

# SYLLABUS

## MATH 10051– Quantitative Reasoning

(4 Credit Hours)

**Catalog Information:** In the broadest sense mathematics should provide students the needed quantitative tools, logical reasoning and problem solving skills, and a sense that quantitative modeling can be used to describe and understand developments in many areas of daily living. Since critical thinking is the primary objective and outcome for our course, in each area of concentration (numeracy, mathematical modeling, and probability and statistics) students will need to read and glean information from the problem situation, convert the information into a usable form, perform any needed routine calculations, make or draw a conclusion, and then communicate the result via explanation using numerical reasoning by writing coherent statements and paragraphs

**Course Materials:** Quantway College, a program of the Carnegie Foundation for the Advancement of Teaching, Carnegie Math Pathways project

### Numeracy (7 days)

- Interpret different uses of %, % of whole - % change
- Solve percentage problems
- Apply proportional (using ratios and proportions) reasoning skills to compare and contrast
- Understand the difference between absolute change and relative change
- Dimensional analysis
- Index numbers: use and calculate indexes to understand and compare data
- Understand budget basics
- Understand how the CPI is used to measure inflation

### Mathematical Modeling (11 days)

#### *General function knowledge*

- Understand functional notation, domain, and range
- Construct and interpret graphs including piecewise functions
- Recognize linear and non-linear functions from formulas, graphs, and/or tables

#### *Linear Functions*

- Recognize when a linear function can be used for modeling real-world data and find the equation that represents this relationship.
  - Find an equation for the regression curve and use this equation to predict values of the dependent variable for given values of the independent variable
- Write linear function to model real-world situations
- Apply and interpret linear models to make decisions

#### *Exponential/log functions*

## (MATH 10051 Syllabus, continued)

- Understand the how to recognize the difference between linear and exponential growth or decay
- Determine when a data set is growing or decreasing at an exponential rate
- Understand the difference between rate of change and percent change
- Analyze relevant formulas to compute simple and compound interest
- Understand ordinary annuities and how to use the accumulated savings formula
- Apply loan payment formula to understand and analyze credit card debt and installment loans
- Find an equation for the regression curve and use this equation to predict values of the dependent variable for given values of the independent variable
- Write exponential function given:
  - Two solutions, parameters, or one parameter and one solution
  - Apply and interpret in application problems parameters and find specific solution given one variable
- Understand the inverse relationship between exponential on logarithmic functions and its usefulness and use this solve exponential equations
- Understand why Logarithms are used for handling very large/small numbers (pH, earthquake magnitudes, sound levels, etc.)

### Basic Probability and Statistics (8 days)

- Distinguish between quantitative and qualitative data
- Draw bar graphs, circle graphs, histograms and be able to interpret them in the context of the data they represent
- Decide what or when each type of graphical display is appropriate for the type of data and describe their strength, limitations and possible deceptions
- Distinguish the difference between surveys, experiments, and case control studies
- Justify statistical decisions
- Compute and compare mean, median, mode and appropriate uses for each
- Compute and use the appropriate measure of center to analyze and compare data sets
  - 5 number summary: construct and interpret a box plot for contextual situations
  - Standard deviation: Use the 68-95-99.7 rule to interpret probabilities
- Calculate probabilities and conditional probabilities and use them to make informed decisions
- Interpret the accuracy of medical testing

### EXAMS (4 days)