Syllabus

MAT 101 Mathematics for Liberal Arts

General Information

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Department Mathematics

Course Prefix MAT

Course Number 101

Course Title Mathematics for Liberal Arts

Course Information

Catalog Description This course is intended for the liberal arts student. The purpose of this course is to share the excitement and enjoyment of contemporary mathematical thinking. The course answers the question, "What do mathematicians do, practice, or believe in?" The use of mathematics in areas of business and industry, politics, networking and telecommunication will be studied with the intent to develop reasoning ability, logical thinking, critical reading, and written and oral communication. The topics are selected so that they are self-contained.

Credit Hours 3

Lecture Contact Hours 3

Lab Contact Hours 0

Other Contact Hours 0

Grading Scheme Letter

Prerequisites

None

Co-requisites

None

First Year Experience/Capstone Designation

This course DOES NOT satisfy the outcomes applicable for status as a FYE or Capstone.

SUNY General Education

This course is designated as satisfying a requirement in the following SUNY Gen Ed category
Mathematics (and Quantitative Reasoning)

FLCC Values

Institutional Learning Outcomes Addressed by the Course
Inquiry and Interconnectedness

Course Learning Outcomes

Course Learning Outcomes

1. Understand and execute algorithms to navigate through and solve problems.
2. Via the topics studied throughout the course, make connections between the historical context and applications to current society.
3. Describe and use the process of abstraction to model real world problems.
4. Evaluate obtained results for reasonableness.

Outline of Topics Covered

The following three topics are mandatory for this course:

1. Voting Theory and Weighted Voting
    a. Preference Schedules
    b. Fairness Conditions and Arrow's Impossiblity Theorem
    c. Voting Methods: Plurality, Instant Runoff, Borda Count, Copeland's
    e. Weighted Voting Systems
    f. Banzhaf and Shapley-Shubik Power Indices

2. Graph Theory
    a. Graphs, Vertices and Edges
    b. Shortest Path, Dijkstra's Algorithm
    c. Euler Circuits and Eulerization
    d. Hamilton Paths and Circuits
    e. Weighted Graphs and the Traveling Salesperson Problem
    e. Spanning Trees

3. Modular Arithmetic with Applications to Cryptography
    a. Substitution ciphers, the Caesar cipher
    b. Modular arithmetic, and modular formulas for the Caesar cipher
    c. Transposition ciphers and modular formulas for them
    d. Public key encryption and RSA

Each section of this class must cover at least two topics selected from the following list. Selection may be made based on instructor preferences or student interest. More than two of these topics may be covered if time permits.

4. Scheduling
    a. Digraphs
    b. Priority Lists and List Processing Algorithms
    c. Critical Path Algorithms

5. Apportionment and Fair Division
    a. Apportionment Criteria and Issues
    b. Apportionment Methods: Hamilton's, Jefferson's, Webster's, Huntington-Hill, Lownde's
    c. Fair Division Methods: Divider-Chooser, Lone Divider, Last Diminisher, Sealed Bids

6. Set Theory
    a. Set Terminology (set, elements, subsets)
    b. Set Operations (union, intersection, complement)
    c. Set Cardinalities
    d. Venn Diagram representations of sets

7. Counting Systems
    a. Roman numerals
    b. Incan quipu
    c. Mayan numerals
    d. Hindu-Arabic (place value) number system
    e. Alternative base place value systems

8. Fractals
    a. Self-similarity and Iterated Fractals

    b. Fractal dimension
    c. Complex numbers and the the complex plane
    d. The Mandelbrot set

9. Symbolic Logic
    a. Boolean logic and operations (conjunction, disjunction, negation, conditionals)
    b. Truth tables
    c. Quantifiers and predicates
    d. Arguments and fallacies

10. Game Theory
    a. Modeling using games, game matrices
    b. Symmetric and asymmetric information
    c. Alternate move and simultaneous move games
    d. Zero sum and non-zero sum games
    e. Nash equilibria
    f. The Prisoner’s dilemma