Delta College
MTH 118W 4 credits

Note, bolded emphasis is mine (T. Allen).

Couse Description Prerequisite: MATH LEVEL 4. Provides a course for students majoring in fields that do not have a specific mathematics requirement. **Emphasizes practical applications of mathematics,** problem solving, and the communication of mathematics. Includes core **topics in Finance, Probability, Statistics, and Geometry. Integrates measurement in the geometry topic, and infuses algebra throughout** all topics. A minimum of **4 additional topics will be selected** from Economics, Calculus, Graph Theory, Set Theory, Game Theory, Number Theory, Logic, Voting, Apportionment, Combinatorics, Linear Programming, or other approved topics. A GRAPHING CALCULATOR IS REQUIRED. (60-0)

- Math level 4 is the beginning algebra level.
- W after 118, designates a writing emphasis throughout the course
- While there are "hand" calculations, using technology as a tool is used throughout the course

Objectives of the course
The core areas:

Students will apply the basic concepts and formulas of mathematical finance.
Objectives:
A Apply the concepts and formulas of compound interest, simple interest and future value and present value annuities.

B Model a scenario for wealth accumulation.

C Work with amortization tables.

D Explore the brilliant human invention of compound interest and exponential growth.

Students will apply the basic concepts of statistics.
Objectives:
A Present data using statistical graphs: stem and leaf plots, bar graphs, histograms, line graphs, circle graphs, and box and whisker plots.

B Interpret several types of graphs.

C Summarize data using the following measures of central tendency: mode, median, and mean.

D Summarize data using the following measures of dispersion: standard deviation, variance and range.

E Apply and interpret percentiles.

F Describe features of a normal distribution.

Students will apply the basic concepts of elementary probability.
Objectives:
A Use sample spaces to show possible outcomes and calculate probabilities.

B Use a tree diagram to represent the outcomes in a sample space and calculate probabilities.

C Compute probabilities in a binomial experiment.

D Determine the odds in favor of or against an event occurring.

E Compute the expected value of an event.

F Determine whether two events, A and B, are dependent or independent.

G Determine whether two events, A and B, are mutually exclusive.

H Compute compound probabilities, that is P(A and B) or P(A or B).

Students will investigate and apply several concepts in geometry.
Objectives:
A Find the area of rectangles, squares, parallelograms, triangles, and circles.

B Find the perimeter of any given polygon and the circumference of any given circle.

C Find the volume of rectangular solids, cylinders, cones, and spheres.

D Find the surface area of rectangular solids and cylinders.

E Explore and describe the numerical and geometric patterns that occur in art and nature.

F Perform conversions in various systems of measurement.

G Work with English and Metric systems of measurement.

H Convert between Celsius and Fahrenheit.

Students will communicate effectively about mathematics.
Objectives:
A Provide complete written solutions to problems using appropriate terminology.

B Articulate important ideas and conclusions in writing.

Students will use technology (graphing calculator) appropriately as a tool to assist in mathematical problem solving, sketching statistical graphs, and simplifying tedious calculations.
Objectives:
A Use the Finance menu of the graphing calculator to simplify complicated mathematical calculations.

B Use the binomial probability distribution function of the calculator to simplify binomial probability calculations.
C Use the Stat Plot feature of the graphing calculator to assist in generating statistical graphs Use the Stat menu of the graphing calculator to assist in calculating complicated statistics such as the standard deviation.

Note: Faculty members will choose at least 4 outcomes from the following list (outcomes 7 - 17). Students will investigate and apply the mathematics of economics.

Objectives:
A Use and apply growth models such as population growth, Ponzi schemes, and chain letters.

B Use and apply decay models such as population decline, radioactive decay, half-life and carbon-14 dating.

C Use and apply logistic models.

D Describe the mathematics behind the Consumer Price Index.

A Model biological populations with chaos theory.

Students will investigate and apply the elementary concepts of calculus.
Objectives:
A Define a derivative and provide several of examples of its use.

B Define an integral and provide several of examples of its use.

C Explain the relationship between a derivative and a rate of change.

D Explain the relationship between and integral and an area.

E Solve elementary problems in differential calculus.

F Solve elementary problems in integral calculus.

Students will use graph theory to solve problems.
Objectives:
A Model relationships and real-world scenarios using graphs, paths and circuits.

B   Define, understand, and use Euler paths and circuits.

C Solve problems using Euler's Theorem.

D Define, understand, and use Hamilton paths and circuits.

E Use directed graphs to model relationships and realistic situations.

F Define, understand, and use spanning trees for both connected and weighted graphs.

Students will investigate properties of sets, use sets to visualize relationships and interpret survey results.
Objectives:
A   Identify the basic properties of sets and subsets.

B Define and use the complement of a set.

C Use Venn diagrams to visualize set relationships.

D Perform operations with sets (union and intersection).

E Use Venn diagrams to organize survey results.

Students will understand the relationship between mathematics and various games.
Objectives:
A   Explain the mathematics behind a variety of games.

B Use game theory to solve games.

Students will investigate and apply concepts in number theory.
Objectives:
A Apply mathematics to identification numbers.

B   Apply the division algorithm and modular arithmetic to check-digit schemes.

C Explain the encoding of data involving a variety of codes including binary codes and UPC Bar codes.

D Explore and describe patterns and relationships in the Fibonacci numbers.

E Explore and describe patterns and relationships in Pascal's triangle.

Students will investigate and apply the concepts of logic.
Objectives:
A Define, compare and contrast inductive and deductive reasoning.

B Construct and use truth tables.

C Use the definitions of negation, conjunction, and disjunction.

D Understand and use a variety of statements (conditional statement, equivalent statements, tautologies, conditional statements).

E Write the contra positive, converse, and negation of a conditional statement.'

F Write equivalent statements using DeMorgan's laws.

G Use forms of valid arguments to draw logical conclusions.

H Use Euler diagrams to determine validity.

I Apply Boolean logic to web searches.

J Use logic to solve puzzles.

Students will investigate the mathematics of apportionment.
Objectives:
A Understand the apportionment problem.

B Use a variety of apportionment methods.

Students will investigate the mathematics of voting.
Objectives:
A Use a variety of voting methods to determine an election's winner.

B Use a variety of criteria to determine a voting system's fairness.

Use the Fundamental Counting Principle to determine the number of outcomes in a sample space.
Objectives:
A Use the Fundamental Counting Principle to count permutations.

B Determine the number of permutation and combinations in a given scenario.

C Solve problems using permutation and combination formulas.

D Calculate probabilities using permutations and combinations.

Students will solve optimization problems using linear programming.
Objectives:
A Write an objective function describing a quantity that must be minimized or maximized.

B Define constraints mathematically with linear inequalities.

C Solve a linear programming problem graphically.
   Solve a linear programming problem with technology using the   Simplex Method.

Typical pacing of the course:

Course Outline
Math 118W – Mathematical Explorations

Text: *Thinking Mathematically* (6th Edition) by Robert Blitzer

Delta College   math118   tim allen

Session	Date	Section(s)	Topics
1	8/26	1.2, 1.3	**Introduction:** problem solving, calculator use, reading mathematics texts
2	8/28	4.1, 4.4	**History of Numbers:** Early Numeration Systems
3	9/4	8.1, 8.2	**Finance**: Budgeting; Percent, Sales Tax, Income Tax,
4	9/9	8.3, 8.4	**Finance**: Simple Interest & Compound Interest
5	9/11	8.5, 8.6	**Finance**: Annuities, Stocks, and Bonds; Cars
6	9/16	8.7, 8.8	**Finance**: Amortization and the Cost of Home Ownership; Credit Cards
7	9/18		**Review/Test 1**
8	9/23	11.1, 11.2	**Probability**: The Fundamental Counting Principle; Permutations
9	9/25	11.3, 11.4	**Probability**: Combinations; Fundamentals of Probability
10	9/30	11.5, 11.6	**Probability**: Fundamental Counting Principle, Permutations, Combinations; Not and Or; Odds
11	10/2	11.7, 11.8	**Probability**: Events Involving And; Conditional Probability; Expected Value
12	10/7	12.1, 12.2	**Statistics**: Sampling, Frequency Distributions, and Graphs; Measures of Central Tendency
13	10/12	12.3, 12.4	**Statistics**: Measures of Dispersion; The Normal Distribution; Percentiles;
14	10/14	13.1, 13.2	**Voting**: Voting Methods; Flaws of Voting Methods
15	10/19	13.3, 13.4	**Apportionment**: Apportionment Methods; Flaws of Apportionment Methods
16	10/21		**Review/Test 2**
17	10/26	2.1-2.3	**Set Theory**: Basic Set Concepts; Subsets; Venn Diagrams and Set Operations
18	10/28	2.4-2.5	**Set Theory**: Solving Survey Problems with Venn Diagrams
19	10/30	3.1-3.2	**Logic**: Statements, Negations, and Quantified Statements; Compound Statements
20	11/4	3.3, 3.6	**Logic**: Arguments and Truth Tables (Negation, Conjunction, Disjunction); DeMorgan's Law
21	11/6	6	**Algebra**: Linear Equations
22	11/11	7.3, 7.5	**Algebra**: Systems of Linear Equations; Linear Programming
23	11/13		**Review/Test 3**
24	11/18	7.6, 12.6	**Algebra**: Modeling Data **Statistics**: Scatter Plots, Correlation, and Regression Lines
25	11/20	9.1, 9.2	**Measurement**: The Metric System; Length, Area, Volume
26	11/25	9.3, 10.1	**Measurement**: Weight and Temperature; Points, Lines, Planes, and Angles;
27	12/2	10.2, 10.3	**Geometry**: Triangles; Pythagorean Theorem; Polygons, Perimeter, & Tessellations
28	12/4	10.4, 10.5	**Geometry**: Area and Circumference, Volume & Surface Area
29	12/9		**Test 4**
30	12/11		**Final : Presentations**

Exams may be administered in the Delta College Testing Center, or may be given during class, depending on the pace of the class.