



Ajloun National University

جامعة عجلون الوطنية

Faculty of Science

Department of Mathematics

**Study Plan for the Bachelor's Degree
in Mathematics
Academic Year 2023/2024**



Ajloun National University

جامعة عجلون الوطنية

Vision

The Department of Mathematics at Ajloun National University seeks to advance knowledge in the field of theoretical and applied mathematics, and to develop its use in a way that suits the needs of society.

Mission

Preparing qualified and distinguished graduates in the field of mathematical sciences to provide them with the principles of knowledge and scientific and logical thinking, and to develop their research skills in various branches of mathematical sciences.

Goals

- 1) Provide quality education and prepare high efficiency graduates.
- 2) Promote intellectual curiosity and lifelong learning.
- 3) Promote production and dissemination of mathematical knowledge.
- 4) Promote linkage between Mathematics department in Ajloun University and the mathematics departments in other national and international universities.
- 5) Promote empirical and theoretical research and support participation in national and international conferences and workshops.
- 6) Supporting professional growth to maintain technical excellence for undergraduate students.
- 7) Promote extracurricular activities that enrich the bright image of the department.
- 8) Develop critical thinking of students and to obtain information and skills in pure and applied mathematics.
- 9) Improve communication skills of students.
- 10) Preparing undergraduates students to connect the theoretical and applied aspects in the field of mathematics.
- 11) To make use of the technical tools to solve math problems .
- 12) Prepare the student to be able to adequately practice teaching as math teacher in schools or to work towards higher education.



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Learning Outcomes

Knowledge

Identify, describe, and use pure mathematical relationships (such as relationships between variables) and draw valid inferences from given information.

Utilize data to write logical justifications proving mathematical results or properties.

Read and write correct mathematical proofs, use libraries and electronic databases to locate information about mathematical issues.

Skills

Design and conduct statistical experiments, collect data, as well as analyze and interpret the data.

Analyze moderately difficult mathematical problems to find the most appropriate computational solutions and assess the accuracy and efficiency of the solution.

Apply foundational skills in algebra, geometry, trigonometry, calculus and analyze fundamental structures and relationships within mathematics.

Formulate and analyze mathematical problems, accurately define key terms, and draw clear and logical conclusions.

Continuously learn research, analyze, interpret, and use critical thinking in solving mathematical problems.

Present results and arguments clearly and accurately, either in written or oral form.

Utilize modern technological, scientific skills and tools such as mathematical packages, statistical software, graphic calculators, and online resources essential for professional practice.

Competencies

Explain the impact of solving mathematical problems in global and social contexts, engage with contemporary issues, generate knowledge, and utilize it for future purposes.

Effectively engage with diverse audiences, develop intellectual and creative collaboration skills in various contexts and participate in university-level events and activities.

Analyze, design, develop and test problem-solving software using modern methods and techniques in high-level programming languages.

Design and implement problems, identify, and define appropriate computing requirements for their solutions, including data types, data structures, and algorithms necessary for application implementation.



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Contents of the Study Plan

The study plan for the bachelor's degree in Mathematics is (132) credit hours distributed as follows:

Certified on Campus learning (1+1, an hour and a half of on Campus learning + one half hour of Campus learning).

Certified Electronic (1+1, an hour and a half synchronous Electronic + Campus learning).

Certified Blended (1+1, an hour and a half synchronous Blended + Campus learning).

Number	Type of Requirement	Credit Hours	Percentage%
First	University Requirements	27	20.45%
Second	Faculty Requirements	21	15.91%
Third	Supportive Requirements	00	00.00%
Fourth	Department Compulsory Requirements	63	47.73%
	Department Elective Requirements	18	13.64%
Fifth	Elective Free Requirements	03	02.27%
Total		132	100%

University Coding System

<u>Faculty Code</u>	<u>Department Code</u>	<u>Level (Academic Year)</u>	<u>Knowledge Area</u>	<u>Ssequence</u>
6	01 Mathematics 02 Physics and Chemistry	0 Remedial 1 First 2 Second 3 Third 4 Fourth		



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Knowledge Area

Knowledge Number	Knowledge Area	Number of Credit Hours
0	Calculus	9
1	Mathematical Analysis	12
2	Differential Equations	18
3	Statistics and Probability	24
4	Algebra	21
5	Foundation of Mathematics	6
6	Geometry and Topology	9
7	Applied Mathematics and Actuarial Science	21
8	Teaching Mathematics and History of Mathematics	6



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First: University Requirements (27) Credit Hours

A. University Compulsory Requirement (12) Credit Hours

Course Code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
704107	Pioneering and Innovation	1			√	
704109	Leadership and Social Responsibility	1			√	
704116	Life Skills	1			√	
704117	English Language Skills (1)	2	714099	√		
704118	Arabic Language Skills (1)	2	704099		√	
704119	National Education	2	-		√	
704200	Military Sciences	3	-	√		

B. University Elective Requirements (15) Credit Hours

Course Code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
201101	Law in our Lives	3			√	
202132	Human Rights	3			√	
401100	Principles of Administration	3			√	
701140	Arab Library and Lexicography	3	-	√		
704103	International and Arab Contemporary Issues	3				√
704104	Islamic Culture	3	-	√		
704108	Integrity and Transparency	3			√	
704110	Digital Culture	3			√	
704112	Arabic Language Skills (2)	3	704118		√	
704113	Art of Rhetoric and Dialogue	3				√
704115	Development and Family Planning in Islam	3			√	
704141	History of Jerusalem	3			√	
704151	Computer Skills (1)	3	724099		√	
704152	Computer Skills (2)	3	704151		√	
704163	Foreign Language other than English	3			√	
704172	Sports and Health	3				√



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Second: Faculty Requirements (21) Credit Hours

Course Code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
311100	Introduction to Computer Programming	3	-	√		
311101	Programming Language (1)	3	311100			√
502102	General Physics (1)	3	-		√	
502108	General Chemistry	3	-		√	
601101	Calculus (1)	3	-		√	
601102	Calculus (2)	3	601101			√
601131	Principles of Statistics	3	-		√	

Third: Supportive Requirements (0) Credit Hours

Course Code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus



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Fourth: Department Requirements (81) Credit Hours

A. Department Compulsory Requirements (63) Credit Hours

Course Code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
601201	Calculus (3)	3	601102			√
601212	Real Analysis (1)	3	601251			√
601221	Ordinary Differential Equation (1)	3	601102		√	
601241	Linear Algebra (1)	3	601101			√
601251	Set Theory and Logic	3	601102			√
601261	Modern Euclidean Geometry	3	601251	√		
601321	Partial Differential Equations (1)	3	601221		√	
601332	Statistical Techniques	3	601131		√	
601333	Probability Theory	3	601201			√
601341	Modern Algebra (1)	3	601251			√
601342	Number Theory	3	601251		√	
601361	General Topology (1)	3	601212			√
601371	Mathematical Software Packages	3	601221			√
601372	Numerical Analysis (1)	3	601101		√	
601373	Mathematical Programming	3	601241			√
601381	Teaching Mathematics	3	601201	√		
601412	Complex Analysis	3	601212		√	
601413	Real Analysis (2)	3	601212		√	
601421	Ordinary Differential Equations (2)	3	601221		√	
601431	Mathematical Statistics	3	601333		√	
601442	Modern Algebra (2)	3	601341		√	



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B. Department Elective Requirements (18) Credit Hours

Course Code	Course Name	Credit Hour	Prerequisite	Learning Type		
				Electronic	Blended	On Campus
601271	Financial Mathematics (1)	3	601102		√	
601311	Mathematical Analysis (1)	3	601212			√
601337	Stochastic Processes	3	601333		√	
601338	Applied Probability	3	601333		√	
601422	Partial Differential equations (2)	3	601321	√		
601423	Dynamical Systems	3	601221			√
601424	Integral Equations	3	601221			√
601432	Time Series	3	601333	√		
601435	Sampling Theory	3	601332		√	
601440	Graph Theory	3	601241		√	
601441	Linear Algebra (2)	3	601241		√	
601444	Matrices Theory	3	601241			√
601452	Special Topics in Pure Mathematics	3	75 Credit Hours			√
601462	General Topology (2)	3	601361			√
601471	Numerical Analysis (2)	3	601372		√	
601472	Methods of Applied Mathematics	3	601221			√
601473	Special Topics in Applied Mathematics	3	75 Credit Hours		√	
601481	History of Mathematics	3	601101	√		

Fifth: Free Elective Requirements (03) Credit Hours

The students studies a free course offered by the university with (3) credit hours



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Advisement Plan for obtaining a bachelor's degree in Mathematics

First Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
311100	Introduction to Computer Programming	3	-
601101	Calculus (1)	3	-
601131	Principles of Statistics	3	-
--	Compulsory University Requirement	2	-
--	Compulsory University Requirement	3	-
--	Compulsory University Requirement	1	-
Total		15	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
311101	Programming Language (1)	3	311100
502102	General Physics (1)	3	-
601102	Calculus (2)	3	601101
--	Compulsory University Requirement	2	
--	Compulsory University Requirement	2	-
--	Elective University Requirement	3	-
Total		16	



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Second Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
502108	General Chemistry	3	-
601201	Calculus (3)	3	601102
601241	Linear Algebra (1)	3	601101
601251	Set Theory and Logic	3	601102
--	Compulsory University Requirement	1	-
--	Elective University Requirement	3	-
Total		16	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
601212	Real Analysis (1)	3	601251
601221	Ordinary Differential Equations (1)	3	601102
601261	Modern Euclidean Geometry	3	601251
704109	Compulsory University Requirement	1	-
--	Elective University Requirement	3	-
--	Elective University Requirement	3	-
Total		16	



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Third Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
601321	Partial Differential Equations (1)	3	601221
601332	Statistical Techniques	3	601131
601341	Modern Algebra (1)	3	601251
601342	Number Theory	3	601251
601371	Mathematical Software Packages	3	601221
--	Elective University Requirement	3	-
Total		18	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
601333	Probability Theory	3	601201
601361	General Topology (1)	3	601212
601372	Numerical Analysis (1)	3	601101
601373	Mathematical Programming	3	601241
601381	Teaching Mathematics	3	601201
---	Elective Department Requirement	3	-
Total		18	



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Fourth Year

First Semester

Course Number	Course Name	Credit Hours	Prerequisite
601412	Complex Analysis	3	601212
601431	Mathematical Statistics	3	601333
--	Elective Department Requirement	3	-
--	Elective Department Requirement	3	-
--	Elective Department Requirement	3	-
Total		15	

Second Semester

Course Number	Course Name	Credit Hours	Prerequisite
601411	Real Analysis (2)	3	601212
601421	Ordinary Differential Equations (2)	3	601221
601442	Modern Algebra (2)	3	601341
--	Elective Department Requirement	3	-
--	Elective Department Requirement	3	-
--	Free Requirement	3	-
Total		18	



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Courses Description

Faculty Compulsory Requirements (21 Credit Hours)

Course Number : 311100
Course Title : **Introduction to Computer Programming**
Credit Hours : 3
Prerequisites : -

General concepts of problem-solving, program concepts, program flowcharts, variables and constants, data types, arithmetic and logical operations, solving problems using decision-making statements, solving problems using repetition statements, solving problems using logical case statements, programming functions, lists and arrays, linked sequences, sorting lists.

Course Number : 311101
Course Title : **Programming Language (1)**
Credit Hours : 3
Prerequisites : 311100

Fundamentals of programming, introduction to programming languages and their evolution, principles of programming in C++, variables and naming conventions, data types, arithmetic and logical operations, control statements, repetition statements, functions, arrays, introduction to object-oriented programming.

Course Number : 502102
Course Title : **General Physics (1)**
Credit Hours : 3
Prerequisites : --

Physics and measurement, vector calculus, motion in one dimension, motion in two dimensions, Newton laws of motion, energy and energy transfer, circular motion, potential energy.



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Course Number : 502108
Course Title : General Chemistry
Credit Hours : 3
Prerequisites : ---

The fundamental theories of chemistry, atomic nature of matter, stoichiometry, periodic table, aqueous solution and concentrations, oxidation and reduction, atomic structure, chemical bonding, law of gases, acids and bases.

Course Number : 601101
Course Title : Calculus (1)
Credit Hours : 3
Prerequisites : ---

Functions, the general exponential and logarithmic functions, limits and continuity, derivatives, rules of differentiation, tangent and normal lines, the mean value theorem of differentiation and its applications, indeterminate forms ($0/0$, ∞/∞), vertical and horizontal asymptotes, local extrema, concavity, and curve sketching, the definite integral, the fundamental theorem of calculus, the indefinite integral, substitution integrals, applications of the definite integral (area, volumes and solids of revolutions).

Course Number : 601102
Course Title : Calculus (2)
Credit Hours : 3
Prerequisites : 601101

Hyperbolic functions, inverse functions of trigonometric and hyperbolic functions, techniques of integration (integration by parts, trigonometric integrals, trigonometric substitutions, partial fractions, improper integrals), sequences and infinite series convergence and divergence, positive term series, alternating series, absolute and conditional convergence, power series (differentiation and integration of power series, Taylor series), plane curves and polar coordinates, area in polar coordinates.



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Course Number : 601131
Course Title : Principles of Statistics
Credit Hours : 3
Prerequisites : ---

Definition of statistics and its uses, data types and methods of collection, descriptive statistics: organizing and displaying data, summarizing data in tables, graphics and numerical measures, measures of central tendency (mean, median and mode), measures of variation (range, quartiles and interquartile range, percentiles and inter-percentile range, variance and standard deviation), outliers, Z-score, Chebyshev's rule and the empirical rule, linear transformations in a descriptive statistics setting, definition and uses of probability, elements of probabilities, counting rules, conditional probability, random variables, expectation and variance, calculating probabilities and areas under the curves of discrete probability distribution (binomial distribution) and continuous probability distribution (normal distribution), central limit theorem.



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Compulsory Department Requirements (63 Credit Hours)

Course Number	: 601201
Course Title	: Calculus (3)
Credit Hours	: 3
Prerequisites	: 601102

Three-dimensional space and vectors: Cartesian coordinates in space, cylindrical surfaces, quadratic surfaces, Surfaces of revolution, vectors: dot product, projections, cross product, parametric equations for the straight line, planes in three-dimensional space, vector-valued functions: differentiation and integration of vector-valued functions, change of parameters, arc length, unit tangent vector, unit vector, normal vector, curvature, multivariable functions: domain, limits and continuity, partial derivatives, differentiability, total differential, chain rule, gradient, directional derivative, tangent planes and normal lines, maxima and minima of functions of two variables, Lagrange multipliers, multiple integrals: double integrals, double integrals in polar coordinates, triple integrals and triple integrals in cylindrical and spherical coordinates, change of variables in multiple integrals.

Course Number	: 601212
Course Title	: Real Analysis (1)
Credit Hours	: 3
Prerequisites	: 601251

Real numbers: absolute value, order relation, bounded sets, Archimedean property, completeness property, supremum and infimum; sequences: limit of a sequence, Cauchy sequences, repeated sequences, increasing and decreasing sequences, limit supremum and infimum; functions: limits of real valued functions, left and right limits, continuous functions on \mathbb{R} , continuity at a point, continuity over an interval, uniform continuity on an interval, the relationship between uniform continuity and continuity over an interval; differentiation: the definition of the left hand side derivative and right hand side derivative, the relationship between continuity and differentiability, Roll's theorem, mean value theorem, an application of the mean value theorem.



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جامعة عجلون الوطنية

Course Number : 601221
Course Title : **Ordinary Differential Equations (1)**
Credit Hours : 3
Prerequisites : 601102

Classification, (first order, second order, higher orders) ordinary differential equations (ODEs) and methods for solving them, applications to mechanics and physics, Laplace transform and its application in solving ODEs, using the series (power series) to solve differential equations.

Course Number : 601241
Course Title : **Linear Algebra (1)**
Credit Hours : 3
Prerequisites : 601101

Systems of linear equations, matrices and matrix operations; homogeneous and nonhomogeneous systems, Gaussian elimination, elementary matrices, the inverse of a matrix, determinants, evaluating determinants, properties of determinants, Cramer's rule, vector spaces, subspaces, linear dependence, bases, dimensions, row space, column spaces, null space, rank and nullity, eigenvalues and eigenvectors, diagonalization, linear transformations, kernel and range.

Course Number : 601251
Course Title : **Set Theory and Logic**
Credit Hours : 3
Prerequisites : 601102

Mathematical Logic, methods of proof, sets, operations on sets, relations, equivalence relation, order relation, partitions, functions, finite and infinite sets, equipotence of sets, denumerable and non-denumerable sets, cardinal numbers and their arithmetic, the axiom of choice and some of its equivalent forms (especially Zorn's lemma and the well-ordering principle).



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Course Number : 601261
Course Title : **Modern Euclidian Geometry**
Credit Hours : 3
Prerequisites : 601251

Axiomatic systems, Euclid's postulates, the difference between Euclidean and non-Euclidean geometry, consistency, independence, completeness, finite geometries, projective geometry, neutral geometry, Euclidean geometry of the plane, connection postulates, the distance, the angles and their measures, congruence and parallel postulates, the circle and its related theories, similarity, Pythagorean theorem, results concerning triangles, hyperbolic geometry, elliptic geometry, asymptotic triangles, amplitude of parallelism, Saccharin and Lambert quadrilaterals.

Course Number : 601321
Course Title : **Partial Differential Equations (1)**
Credit Hours : 3
Prerequisites : 601221

Classification, some physical models (heat, wave, Laplace equations), separation of variables, Sturm-liouville BVP, Fourier series, integrals and transforms, homogeneous and nonhomogeneous problems, infinite domain problems, BVP involving rectangular and circular regions, BVP involving cylindrical and spherical regions.

Course Number : 601332
Course Title : **Statistical Techniques**
Credit Hours : 3
Prerequisites : 601131

Normal, t , χ^2 and F- distributions, sampling distributions, statistical inference about one and two populations parameters, correlation and simple linear regression, multiple regression, χ^2 and F- tests: goodness of fit test, independence, comparing two variances, analysis of variance, nonparametric tests: the sign tests, the Wilcoxon tests, the Kruskal-Wallis tests, Mann-Whitney tests, Spearman correlation coefficient.



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Course Number : 601333
Course Title : **Probability Theory**
Credit Hours : 3
Prerequisites : 601201

Definition of probability and its axioms, some probability theorems, conditional probability and independence, random variables, probability distributions, expectation and variance, moment generating function, some discrete and continuous distributions, Joint distributions, marginal and conditional distributions, distributions of functions of random variables: (the cumulative distribution function method, moment generating function method and the Jacobian transformation method), sampling distributions, limiting distributions.

Course Number : 601341
Course Title : **Modern Algebra (1)**
Credit Hours : 3
Prerequisites : 601251

Binary operations, groups, subgroups, cyclic groups, permutation groups, isomorphisms of groups, direct product of groups, cosets, and Lagrange's theorem, normal subgroups and factor groups, homomorphisms of groups, the fundamental theorem of group homomorphism.

Course Number : 601342
Course Title : **Number Theory**
Credit Hours : 3
Prerequisites : 601251

Division algorithm, divisibility, test of divisibility, greatest common divisor, least common multiple, Euclidean lemma, linear Diophantine equations, prime number and their distribution, fundamental theorem of arithmetic, congruences, linear congruences, Chinese remainder theorem, Fermat little theorem, Wilson's theorem, Euler's theorem, Euler's function, the divisors of an integer.



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Course Number : 601361
Course Title : General Topology (1)
Credit Hours : 3
Prerequisites : 601212

Topological spaces, open sets, boundary, interior, accumulation points, topologies induced by functions, subspace topology, bases and subbases, finite products, continuous functions, open and closed functions, homeomorphisms, separation axioms, countability axioms, metric spaces, connectedness and compactness.

Course Number : 601371
Course Title : Mathematical Software Packages
Credit Hours : 3
Prerequisites : 601221

applications including calculus, linear algebra, plotting in 2-D and 3-D, solving linear systems, solving differential equations, applications in probability and statistics.

Course Number : 601372
Course Title : Numerical Analysis (1)
Credit Hours : 3
Prerequisites : 601101

Mathematical preliminaries and error analysis, solutions of equations in one variable, interpolation and polynomial approximation, numerical differentiation and integration, direct methods for solving linear systems.

Course Number : 601373
Course Title : Mathematical Programming
Credit Hours : 3
Prerequisites : 601241

Fundamentals of linear programming, formulation of linear programming problem, the simplex method, the geometry of the simplex method, duality of linear programming, the dual simplex method, sensitivity analysis, introduction to graphs, network flows.



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Course Number : 601381
Course Title : Teaching Mathematics
Credit Hours : 3
Prerequisites : 601201

Nature and characteristics of mathematics, mathematics curriculum, learning mathematics, teaching strategies, teaching mathematical concepts, mathematical principles and generalizations, teaching algorithms and mathematical skills, teaching mathematical problem solving, proofs, planning for effective teaching evaluation, assessment.

Course Number : 601412
Course Title : Complex Analysis
Credit Hours : 3
Prerequisites : 601212

Complex numbers: definition geometric meaning, polar representation, exponential representation, power and roots of complex numbers, complex plane, analytic functions: definition, domain and effect, Cauchy-Riemann equations, elementary functions (exponential, trigonometric, hyperbolic, and logarithmic functions), contours and contour integration, the Cauchy-Goursat theorem, simply and multiply connected regions, Maclaurin series and Laurent series.

Course Number : 601413
Course Title : Real Analysis (2)
Credit Hours : 3
Prerequisites : 601212

Riemann integrability, properties of Riemann integration, fundamental theorem in integration, the integral as a limit of Riemann sum, integrability of continuous functions, sequences of functions, pointwise and uniform convergence of sequences, interchange of limits, infinite series, convergence of infinite series, absolute convergence test, series of functions, pointwise and uniform convergence of series, bounded and uniformly continuous functions.



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Course Number : 601421
Course Title : **Ordinary Differential Equations (2)**
Credit Hours : 3
Prerequisites : 601221

Linear and nonlinear ordinary differential equations (ODEs), series solutions of ODEs, gamma function, beta function, bessel equations, Legendre equations, solving systems of linear differential equations.

Course Number : 601431
Course Title : **Mathematical Statistics**
Credit Hours : 3
Prerequisites : 601333

Some methods of point estimation: (method of moment and maximum likelihood methods), criteria for evaluating estimators: (the unbiased estimator, the minimum variance unbiased estimator, Cramer- Rao theorem, the relatively efficient estimator, the mean square error), large-sample properties: asymptotic unbiased and consistent estimators, sufficiency and completeness, the Rao-Blackwell theorem, Lehmann–Scheffé theorem), interval estimation: (confidence intervals, Pivotal quantity method), tests of hypotheses: (definitions and some examples, most powerful tests, Neyman-Pearson theorem, uniformly most powerful tests).

Course Number : 601442
Course Title : **Modern Algebra (2)**
Credit Hours : 3
Prerequisites : 601341

Rings, subrings, integral domains, factor rings and ideals, ring homomorphisms, polynomial rings, factorization of polynomials, reducibility and irreducibility tests, divisibility in integral domains, principal ideal domains, unique factorization domains, extension of fields.



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Department Elective Requirements (18 Credit Hours)

Course Number : 601271
Course Title : **Financial Mathematics (1)**
Credit Hours : 3
Prerequisites : 601102

Using mathematical and statistical techniques in compound interest, cash flow, discounting, valuation of cash flows of insurance contracts, analysis and valuation of financial credits (short-term, bonds, loans), financial yield curves, financial immunization, stochastic interest rate models, actuarial applications.

Course Number : 601311
Course Title : **Mathematical Analysis (1)**
Credit Hours : 3
Prerequisites : 601212

Vector spaces, metric spaces, normed and Banach spaces (completion, products and quotients of normed spaces), finite dimensional normed spaces and subspaces, boundedness and continuity of linear functional, inner product space, Hilbert space (orthonormal sets, representation of functional in Hilbert spaces, Hilbert adjoint operator, self-adjoint operator, unitary and normal operators).

Course Number : 601337
Course Title : **Stochastic Processes**
Credit Hours : 3
Prerequisites : 601333

Revision of probability distributions, Markov chains, transition probability, classification of states, transformation matrices, branching and queueing chains, stationary distributions of Markov chains, Markov pure jump processes, second order processes, Poisson processes.



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Course Number : 601338
Course Title : **Applied Probability**
Credit Hours : 3
Prerequisites : 601333

Revision of probability distributions and statistical inference, queueing theory: (Poisson Processes and birth- death Processes), reliability theory: (failure laws and failure rate, reliability of series and parallel systems), quality control: (control charts, acceptance sampling, single sampling plan, other sampling plans).

Course Number : 601422
Course Title : **Partial Differential Equation (2)**
Credit Hours : 3
Prerequisites : 601321

First order differential equation in two independent variables, semi linear and quasilinear equations, second order linear equations, canonical forms, Greens function method, transforms method.

Course Number : 601423
Course Title : **Dynamical Systems**
Credit Hours : 3
Prerequisites : 601221

The basic concepts, examples of dynamical systems, linear systems, diagonal and non-diagonal systems, non- linear systems, fixed points and stability, the behavior of repetition and chaos for nonlinear systems, partial dimension.

Course Number : 601424
Course Title : **Integral Equations**
Credit Hours : 3
Prerequisites : 601221

Introductory concepts, Fredholm integral equations, Volterra integral equations, Fredholm integro-differential equations, Volterra integro-differential equations, singular integral equations.



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Course Number : 601432
Course Title : **Time Series**
Credit Hours : 3
Prerequisites : 601333

Traditional time series models, time series models using regression, exponential smoothing model, stationary time series, linear autocorrelation and partial autocorrelation functions, regular and seasonal ARMA models, identification and estimation of time series models, models evaluation, forecasting.

Course Number : 601435
Course Title : **Sampling Theory**
Credit Hours : 3
Prerequisites : 601332

Questionnaires construction, types of samples: (simple random sampling, systematic sampling, stratified sampling, one-stage and two-stage cluster sampling), how to draw the sample, selecting the size of the sample to estimation of population mean and the proportion, comparing different sampling methods, regression estimation.

Course Number : 601440
Course Title : **Graph Theory**
Credit Hours : 3
Prerequisites : 601241

Definitions and basic concepts and definitions of graph theory, isomorphisms of graphs, complement and self-complement graphs, line graphs, Paths and cycles, Trees, Eulerian graphs, Hamiltonian graphs, planarity, coloring graphs.

Course Number : 601441
Course Title : **Linear Algebra (2)**
Credit Hours : 3
Prerequisites : 601441

Inner product spaces, orthogonality, eigenvalues and eigenvectors, diagonalization, Hermitian matrix, unitary matrix, matrix representations of linear transformation, change of basis, similarity, characteristic and minimal polynomials of a linear operator, Cayley Hamilton theorem, Gram-Schmidt orthogonalization process, Normal, orthogonal and unitary operators, Jordan and rational canonical forms of matrices, linear function and the dual spaces.



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Course Number : 601444
Course Title : **Matrices Theory**
Credit Hours : 3
Prerequisites : 601441

A review of linear algebra, eigenvalues, eigenvectors and similarity of matrices: similarity and canonical forms, diagonalization and simultaneous diagonalization of matrices, determination of eigenvalues, special classes of matrices, unitary equivalence of matrices, Schur's theorem and spectral theorem, singular value decomposition and polar decomposition, generalized inverses, least-squares solutions for linear systems, determinants and trace inequalities, the min-max principle, singular value inequalities, perturbation inequalities, vectors and matrix norms, the spectral radius and numerical radius, unitarily invariant norms, norm inequalities, the Lowner ordering of Hermitian matrices, Hadamard product of matrices, applications.

Course Number : 601452
Course Title : **Special Topics in Pure Mathematics**
Credit Hours : 3
Prerequisites : 75 Credit Hours

This course aims to familiarize students with the basic concepts of special topics in pure mathematics. The course includes: Certain pure mathematics subjects chosen by the instructor and not to be part of the courses offered by the department.

Course Number : 601462
Course Title : **General Topology (2)**
Credit Hours : 3
Prerequisites : 601361

Separation axioms T_2 , T_3 , T_4 and some examples and theorems related to them, 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.



Ajloun National University

جامعة عجلون الوطنية

Course Number : 601471
Course Title : Numerical Analysis (2)
Credit Hours : 3
Prerequisites : 601372

Numerical solutions of ordinary differential equations, iterative techniques in matrix algebra, numerical solutions of nonlinear systems of equations, approximation theory, approximating eigenvalues.

Course Number : 601472
Course Title : Applied Mathematics Methods
Credit Hours : 3
Prerequisites : 601221

Review of static's of particles, rigid bodies, systems and equilibrium, centroid and center of gravity, moments of inertia, analysis of structures.

Course Number : 601473
Course Title : Special Topics in Applied Mathematics
Credit Hours : 3
Prerequisites : 75 Credit Hours

This course aims to familiarize students with the basic concepts of Special Topics in applied mathematics. The course includes: Certain applied mathematics subjects chosen by the instructor and not to be part of the courses offered by the department.

Course Number : 601481
Course Title : History of Mathematics
Credit Hours : 3
Prerequisites : 601101

The emergence and evolution of some mathematical concepts, facts and algorithms in arithmetic, algebra, trigonometry, Euclidean geometry, analytic geometry and calculus through early civilizations, Egyptians, Babylonians, Greeks, Indians, Chinese, Muslims and Europeans, evolution of solutions of some conjectures and open problems.