Courses Description

College: Science

Department: Mathematics

Couse ID: 110101099	**Description:** Introduction to Calculus
Full Course Description:	*Equations, inequalities, functions, limits and continuity, derivatives and their applications, definite and indefinite integrals, applications of integrations.
Couse ID: 110101102	**Description:** Calculus (2)
Full Course Description:	*Applications of integrals, areas, volumes, arc length, and surface area, methods of integration, improper integrals, polar coordinates and polar functions, parametric equations and conic sections, sequences and infinite series, tests of convergence of series, power series.
Couse ID: 110101152	**Description:** Discrete Mathematics
Full Course Description:	Logic, proof, sets, functions, sequences, series, matrices, growth of functions, number theory, mathematical induction, principle of counting, relations, graphs, isomorphic graphs and trees.
Couse ID: 110101201	**Description:** Calculus (3)
Full Course Description:	*Vectors and analytic geometry in space, functions of several variables, and their limits, partial differentiation, directional derivatives, extrema of functions of several variables with their applications, multiple integrals: double and triple integrals, and change of variables.
Couse ID: 110101203	**Description:** Ordinary Differential Equations (1)
Full Course Description:	* Solutions of differential equations: first order, second and higher orders with applications to mechanics and physics, series solutions of second order linear ordinary differential equations, Laplace transforms and their applications in solving initial value problems.
Couse ID: 110101205	**Description:** Mathematical Programming packages
Full Course Description:	*A studying of one of the mathematical programming packages: Matlab, Maple, Mathematica….etc. with applications on calculus, linear algebra, and differential equations.
Couse ID: 110101211	**Description:** Real Analysis (1)
Full Course Description:	*Algebraic, order, completeness properties of real numbers, nested interval properties, Bolzano-Weistrass theorem for sets, Archimedean property, density theorem, bounded and monotonic sequences, subsequences, Cauchy sequences, partial sum sequences, limits of functions and sequences by the neighborhood method, continuity, properties of continuous functions, uniform continuity.
Couse ID: 110101241	**Description:** Linear Algebra (1)
Full Course Description:	*Systems of linear equations, matrices and their operations, homogenous and non-homogenous systems, Gauss eliminations method, singular matrices, inverse of matrices, determinants, Cramer rule, vector space, bases, linear independence, Gramm-Shmidt process ,linear transformations, kernel and range of linear transformations, eigenvalues, eigenvectora and diagonalization.☐
Couse ID: 110101251	**Description:** Foundation of Mathematics
Full Course Description:	*Logic, methods of mathematical proof, set theory, Cartesian products, relations, functions, one-to-one function, onto function, finite sets, infinite sets, cardinality of sets, countable and uncountable sets.
Couse ID: 110101261	**Description:** Euclidean Geometry
Full Course Description:	*Euclidean postulates, congruence, parallelism, similarity, area and equivalence, circle, lines and planes in space, solids.
Couse ID: 110101302	**Description:** Ordinary Differential Equations (2)
Full Course Description:	*Systems of first order linear differential equations, homogenous systems with constant coefficients, nonhomogeneous systems, non-linear differential systems and stability, almost linear systems, periodic solutions, boundary value problems and Sturm-Liouville's theorem, homogeneous and nonhomogeneous boundary value problems.

Courses Description

College: Science

Department: Mathematics

Couse ID: 110101303	**Description:** Special Functions

Full Course Description: *Gamma and Beta functions, Legendre functions, associated Legendre functions, Bessel functions, spherical Bessel functions, Chebyshev, Laguerre and Hermite polynomials, hypergeometric function and confluent hypergeometric function.

Couse ID: 110101311	**Description:** Real Analysis (2)

Full Course Description: *Differentiation, Roll's theorem, mean-value theorem, L'Hôpital's rule, Taylors' theorem, Darboux's theorem,Riemann integral, definition and properties, improper integral, definite integrals, integral approximation and sequences of functions. Point-wise convergence, uniform convergence, interchange of limits and integration, exponential, logarithmic, trigonometric functions, convergence of infinite series, convergence tests, series of functions, interchange of integration and summation.

Couse ID: 110101341	**Description:** Abstract Algebra (1)

Full Course Description: *Groups, subgroups, cyclic groups, permutation groups, group homomorphism, direct product groups, cosets and Lagrange's theorem, normal subgroups, quotient groups, simple groups, first isomorphism theorem, second isomorphism theorem, third isomorphism theorem.

Couse ID: 110101342	**Description:** Linear Algebra (2)

Full Course Description: *Finite dimensional vector spaces, subspaces, direct sum, linear transformations, invertible linear transformation, eigenvalues and eigenvectors, invariant subspaces, matrix representation of a linear transform, upper triangular and diagonal matrices, polynomials, inner product, norm, orthonormal bases, orthogonal projection, adjoint of operators, Schur's theorem, spectral theory, normal operator, positive operator, QR-decomposition, least squares problem, polar decomposition, singular value decomposition, generalized eigenvectors.

Couse ID: 110101343	**Description:** Number Theory

Full Course Description: *Division algorithm, divisibility, greatest common divisor, least common multiple, Diophantine equations, prime numbers, the fundamental theorem of arithmetic, congruence, linear congruence equations, Chinese remainder theorem, divisibility tests, Fermat's theorem, Euler's theorem, arithmetic functions.

Couse ID: 110101344	**Description:** Graph Theory

Full Course Description: *Graphs, basic types of graphs, operations on graphs, connectivity, trees, distance in graphs, Eulerian and Hamiltonian graphs, matrix representation of a graph, plane graphs and graph coloring, domination in graphs.

Couse ID: 110101351	**Description:** Fuzzy Sets

Full Course Description: *Fuzzy sets, operations on fuzzy sets, composition and fuzzy relations, graph and fuzzy logic.

Couse ID: 110101361	**Description:** Non - Euclidian Geometry

Full Course Description: *Foundation of Euclidean geometry, the fifth postulate in Euclidean geometry and some of its equivalent statements, hyperbolic plane geometry, introduction to elliptic plane geometry, consistency of the non-Euclidean geometries.

Couse ID: 110101391	**Description:** History of Mathematics

Full Course Description: *Numerical systems, arithmetic systems, arithmetic and area in Egyptian (Pharaonic) mathematics, mathematics in the Greek civilization, mathematics in Islamic period, modern mathematics in Europe.

Courses Description

College: Science

Department: Mathematics

Couse ID: 110101401	**Description:** Advanced Calculus

Full Course Description: *Functions of several variables; vector valued functions, differentiation and differential operators, integration of vector valued functions, line integrals, surface integrals, Greens' theorem, Gauss's theorem, Stocks' theorem, work ,conservative fields and potential functions, implicit function theorem and inverse functions, extrema of functions, Leibniz's rule and calculus of variation.

Couse ID: 110101402	**Description:** Numerical Analysis (1)

Full Course Description: * Computing errors, reasons of errors, numerical solution of equations in one variable, interpolation and polynomial approximation, numerical differentiation and integration, and numerical solutions of initial-value problem for ordinary differential equations.

Couse ID: 110101405	**Description:** Integral Equations

Full Course Description: *Types of integral equations, converting IVP and BVP into integral equations, integral equations with separable kernels, Method of successive approximations, integral equations with symmetric kernels, Abel integral equation, solving integral equations by integral transforms.

Couse ID: 110101407	**Description:** Numerical Analysis (2)

Full Course Description: *Direct and iterative techniques for solving linear systems of equations, numerical solutions of nonlinear systems of equations, numerical solutions of boundary value problem for ordinary differential equations, some numerical solutions for partial differential equations.

Couse ID: 110101408	**Description:** Numerical Methods

Full Course Description: Computing errors, reasons of errors, numerical solution of equation in one variable, interpolation and polynomial approximation, numerical differentiation and integration, and direct and iterative techniques for solving linear systems of equations.

Couse ID: 110101411	**Description:** Real Analysis (3)

Full Course Description: * The Euclidean space of -dimension, the completeness property of the space , the continuity on , the differentiability on , Roll's theorem, the mean-value theorem, the partial derivatives, the directional derivatives, the chain rule, the mixed partial derivatives and the Implicit function theorem, functions of bounded variations, functions of total variation, the Riemann-Stieltjes integral, Riemann-Stieltjes sum, integration by parts, Euler's summation formula, the mean-value theorems for Riemann-Stieltjes integrals.

Couse ID: 110101413	**Description:** Complex Analysis

Full Course Description: *Complex numbers, geometric, polar representation of complex numbers, exponentials and roots, regions in the complex plane, analytic functions, continuity, elementary functions, logarithmic functions and their branches, contour integrals, integrals on closed contours, Cauchy theorem, derivatives of analytic functions, Morera's theorem, Liouville's theorem, convergence of sequences and series, Taylor's series, Laurent's series, uniform convergence, integrals, residues and poles, residue theorem, improper real integrals.

Couse ID: 110101441	**Description:** Abstract Algebra (2)

Full Course Description: *Rings, fields, subrings, subfields, integral domains, subdomains, ideals, prime ideals, maximal ideals and quotient rings, ring-homomorphism, Polynomial rings, Division Algorithm Theorem for polynomials over a field, unique factorization domains, principal ideal domains, Euclidean domains, quotient fields, algebraic and transcendental extension fields, algebraically closed fields, introduction to Galois Theory.

Couse ID: 110101443	**Description:** Combinatorics

Full Course Description: * Basics of counting, permutations and combinations, recurrence relations, generating functions, inclusion and exclusion, combinatorial graphs, trees and searching.

Couse ID: 110101495	**Description:** Special Topics

Full Course Description: *A study of one of the modern topics in mathematics.

Courses Description

College: Science

Department: Mathematics

Couse ID: 2001011232   **Description:** Introduction to Probability and statistics

Full Course Description: Descriptive statistics, basics of probability, random variables, expected values and their properties, binomial distribution, normal distribution, statistical inference (confidence intervals and testing hypothesis) about one mean, one proportion and one variance, difference between two means and difference between two proportions and ratio of two variances for large and small samples, paired and independent samples. □

Couse ID: 2001011304   **Description:** Partial Differential Equations

Full Course Description: Sturm-Liouville's problems, orthogonal functions and eigenfunction expansions, Fourier series, method of separation of variables for solving partial differential equations, the wave equation, heat equation and Laplace equation, method of integral transforms, Fourier transforms.

Couse ID: 2001011305   **Description:** Linear Programming

Full Course Description: Foundation of linear programming, graphical solutions, simplex method, M technique and the two phase methods, duality, dual simplex method, sensitivity, integer programming, transportation and assignment problems, network minimization, shortest route and maximal flow problems.

Couse ID: 2001011306   **Description:** Dynamical Systems

Full Course Description: Phase space, fixed points and stability analysis, local and global bifurcations, Poincare-Bendixson theorem, limit cycles, Poincare maps, iterative maps, period-doubling bifurcation, Lorenz equations, Lyapunov exponents, chaos, fractals and strange attractors.

Couse ID: 2001011321   **Description:** Probability Theory

Full Course Description: The probability hypotheses, conditional probability and stochastic independence, random variables, probability density functions, cumulative distribution functions, mathematical expectations and moment generating functions, some special discrete and continuous distributions, distribution of functions of random variables, distributions of mean and variance of sample of normal distribution, order statistics, convergence in probability and limiting distributions.

Couse ID: 2001011332   **Description:** Statistical Methods

Full Course Description: Simple linear regression and correlation coefficient, multiple correlation, Chi-square test for consistency, independence and homogeneity, one and two dimensional analysis of variance with and without reactions, non-parametric statistics: Wilcoxon test, sign test, Spermann correlation coefficient and test of independence, Croscal and Alice test.

Couse ID: 2001011333   **Description:** Sampling Methods□

Full Course Description: Design a questionnaire, systematic sampling, simple random sampling, stratified sampling, cluster sampling, multistage cluster sampling, ratio estimates, regression and difference estimates, and estimation of population size.

Couse ID: 2001011334   **Description:** Design of Experiment

Full Course Description: Completely randomized design for a single factor, multiple comparison, randomized block designs, Latin-square design and Graeco-Latin design, incomplete block designs, factorial experiments with two and three factors, blocking in factorial experiments, nested designs. Analysis of covariance, optimum designs.

Couse ID: 2001011335   **Description:** Applied Regression Analysis

Full Course Description: Simple linear regression, least square method, testing and estimation, residuals analysis, model checking, matrix formulation, multiple regression, polynomial regression, selection of independent variables, indicator variables and model building.

Courses Description

College: Science

Department: Mathematics

Couse ID: 2001011412	**Description:** Functional Analysis

Full Course Description: Metric spaces, open set, closed set, neighborhood, convergence, Cauchy sequences in metric spaces, completeness, normed linear Spaces, the spaces: ,), , p, , the H?lder-Minkowi's inequality, convergence and Cauchy sequences, completeness of normed linear spaces, noncomplete spaces, Dual spaces, Banach spaces, Hilbert spaces.

Couse ID: 2001011433	**Description:** Mathematical Statistics

Full Course Description: Point estimation, sufficient and complete statistics, the family of exponential distributions, Cramer and Rao's inequality, confidence intervals, point and interval estimation using Baye's method, hypothesis testing, Neyman-Pearson Iemma, sequential test, Chi-square test and non-parametric methods.

Couse ID: 2001011444	**Description:** Matrix Theory

Full Course Description: Partitioned matrices, rank, determinants, eigenvalues, Gershgorin circle theorem, matrix polynomials, Cayley-HamiltonTheorem, characteristic and minimal polynomials, Jordan matrix, similar matrices, diagonalization, canonical forms, polar decomposition, singular value decomposition, generalized Moore-Penrose inverses, -decomposition, numerical range, matrix norms, Kronecker and Hadamard products, Schur's Theorem, normal matrices, unitary matrices, Hermitian matrices, positive matrices, the spectral Theorem.

Couse ID: 2001011445	**Description:** Graphs and Digraphs

Full Course Description: Graphs as models, decomposition of graphs, clique number, independence number, some types of graph products, directed graphs, orientations and tournaments, optimization and trees, flows and cuts in networks.

Couse ID: 2001011461	**Description:** Topology (1)

Full Course Description: Topological spaces, open sets, closed sets, the closure, the interior, and the boundary of a set, the derived set, an accumulation point, an interior point, a boundary point, and an isolated point of a set, subspaces, finite products of topological spaces, continuous functions, open functions, closed functions, homeomorphisms, separation axioms.

Couse ID: 2001011462	**Description:** Topology (2)

Full Course Description: The first axiom of countability, the second axiom of countability, connected spaces, components of a space, locally connected spaces, compact spaces, compactness in , countably compact spaces, metric spaces, metric topologies, equivalent metric topologies.