Learning Outcomes for Math 1101, 1111, and 1113

Approved by ACMS, February 27, 2004

MATH 1101 Introduction to Mathematical Modeling

COURSE DESCRIPTION: This course is an introduction to mathematical modeling using graphical, numerical, symbolic, and verbal techniques to describe and explore real-world data and phenomena. Emphasis is on the use of elementary functions to investigate and analyze applied problems and questions, supported by the use of appropriate technology, and on effective communication of quantitative concepts and results.

COMMON LEARNING OUTCOMES – After successful completion of the course the student will be able to:

1. Model situations from a variety of settings in mathematical forms by extracting quantitative data from a given situation, translating the data into information in various modes, evaluating the information , abstracting essential information, making logical deductions, and arriving at reasonable conclusions;
2. Manipulate mathematical information, concepts, and thoughts in verbal, numeric, graphical and symbolic form while solving a variety of problems;
3. Solve multiple-step problems through different (inductive, deductive and symbolic) modes of reasoning;
4. Express mathematical information , concepts, and thoughts in verbal, numeric, graphical and symbolic form while solving a variety of problems;
5. Shift among the verbal, numeric, graphical and symbolic modes of considering relationships;
6. Use appropriate technology in the evaluation, analysis, and synthesis of information in problem-solving situations.

MATH 1111 College Algebra

COURSE DESCRIPTION: This course is a symbolically intensive, functional approach to algebra that incorporates the use of appropriate technology. Emphasis will be placed on the study of functions and their graphs, inequalities, and linear, quadratic, piece-wise defined, rational, polynomial, exponential, and logarithmic functions. Appropriate applications will be included.

COMMON LEARNING OUTCOMES – After successful completion of the course the student will be able to:

1. Express relationships using the concept of a function and use verbal, numerical, graphical and symbolic means to analyze a function.
2. Model situations from a variety of settings by using polynomial, exponential and logarithmic functions.
3. Manipulate mathematical information, concepts, and thoughts in verbal, numeric, graphical and symbolic form while solving a variety of problems which involve polynomial, exponential or logarithmic functions.
4. Apply a variety of problem-solving strategies, including verbal, algebraic, numerical, and graphical techniques, to solve multiple-step problems involving polynomial, exponential, logarithmic equations and inequalities and systems of linear equations.
5. Shift among the verbal, numeric, graphical and symbolic modes in order to analyze functions.

6. Use appropriate technology in the evaluation, analysis and synthesis of information in problem-solving situations.

MATH 1113 Precalculus

COMMON LEARNING OUTCOMES – The primary outcome for a student who successfully completes a MATH 1113 course is that the student will have a reasonable expectation of success in a Calculus I course in the University system. In particular, a Calculus I course will anticipate that the student will have a systematic knowledge and understanding of functions. To this end, a student who successfully completes a MATH 1113 course will:

1. Identify the inherent restrictions on the domain of a function;*
2. Identify the range of a function;
3. Understand the interconnectedness of various modes of defining a function (numeric, graphical, generalized)** and be able to analyze functions from numeric, graphical, and symbolic points of view; shift among them when appropriate; and justify this through inductive or deductive reasoning;
4. Be capable through inductive and deductive reasoning of moving from one to another of those modes of definition;
5. Recognize and apply appropriate functions to solve a variety of applied problems.

Classifications of types of functions that may be encountered to attain these outcomes:

- *piecewise defined*
- *linear*
- *quadratic*
- *general polynomial*
- *rational*
- *exponential*
- *logarithmic*
- *trigonometric*

Within those modes of definition, a student will:

a. *(Numeric) be capable of interpolation and extrapolation given various assumptions; apply the periodicity of certain functions and the concept of an inverse as appropriate;*
b. *(Graphical) be capable of manifesting changes in a symbolic definition as a shift, expansion/contraction, reflection; recognize increasing/decreasing and odd/even functions; be capable of moving between standard plane and analytic geometry; apply the periodicity and the concept of an inverse of certain functions;*
c. *(Generalized) be capable of performing the various operations involved in the calculus of functions: addition, subtraction, multiplication, division, composition, developing inverses; simplify and transform expressions; solve systems of equations; develop the periodicity and the inverse of certain*

functions.