General Education

Category:

Goal 2: Mathematics

Course coordinator:

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Required texts & Other materials:

- MyLab Math with Pearson eText -- Access Card -- for A Survey of Mathematics with Applications (18-Weeks) Edition: 11th: ISBN: 9780135740330
- Scientific Calculator

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Represent and organize concepts in mathematical symbols. [Supports ILG #2]
2. Demonstrate comprehension of algorithms and axioms. [Supports ILG #2, 11]
3. Analyze, represent, and solve problems in logic, set theory, and group theory. [Supports ILG #2, 11]
4. Recognize and apply the characteristics of a mathematical structure. [Supports ILG #2, 11]
5. Appreciate the development of mathematical systems throughout history. [Supports ILG #2]
6. Understand the close relationship between logic and set theory. [Supports ILG #2, 11]
7. Apply the rules of logic to understanding advertisements in newspapers, magazines, and TV. [Supports ILG #2, 11]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills to understand, analyze, or apply information or solve problems.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **Set Theory [Supports Course SLOs #1, 2, 3]**

Learning Objectives

The student will be able to:

- Recognize, explain, and use basic set notation.
- Explain and discuss the cardinality of a set and its subsets.
- Determine the number of subsets a set has and write the subsets of the given set.
- Explain the difference between equal sets and equivalent sets.
- Perform the set operations of complement, intersection, union and set difference.
- Explain the relationships among the sets of natural number, whole numbers, integers, and rational numbers.
- Visualize sets in a Venn diagram and determine the regions in the diagram that represent a given set of operations.
- Analyze a survey problem by making a Venn diagram and answering questions related to the survey.
- Understand and apply De Morgan's Laws for sets.
- Prove that a given set is infinite by showing a one-to-one correspondence between the set and proper subset of itself.
- Explain the difference between number and a numeral.

Unit II **Logic [Supports Course SLOs #1, 2, 3, 4, 6, 7]**

Learning Objectives

The student will be able to:

- Determine if a given sentence is a simple or compound proposition.
- Negate simple propositions and quantified propositions.
- Translate propositions from words into symbolic form and vice versa.
- Know the basic rules of logic – negation, conjunction, disjunction, conditional and biconditional – and apply them to determine the truth value of a given proposition.
- Construct truth tables to determine the conditions under which a symbolic proposition is true or false.
- Determine the converse, inverse and contrapositive of a given implication.
- Know and recognize De Morgan's Laws for logic and how they are related to sets.
- Recognize various ways of rewriting an implication.
- Determine if a given proposition is a tautology, self-contradiction, or neither.
- Know and apply the Laws and Fallacies of symbolic arguments.
- Determine if an argument is valid or invalid by truth table, symbolic arguments, or Euler diagrams.

Unit III **Numeration Systems [Supports Course SLO #1, 2, 4, 5, 7]**

Learning Objectives

The student will be able to:

- Recognize and explain the difference among additive, multiplicative, ciphered, and positional value systems.
- Interpret and write numerals in Early Egyptian, Roman, Chinese, Ionic Greek, Babylonian, and Mayan numeration systems.

- Understand the numeration system used today as the Hindu-Arabic as compared to early mathematical systems.
- Convert base 10 numerals to other bases and vice versa.
- Convert numerals in bases other than 10 to another base.
- Perform operations of addition, subtraction, multiplication, and division in any base.

Unit IV **Mathematical Systems [Supports Course SLO #1, 3, 4]**

Learning Objectives

The student will be able to:

- Define a mathematical system.
- Identify the properties of groups and abelian groups.
- Use clock arithmetic to calculate values in application problems.
- Find equivalence classes in modular systems.
- Determine if two numbers are equivalent in a modular system.
- Perform operations with modular arithmetic.

Evaluation of student learning:

All course student learning outcomes will be assessed by the following activities. Test and quiz questions will be selected to evenly assess all expected outcomes.

Grades will be assigned as detailed below:

Tests (4)	60%
Projects (3)	20%
Homework and Quizzes	20%