MATH 44: MATH FOR THE LIBERAL ARTS

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2022
Units:	5
Hours:	5 lecture per week (60 total per quarter)
Prerequisite:	Intermediate Algebra or equivalent.
Advisory:	Demonstrated proficiency in English by placement via multiple measures OR through an equivalent placement process OR completion of ESLL 125 & ESLL 249.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Area V: Communication & Analytical Thinking
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Students will apply PolyaÕs 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 PolyaÕs 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:

1. Use Polya's problem-solving method.
2. Practice sound logical reasoning and identify common errors in logic.
3. Express quantitative ideas in accurate mathematical language and notation.
4. Investigate problems analytically, numerically, graphically, and verbally.
5. Identify salient quantitative features of particular phenomena.
6. Select appropriate mathematical functions to model particular phenomena.
7. Construct mathematical models appropriate to given problems.
8. Justify the selection and construction of a particular mathematical model.
9. Use mathematical models accurately.
10. Interpret the output of a mathematical model in qualitative context.
11. Justify the reasonableness of a mathematical outcome in qualitative context.

Course Content

1. A brief history of mathematics
   a. Early mathematics
   b. Contributions from different cultures
2. Review of basic mathematical concepts
   a. Basic rules
   b. Percentages
   c. Prime numbers and factorization
   d. Greatest common factor
   e. Rationals and irrationals
   f. Binary arithmetic
3. Applications of powers and geometric sequences
   a. Applications of powers
   b. Half-lives
   c. Compound interest
   d. IRAs/annuities—present and future value
   e. Geometric series
4. Areas and volumes
   a. Areas
   b. Volumes
   c. Surface area of a solid
5. Galilean relativity
   a. Displacement and velocity vectors
   b. Doppler effect
   c. Components of vectors
6. Special relativity
   a. Simultaneity and Einstein's postulates
   b. Time dilation
   c. Length contraction
7. Probability
   a. Single events
   b. Joint or compound events
   c. Conditional events
8. Reasoning with formal logic
   a. Truth tables
   b. Entailment
   c. Converse, inverse, and contrapositive
   d. Counterexamples
   e. Errors in logic
9. Developing and using mathematical models

a. Power functions and polynomial models
b. Exponential and logarithmic models
c. Trigonometric models of periodic phenomena
d. Probabilistic models
e. The normal distribution
f. Other selected models

10. Choosing appropriate mathematical models
    a. Polya's method
    b. Data analysis
    c. Pattern matching
    d. Rates of change
    e. Other model selection criteria
11. Applying mathematical models to selected applications
    a. Growth and decay
        i. Carbon dating
        ii. Isotope storage
        iii. Drug metabolism
        iv. Time of death
    b. Periodic phenomena
        i. Hours of daylight
        ii. Tides
        iii. Temperature fluctuation
        iv. Orbital mechanics
        v. Acoustic waves
        vi. Electrical currents
    c. Logarithmic scales
        i. Richter scale for earthquake magnitude
        ii. Decibel scale for sound intensity
        iii. pH scale for chemical acidity
    d. Biological populations
    e. Voting and apportionment problems
    f. Financial applications
        i. Economic utility
        ii. Compound interest
        iii. Present and future values
        iv. Depreciation
        v. Resource allocation
    g. Risk analysis
        i. Public health policies
        ii. Medical decision-making
    h. Other applications

Lab Content

Not applicable.

Special Facilities and/or Equipment

Graphing calculator

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Homework
Class participation
Term paper(s)
Presentation(s)
Computer assignment(s)
Quizzes
Unit exam(s)
Proctored comprehensive final examination

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture
Discussion
Cooperative learning exercises

Representative Text(s) and Other Materials

Aufmann, Richard N., et al.. Mathematical Excursions, 4th ed.. 2018.

Bello, Ignacio, et al.. Topics in Contemporary Mathematics, 10th ed. (ISBN: 9781133107422). 2013.

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

1. 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.
2. Five hours per week of lecture covering subject matter from text and related material. Reading and study of the textbook, related materials and notes.
3. 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.
4. 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