Mathematics

Course Learning Outcomes are measurable statements that are used to identify the specific knowledge and skills that a student should have at the end of a course.

MATH 1108
L1- Demonstrate the ability to solve a variety of types of equations, and application problems involving some of those types of equations.
L2- Demonstrate the ability to solve a variety of types of inequalities.
L3- Demonstrate the ability to work with equations of lines, parabolas, and circles.

MATH 1123
L1- Interpret mathematical concepts.
L2- Represent information/ data.
L3- Use appropriate strategies/procedures when solving mathematical problems.
L4- Draw reasonable conclusions based on quantitative information.

MATH 1130
L1- Develop ability to work with matrices and systems of linear equations.
L2- Linear Programming.
L3- Sets, Counting, and Probability.
L4- Markov Chains

MATH 1143
L1- Use the language of mathematics to communicate mathematical ideas, using symbols and notations correctly, and presenting solutions in a clear and organized way.
L2- Interpret and use functions of several forms: formulas, numerical data, graphs or verbal rules.
L3- Recognize and apply polynomial, rational, power, exponential, and logarithmic functions to solve related equations.
L4- Apply problem-solving skills to find solutions of real-world problems that involve polynomial, rational, power, exponential and logarithmic functions.
L5- Use technology to study functions and solve problems.

MATH 1144
L1- Represent, interpret, and use trigonometric functions as formulas, graphs, numerical data, or verbal rules.
L2- Recognize and apply trigonometric and inverse trigonometric functions, identities and laws, polar coordinates, and vectors to solve equations and problems related to triangles and circles.
L3- Apply problem-solving skills to interpret and solve real-world problems involving circular motion, triangles, and periodic behavior.
L4- Use technology and mathematical knowledge to evaluate trigonometric functions, interpret graphs, and check work.
L5- Clearly and correctly communicate mathematical ideas involving trigonometry.

MATH 1147
L1- Use the language of mathematics to communicate mathematical ideas, using symbols and notations correctly, and presenting solutions in a clear and organized way.
L2- Represent, interpret, and use functions as formulas, graphs, numerical data, or verbal rules
L3- Recognize and apply polynomial, rational, power, exponential, logarithmic functions, trigonometric and inverse trigonometric functions, identities and laws, polar coordinates, and vectors to solve equations and problems.
L4- Apply problem-solving skills to find solutions of real-world problems that involve polynomial, rational, power, exponential, logarithmic, and trigonometric functions (including involving circular motion, triangles, and periodic behavior).
L5- Use technology and mathematical knowledge to evaluate functions, interpret graphs, and check work.

MATH 1153
L1- Create a graph and numerical summary of a data set and provide a brief, meaningful written summary of the data.
L2- Identify the conceptual components of a sampling scheme and identify any potential sources of bias.
L3- Given a scatterplot, describe the relationship between the variables and use the relationship to make valid predictions.
L4- Identify when the normal model is appropriate and use the model to assign probabilities to events.
L5- Construct and interpret an interval estimate of a population parameter.
L6- Perform and interpret a hypothesis test for a population parameter.

MATH 1160
L1- Develop ability to work with exponential and logarithmic functions.
L2- Differentiation.
L3- Integration.
L4- Applications (developed in cooperation with client departments)

MATH 1170
L1- Deduce the existence or nonexistence of the limit of a function by investigating function values and graphs of functions, and calculate limits of functions using limit laws and rules.
L2- Determine the derivative of a function by using the limit definition and differentiation rules and interpret the derivative as the instantaneous rate of change of one quantity with respect to another in various applications in the natural and physical sciences.
L3- Apply derivatives to build linear approximations, optimize functions, reveal behavior of graphs of functions, and relate rates of changing quantities.
L4- Determine indefinite integrals of functions by using antidifferentiation formulas and substitution, approximate definite integrals using their definition as a limit of Riemann sums, and calculate the exact value of a definite integral of a function by evaluating an antiderivative of that function at both the upper and lower limits of the definite integral and computing the difference.
L5- Apply definite integrals to compute areas and volumes and calculate the net change in a quantity in various applications in the natural and physical sciences.

MATH 1175
L1- Determine antiderivatives using methods of integration and estimate definite integrals using numerical approximation.
L2- Solve problems related to finding antiderivatives and definite integrals, including determining convergence of improper integrals and solving basic differential equations.
L3- Use integrals to solve geometric problems involving areas and volumes and applied problems involving hydrostatic pressure and force, moments, and center of mass.
L4- Determine convergence of infinite series and use this to approximate functions by polynomials.
L5- Apply calculus to study more general curves in the plane, given parametrically or in polar coordinates.

MATH 2240
L1- Put a matrix into row or reduced row echelon form. Describe the solution space of a system of linear equations using row echelon forms, inverses, or Cramer’s Rule.

L2- Calculate scalar products, sums, differences, and products of matrices. Find the determinant of a square matrix and the inverse of an invertible matrix. Compute inner products and orthogonal projections.
L3- Find eigenvalues and eigenvectors of a square matrix. Diagonalize a square matrix.
L4- Use bases, coordinate vectors and matrices to represent vector spaces, their linear transformations and change of basis.
L5- Apply definitions and theorems involving linear systems; vectors and matrices; linear independence, linear combinations and span; properties of homogeneous and nonhomogeneous systems; eigenvalues and eigenvectors; vector spaces and subspaces; bases and dimension; linear transformations; and inner products.

MATH 2257
L1- Demonstrate basic concepts of Euclidean Geometry.
L2- Develop basic statistical properties of center, spread and likelihood.

MATH 2275
L1- Students will perform algebraic manipulations, particularly differentiation and integration, quickly and accurately.
L2- Students will use concepts of calculus to model real-world problems.
L3- Students will make connections between different mathematical concepts, such as geometric, analytic, and numerical interpretations of functions, derivatives, and integrals.

MATH 2287
L1- Demonstrate the ability to work with equations of lines, parabolas, and circles.
L2- Students will learn how to read and write proofs.
L3- Students will learn about sets, functions, and relations.

MATH 3310
L1- Translate everyday situations into mathematical statements (models) which can be solved/analyzed, validated, and interpreted in context.
L2- Identify assumptions which are consistent with the context of the problem and which in turn shape and define the mathematical characterization of the problem.
L3-Revise and improve mathematical models so that they will better correspond to empirical information and/or will support more realistic assumptions.
L4- Assess the validity and accuracy of their approach relative to what the problem requires.
L5- Work as members of a team toward a common goal.
L6- Communicate mathematics in both oral and written form to a broad mathematical and lay audience, including the “end users” of a modeling problem, who may be utterly unfamiliar with the mathematics used.

MATH 3335
L1- Develop problem-solving and communication skills through collaboration, discussion and (student) presentations.
L2-Compute greatest common divisors and prime factorizations over the integers. Performarithmetic operations, evaluate number-theoretic functions, and solve linear and quadratic equations in different number systems.
L3- Explore, investigate and prove properties of the integers and related number systems.
L4- Be able to state, verify and interpret definitions, and to provide examples and nonexamples of definitions.
L5- Understand, interpret, and apply main theorems. Be able to state the theorem and its contrapositive, know whether converse is true, know why hypotheses are necessary, find relevant examples, apply to specific situations.
L6- Write mathematical proofs in a clear and organized way, in accordance to conventions of the discipline, and correctly using formal reasoning and mathematical logic.
L7- Find joy in doing mathematics through open-ended problems, exploration and experimentation, pattern finding, and exposure to history and recent research.

MATH 3350
L1- Perform a descriptive data analysis for one variable or a relationship between two variables.
L2- Demonstrate an understanding of standard probability models.
L3- Perform an inferential analysis.

MATH 3352
L1- Compute probabilities of abstract events using axioms, definitions and rules of probability.
L2- Determine conditional probabilities and independence in real-world situations.
L3- Model real-world situations using appropriate probabilistic models and distributions.
L4- For single variable distributions (discrete and continuous) calculate probabilities, means and variances. For bivariate discrete distributions, calculate marginal and conditional probabilities; and correlation.
L5- Given a distribution and a sampling process, give a qualitative description of the sampling distribution, including shape, center and spread.

MATH 3360
L1- Solve first-order equations.
L2- Solve higher-order linear equations with constant coefficients.
L3- Use power series to solve differential equations.
L4- Solve first-order linear systems with constant coefficients.

MATH 3362
L1- Perform algebra with complex numbers.
L2- Identify complex-differentiable functions.
L3- Compute complex line integrals.
L4- Use the residue theorem.

MATH 4405
L1- Select or design a method or approach for solving a problem in linear algebra.
L2- Evaluate a method for its accuracy, stability, and computational cost.
L3- Discuss efficiency implications in a computer implementation of a method.
L4- Use Matlab and other numerical software appropriately, i.e., understand when to use certain methods and what the limitations of different methods are.
L5- Implement selected algorithms on a computer.

MATH 4406
L1- Students will establish properties of linear transformations between real or complex vector spaces.
L2- Students will establish structural properties of inner products.
L3- Students will write clear and precise proofs.

MATH 4421
L1- Students will use Fourier series and apply them to partial difference equations.
L2- Students will use Laplace and Fourier transforms.
L3- Students will perform basic statistical data analysis.

MATH 4422
L1- Students will use Fourier series and apply them to partial difference equations.
L2- Students will use Laplace and Fourier transforms.
L3- Students will perform basic statistical data analysis.

MATH 4423
L1- Students will state and verify definitions and provide examples and counterexamples.

L2- Students will demonstrate an understanding of main theorems and use them in computations.
L3- Students will write clear and precise proofs.

MATH 4424
L1- Students will state and verify definitions and provide examples and counterexamples.
L2- Students will demonstrate an understanding of main theorems and use them in computations.
L3- Students will write clear and precise proofs.

MATH 4465
L1- Solution of a first order quasi-linear initial value problem.
L2- Solution of the initial value problem for the wave equation in three space dimensions.