Majmaah University
Deanship of Quality and
Skills Development

College: **Science** Department: **Mathematics** Program: **B.Sc.(Mathematics)**

Code MUP16

Course Student Learning Outcomes to Program Learning Outcomes Map

Course Number: PMTH112 – Introduction to Mathematics (1)

Course Learning Outcomes:

1	able to **write** the number properties, algebraic expressions, graphs linear equation and quadratic equation
2	able to recognize and define logarithmic functions and exponential functions, inverse functions, synthetic division and remainder theorem and linear equations, linear inequalities & absolute value equations and quadratic equations
3	**Define and Recognize** the fundamental in basic mathematics such as: logarithmic functions and exponential functions, inverse functions, synthetic division and remainder theorem and linear equations, linear inequalities & absolute value equations and quadratic equations
4	Must be **shown** the ability of working independently and with groups.
5	The student should **illustrate** how to communicating with: Peers, Lecturers and Community.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes** **Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3				√						
4						√				
5									√	

Course Number: PMTH127 – Introduction to Mathematics (1)

Course Learning Outcomes:

1	a) Convert between degrees and radians for nonstandard angles, find fixed ratios of the sides of the special triangles ,solve general applications of right triangle b) Use fundamental Identities to express a given trig function in terms of the other five and basic algebra skills. Derive and use the double-angle identities, solve applications using these identities c) To solve linear and nonlinear systems by substitution, elimination d) Solve systems using matrix equations, Find determinants and inverse of a square matrix e) Use the equations of circle ,ellipse ,hyperbola and parabola to sketch and locate the foci , centre ,vertices
2	Write out the terms of sequences and series; identify an arithmetic and geometric sequences. Find the nth terms of an arithmetic, apply mathematical inductions
3	The students will **explain and interpret** a general knowledge of Linear Algebra.
4	Must be **shown** the ability of working independently and with groups.
5	The student should **illustrate** how to communicating with: Peers, Lecturers and Community.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3				√						
4						√				
5									√	
6										
7										

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Course Number: **Math201 – Calculus (1)**

Course Learning Outcomes:

1	Define Real numbers and real line – Inequalities.
2	Recognize the different methods of calculus problems and write the best method for solving it.
3	Describe , Apply , explain and interpret a general knowledge of Calculus
4	Acquire different techniques and named the best for solving Differential problems
5	The students will explain and interpret a general knowledge of general calculus laws
6	Must be shown the ability of working independently and with groups.
7	The student should illustrate how to communicating with: Peers, Lecturers and Community.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2		√								
3		√								
4						√				
5						√				
6								√		
7								√		

Course Number: STAT 302- Statistics and Probability 2

Course Learning Outcomes:

1	Define statistics, population and sample. Understand the statistic and the parameter. List the addition and the multiplication rules of probability
2	Determine probabilities from probability mass functions and the reverse.
3	Deduce the sampling distribution of the sample mean. The students will estimate the population parameter by the statistic
4	Approximate probabilities for some binomial and Poisson distributions Understand the assumptions for each of the discrete probability distributions presented.
5	Must be **shown** the ability of working independently and with groups.
6	The student should **appraise** how to Use the computer skills and library
7	

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes** **Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1		√								
2		√								
3					√					
4					√					
5								√		
6										√
7										

Course Number: 202 Calculus(2)
Course Learning Outcomes:

1	Students will be able to define and interpret definite integral and its properties – mean value theorem of integral – the fundamental theorem of calculus-Indefinite integral. Standard integrals.-Derivatives & integrals of hyperbolic and inverse hyperbolic functions-.
2	Students will reproduce methods of integration by substitution – integration by parts-integration by partial fractions – Other substitutions- L'Hospitals Rule – implicit integration. Students will evaluate area and volume of revolution- arc length- Numerical integration (Trapiziodal rule). Polar coordinates-Polar curves graphs-Areas using polar coordinates.
3	The students will **explain and interpret** a general knowledge of Calculus
4	Enable students to **analyses** the mathematical problems using Calculus.
5	The student should **illustrate** how take up responsibility.
6	The students will **show** the ability of working independently and with groups.
7	The student should **illustrate** how to communicating with: Peers, Lecturers and Community.
8	The student should **interpret** how to Know Calculus using the internet.

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3				√						
4				√		√				
5						√				
6									√	
7									√	

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Course Number: MATH 203

Course Learning Outcomes:

1	Identify the functions in more than one variable and their properties.
2	Generalize some applications such as: Limits, Continuity
3	Must be shown the ability of working independently and with groups
4	The student should illustrate how take up responsibility
5	The student should appraise how to Use the computer skills and library
6	
7	

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes** **Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2		√								
3						√				
4							√			
5										√
6										
7										

Course Number: **Math 231 Basis of Mathematics**

Course Learning Outcomes:

1	Study the necessary background of sets theory, functions, and relations and understand why we need them.
2	The student should understand the principals of mathematical logic and be able to translate any literal statement in a mathematical statement.
3	The proof methods (induction contraapositive, contradiction) should be well understand and applied.
4	An elementary study of groups will be our first algebraic structure. The student should understand why we are concerned by such a structure.
5	Rising from the study of addition and multiplication on Z we show how we can generalize the obtained properties to define the notion of a ring. We establish then some differences between Z and R and introduce new concepts.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes** Use LOs Codes									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3						√				
4									√	
5									√	

Course Number: MATH 271: Introduction to Geometry

Course Learning Outcomes:

1	Deepen students' concepts, Improve students understanding and awareness.
2	Expand students' exposure to solve the problems.
3	Ability to think analytically and critically
4	Ability to understand and analyse the mathematical problems
5	Students can complete assignments in due time
6	Students can actively and critically participate in class activities
7	Students can act responsibly and ethically in conducting their work.
8	Students can communicate, negotiate and evaluate their strengths and weaknesses as team members

Mapping:

Course LOs #	Program learning outcomes									
	a1	a2	a3	b1	b2	c1	c2	c3	d1	d2
1	✓									
2	✓									
3			✓							
4			✓							
5				✓						
6				✓						
7							✓			
8									✓	

Course Number: 241: Linear Algebra
Course Learning Outcomes:

1	Students will be able to understand and interpret Matrices and their operations- Types of matrices- Elementary transformations -Determinants-elementary properties of determinants- Inverse of a matrix- Rank of matrix- Linear systems of equations-
2	Students will be able to understand and interpret Vector spaces- Linear independence - Finite dimensional spaces - Linear subspaces- Linear dependence and independence, basis and dimension(also, in subspaces), rank of a matrix, linear equations of vectors spaces, coordinates. Students will reproduce methods Linear mappings- Kernel and image of a linear mapping- Eigenvalues and eigenvectors of a matrix and of a linear operator mapping.
3	The students will **explain and interpret** a general knowledge of Linear Algebra.
4	Enable students to **analyses** the mathematical problems using Linear Algebra..
5	The student should **illustrate** how take up responsibility.
6	The students will **show** the ability of working independently and with groups.
7	The student should **illustrate** how to communicating with: Peers, Lecturers and Community.
8	The student should **interpret** how to Know Linear Algebra using the internet.

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3				√						
4				√		√				
5						√				
6									√	
7									√	

Course Number: STAT 302- Statistics and Probability 2
Course Learning Outcomes:

1	Define statistics, population and sample. Understand the statistic and the parameter. List the addition and the multiplication rules of probability
2	Determine probabilities from probability mass functions and the reverse.
3	Deduce the sampling distribution of the sample mean. The students will estimate the population parameter by the statistic
4	Approximate probabilities for some binomial and Poisson distributions Understand the assumptions for each of the discrete probability distributions presented.
5	The student should **illustrate** how take up responsibility
6	The student should **illustrate** how to Search the internet and using software programs to deal with problems
7	

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes** **Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1		√								
2		√								
3					√					
4					√					
5								√		
6										√
7										

Course Number: Math352
Course Learning Outcomes:

1	State a convex sets, convex and concave functions, polygons , vertex points and the optimization theory
2	Knows how to work the mathematical formulation of some actual problems (mathematical formulation of the linear programming problems).
3	The ability to form groups and distribution of tasks.
4	The student should **illustrate** how to Search the internet and using software programs to deal with problems
5	Recall a different ways to solve a problem of linear programming

Mapping:

	Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #		**Program Learning Outcomes** **Use LOs Codes**								
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1				√						
2					√					
3						√				
4								√		
5										√

Course Student Learning Outcomes to Program Learning Outcomes Map
Course Number: **Math 321 - Introduction to Ordinary Differential equations**
Course Learning Outcomes:

1	Define the basic fundamentals in ODE such as: Differential equations, order of DE, degree of DE, Classifications of DE, Linear, nonlinear, exact, homogeneous, Bernolli, Ricataau, Claiarot, Cauchy-Euler differential equations and the power series solutions.
2	Recognize the different kinds of differential equations and write the best method for solving it.
3	Describe and Apply mathematical concepts of differential equations to models of real world problems
4	Acquire Laplace and inverse Laplace method and named the solutions of the initial value Differential equation problems
5	The students will explain and interpret a general knowledge of general Differential equations.
6	Must be shown the ability of working independently and with groups.
7	The student should illustrate how to communicating with: Peers, Lecturers and Community.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	Program Learning Outcomes Use LOs Codes									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3		√								
4						√				
5						√				
6								√		
7								√		

Course Number: MATH342 **Group Theory**

Course Learning Outcomes:

1	Cite and understand a representative selection of the definitions and terms introduced in this course.
2	Cite examples of the main mathematical structures introduced during the course: groups, subgroups, normal subgroups, cosets, factor group, finite groups, order, Lagrange Theorem, symmetric groups, Cauchy and Sylow's theorems.
3	Execute simple proofs and deductions from the axioms for these structures and express the reasoning with reasonable clarity.
4	Perform simple calculations in specific examples of the main structures discussed in the course (tables, generated subgroups...).
5	Appreciate the relevance of the abstract structures to related areas of mathematics. The Intended Generic Learning Outcomes and, as appropriate, their relationship to programme Learning Outcomes. On successful completion of this course, students will have developed further: -a logical, mathematical approach to solving problems in algebra; - their ability to communicate these solutions, simple proofs and calculations; -their numeracy and computational skills; -their ability to plan and and carry out effective ways of studying; -their key skills in numeracy, problem solving and written communication.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3						√				
4						√				
5									√	

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Course Number: MATH-381

Course Learning Outcomes:

1	Deepens student's concepts
2	Expand students' exposure to solve the problems
3	Ability to understand and analyse the mathematical problems
4	Students can act responsibly and ethically in conducting their work;
5	Students can communicate, negotiate and evaluate their strengths and weaknesses as team members.
6	Students can actively and critically participate in class activities
7	

Mapping:

	Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)									
Course LOs #		**Program Learning Outcomes Use LOs Codes**								
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2				√						
3				√						
4							√			
5							√			
6									√	
7										

Course Number: **Number Theory, Math 344**

Course Learning Outcomes:

1	Define and use the fundamental in Number Theory such as: the basic concepts and properties of the integers and reliable in the study of abstract algebraic concepts,.
2	Recognize knowledge by learning theories, and basic concepts in the theory of numbers.
3	Describe and to apply the basic principles of the theory of numbers that they have learned in this course to solve some numerical problems.
4	Stat and identify appropriate analytical procedures to find the right solution for some of the problems of life.
5	The students will explain and interpret a general knowledge of general number theory.
6	Must be shown the ability of working independently and with groups.
7	The student should illustrate how to communicating with: Peers, Lecturers and Community.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3	√	√								
4						√		√		
5						√		√		
6										
7										

Course Number: MATH_353 –
Course Learning Outcomes:

1	finding the limits and derivatives of the functions with MATHEMATICA.
2	calculating definite and indefinite integrals with MATHEMATICA
3	operations on matrices and determinants with MATLAB
4	solving systems of equations with MATLAB
5	writing scientific researches and reports by Scientific work plus
6	
7	

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes** **Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1		✓								
2			✓							
3						✓				
4								✓		
5									✓	
6										
7										

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Course Number: Math-423

Course Learning Outcomes:

1	Deepen students' concepts
2	Ability to think analytically and critically
3	Ability to understand and analyse the mathematical problems
4	Students can communicate, negotiate and evaluate their strengths and weaknesses as team members
5	Students can act responsibly and ethically in conducting their work.
6	
7	

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2				√						
3					√	√				
4						√				
5										
6										
7										

Course Number: MATH443 **Rings and Fields**

Course Learning Outcomes:

1	Cite and understand a representative selection of the definitions and terms introduced in this course.
2	Cite examples of the main mathematical structures introduced during the course: rings, subrings, ideals and fields.
3	Execute simple proofs and deductions from the axioms for these structures and express the reasoning with reasonable clarity.
4	Perform simple calculations in specific examples of the main structures discussed in the module.
5	Appreciate the relevance of the abstract structures to related areas of mathematics. The Intended Generic Learning Outcomes and, as appropriate, their relationship to programme Learning Outcomes. On successful completion of this course, students will have developed further: -a logical, mathematical approach to solving problems in algebra; - their ability to communicate these solutions, simple proofs and calculations; -their numeracy and computational skills; -their ability to plan and and carry out effective ways of studying; -their key skills in numeracy, problem solving and written communication.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1				√						
2				√						
3						√				
4									√	
5									√	

Course Number: Math 472, **Introduction to topology**

Course Learning Outcomes:

1	Define Topological Spaces, Accumulation Points , Interior, Closure, Boundary and exterior of sets – Coarser and Finer Topologies – Subspace
2	Recognize Bases and Subbases for topologies and write Topologies generated by classes of sets
3	Describe Continuous Function , continuity at a point and list separation axioms
4	Stat Covers – Compact Sets and named Connect Sets – Connects Spaces
5	The students will explain and interpret a general knowledge of general topology.
6	Must be shown the ability of working independently and with groups.
7	The student should illustrate how to communicating with: Peers, Lecturers and Community.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1			√							
2			√							
3			√							
4			√							
5				√						
6						√				
7									√	

Course Number: **Introduction to Differential Geometry (Math 473)**

Course Learning Outcomes:

1	Define Theory of curves in R^3-Regular curves, reproduce arc length and reparametrization and Natural parametrization
2	Define Serret-Frenet equations and Construct and Existence and uniqueness theorem for space curves. Define Bertrand curves, Involutes and evolutes of curves
3	Describe Local theory of surfaces-Simple surfaces-Coordinate transformations list the difference between surfaces and curves
4	State Tangent vectors & tangent spaces - First and second fundamental forms– Normal and geodesic curvature
5	Recognize Weingarten map- Principal Gaussian and mean curvatures- Geodesics- Equations of Gauss and Godazzi-Mainardi.
6	The students will explain and interpret a general knowledge of Differential Geometry.
7	The student will have the ability of working independently and with groups.
8	The student should illustrate how to communicate with: Peers, Lecturers and Community.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes** Use LOs Codes									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1			√							
2			√							
3			√							
4			√							
5			√							
6				√						
7						√				
8									√	

Course Number: **Introduction to Functional Analysis**

Course Learning Outcomes:

1	Define the fundamental concepts of functional analysis
2	Explain and interpret the different types of spaces
3	Describe Continuous Function , continuity at a point and list se
4	State the basic properties of metric –normed and Hilbert spaces
5	The students will explain the ability of to take responsibility .
6	Must be shown the ability of working independently and with groups.
7	Analyse and realize the importance of the different codes of Ethics

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes** Use LOs Codes									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1			√							
2			√							
3			√							
4			√							
5					√					
6							√			
7								√		

Course Number: Introduction to Differential Geometry (Math 482)

Course Learning Outcomes:

1	Define Definition of Riemann integral- Dario theorem and Riemann sums
2	Construct Properties and the principle theorem in calculus. Sequence
3	Describe Series of functions- Pointwice convergence and uniform convergence
4	State Algebra and (sigma algebra)- Finite additive and countable additive- Main extension theorem and outer measure- Measurable sets - Measure
5	Recognize Lebesgue measure and its properties- Simple functions- Measurable functions- Lebesgue integral- Theorems of convergence- The relation between Lebesgue and Riemann integral.
6	The students will explain and interpret a general knowledge of Real analysis.
7	The student will have the ability of working independently and with groups.
8	The student should illustrate how to communicate with: Peers, Lecturers and Community.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1			√							
2			√							
3			√							
4			√							
5			√							
6				√						
7						√				
8									√	

Course Number: **Math 483 - Complex Analysis**

Course Learning Outcomes:

1	Define the fundamental concepts of complex numbers and its properties, exponential , trigonometric and hyperbolic functions
2	State the Physical problems by the mathematical methods
3	Describe Continuous Function , continuity at a point and list se
4	State the analytic function notion and name the equivalent methods
5	The students will explain and interpret a general knowledge of complex analysis.
6	Must be shown the ability of working independently and with groups.

Mapping:

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	Program Learning Outcomes Use LOs Codes									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1			√							
2			√							
3			√							
4			√							
5					√					
6							√			

Course Number: : 411: Topics in Applied Mathematics

Course Learning Outcomes:

1	Students will be able to understand the Mathematical model for initial and boundary value problems that appear in applied sciences. Students will be able to understand Mechanics of particles and rigid bodies in different dimensions
2	Students will be able to understand the concepts of Fluid Mechanics and Heat Transfer. Students will be able to understand application of Electromagnetics
3	The students will **explain and interpret** a general knowledge of subjects in applied mathematics.
4	Enable students to **analyses** the mathematical problems.
5	The student should **illustrate** how take up responsibility.
6	The students will **show** the ability of working independently and with groups.
7	The student should **illustrate** how to communicating with: Peers, Lecturers and Community.
8	The student should **interpret** how to Know topics in Applied Mathematics using the internet.

Map course LOs with the program LOs. (Place course LO #s in the left column and program LO #s across the top.)

Course LOs #	**Program Learning Outcomes Use LOs Codes**									
	a1	**a2**	**a3**	**b1**	**b2**	**c1**	**c2**	**c3**	**d1**	**d2**
1	√									
2	√									
3				√						
4				√			√			
5							√			
6									√	
7									√	