

<b>Brief course description- Course Plan Development and Updating Procedures\ Mathematics Department</b>	<b>QF01/0409-3.0E</b>
--	-----------------------

Faculty	Science & IT	Academic Department	Mathematics	Number of the course plan (2021-2022)
Number of Major requirement courses	<b>40</b>	Date of plan approval		
Course number	Credit hours	Title of the course	Prerequisite-co-requisite	
<b>0101101</b>	<b>3</b>	<b>Calculus (1)</b>	<b>None</b>	
Functions types (polynomials, rational functions, piecewise functions, trigonometric functions, exponential and logarithmic functions), Limits, Continuity, The derivative, Chain rule, Implicit differentiation, Applications of derivative, Finite integration, Infinite integration.				
Course number	Credit hours	Title of the course	Prerequisite-co-requisite	
<b>0101102</b>	<b>3</b>	<b>Calculus (2)</b>	<b>0101101</b>	
Inverse functions, Inverse trigonometric functions, Hyperbolic and inverse hyperbolic functions, L'Hopital rule, Methods of integration, Improper integrals, Applications of integrals (Area, Volume, Arc length, Surface area), Introduction to sequences and series.				
Course number	Credit hours	Title of the course	Prerequisite-co-requisite	
<b>0101103</b>	<b>3</b>	<b>General Mathematics</b>	<b>None</b>	
Basic set operations, Greatest common divisor and least common multiple, One and two-dimensional graphical representations, Quadratic formula, Complex numbers, Functions, Limits, Continuity, Derivatives, Definition of statistics, Statistical measurements ( Mean, Median, Quantiles, Variance and Standard deviation), Frequency tables, Graphical representation of data (Histograms, Bar and pie charts).				
Course number	Credit hours	Title of the course	Prerequisite-co-requisite	
<b>0101104</b>	<b>3</b>	<b>Calculus (2) for Engineering</b>	<b>0101101</b>	
Inverse functions, Inverse trigonometric functions, Hyperbolic and inverse hyperbolic functions, L'Hopital rules, Methods of integration, Improper integrals, Applications of integrals (Area, Volume, Arc length, Surface area), Introduction to sequences and series.				
Course number	Credit hours	Title of the course	Prerequisite-co-requisite	
<b>0101112</b>	<b>3</b>	<b>Foundations of Mathematics</b>	<b>None</b>	
Introduction to Logical Symbols, Connectives, Tautologies and contradictions, Quantifiers, Methods of proof, Operations on sets, Indexed families, Proof by induction, Relations, Cartesian graphs and direct graphs, Equivalence relations, Partitions, Functions, Operations on functions, Inverse functions, Finite sets and infinite sets, Countable sets.				
Course number	Credit hours	Title of the course	Prerequisite-co-requisite	
<b>0101140</b>	<b>3</b>	<b>Statistics and Probability</b>	<b>None</b>	
Descriptive statistical measures, Updating descriptive measures and applications, Random experiment, probability concepts, Conditional probability, Univariate and bivariate random variables, Some discrete distributions (Binomial, Poisson, Geometric and hypergeometric), Continuous distribution (Normal), The central limit theorem, The distribution of the sample mean and the sample variance.				
Course number	Credit hours	Title of the course	Prerequisite-co-requisite	
<b>0101201</b>	<b>3</b>	<b>Calculus (3)</b>	<b>0101102</b>	
3-dimensional space, vectors, lines and planes in 3-space, Functions of two or more variables, partial derivatives and multiple integrals.				
Course number	Credit hours	Title of the course	Prerequisite-co-requisite	
<b>0101205</b>	<b>3</b>	<b>Calculus (3) for Engineering</b>	<b>0101104</b>	
3-dimensional space, vectors, lines and planes in 3-space, Functions of two or more variables, partial derivatives and multiple integrals.				

<b>Brief course description- Course Plan Development and Updating Procedures\ Mathematics Department</b>	<b>QF01/0409-3.0E</b>
--	-----------------------

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101202</b>	<b>3</b>	<b>Advanced Calculus</b>	<b>0101201</b>
Line and surface integrals, Jacobian determinant, Change of variables, Green's theorem, Curl and divergence of a vector field, Divergence theorem.			

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101212</b>	<b>3</b>	<b>Number Theory</b>	<b>0101112</b>
Properties of integer numbers, Division algorithm, Greatest common divisor, Least common multiple, Prime numbers, Fundamental theorem of arithmetic, Diophantine equations, Congruence, Linear congruence, Chinese remainder theorem, Fermat's theorem, Euler's theorem and Wilson's theorem.			

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101221</b>	<b>3</b>	<b>Linear Algebra (1)</b>	<b>None</b>
Matrices and operations on matrices, Determinants, Inverse of matrix using adjoint, matrices form of linear systems and solving linear systems, Eigenvalues and eigenvectors, Characteristic polynomial, Vectors in 2-space or 3-space, Dot product, Cross product, Vector space, Subspaces, Linearly independence, Basis and dimension, Linear transformations from $\mathbb{R}^n$ to $\mathbb{R}^m$ .			

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101231</b>	<b>3</b>	<b>Euclidean Geometry</b>	<b>0101112</b>
Postulates, The congruent concept, Isosceles triangles, Equilateral triangles, Other cases of congruent triangles, The parallel concept, The Euclidean parallel postulate, Parallelograms, Quadrilaterals, Similarity concept, The basic similarity theorems, Pythagoras theorem, The area postulate, Area of polygons, Equivalence of polygons, Circles.			

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101251</b>	<b>3</b>	<b>Real Analysis (1)</b>	<b>0101101+ 0101112</b>
Properties of real numbers, Inequalities, Completeness property of $\mathbb{R}$ , Suprema and infima, Sequences of real numbers, Subsequences, Continuous functions, Uniform continuity, Lipchitz functions, Open and closed sets, Compact sets, Heine-Borel theorem.			

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101272</b>	<b>3</b>	<b>Numerical Analysis (1)</b>	<b>0101101+0101221</b>
Introduction to representation of numbers, Errors and their sources, Numerical solution of nonlinear equations with one variable (the bisection, the fixed- point, Newton-Raphson and the secant methods), Multiplicity, the modified Newton's method, Synthetic division, Approximating functions by Taylor polynomials, Interpolation (Lagrange's formula, and Newton's finite divided differences formula), Numerical methods to solve systems of linear equation: direct methods (Cramer's Method, inverse method, Gauss elimination method) and iterative methods (Jacobi method and Gauss-Seidel method).			

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101273</b>	<b>3</b>	<b>Ordinary Differential Equations (1)</b>	<b>0101102</b>
Differential equations of first-order, Methods for solving linear differential equations of higher order, Methods for solving Cauchy – Euler equations, Laplace transformations.			

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101322</b>	<b>3</b>	<b>Linear Algebra (2)</b>	<b>0101221</b>
General vector space, Row space, Column space and Null space, Rank and nullity, Eigenvalues and eigenvectors, Similar matrices and diagonalization, Inner products, Inner products generated by matrices, Angle and orthogonality in inner product spaces, Orthonormal bases, Gram–Schmidt process, QR – decomposition, Diagonalization and quadratic forms, General linear transformations, Kernel and			



<b>Brief course description- Course Plan Development and Updating Procedures\ Mathematics Department</b>	<b>QF01/0409-3.0E</b>
--	-----------------------

range, Inverse linear transformations.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101323</b>	<b>3</b>	<b>Abstract Algebra (1)</b>	<b>0101212</b>
Groups and subgroups, Cyclic groups, Permutation groups, Homomorphisms of groups, Isomorphism's of groups, Direct product of groups, Cosets and Lagrange's theorem, Normal subgroups and factor groups, The first isomorphism theorem.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101341</b>	<b>3</b>	<b>Probability theory</b>	<b>0101201</b>
Expectations and variance, Moments and moment generating function, Exponential, Normal joint distributions, Joint moment, Conditional distributions, Independence of random variables, Functions of random variables, Transformation technique one variable, Transformation technique several variable, Moment-generating function technique, Sampling distribution.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101347</b>	<b>3</b>	<b>Introduction to financial Mathematics</b>	<b>None</b>
The theory of simple interest: present value and discount, debt settlement, discounting of commercial papers, amortization of short-term loans and addressing the theory of compound interest: the basic laws of applying compound interest, calculating the period and rate, present value and discount, debt settlement, payments, amortization of loans.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101351</b>	<b>3</b>	<b>Complex Analysis</b>	<b>0101251</b>
Complex numbers, Algebraic properties, Cartesian coordinates, The triangle Inequality, Polar coordinates, Power and roots, Functions of a complex variable, Limits, Continuity, Derivatives, The Cauchy-Riemann equations, Analytic functions, Harmonic functions, The exponential functions, Trigonometric functions, Branches of Logz, Complex exponent, Contours, Line integrals, The Cauchy-Goursat theorem, Cauchy integral formula, Derivative of analytic functions.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101353</b>	<b>3</b>	<b>Real analysis (2)</b>	<b>0101251</b>
Derivatives, Derivative rules, Chain rule, Local extrema, Monotonic functions, Rolle's theorem, Mean-value theorem, Generalized mean-value theorem, Taylor's theorem. Riemann integral and its properties, Upper and lower sums, Integration by parts, Fundamental theorems of calculus, Bounded functions, Pointwise and uniform convergence of sequences and series of functions, Power series.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101361</b>	<b>3</b>	<b>Methods of Teaching Mathematics</b>	<b>Dept. Approval</b>
This course introduces students to a variety of modern methods for teaching mathematics by distinguishing between the behaviorist teaching methodologies and the more recent constructivist methods of teaching. In addition, this class familiarizes students with the standards of the NCTM. It also develops students' abilities to prepare lesson plans and compose valid exams.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101363</b>	<b>3</b>	<b>History of Mathematics</b>	<b>None</b>
Development of the arithmetica, Logistic of natural numbers, Mechanical aids to calculation, Artificial numbers, Geometry, Algebra, Trigonometry, Measures, The calculus history.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101370</b>	<b>3</b>	<b>Graph Theory</b>	<b>0101112</b>
Some counting techniques such as the principle of inclusion and exclusion, Graphs, Paths, Trees and networks and useful algorithms on networks such as shortest path algorithm, Minimal spanning tree			

<b>Brief course description- Course Plan Development and Updating Procedures\ Mathematics Department</b>	<b>QF01/0409-3.0E</b>
--	-----------------------

algorithm and flow algorithms in networks.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101372</b>	<b>3</b>	<b>Mathematical Modeling (1)</b>	<b>0112120</b>
Programing and coding for solving mathematics problems. Introductions to Matlab and its use for matrices, Plotting, Integration and differentiation, Curves and If conditions, Optimizing and solving system of polynomials.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101374</b>	<b>3</b>	<b>Partial Differential Equations</b>	<b>0101273</b>
Partial differential equations of the first-order, Nonlinear pde's of the first-order, Linear pde's with constant coefficients, Linear pde's with variable coefficients, wave, heat, and Laplace equations.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101376</b>	<b>3</b>	<b>Linear Programming &amp; Game Theory</b>	<b>0101221</b>
Introducing the linear optimization theory and its applications, Modeling of real world problems as linear programs, Basic theory of linear programming, Simplex algorithm, Two phase method, Duality, Dual simplex method, Post optimality analysis, Transportation and assignment problems, Simple network models, Linear integer programming, Basic game theory, 2-player games, Mini-max solutions, Zero sum games Nash equilibrium.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101377</b>	<b>3</b>	<b>Numerical Analysis (2)</b>	<b>0101272</b>
Introducing the students to more numerical methods as well as teaching how to do some error analysis. These methods include finite difference methods for numerical differentiation the trapezoidal rule, Simpson's rule and Gaussian quadrature for numerical integration and Euler's, Taylor series and Runge-Kutta formulas for solving differential equations.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101424</b>	<b>3</b>	<b>Abstract Algebra (2)</b>	<b>0101323</b>
Rings, Subrings, Integral domain, Factor ring and ideals, Ring homomorphisms, Polynomial rings, Factorization of polynomial, Reducibility and irreducibility tests, Divisibility in integral domain, Principal ideal domains and unique factorization domains, Algebra extension of fields.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101432</b>	<b>3</b>	<b>Topology</b>	<b>0101251</b>
Topological spaces, Open and closed sets, Interior points, Boundary points, Limit points, Closure sets, Subspace topology, Bases and subbases, Continuous functions, Homeomorphisms, Hausdroff space, Separation axioms, Connected space, Compact spaces, Metric spaces, The metrizability.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101433</b>	<b>3</b>	<b>Differential Geometry</b>	<b>0101201</b>
Plane and space curves, Reparametrization by arc length, Curvature, Torsion, Frenet formulas, Osculating plane, normal plane, Rectifying plane, Bertrand curves, Surfaces in three dimensions, Smooth surfaces, The first fundamental form, length of curves on surfaces, Surface area, The Gauss map, The second fundamental form, Gauss formula, The normal and geodesic curvatures, Principal curvatures, Mean and Gauss curvatures, Geodesics and applications.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101442</b>	<b>3</b>	<b>Mathematical Statistics</b>	<b>0101341</b>
Sampling distribution, Estimation theory, Method of moments, Method of maximum likelihood, Point estimation, Unbiased estimators, Consistency, Efficiency, Sufficiency, Completeness, Cramer Rao theorem. UMVUE, Interval estimation and hypothesis testing about the parameters.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite



<b>Brief course description- Course Plan Development and Updating Procedures\ Mathematics Department</b>	<b>QF01/0409-3.0E</b>
--	-----------------------

<b>0101443</b>	<b>3</b>	<b>Applied Statistics</b>	<b>0101341</b>
Elements of testing hypotheses, Statistical inference about one and two populations parameters, Simple and multiple regression, Correlation coefficient, The analysis of variance of one and two-factor experiments, The Latin squares, Chi square test for homogeneity, Independences and goodness of fit, Using SPSS programing.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101452</b>	<b>3</b>	<b>Functional Analysis</b>	<b>0101251</b>
Metric spaces, Normed linear spaces, Inner product spaces, Banach spaces, Hilbert spaces, Linear operators, Bounded and continuous linear operators on these spaces.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101455</b>	<b>3</b>	<b>Special Functions</b>	<b>0101273</b>
Frobinius method, Gamma and beta functions, Legendre polynomials functions and polynomials, Bessel's equation.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101462</b>	<b>3</b>	<b>Practical Education in Teaching Mathematics</b>	<b>0101361</b>
This course follows the strategy of microteaching in order to develop students' abilities at class management; consequently, each student will be allowed to perform practical demonstrations of teaching mathematics in class. Afterwards, students will engage in dialogues and discussions regarding their practical presentations of mathematics lessons. Overall, this class develops students' strategies in teaching mathematics and conducting real assessment, as well as the practical application of such strategies in class.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101464</b>	<b>1</b>	<b>Research Seminar in Mathematics</b>	<b>Dept. Approval</b>
Introducing students to the methods of writing a scientific report by submitting a report at the end of the semester on a specific scientific topic.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101471</b>	<b>3</b>	<b>Mathematical Modeling (2)</b>	<b>None</b>
This course is an introduction to mathematical modeling using tools from various parts of mathematics to describe and explore real-world data and phenomena. A variety of modeling techniques will be discussed with examples taken from linear programming, Graph theory, Differential and methods of solving matrices, Using of Matlab will take a part of this course. Finally, we study the expansion of polynomials by different methods.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101475</b>	<b>3</b>	<b>Applied Mathematics</b>	<b>0101374</b>
Boundary value problems (Sturm- Liouville problem), Series solutions of ordinary differential equations, Fourier series, Fourier coefficients, Convergence of Fourier series, Sine and Cosine series, Fourier integration, Solutions of wave, Laplace and heat equations by Fourier series, Fourier solutions of the boundary value problems.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
<b>0101477</b>	<b>3</b>	<b>Selected Topics in mathematics</b>	<b>Dept. Approval</b>
Study of selected areas in mathematics. Designed for special needs of students.			

Approved by department council		Date of approval	
--------------------------------	--	------------------	--



جامعة الزيتونة الأردنية  
Al-Zaytoonah University of Jordan  
كلية العلوم وتكنولوجيا المعلومات  
Faculty of Science and Information Technology



"عراقة وجودة"  
"Tradition and Quality"

Brief course description- Course Plan Development and Updating Procedures\  
Mathematics Department

QF01/0409-3.0E