MATHEMATICS GENERAL EDUCATION COURSES

College Learning Outcomes Matrix: Rate each course from 1 to 5 with 5 being the most important.

MATHEMATICS	Year of SLO Review	**1. Written, Oral and Visual Communication:**	**2. Scientific and Quantitative Reasoning:**	**3. Critical Thinking /Problem Solving**	**5. Information Literacy:**	**GE**	**DEGREE**
MATH 103 Intermediate Algebra	**annually**	3	3	5	1	X	N/A
MATH 104 Trigonometry	**annually**	3	3	5	1	X	N/A
MATH 105 College Algebra	**annually**	3	3	5	1	X	N/A
MATH 109 Pre-calculus College Algebra and Trigonometry	**annually**	3	3	5	1	X	N/A
MATH 115 Probability and Statistics	**annually**	3	3	5	1	X	N/A
MATH 116 Linear Algebra	**annually**	3	3	5	1	X	N/A
MATH 121 Calculus I with Applications	**annually**	3	3	5	1	X	N/A
MATH 122 Calculus II with Applications	**annually**	3	3	5	1	X	N/A
MATH 123 Analytic Geometry and Calculus I	**annually**	3	3	5	1	X	N/A
MATH 124 Analytic Geometry and Calculus II	**annually**	3	3	5	1	X	N/A

MATHEMATICS GENERAL EDUCATION COURSES

GENERAL EDUCATION SLOS: WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

MATHEMATICS	1. Written, Oral and Visual Communication	2. Scientific and Quantitative Reasoning:	3. Critical Thinking:	4. Problem Solving:	5. Information Literacy:
MATH 103 Intermediate Algebra (A/B/X/Y)		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 104 Trigonometry (104Y)		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 105 College Algebra		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 109 Pre-calculus College Algebra and Trigonometry		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 115 Probability and Statistics		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 116 Linear Algebra		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	

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GENERAL EDUCATION SLOS: WHAT ASSIGNMENTS DO YOU GIVE IN THESE CLASSES THAT ASSESS THE FOLLOWING GE SLOS? What assessment tools do you use? Assess only SLOs that you rated 4 or 5.

MATHEMATICS	**1. Written, Oral and Visual Communication**	**2. Scientific and Quantitative Reasoning:**	**3. Critical Thinking:**	**4. Problem Solving:**	**5. Information Literacy:**
MATH 121 Calculus I with Applications		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 122 Calculus II with Applications		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 123 Analytic Geometry and Calculus I		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	
MATH 124 Analytic Geometry and Calculus II		Final Exam (course SLO questions)	Final Exam (course SLO questions)	Final Exam (course SLO questions)	

MATHEMATICS GENERAL EDUCATION COURSES

MATH_103	Intermediate Algebra	Revise Course
Expected Outcomes for Student:		
1. Apply the concepts of slopes and linear relationships to modeling and solving linear systems. 2. Apply matrices in solving systems of linear equations, including the use of Gaussian elimination and Cramer's rule. 3. Solve linear programming problems. 4. Perform the complete set of basic operations on polynomials. 5. Perform the complete set of basic operation on rational expressions and functions, and solve rational equations; including proportions. 6. Perform the complete set of basic operations on functions; including composites and inverses. 7. Perform the complete set of basic operations on radicals; including simplification and factoring. 8. Perform the complete set of basic operations on complex numbers; including rationalization and conjugates. 9. Graph, and solve quadratic equations by means of the square root property, completing the square, and the quadratic formula and graph quadratic equations. 10. Graph and perform the complete set of basic operations on exponential functions and find solutions for equations with exponential functions. 11. Graph and perform the complete set of basic operations on logarithmic functions and find solutions for equations with logarithmic functions. 12. Translate, model, and solve application problems. 13. Identify Conic Sections given their equations. 14. Determine the radius and center of circles given their equations in general form. 15. Apply the Binomial Theorem.		

MATH_104	Plane Trigonometry	Revise Course
Expected Outcomes for Student:		
Math 104 Student Learning Outcomes 1. Find all solutions in the interval 0 le x < 2pi of a trigonometric equation. 2. Solve for the sides and or angles of a triangle using the Law of Sines and/or the Law of Cosines. 3. Draw the graph of a sine or cosine function, correctly determining the amplitude, period, and phase shift.		

MATH_105	College Algebra	Revise Course
Expected Outcomes for Student:		
1. Algebraically determine the real and/or complex roots of a polynomial of fifth or less than can be factored using the standard methods of college algebra. 2. Determine the horizontal asymptotes of a rational function. 3. Solve an exponential equation of the level of difficulty equal to that of solving for the domain variable of one of the hyperbolic functions.		

MATH_109	Precalculus College Algebra and Trigonometry	Revise Course
Expected Outcomes for Student:		
1. Algebraically determine the real and/or complex roots of a polynomial of fifth or less than can be factored using the standard methods of college algebra. 2. Determine the horizontal asymptotes of a rational function. 3. Determine the period and phase shift of either a sine or cosine function such as y = Asin(omega t + phi) and correctly draw the graph of that function.		

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MATH_115	Probability and Statistics	Revise Course
Expected Outcomes for Student:		
Upon completion of this course, Students will be able to: 1. Solve problems involving the basics of probability theory. 2. Calculate various types of measures of central tendency and measures of dispersion. 3. Interpret and construct graphical representations of data. 4. Apply uniform, binomial, and Poisson distributions. 5. Solve problems that use a continuous random variable and the normal distribution and the t-distribution. 6. Compute point and interval estimates for population parameters, and be able to determine sample sizes for fixed interval estimates. 7. Perform hypotheses tests for populations parameters; 8. Solve problems with chi-square procedures, tests of independence and tests of homogeneity. 9. Derive the linear regression equation; 10. Calculate a least squares fit; 11. Perform estimation and prediction. 12. Perform hypothesis testing using analysis of variance.		

MATH_116	Linear Algebra	Revise Course
Expected Outcomes for Student:		
At the end of Math 116, after studying and learning the content, a student will be able to do the following 1. Perform applicable arithmetic operations on vectors and matrices. 2. Determine when a function is or is not a linear transformation. 3. Given a linear transformation, a. Determine the range, kernel, rank and nullity. b. Determine if it is invertible, and if so then construct the inverse. 4. Construct elementary matrices corresponding to elementary row operations and use both to construct the inverse of an invertible square matrix. 5. Determine if a set of vectors is linearly independent. 6. Construct a basis for a given vector space, and determine its dimension. 7. Determine if a subset of a given vector space is a subspace. 8. Assess whether a given set and field with addition and scalar multiplication is or is not a vector space. 9. Compute the transition matrix between two bases. 10. Calculate the determinant of a square matrix and use it to determine the linear independence of row or column vectors, and determine invertibility. 11. Calculate a determinant by expansion in cofactors. 12. Calculate the eigenvalues and construct a basis for the eigenspaces of a matrix or linear transformation. 13. Construct the diagonal decomposition of a square matrix, or explain why the matrix cannot be diagonalized. 14. Construct orthonormal bases in Rn.		

MATHEMATICS GENERAL EDUCATION COURSES

MATH_121	Calculus I with Applications	Revise Course

Expected Outcomes for Student:

1. Students will know and be able to apply :

a. The power rule for differentiation
b. The constant multiple rule for differentiation
c. The sum rule for differentiation
d. The chain rule for differentiation
e. The product rule for differentiation
f. The quotient rule for differentiation
g. The power rule for integration
h. The method for differentiating and integrating exponential functions
i. The method for differentiating logarithmic functions
j. The methods to calculate integrals of the form $f(x) = 1/x$ and for exponential functions
k. The method for integrating by substitution
l. The method for finding higher order derivatives
m. The method for implicit differentiation
n. The methods for calculating both definite and indefinite integrals
o. The method of logarithmic differentiation

2. Students will be able to demonstrate mastery of the concept of a limit in the following ways:

a. Know the definition of a derivative
b. Determine whether a function is continuous and/or differentiable
c. Perform a secant line calculation of the derivative
d. Calculate limits of various polynomial and rational functions
e. Calculate Riemann Sums and understand their limits and some applications

3. Students will be able to demonstrate mastery of the concept and applications of a derivative in the following ways:

a. Find the slope of a tangent to a curve.
b. Write the equation of a tangent line to a curve at a given point
c. Graph polynomial and rational equations using calculus
d. Explain the relationship between instantaneous rate of change and average rate of change
e. Set up and solve optimization (min/max) problems
f. Explain the relationship between slope of a tangent line and instantaneous rate of change
g. Explain marginal profit/revenue/cost and their relationships to the derivative
h. Find marginal profit/revenue/cost; position/velocity/acceleration
i. Set up and solve related rates problems
j. Analyze a set of graphs whose relationship is a function and its derivative; be able to determine which is which

k. Solve a differential equation of the form y' = ky

4. Students will be able to demonstrate mastery of the concept and applications of the integral in the following ways:

a. Explain, in a heuristic manner, the Fundamental Theorem of Calculus and the definite integral
b. Solve applications problems for definite integrals such as finding areas in the xy-plane, volumes of revolution, average values, and future values
c. Solve applications that go from rates of change to values of functions

5. Students will be able to demonstrate mastery of logarithmic and exponential functions in the following ways:

a. Manipulate logarithmic and exponential expressions
b. Graph logarithmic and exponential functions
c. Solve logarithmic and exponential equations
d. Solve applications of exponential and logarithmic functions such as growth and decay and compound interest problems

MATH_122	Calculus II with Applications	Revise Course
Expected Outcomes for Student:		
At the end of Math 122, after studying and learning the content, a student will be able to do the following: 1. Determine partial derivatives and total differentials. 2. Construct and solve optimization models involving functions of several variables. 3. Construct and solve models using the method of least squares. 4. Determine indefinite and definite integrals by applying basic integration techniques such as: substitution method, integration by parts, numerical integration including the trapezoidal rule and Simpson?s Rule. 5. Evaluate improper integrals and double integrals. 6. Determine indefinite and definite integrals involving trigonometric, logarithmic, and exponential functions. 7. Solve differential equations, including initial value problems, by applying the following techniques: anti-differentiation, separation of variables, Euler?s Method, and constructing solution sketches. 8. Construct and solve models using integrals for applications in elementary probability theory. 9. Construct and solve models using differential equations for applications in business, biology and chemistry. 10. Approximate a function using a Taylor Polynomial. 11. Apply sigma notation in the representation of a series. 12. Determine the sums of geometric series. 13. Determine if a geometric series is convergent.		

MATH_123	Analytic Geometry and Calculus I	Revise Course
Expected Outcomes for Student:		
Student learning outcomes for Math 123 include but are not limited to the following: 1. Calculate limits using epsilon-delta definition and theorems for the limit of a function at a point; 2. Determine continuity and understand the intermediate value theorem; 3. Work with the definition of derivative, tangent lines;		

4. Work with the derivatives of trigonometric functions; 5. Work with the differentiation rules (sum, product, quotient, chain) and implicit differentiation; 6. Make linear approximations and calculate the differential; 7. Apply Newton's method and solve related rates problems; 8. Sketch curves using extrema and critical points, first and second derivative tests. 9. Solve optimization problems; 10. Use the Mean Value Theorem; 11. Calculate Riemann sums, the Riemann integral, and understand its properties and existence; 12. Apply the Fundamental Theorems of Calculus; 13. Calculate change of variables and do numerical integration; 14. Calculate areas of plane regions, volumes; arc length and area of a surface of revolution; center of mass; work; fluid force on submerged lamina and other applications.

MATH_124	Analytic Geometry and Calculus II	Revise Course
Expected Outcomes for Student:		
Student learning outcomes for Math 124 include the following: 1. Find an indefinite integral that requires the method of partial fraction decomposition. 2. Evaluate the limit of an indeterminate form.4. indeterminate forms; 3. Find the interval of convergence of a power series.		