



Faculty of Arts and Sciences

Department of Mathematics

Study Plan of the Bachelor's Degree

In: Mathematics

Academic Year: 2022/2023

**Vision of the Department**

Entrepreneurship and distinction in the quality of teaching and learning, scientific research and community service at local and regional levels.

Mission of the Department

Preparing qualified and distinguished graduates to meet the needs of the local and regional community, by local and international quality criteria.

Mission of the Program

Preparing qualified and distinguished graduates to meet the needs of the local and regional community, through qualified cadres capable of keeping pace with local and international criteria by the e-learning integration criteria.

Objectives of the Educational Program

1. Preparing professionals in mathematics equipped with mathematical knowledge and scientific skills.
2. Assisting students to deal with mathematical problems and find solutions.
3. Disseminating a mathematics culture as a free critical, and analytical ideology in the university and community.
4. Enhancing the scientific attitudes of students and fostering interest in graduate studies.

Educational Program Outcomes

The intended results of this program are to prepare graduates who are able to:

1. Recognize the mathematical knowledge and skills acquired in the major and other related sciences.
2. Clarify mathematical problems using modern methods.
3. Apply mathematical skills.
4. Analyze and tackle results by statistical methods.
5. Building mathematical arguments and evidence.



Framework

Framework of the Bachelor's Degree in Mathematics (132 Cr. Hrs.)

| Sequence | Classification | Credit Hours | Percent % |
|----------|-------------------------|--------------|-----------|
| 1st | University Requirements | 27 | 20.45% |
| 2nd | Faculty Requirements | 18 | 13.63% |
| 3rd | Department Requirements | 87 | 65.92% |
| Total | | 132 | 100% |

Course Numbering

| | | | | |
|-------------|--------------|------------------|---------------------------|--------------|
| <div></div> | <div></div> | <div></div> | <div>0</div> <div>2</div> | <div>5</div> |
| Sequence | Course Level | Cognitive Domain | Program Code | Faculty Code |

Cognitive Domains

| Number | Cognitive Domain | Credit Hours |
|--------|---|--------------|
| 0 | | |
| 1 | Foundation of Mathematics, Algebra, Geometry and Topology | 33 |
| 2 | Real Analysis and Calculus | 42 |
| 3 | Statistics and Probability | 9 |



A. University Requirements: (27) Credit Hours

A. Compulsory Requirements: (18) Credit Hours

| Course No. | Course Title | Cr. Hr. | Prerequisite |
|------------|--|---------|--------------|
| 50511108 | Remedial Course in Arabic | 0 | - |
| 50511109 | Remedial Course in English | 0 | - |
| 50511110 | Remedial Course in Computer Science | 0 | - |
| 50511104 | Communication Skills - Arabic Language (I) | 3 | 50511108 |
| 50511105 | Communication Skills - English Language (I) | 3 | 50511109 |
| 50511206 | National Education | 3 | - |
| 50511308 | Military Sciences | 3 | - |
| 50511305 | Innovation and Entrepreneurship | 3 | - |
| 50511205 | Life Skills and Social Responsibility and Leadership | 3 | - |

B. Elective Requirements: (9) Credit Hours from the following list:

| Course No. | Course Title | Cr. Hr. | Prerequisite |
|------------|---|---------|--------------|
| 50541103 | Computer Skills | 3 | 50511110 |
| 50541309 | Digital Culture | 3 | 50511110 |
| 50521106 | Communication Skills 2 (Arabic Language) | 3 | 50511104 |
| 50521107 | Communication Skills 2 (English Language) | 3 | 50511105 |
| 50521203 | Principles of Psychology | 3 | - |
| 50521204 | Human Rights | 3 | - |
| 50531101 | Islamic Culture | 3 | - |
| 50531205 | Quds and Hashemite Custodianship | 3 | - |
| 50541204 | Environment and development | 3 | - |
| 50541206 | Health and Community | 3 | - |
| 50541308 | Foreign Language | 3 | - |



B. Faculty Requirements: (18) Credit Hours

A. Compulsory Requirements: (18) Credit Hours

| Course No. | Course Title | Cr. hr.* | Theoretical | Practical | Prerequisite |
|--------------|---|-----------|-------------|-----------|--------------|
| 5021101 | Fundamentals of Mathematics | 3 | 3 | - | - |
| 5022101 | Calculus (1) | 3 | 3 | - | - |
| 5022102 | Calculus (2) | 3 | 3 | - | 5022101 |
| 5023101 | Principle of Statistics and Probability | 3 | 3 | - | - |
| 5055103 | General Chemistry | 3 | 3 | - | - |
| 5055101 | General Physics (1) | 3 | 3 | - | - |
| Total | | 18 | 18 | | |

* Credit Hours

C. Department Requirements (87) Credit Hours

A. Compulsory Requirements: (69) Credit Hours

| Course No. | Course Title | Cr. hr.* | Theoretical | Practical | Prerequisite |
|------------|-------------------------------------|----------|-------------|-----------|--------------|
| 5021103 | Logic and Set Theory | 3 | 3 | - | 5022101 |
| 5021204 | Linear Algebra (1) | 3 | 3 | - | 5022101 |
| 5021209 | Linear Algebra (2) | 3 | 3 | - | 5021204 |
| 5022104 | Calculus (3) | 3 | 3 | - | 5022102 |
| 5021208 | Numbers Theory | 3 | 3 | - | 5021103 |
| 50223113 | Mathematical Analysis (1) | 3 | 3 | - | 5021103 |
| 50223217 | Mathematical Analysis (2) | 3 | 3 | - | 50223113 |
| 50224118 | Complex Analysis (1) | 3 | 3 | - | 5022104 |
| 50213214 | Topology (1) | 3 | 3 | - | 50223113 |
| 50214116 | Topology (2) | 3 | 3 | - | 50213214 |
| 50213110 | Modern Euclidean Geometry | 3 | 3 | - | 5021103 |
| 50214115 | Modern Algebra (1) | 3 | 3 | - | 5021208 |
| 50214216 | Modern Algebra (2) | 3 | 3 | - | 50214115 |
| 50214217 | Graph Theory | 3 | 3 | - | 5021103 |
| 50222209 | Ordinary Differential Equations (1) | 3 | 3 | - | 5022102 |
| 50223112 | Ordinary Differential Equations (2) | 3 | 3 | - | 50222209 |
| 50223216 | Partial Differential Equations (1) | 3 | 3 | - | 50222209 |
| 50223111 | Numerical Analysis (1) | 3 | 3 | - | 5022101 |
| 50224219 | Numerical Analysis (2) | 3 | 3 | - | 50223111 |



| | | | | | |
|--------------|-------------------------------------|-----------|-----------|---|-----------------|
| | | | | | and 50222209 |
| 50223214 | Mathematical Modeling | 3 | 3 | - | 50222209 |
| 50222105 | Fundamentals of Applied Mathematics | 3 | 3 | - | 50221202 |
| 50232102 | Probability Theory | 3 | 3 | - | 50231101 |
| 50232204 | Mathematical Statistics | 3 | 3 | - | 50232102 |
| Total | | 69 | 69 | | |

* Credit Hours



B. Elective Requirements: (12) Credit Hours from the following list:

| Course No. | Course Title | Cr. hr.* | Theoretical | Practical | Prerequisite |
|--------------|--|-----------|-------------|-----------|---------------|
| 50222207 | Advanced Calculus | 3 | 3 | - | 50222104 |
| 50213212 | Non-Euclidean Geometry | 3 | 3 | - | 50213110 |
| 50232203 | Applied Statistics | 3 | 3 | - | 50231101 |
| 50222103 | Special Functions | 3 | 3 | - | 50221202 |
| 50224220 | Partial Differential Equations (2) | 3 | 3 | - | 50223216 |
| 50224221 | Complex Analysis (2) | 3 | 3 | - | 50224118 |
| 50223215 | Computer Application in Mathematics | 3 | 3 | - | 50223111 |
| 50222208 | Introduction to Fuzzy Logic | 3 | 3 | - | 50211203 |
| 50222206 | Financial Mathematics | 3 | 3 | - | 50221202 |
| 50213111 | Matrix Analysis | 3 | 3 | - | 50212209 |
| 50223110 | Transformations and Integral Equations | 3 | 3 | - | 50221202 |
| 50213213 | Special Topics in Mathematics | 3 | 3 | - | pass 75 hours |
| 50212206 | Game Theory and Linear Programming | 3 | 3 | - | 50212104 |
| Total | | 12 | 12 | | |

C. Ancillary Courses (6) Credit Hours:

| Course No. | Course Title | Cr. hr.* | Theoretical | Practical | Prerequisite |
|--------------|--|----------|-------------|-----------|--------------|
| 50551201 | General Physics (2) | 3 | 3 | - | 50551101 |
| 40241101 | Fundamentals of Information Technology | 3 | 3 | - | - |
| Total | | 6 | 6 | | |

* Credit Hours



Advisory Study Plan for the Bachelor's Degree in

| First Year | | | | |
|----------------|---|-----------|--------------|--------------|
| First Semester | | | | |
| Course No. | Course Title | Cr. hrs. | Prerequisite | Co-requisite |
| 50211101 | Fundamentals of Mathematics | 3 | - | |
| 50221101 | Calculus (I) | 3 | - | |
| 50231101 | Principle of Statistics and Probability | 3 | - | |
| | University Requirement | 3 | - | |
| | University Requirement | 3 | - | |
| Total | | 15 | | |

| Second Semester | | | | |
|-----------------|-------------------------------------|-----------|--------------|--------------|
| Course No. | Course Title | Cr. hrs. | Prerequisite | Co-requisite |
| 50221202 | Calculus (2) | 3 | Calculus (I) | |
| 50211203 | Logic and Set Theory | 3 | Calculus (I) | |
| 40241101 | Principle of Information Technology | 3 | - | |
| 50551103 | General Chemistry | 3 | - | |
| | University Requirement | 3 | - | |
| | University Requirement | 3 | - | |
| Total | | 18 | | |



| Second Year | | | | |
|----------------|-------------------------------------|-----------|---|--------------|
| First Semester | | | | |
| Course No. | Course Title | Cr. hrs. | Prerequisite | Co-requisite |
| 50222104 | Calculus (3) | 3 | Calculus (2) | |
| 50212104 | Linear Algebra (I) | 3 | Calculus (I) | |
| 50232102 | Probability Theory | 3 | Principle of Statistics and Probability | |
| 50222105 | Fundamentals of Applied Mathematics | 3 | Calculus (2) | |
| 50551101 | General Physics (I) | 3 | - | |
| | University Requirement | 3 | - | |
| Total | | 18 | | |

| Second Semester | | | | |
|-----------------|-----------------------------------|-----------|----------------------|--------------|
| Course No. | Course Title | Cr. hrs. | Prerequisite | Co-requisite |
| 50222209 | Ordinary Differential Equations I | 3 | Calculus (2) | |
| 50212208 | Number Theory | 3 | Logic and Set Theory | |
| 50232204 | Mathematical Statistics | 3 | Probability Theory | |
| 50212209 | Linear Algebra (2) | 3 | Linear Algebra (I) | |
| 50551201 | General Physics (2) | 3 | General Physics (I) | |
| | University Requirement | 3 | - | |
| Total | | 18 | | |



| Third Year | | | | |
|----------------|-------------------------------------|-----------|-------------------------------------|--------------|
| First Semester | | | | |
| Course No. | Course Title | Cr. hrs. | Prerequisite | Co-requisite |
| 50223113 | Mathematical Analysis (I) | 3 | Logic and Set Theory | |
| 50213110 | Modern Euclidean Geometry | 3 | Logic and Set Theory | |
| 50223111 | Numerical Analysis (I) | 3 | Calculus (I) | |
| 50223112 | Ordinary Differential Equations (2) | 3 | Ordinary Differential Equations (I) | |
| | Elective Department Requirements | 3 | - | |
| | University Requirement | 3 | - | |
| Total | | 18 | | |

| Second Semester | | | | |
|-----------------|------------------------------------|-----------|-------------------------------------|--------------|
| Course No. | Course Title | Cr. hrs. | Prerequisite | Co-requisite |
| 50223214 | Mathematical Modeling | 3 | Ordinary differential Equations (I) | |
| 50223216 | Partial Differential Equations (I) | 3 | Ordinary Differential Equations (I) | |
| 50213214 | Topology (I) | 3 | Mathematical Analysis (I) | |
| 50223217 | Mathematical Analysis (2) | 3 | Mathematical Analysis (I) | |
| | Elective Department Requirements | 3 | - | |
| | University Requirement | 3 | - | |
| Total | | 18 | | |



| Fourth Year | | | | |
|----------------|----------------------------------|-----------|---------------|--------------|
| First Semester | | | | |
| Course No. | Course Title | Cr. hrs. | Prerequisite | Co-requisite |
| 50224118 | Complex Analysis (I) | 3 | Calculus (3) | |
| 50214115 | Modern Algebra (I) | 3 | Number Theory | |
| 50214116 | Topology (2) | 3 | Topology (I) | |
| | Elective Department Requirements | 3 | - | |
| | University Requirement | 3 | - | |
| Total | | 15 | | |

| Second Semester | | | | |
|-----------------|----------------------------------|-----------|---|--------------|
| Course No. | Course Title | Cr. hrs. | Prerequisite | Co-requisite |
| 50214216 | Modern Algebra (2) | 3 | Modern Algebra (I) | |
| 50214217 | Graph Theory | 3 | Logic and Set Theory | |
| 50224219 | Numerical Analysis (2) | 3 | Numerical Analysis (I) and Ordinary Differential Equations (I) | |
| | Elective Department Requirements | 3 | - | |
| Total | | 12 | | |



Description of Courses

(50211101), Fundamentals of Mathematics, (T: 3, P: 0) Credit hrs., Prerequisite: (Non)

Real number system, exponents and roots, polynomials, inequalities, the Cartesian plane, equations, functions, functions drawing, linear and slope functions, quadratic and drawing connections, combination of functions, inverse functions, relative and drawing relationships, partial fractions, exponential and logarithmic functions, exponential and logarithmic equations, Unit circle, measure of angles, trigonometric functions and their drawing, inverse trigonometric functions.

(50221101), Calculus (I), (T: 3, P: 0) Credit hrs., Prerequisite: (Non)

Limits and continuity of functions at a point and on interval, derivatives, techniques of differentiation, chain rule, implicit differentiation, Derivatives of exponential functions, derivatives of logarithmic functions, derivatives of trigonometric functions, equations of the tangent and normal, L'Hospital theorem, extreme values of functions, increasing and decreasing, concavity, maximum and minimum values, graphs of functions, integration, techniques of integration.

(50221202), Calculus (2), (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (I) (50221101)

Techniques of integration, integration by substitution, integration by parts, trigonometric integrals, trigonometric substitutions, integration by partial fractions, area of a surface, volumes of revolution, length of a plane curve, improper integrals, polar coordinates, Series and sequences, convergence and divergence, absolute convergence and conditional convergence, alternating series, power series, Taylor and Maclurine series, differentiation and integration of power series.

(50222104), Calculus (3), (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (2) (50221202)

Three dimensional space and vectors, cylindrical surfaces, quadric surfaces, vectors, dot product and cross product, functions of two variables: limits and continuity, differentiability, partial derivatives, integrations: double integrals in rectangular coordinates, double integrals in polar coordinates, triple integrals in rectangular and cylindrical coordinates, multiple integrals.

(50222207), Advanced Calculus, (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (3) (50222104)

Multiple Integrals: double Integrals, triple Integrals, double and triple integrals over general regions, double and triple integrals in polar coordinates, triple integrals in cylindrical coordinates, surface area, area and volume revisited. Line integrals: vector fields, line integrals of vector fields, fundamental theorem for line integrals, Green's theorem, Stokes theorem.

(50211203), Logic and Set Theory, (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (I) (50221101)

Logic: axioms and theorems, negations, quantifiers. Algebra of sets: union, intersection, symmetric difference, difference, complement. Functions: domain and range, different classes of functions including 1-1 and onto, graph of a function. Relations on sets: equivalence relations and equivalence classes, partial order relation, total order relation. Cardinality of sets: finite sets, countable sets, uncountable sets.



(50212104), Linear Algebra (1), (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (I) (50221101)

Matrices and matrix operations, transpose and inverse of a matrix, determinants and their properties, vector spaces and subspaces, linearly independent and linearly dependent, row space and column space, null space of a matrix, inner product space, system of linear equations, methods of solving system of linear equations.

(50212209), Linear Algebra (2), (T: 3, P: 0) Credit hrs., Prerequisite: Linear Algebra (I) (50212104)

Vector Spaces, quotient spaces, linear independence and bases, dual spaces, inner product spaces, matrix of a linear transformation, matrix representation, change of basis and similarity, forms of linear transformations.

(50212208), Number Theory, (T: 3, P: 0) Credit hrs., Prerequisite: Logic and Set Theory (50211203)

Division algorithm, divisibility, greatest common divisor and least common multiple, prime numbers and their distribution, Diophantine equations, fundamental theorem of arithmetic, linear congruence equations, tests of divisibility, remainder theorem, application of number theory.

(50213110), Modern Euclidean Geometry, (T: 3, P: 0) Credit hrs., Prerequisite: Logic and Set Theory (50211203)

Axiomatic systems: consistency, independence and completeness, finite projective geometry, paradoxes of Euclidean geometry, the postulates of connection, the measurement of distance, ruler postulate, order relations, plane-separation postulate, space-separation theorem, Pasch theorem, further properties of angles, triangles, congruence postulate, parallel postulate, similarity, Pythagorean theorem, theorems of Cheva and Menelous, Erdős theorem, circles, central and inscribed angles, cyclic quadrilaterals, Simson's line, nine point circle, lines and planes in space.

(50213212), Non-Euclidean Geometry, (T: 3, P: 0) Credit hrs., Prerequisite: Modern Euclidean Geometry (50213110)

Study of the parallel postulate and some of its equivalent statements, hyperbolic geometry and some related theorems, Elliptic geometry and some related theorems, Spherical geometry.

(50214115), Modern Algebra (I), (T: 3, P: 0) Credit hrs., Prerequisite: Number Theory (50212208)

Groups and subgroups, cyclic groups, permutation groups, isomorphism of groups, direct product of groups, cosets, and Lagrange's theorem, normal subgroups and factor groups, homomorphism of groups, the first isomorphism theorems.

(50214216), Modern Algebra (2), (T: 3, P: 0) Credit hrs., Prerequisite: Modern Algebra (I) (50214115)

Rings, subrings, integral domains, factor rings and ideals. Ring homomorphism; polynomial rings, factorization of polynomials, reducibility and irreducibility tests, divisibility in integral domains, principal ideal domains and unique factorization domains.

(50213214), Topology (I), (T: 3, P: 0) Credit hrs., Prerequisite: Mathematical Analysis (I) (50223113)

Topological spaces, open sets; boundary, interior; accumulation point, topologies induced by functions, subspace topology, bases and subbases, finite products, continuous functions, open and closed functions homeomorphisms, separation axioms and T_0, T_1, T_2 topological spaces.



(50214116), Topology (2), (T: 3, P: 0) Credit hrs., Prerequisite: Topology (1) (50213214)

Separation axioms T_3, T_4 and some examples and theorems related to them, countability Axioms, compact spaces and some related theorems, connected spaces and some related theorems, metric spaces and some related examples and theorems, sequences and their convergence in topological spaces.

(50223113), Mathematical Analysis (1), (T: 3, P: 0) Credit hrs., Prerequisite: Logic and Set Theory (50211203)

The completeness property of R , The Archimedean principle in R , limit of a sequence, convergent sequences, monotone and bounded sequences, Cauchy sequences, subsequences and limit points, Bolzano--Weierstrass theorem, open sets, closed sets, bounded sets and compact sets in R , limits of real valued functions, definition of limits by neighborhoods, definition of limits by sequences, continuous functions on R , sequence definition and neighborhood definition of continuity, boundedness of continuous functions on compact intervals, the extreme value theorem, the intermediate value theorem, uniformly continuous functions, the sequential criterion for uniform continuity. The derivative of functions. Rolle's Theorem, Mean value theorem, Generalized Mean value theorem. Taylor Theorem with remainder. L' Hospital's rule.

(50223217), Mathematical Analysis (2), (T: 3, P: 0) Credit hrs., Prerequisite: Mathematical Analysis (1) (50223113)

Functions of bounded variation on $[a, b]$, continuous functions of bounded variation. Riemann integral, the definition, existence of Riemann integral, basic properties of Riemann integral, classes of Riemann integral functions (step functions, continuous functions, monotone functions), Mean value theorems for Riemann integral. Fundamental theorem of calculus. The Riemann-Stieltjes integral: the definition, basic properties of R-S integral, integration by parts, continuous functions and the R-S integral. Monotone functions and the R-S integral. Mean value theorems for R-S integral. The fundamental theorem for R-S integral, linear transformations on R^n and their matrix representation (fast revision), function from R^n to R^m (basic setup and examples), the derivative of vector valued functions of several variables, the definition, directional derivatives, differentiability implies continuity, partial derivatives, matrix representation of the derivative, the gradient and its properties, the chain rule, the mean value theorem. Higher order derivatives (the second). Inverse and implicit mapping theorems (statements). Taylor series in two variables.

(50224118), Complex Analysis (1), (T:3, P:0) Credit hrs., Prerequisite: Calculus (3), (50222104)

Complex numbers: analytic functions; functions of complex variables, exponential and logarithmic functions, trigonometric and hyperbolic functions; harmonic functions, the maximum principle, definite integrals, Cauchy theorem, Cauchy integral formula; sequences and series, convergence of series and sequences, Taylor series, Maclaurin series, zeros of analytic functions: singularity, principle parts; residues; poles; residue theorem.

(50224221), Complex Analysis (2), (T: 3, P: 0) Credit hrs., Prerequisite: Complex Analysis (1) (50224118)

Residue theorem, Residues at poles, evaluation of improper integrals, definite integrals involving sines and cosines, integrals a long branch cut, argument principal, Rouche's Theorem, linear transformation, the transformation $w = \frac{1}{z}$, Mobius transformation, the transformations: $\sin z, \cos z, \sinh z, \cosh z, z^2, z^{1/2}$, Conformal mapping, harmonic conjugate, transformation of harmonic conjugate.



(50214217), Graph Theory, (T: 3, P: 0) Credit hrs., Prerequisite: Logic and Set Theory (50211203)

Fundamental concepts of graphs and digraphs, trees, matchings, factorizations, connectivity, networks, graph colorings, planar graphs, Eulerian and Hamiltonian graphs, etc.

(50222209), Ordinary Differential Equations (I), (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (2) (50221202)

Solutions of first order differential equations with applications, solutions of second order differential equations with applications, systems of differential equations, series solutions, Laplace transform.

(50223112), Ordinary Differential Equations (2), (T: 3, P: 0) Credit hrs., Prerequisite: Ordinary Differential Equations (I) (50222209)

Existence and uniqueness theory to ordinary differential equations, systems ordinary equations, Frobenius method to solve ordinary differential equations, Stability Theory to nonlinear ordinary differential equations, etc.

(50223216), Partial Differential Equations (I), (T: 3, P: 0) Credit hrs., Prerequisite: Ordinary Differential Equations (I) (50222209)

Introduction to partial differential equations (PDEs), Second order equations and classification into canonical forms (Parabolic, Elliptic and hyperbolic), Sturm-Liouville boundary-value problems, Fourier series, Separation of variables for linear homogeneous PDEs, the heat equations, Wave equations, Laplace's equation and potential equation in a disk, Fourier transforms for finding solution of PDEs, Fourier sine and cosine transforms for finding solution of PDEs, Finite Fourier transforms for finding solution of PDEs.

(50224220), Partial Differential Equations (2), (T: 3, P: 0) Credit hrs., Prerequisite: Partial Differential Equations (I) (50223216)

Lagrange's method for linear partial differential equation of the first order, Cauchy problems, Complete integrals of nonlinear partial differential equations of first order, four standard forms, Charpit's method, Monge's method. Higher order linear partial differential equations with constant coefficients.

(50223111), Numerical Analysis (I), (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (I) (50221101)

Elementary introduction to numerical analysis, linear and nonlinear equations, numerical methods for linear problems which do not contain exact solutions or too difficult to solve analytically, error analysis, solutions of nonlinear problems: Fixed-point iteration, Taylor polynomial, Bisection method, Newton-Raphson method, etc.

(50224219), Numerical Analysis (2), (T: 3, P: 0) Credit hrs., Prerequisite: Numerical Analysis (I) (50223111) and Ordinary Differential Equations (I) (50222209)

Review of properties and the numerical methods, advance methods for solving nonlinear equations, representation of numbers and analysis of errors, solution of systems of linear equations: Lagrange polynomials, Newton polynomials, etc., numerical differentiation, numerical integration.



(50222105), Fundamentals of Applied Mathematics, (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (2) (50221202)

Taylor and power series, Fourier sine and cosine series, discrete Fourier transform, continuous Fourier transform, Laplace series, Laplace transform, Z-transform, applications.

(50223214), Mathematical Modeling, (T: 3, P: 0) Credit hrs., Prerequisite: Ordinary Differential Equations (I) (50222209)

Compartmental models, growth and decay of a single population, interacting populations, phase plane, linear and non-linear analysis, extended population models, act.

(50222103), Special functions, (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (2) (50221202)

Error and complementary error functions, Gamma function, Beta functions, relation between Gamma and Beta functions, applications, Bessel functions, Bessel's differential equation, Euler function, Legendre function, etc.

(50231101), Principle of Statistics and Probability, (T: 3, P: 0) Credit hrs., Prerequisite: (Non)

Describing Statistical Data by tables, graphs and numerical Measures, Measures of Central Tendency and Deviation, counting methods, The Variance, binomial and Normal distribution, probabilities Laws, Random Variables, Sampling distributions, testing of statistical hypotheses for two populations, correlation and regression, correlation coefficient.

(50232102), Probability Theory, (T: 3, P: 0) Credit hrs., Prerequisite: Principle of Statistics and Probability (50231101)

Random variables, statistical distributions, randomized experiments, principles of probability, conditional probability, Bayes theorem, expected value of a discrete random variable, probability distributions, inferential statistics, null and alternative hypothesis, test function, power of the test, etc.

(50232203), Applied Statistics, (T: 3, P: 0) Credit hrs. Prerequisite: Principle of Statistics and Probability (50231101)

Estimation (Point and Interval), Elements of Testing Hypotheses (one-Tail Test, Two-Tail Test), Statistical Inference about one and two Populations Parameters.

(50232204), Mathematical Statistics, (T: 3, P: 0) Credit hrs., Prerequisite: Probability Theory (50232102)

basic probability theory, discrete, continuous, and mixed random variables, expected values, moments, univariate probability distributions including the hypergeometric distribution, Bernoulli and binomial distributions, geometric and negative binomial distributions, Poisson distribution, discrete and continuous uniform distributions, exponential and gamma distributions, chi-square distributions, and normal distributions, joint probability distributions including the multivariate hypergeometric distribution, multinomial distribution, and bivariate normal distribution, covariance and correlation, and conditional probability distributions.



(50222208), Introduction to Fuzzy Logic, (T: 3, P: 0) Credit hrs., Prerequisite: Logic and Set Theory (50211203)

Fuzzy sets, from crisp sets to fuzzy sets, basic concepts and definitions, fuzzy Arithmetic, fuzzy numbers, Arithmetic operations on intervals, Arithmetic operations on fuzzy numbers, Addition – Subtraction – Multiplication– Division fuzzy equations, fuzzy operations, t-norms, t-conorms, aggregation operations, fuzzy arithmetic, fuzzy numbers, linguistic variables, fuzzy relations, fuzzy equivalence, fuzzy relational equations, fuzzy measures, possibility theory, Dempster-Shafer theory of evidence, fuzzy logic, multi-valued logic, fuzzy qualifiers.

(50223215), Computer Application in Mathematics, (T: 3, P: 0) Credit hrs., Prerequisite: Numerical Analysis (I) (50223111)

Solve some problems in mathematics with the help of mathematical software packages. In particular, solve problems from calculus, linear algebra, ordinary differential equations, numerical analysis, and statistics.

(50212206), Linear Programming and Game Theory, (T: 3, P: 0) Credit hrs. Prerequisite: Linear Algebra (I) (50212104)

Linear programming introduces the student to a specific mathematical model: the linear programming model. This model has a wide range of applications, and is of interest to practitioners in operations research, statistics, economics management and psychology. This, and the fact that good algorithms can solve huge linear programs, is the reason for the success of this model. The theory of the course treats the simplex algorithm, duality theory, and sensitivity analysis. The theory is accompanied by practical examples that illustrate the power of the model, and teach the student the skill of modelling. After completing this course student will have obtained knowledge of the existing algorithms for linear programming. Students will be able to detect when a problem be solved via linear programming, and model it accordingly. Furthermore, student will be able to perform sensitivity analysis.

(50222206), Financial Mathematics, (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (2) (50221202)

Mathematical and statistical methods for calculating compound interest, uncorrelated financial flow, financial values of insurance contracts, analysis and evaluation of annual aid, documents, loans, other guarantees, curves and immunities, financial rate models, actuarial applications.

(50213213). Special Topics in Mathematics, (T: 3, P: 0) Credit hrs., Prerequisite: pass 75 hours

In this course, a topic in mathematics is given whose content is not found in the courses offered by the department.

(50213111), Matrix Analysis, (T: 3, P: 0) Credit hrs., Prerequisite: Linear Algebra (2) (50212209)

Similarity and canonical forms, special classes of matrices, the singular value decomposition, determinant and trace inequalities, the min-max principle, norms of vectors and matrices, the Lower order of Hermitian matrices, Kronecker product of matrices.

(50223110), Transformations and Integral Equations, (T: 3, P: 0) Credit hrs., Prerequisite: Calculus (2) (50221202)

Fourier transforms, Laplace transforms, Millen transformations, discrete integral and differential equations, approximation methods in solving integral and integral equations to solve the initial value problem the boundary value, solving equations and Laplace integrals.

**(40241101), Fundamentals of Information Technology, (T: 3, P: 0) Credit hrs., Prerequisite: (Non)**

Knowledge of the terminology, information systems environment, processes, and components associated with information technology, information Systems concepts, components, tools, and applications. It will provide an introductory understanding of computer hardware, numbering system and knowledge of how data is prepared for computer, instruction processed at a basic machine level, and software (operating systems, database, and web development and applications). It also introduces the networking, Internet, and the basics of the information security, web searching, in addition to algorithms and problem solving, the course includes complete a practical project or research by the students.

(50551101), General Physics (I), (T: 3, P: 0) Credit hrs., Prerequisite: (Non)

Motion in One Dimension, Vectors, Motion in Two Dimensions, The Laws of Motion, Circular Motion and Other Applications of Newton's Laws, Work and Kinetic Energy, Potential Energy and Conservation of Energy, Linear Momentum and Collisions, Rotation of a Rigid Object About a Fixed Axis, Rolling Motion and Angular Momentum.

(50551201), General Physics (2), (T: 3, P: 0) Credit hrs., Prerequisite: General Physics (I) (50551101)

This course is a continuation of University Physics I. Topics include mechanics of materials, basic thermodynamics, fundamentals of electricity and magnetism.

(50551103), General Chemistry, (T: 3, P: 0) Credit hrs., Prerequisite: (Non)

Periodicity table, electronic composition and electronic distribution. The connectivity and periodic properties for the element. Chemical calculations, Oxidation and reduction system. Chemical equilibrium, Thermo-chemistry and Electrochemistry.