# SYLLABUS FOR MATH 1101
## Mathematical Modeling

**Course Description**
This course introduces mathematical modeling, based on the use of elementary functions, to describe and explore real-world data and phenomena. Graphical, numerical, symbolic, and verbal methods are used in the investigation of data, functions, equations, and models. Emphasis is placed on the applications and the ability to construct useful mathematical models, to analyze them critically, and to communicate quantitative concepts effectively (including a short paper on an appropriate problem modeling, for example, population growth, spread of disease, or credit card debt). Setting up and solving basic word problems is a key component of the course.

*This course is NOT meant to prepare students for any other math course* (e.g., MATH 1113, Precalculus).

**Course Materials**

1. Text: *Elementary Mathematical Modeling,* Functions and Graphs, Second Edition, by Davis and Edwards
2. Texas Instruments Graphing Calculator TI-83 or TI-84. Although one can complete this course using a TI-85, TI-86 or TI-89, this is not recommended. You cannot use a TI-81 for this course. Students are expected to have their calculators with them during each class.

**Course Outline.** The course is divided into 4 components:

I. Modeling with Linear Functions, Tables, Graphs, and Formulas.

**Chapter 1, Chapter 2 (11 days)**

a. Definition of functions
b. Domain and Range
c. Functions defined by tables, graphs and formulas
d. Average rate of change
e. Increasing and decreasing functions
f. Concavity of functions
g. Constant change and linear growth
h. Equation of lines
i. Linear functions and graphs
j. Piecewise-linear functions
k. Fitting Linear Models to Data

II. Modeling Natural Growth.

**Chapter 3 (10 days)**

l. Percentage increasing and decreasing
m. Simple interest
n. Tax rate
o. Iteration

p. Exponential functions and Graphs
q. Natural growth and decline in the world
r. Fitting natural growth models to data
s. Newton's law of cooling

## III. Modeling Growth with Quadratic, Exponential, and Logarithmic Functions.

**Section 4.1 and Chapter 5 (10 days)**

t. Compound interest
u. Credit card problems using Excel
v. Continuous growth
w. Quadratic functions and graphs
x. Quadratic highs and lows, including word problems
y. Fitting quadratic models to data
z. Use Excel to fit population data using linear, quadratic, and exponential models

## IV. Polynomial Models and Linear Systems

**Chapter 6 (8 days)**

aa. Polynomial functions and graphs
bb. Solving polynomial equations, including word problem applications
cc. Setting up a system of equations
dd. Solving pairs of linear equations by substitution, elimination, determinants and matrices. Word problem applications.
ee. Solving linear systems of equations. Word problem applications.