

# MATH 44: MATH FOR THE LIBERAL ARTS

## Foothill College Course Outline of Record

Heading	Value
<b>Units:</b>	5
<b>Hours:</b>	5 lecture per week (60 total per quarter)
<b>Prerequisite:</b>	MATH 105 or equivalent.
<b>Advisory:</b>	Demonstrated proficiency in English by placement via multiple measures OR through an equivalent placement process OR completion of ESLL 125 & ESLL 249.
<b>Degree &amp; Credit Status:</b>	Degree-Applicable Credit Course
<b>Foothill GE:</b>	Area V: Communication & Analytical Thinking
<b>Transferable:</b>	CSU/UC
<b>Grade Type:</b>	Letter Grade (Request for Pass/No Pass)
<b>Repeatability:</b>	Not Repeatable

## Student Learning Outcomes

- Students will apply Polya's problem-solving method to solve problems from a variety of qualitative contexts. They will select, construct, and use mathematical models, identifying salient features of particular phenomena and interpreting and justifying the reasonableness of their results.
- Students will develop conceptual understanding of Polya's problem-solving method. They will demonstrate this understanding by communicating/presenting their thinking on each of the four steps: Understanding, planning, acting, checking.
- Students will investigate particular phenomena analytically, numerically, graphically, and verbally.

## Description

A survey of mathematical models and other tools to introduce the nonspecialist to the methods of quantitative reasoning. Problem solving by Polya's method with analytic, numeric, graphical, and verbal investigation. Selecting, constructing, and using mathematical models. Interpreting quantitative results in qualitative context. Emphasis on deductive reasoning and formal logic; algebraic, exponential, logarithmic, and trigonometric models; probability and the normal distribution; data analysis; and selected topics from discrete math, finite math, and statistics.

## Course Objectives

The student will be able to:

- Use Polya's problem-solving method.
- Practice sound logical reasoning and identify common errors in logic.
- Express quantitative ideas in accurate mathematical language and notation.
- Investigate problems analytically, numerically, graphically, and verbally.
- Identify salient quantitative features of particular phenomena.

- Select appropriate mathematical functions to model particular phenomena.
- Construct mathematical models appropriate to given problems.
- Justify the selection and construction of a particular mathematical model.
- Use mathematical models accurately.
- Interpret the output of a mathematical model in qualitative context.
- Justify the reasonableness of a mathematical outcome in qualitative context.

## Course Content

- A Brief History of Mathematics
  - Early Mathematics
  - Contributions From Different Cultures
- Review of Basic Mathematical Concepts
  - Basic Rules
  - Percentages
  - Prime Numbers and Factorization
  - Greatest Common Factor
  - Rationals and Irrationals
  - Binary Arithmetic
- Applications of Powers and Geometric Sequences
  - Applications of Powers
  - Half-lives
  - Compound Interest
  - IRAs/Annuities-Present and Future Value
  - Geometric Series
- Areas and Volumes
  - Areas
  - Volumes
  - Surface Area of a Solid
- Galilean Relativity
  - Displacement and Velocity Vectors
  - Doppler Effect
  - Components of Vectors
- Special Relativity
  - Simultaneity and Einstein's Postulates
  - Time Dilation
  - Length Contraction
- Probability
  - Single Events
  - Joint or Compound Events
  - Conditional Events
- Reasoning with Formal Logic
  - Truth Tables
  - Entailment
  - Converse, Inverse, and Contrapositive
  - Counterexamples
  - Errors in Logic
- Developing and Using Mathematical Models
  - Power Functions and Polynomial Models
  - Exponential and Logarithmic Models
  - Trigonometric Models of Periodic Phenomena
  - Probabilistic Models
  - The Normal Distribution
  - Other Selected Models
- Choosing Appropriate Mathematical Models
  - Polya's Method
  - Data Analysis
  - Pattern Matching
  - Rates of Change

- 5. Other Model Selection Criteria
- K. Applying Mathematical Models to Selected Applications
  - 1. Growth and Decay
    - a. Carbon Dating
    - b. Isotope Storage
    - c. Drug Metabolism
    - d. Time of Death
  - 2. Periodic Phenomena
    - a. Hours of Daylight
    - b. Tides
    - c. Temperature Fluctuation
    - d. Orbital Mechanics
    - e. Acoustic Waves
    - f. Electrical Currents
  - 3. Logarithmic Scales
    - a. Richter Scale for Earthquake Magnitude
    - b. Decibel Scale for Sound Intensity
    - c. pH scale for Chemical Acidity
  - 4. Biological Populations
  - 5. Voting and Apportionment Problems
  - 6. Financial Applications
    - a. Economic Utility
    - b. Compound Interest
    - c. Present and Future Values
    - d. Depreciation
    - e. Resource Allocation
  - 7. Risk Analysis
    - a. Public Health Policies
    - b. Medical Decision-Making
  - 8. Other Applications

## Lab Content

Not applicable.

## Special Facilities and/or Equipment

Graphing calculator

## Method(s) of Evaluation

- A. Homework
- B. Class Participation
- C. Term paper(s)
- D. Presentation(s)
- E. Computer Lab Assignment(s)
- F. Quizzes
- G. Unit Exam(s)
- H. Proctored Comprehensive Final Examination

## Method(s) of Instruction

Lecture, Discussion, Cooperative learning exercises.

## Representative Text(s) and Other Materials

Bello, Ignacio, et. al. Topics in Contemporary Mathematics. 10th ed. Houghton Mifflin, 2013. ISBN 9781133107422

Aufmann, Richard N., et. al. Mathematical Excursions. 3rd ed. Houghton Mifflin, 2014. ISBN 9781285454221

## Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Homework Problems: Homework problems covering subject matter from text and related material ranging from 30-60 problems per week. Students will need to employ critical thinking in order to complete assignments.

B. Lecture: Five hours per week of lecture covering subject matter from text and related material. Reading and study of the textbook, related materials and notes.

C. Projects: Student projects covering subject matter from textbook and related materials. Projects will require students to discuss mathematical problems, write solutions in accurate mathematical language and notation and interpret mathematical solutions. Projects may require the use of a computer algebra system such as Mathematica or MATLAB.

D. Worksheets: Problems and activities covering the subject matter. Such problems and activities will require students to think critically. Such worksheets may be completed both inside and/or outside of class.

## Discipline(s)

Mathematics