التوصيف الأكاديمي لقسم الرياضيات

يقدم قسم الرياضيات خطة أكاديمية (برنامجاً) لمدة أربع سنوات لنيل درجة البكالوريوس في ثلاث مسارات (الرياضيات – الإحصاء (معلق) – الرياضيات المالية (معلق)) . حيث بنيت الخطة الدراسية للمرحلة الجامعية على ١٣٠ وحدة دراسية (ساعة معتمدة) موزعة على ثمانية فصول (ثمانية مستويات) ويبين الجدول التالي الخطة المفصلة لمسار الرياضيات:

المتطلبات	الساعات المعتمدة
متطلبات الجامعة	٢٣
متطلبات الكلية	٢١
متطلبات القسم	٤٨
متطلبات المسار	٣٨
الساعات الإجمالية	١٣٠

الخطة الدراسية لمسار الرياضيات

١. متطلبات الجامعة: (٢٣ ساعة):

م	رمز المقرر	اسم المقرر	المستوى	الساعات	المتطلب
١	١٠١ سلم	المدخل إلى الثقافة الإسلامية	الأول	٢	---
٢	١٣٠ نجم	اللغة الإنجليزية ١	الأول	٨	---
٣	١٣٠ تقن	مهارات الحاسب	الأول	٣	---
٤	١٠٢ سلم	الإسلام وبناء المجتمع	الثاني	٢	---
٥	١٠١ عرب	المهارات اللغوية	الثاني	٢	---
٦	١٠٣ سلم	النظام الاقتصادي في الإسلام	الثالث	٢	---
٧	١٠٣ عرب	التحرير العربي	الرابع	٢	---
٨	١٠٤ سلم	أسس النظام السياسي في الإسلام	الرابع	٢	---
المجموع				٢٣	

٢. متطلبات الكلية: ((٢١ ساعة – السنة التأسيسية العلمية):

م	رمز المقرر	اسم المقرر	المستوى	الساعات	المتطلب
١	١٣٠ ريض	مقدمة في الرياضيات ١	الأول	٣	---
٢	١٠١ فيز	فيزياء عامة1	الثاني	٤	١٣٠ ريض
٣	١٤٠ تقن	تطبيقات الحاسب	الثاني	٢	١٣٠ تقن
٤	١٠١ احص	مبادئ الإحصاء والاحتمالات ١	الثاني	٣	١٣٠ ريض
٥	١٤٠ ريض	مقدمة في الرياضيات ٢	الثاني	٢	١٣٠ ريض
٦	١٤١ نجم	اللغة الإنجليزية ٢	الثاني	٣	١٣٠ نجم
٧	102 كيم	مقدمة في الكيمياء	الرابع	٤	---
المجموع				٢١	

٣. متطلبات القسم: (٤٨ ساعة):

م	رمز المقرر	اسم المقرر	المستوى	الساعات	المتطلب
١	٢٣٠ نجم	لغة إنجليزية علمية (مصطلحات وكتابة تقارير)	الثالث	٢	١٤٠ نجم
٢	٢١٢ ريض	حساب التكامل	الثالث	٤	١٤٠ ريض
٣	٢٣٤ ريض	أسس الرياضيات	الثالث	٤	١٤٠ ريض
٤	٢٣٢ ريض	حساب التفاضل والتكامل	الرابع	٤	٢١٢ ريض
٥	٢١٢ احص	نظرية الاحتمال ١	الرابع	٣	١٠١ احص
٦	٢٤٤ ريض	الجبر الخطي	الرابع	٣	٢٣٤ ريض
٧	٣٣٣ ريض	المعادلات التفاضلية العادية	الخامس	٣	٢١٢ ريض
٨	٣٠٢ احص	الطرق الإحصائية	الخامس	٣	٢١٢ احص
٩	٣٢١ ريض	مبادئ الرياضيات المالية	الخامس	٣	٢٤٤ ريض
١٠	٣٥٣ ريض	التحليل العددي	الخامس	٣	٢٤٤ ريض
١١	٣٦١ ريض	بحوث العمليات ١	السادس	٣	٢١٢ احص
١٢	٣١٥ ريض	المعادلات التفاضلية الجزئية	السادس	٣	٣٣٣ ريض
١٣	٣١٢ احص	نظرية الاحتمال ٢	السادس	٣	٢١٢ احص
١٤	٣٧١ ريض	الرياضيات الاقتصادية والمالية	السادس	٣	٣٢١ ريض
١٥	٤٨٨ ريض	مشروع بحث ١	السابع	٢	---
١٦	٤٩٩ ريض	مشروع بحث ٢	الثامن	٢	---
		المجموع		٤٦	

٤. متطلبات مسار الرياضيات:

أولا: (١٤ س إجباري)

م	رمز المقرر	اسم المقرر	المستوى	الساعات	المتطلب
٣	٣٣٥ ريض	تحليل المتجهات	السابع	٣	٢٣٢ ريض
٤	٣٤٤ ريض	نظرية الزمر	السابع	٢	٢٤٢ ريض
٥	٣٨٣ ريض	التحليل الحقيقي	السابع	٣	٢٣٢ ريض
٨	٤٧٣ ريض	توبولوجي	الثامن	٣	٣٨٣ ريض
٩	٤٧٥ ريض	الهندسة التفاضلية	الثامن	٣	٣٣٥ ريض
		المجموع		١٤	

ثانيا: (٢٤ س اختياري من عدد ٤١ س)

م	رمز المقرر	اسم المقرر	المستوى	الساعات	المتطلب
١	٣١٨ ريض	تاريخ الرياضيات	الرابع	٣	
٢	٣١٩ ريض	الرياضيات في حياتنا	الخامس	٣	
٣	٤١٧ ريض	دوال الخاصة	السادس	٣	٣٣٣ ريض
٤	٤٣٢ ريض	تحليل الدالي	الثامن	٣	٣٨٣ ريض
٥	٤١٦ ريض	المعادلات التكاملية	الثامن	٣	٣٥٣ ريض
٦	٤٨٥ ريض	التحليل المركب	الثامن	٣	٣٨٣ ريض
٧	٣٦٧ ريض	نظرية الأعداد	السابع	٣	٢٣٤ ريض
٨	٤٤٤ ريض	الحلقات والحقول	السابع	٣	٣٤٤ ريض
٩	٣٣١ ريض	تحليل حقيقي تطبيقي	الثامن	٣	٣٨٣ ريض
١٠	٤٦٨ ريض	نظرية المخططات	السابع	٣	٢٣٤ ريض
١١	٣٤٢ ريض	طرق حسابية للمعادلات التفاضلية	الثامن	٣	٣٣٣ ريض
١٢	٤٤٢ ريض	طرق حسابية للمعادلات التفاضلية الجزئية	السابع	٣	٣٥٣ ريض
١٣	٣٠٠ تقن	البرمجة الرياضية	الخامس	٢	١٤٠ تقن
		المجموع		٣٨	

Courses description توصيف مقررات مسار الرياضيات

MATH 212 Introduction to Integral Calculus 4 (3 + 2+0) credit Hours.

Definition of definite integral by using Riemann sum, properties of definite integral, Mean value theory of integration and differentiation. Definition of non-definite integral, method of integration by substitution. Logarithmic and power functions, Hyperbolic functions and their inverse. Method of integration: by parts, by trigonometric functions, square complete, rational functions integration, approximate method of definite integral, Loupital rate, proper integral, calculations of area, rotation of value bodies, length of curves, polar coordinates, graphic of some polar coordinate curves. Sequences, infinite series, Taylor and Maclaurin series, the binomial series. Prerequisite: MATH 140

MATH 234 Foundations of Mathematics 4 (3 + 2+0) credit-hours.

Algebra of propositions, Mathematical induction, operations on sets, binary relations, equivalence relations and operations, denumerable sets, Cardinal numbers, Partial order. Boolean algebra. Prerequisite: MATH 140

MATH 232 Differential and Integral Calculus 4 (3 + 2+0) credit-hours.

Cartesian, cylindrical and spherical coordinate systems. Functions of two and three variables, limits and continuity, partial derivatives, the chain rule, extreme of functions of two variables, Lagrange multipliers. Double integrals, moments and center of mass, double integrals in polar coordinates, triple integrals, application of triple integrals, and triple integrals in cylindrical and spherical coordinates, surface area.
Prerequisite: MATH 212

MATH 242 Linear Algebra 3 (2 + 2+0) credit-hours.

Matrices: matrix operations, inverse of a matrix, solving systems of linear equations. Determinants: definition and properties, cofactor expansion and applications. Vectors in R2, R3 scalar and cross products, lines and planes, applications. The vector space R^n, Subspaces, linear independence, basis and dimensions, orthogonality. Gram – Schmidt orthogonalization process. Rank of matrix. Eigen values and Eigenvectors, diagonalization of a matrix. Prerequisite: MATH 234

MATH 353 Numerical analysis 3 (2 + 2+0) credit-hours.

Numerical solution of nonlinear equations. Numerical solution of linear algebraic systems: direct and iterative methods. Polynomial interpolation. Least - squares approximation. Numerical integration.
Prerequisite: MATH 244

STAT 212 Probability Theory 1 3 (2 + 2+0) credit-hours.

Probability, Random Experiment, Sample Space, and Events. Axioms of Probability, Probability laws, combinatorial analysis for Probability. Conditional Probability, and Independence Total Probability law, and Bayes Theorem Random variables, Discrete Random variables, Probability Mass Function. Expectation and Variance, Cumulative Distribution Function and their properties. Continuous Random Variables, Probability Density Function, Cumulative Distribution Function, Expectation and Variance. Moments – Moment Generating Function. Discrete Distributions, Bernoulli trials, Binomial distribution. Poisson and Geometric Distributions. Negative Binomial and Hyper geometric Distributions. Continuous Distributions: Uniform, and Exponential. Normal, and Standard Normal Distributions, and the relation between them, χ^2 distribution, T- distribution, F-distribution. Prerequisite: MATH 212 + STAT 101

MATH 333 Ordinary Differential Equations 3 (2 + 2+0) credit-hours.

Definition of differential equation methods of solution of differential equations with order one-orthogonal orbits. Solution of higher order linear differential equation with constants coefficients and variable coefficients-linear systems of differential equation. Solution with polynomial coefficients using the series method-Laplace's transforms, Fourier's series. Prerequisite: MATH 212

FM 321 Elementary and Financial Mathematics 3 (2 + 2+0) credit-hours.

Mathematical models in economics. Interests and capital growth. Marginal cost. Profit maximization. Elasticity of demand. Efficient small firm. Portfolios, arbitrage portfolio and state prices. IS-LM analysis. Input-output models. Consumer surplus. Prerequisite: MATH 244

STAT 302 Statistical methods 3 (2 + 2+0) credit-hours.

Some discrete and continuous Statistical distributions. Sampling distribution and central limit theorem. Estimation. Hypothesis testing. Chi-square tests. Analysis of variance. Analysis of correlation and regression. Nonparametric methods. Prerequisite: STAT 212

STAT361 Operation Research 1 3 (2 + 2+0) credit-hours.

Operation research introduction: history of op-research-meaning of OR-subjects of OR-problem formulation-creation-creation of the mathematical model. Introduction to decision theory: pay off matrix- Decision in the different situation (sure, risk, probabilistic) - returns – decision tree. Introduction to linear programs and its applications: graphical method for solving L. P- Transportation model. Assignment model. Introduction to graph theory and networks: shapes and directed shapes- types of shapes- trees- network definition- shortest route problem in networks without directive loops. Prerequisite: STAT 212

MATH 315 Partial differential equations 3 (2 + 2+0) credit-hours.

First and second order linear partial differential equations. The method of characteristics, Separation of variables and its applications to linear partial differential equations- Fourier series – Sturm-Liouville problems, Green functions. Prerequisite: MATH 333

STAT 312 Probability Theory 2 3 (2 + 2+0) credit-hours.

Continuous and discrete bivariate random variables – joint probability distributions – marginal and conditional distributions- moments – independence – covariance – correlation coefficient – moment generating function – bivariate normal distribution – multivariate variables - distribution of the sum of random variables
Prerequisite: STAT 212 + MATH 232

MATH 371 Economic and Financial Mathematics 2 (2 +1+ 0) credit-hours.

First order recurrences. The Cobweb model. Contours and isoquants. Optimization in two variables. Vectors, preferences and convexity. Constrained optimization, elementary theory of the firm, Cobb-Douglas firm. Lagrangeans and the consumer, elementary theory of the consumer. Second order recurrences, dynamics of economy, business cycles. Ordinary differential equations, continuous time models, market trend and consumer demand. Prerequisite: MATH 321

MATH 335 Vector analysis 3 (2 + 2+0) credit-hours.

Vectors, dot product, cross product, parametric curves, velocity, acceleration, arc length , curvature, torsion, tangent plane, scalar field and gradient, directional derivatives , Lagrange multipliers, double and iterated integral, double integral in polar coordinates, change of variables, triple integral in rectangular and spherical coordinates, Green theorem. Two dimensional Curl, simply connected region, surface integrals, line integral in space, exactness. Prerequisite: MATH 232

MATH 383 Real Analysis 3 (2 + 2+0) credit-hours.

Limits of functions, continuous functions, properties of continuity, regular continuity, connected set and continuity, derivative and properties of derivation, Mean value theorem, Loupital rule, Taylor theory, Riemann sums, Fundamental theory of differential and integral calculus.
Prerequisite: MATH 232

MATH 473 Topology 3 (2 + 2+0) credit-hours.

sub base, metric spaces, continuous functions, Examples, classification of continuous functions on topological spaces and metric spaces, Homomorphism between two topological spaces, topological property, compact spaces, Examples, Separation Axioms, compact by sequences connected spaces, Applications.
Prerequisite: MATH 383

MATH 475 differential geometry 3 (2 + 2+0) credit-hours.

Theory of curves in R3 space, regular curves, changes of parameter, Serret-Frenet status and Theory, Existence and uniqueness Theory of curves in R3 spaces. Local Theory of surfaces, simple surfaces, Coordinate transformations, Tangent vector and space of tangents, First and Second fundamental forms. Weingarten map. principal curvatures, Gauss curvature, mean curvature, Geodesic curves, Gauss-Codazzi-Minardi equations.
Prerequisite: MATH 335

MATH 344 Group Theory 2 (1 + 2+0) credit-hours.

Definition and examples, subgroups, Lagrange theorem, normal subgroups, outer groups, homomorphism isomorphic theorem, characteristic (Eigen) isomorphism Kayles theorem and its generalizations. Simple groups, automorphisms, class equation effective groups on sets, prime groups. Cauchy's theorem, Cylew's theorem , inner and outer product for groups, Brnsayed's theorem, even groups, four's groups, characteristic isomorphism's for finite and infinite Cyclic groups.
Prerequisite: MATH 233 + MATH 242

MATH 488 Graduation Project (1) 2(2+0+0) credit-hours.

Student should have a case study in his specialized topic and at the end he will write an essay in an English language. There are no specific guidelines concerning the length of an essay but not to exceed 60 pages, but students are reminded that an accurate and concise essay usually indicates a better understanding of the topic. The organization of the essay should follow that of a typical research paper, as outlined below:
Title page
Abstract
Introduction
Materials & Methods

Results
Discussion
Conclusions
Acknowledgements
References

The Abstract should be brief and to the point, no more than half a page.

The Introduction The student should conduct a literature survey of the case he chooses for his study. He should clearly identify the purpose of the work, especially focusing on the study case problems and questions being addressed. Other researcher idea should be addressed and criticized. The student approach to solve the problem should be justified.

The other sections of the theses should have appropriate sub-headings to make the story readable and easy to follow. There is a trend in modern papers for these headings to be in the form of very short (e.g. 2-5 words) statements giving the main point of the section, a trend you may wish to follow.

The Materials & Methods, the results and the discussion should be completed.

The Conclusions should refer back to the introduction, showing how the completed work relates to the original objectives.

The References section should be accurate and in the style of one of the leading journals in the field.

Students are reminded to consult the Senate document relating to academic honesty. Paraphrasing sentences or larger sections of research articles or reviews will constitute plagiarism.

Finally student at the end of the semester should write a draft report on the work he did in his project. His report will be marked on the basis of completing the above requirements.

Finally he should submit the report and give at least couple of seminars on those topics.

MATH 499 Graduation Project (2) 2(2+0+0) credit-hours.

The student should submit the essay and give at least couple of seminars on his work then he has to set a viva-voice.

Traditionally, the viva-voice or oral examination occurs after submitting an essay on the topics that he had chosen.

Oral presentations are a very good measure of student understands of a subject and their ability to verbally explain the subject to someone else. Finally student should sit for oral examination. Oral examinations may be conducted preferable by one external or one internal examiner. Oral examinations typically have two main purposes. Firstly, the oral exam allows an examiner to ascertain the comparability of a degree grade amongst different educational institutions. Secondly, it allows the examiner to confirm or improve the appropriate degree grade classification for a student that may be just under the borderline for a higher degree grade. Oral examinations are not just an assessment of the student's performance- oral exams are usually an opportunity for the examiner to get feedback from the students on the performance of the department and university.

Elective Courses for Mathematics

MATH 342 Computational Methods for Differential Equations 3 (2 + 2+0) credit-hours.

Modeling of systems which lead to differential equations (examples include vibrations, population dynamics, and mixing processes). Scalar first order differential equations, second-order differential equations, systems of differential equations. Stability and qualitative analysis. Implicit and explicit time-stepping. Comparison of different methods. Stiffness. Linearization and the role of the Jacobean. Prerequisite: MATH 333

MATH 442 Computational Methods for Partial Differential Equations 3 (2 + 2+0) credit-hours.

This course studies basic methods for the numerical solution of partial differential equations. Emphasis is placed on regarding the discretized equations as discrete models of the system being studied. Basic discretization methods on structured and unstructured grids. Boundary conditions. Implicit/explicit time stepping. Stability, consistency and convergence. Non-conservative versus conservative systems. Nonlinearity.
Prerequisite: MATH 353

MATH 416 Integral Equations 3 (2 + 2+0) credit-hours.

-Kind of integral equation(linear- nonlinear-Volterra first kind and second-Fredholm first and second- Singular integral equations).- Degenerate kernel- Resolve kernel- Symmetric kernel- Eigen values-Eigen function-methods for solving Volterra and Fredholm integral equations. Approximate methods solving integral equations.
Prerequisite: MATH 353

MATH 331 Applied Real Analysis 3 (2 + 2+0) credit-hours.

Topology of Euclidean spaces, continuity, norms, completeness. Contraction mapping principle. Fourier series. Various applications, for example, to ordinary differential equations, optimization and numerical approximation.
Prerequisite: MATH 383

CS 300 Mathematical programming 2 (2 + 1+0) credit-hours.

Problem formulation, algorithm development, FORTRAN 95- program creation, compilation and linking variables and parameters, flow control, subroutines and functions, use of libraries, C++ for scientific users, Mathematica, numerical calculations, Graphics, MATLAB Matrix Laboratory, Applications: polynomials, interpolation, integration, differentiation, graphic 2d and 3d, graphics program. Prerequisite: CS 140

MATH 417 Special Functions 3 (2 + 2+0) credit-hours.

Gamma Function, Beta Function, Complete Elliptic Integral of the First Kind, Complete Elliptic Integral of the Second Kind, Confluent (Degenerate) Hypergeometric Function of the First Kind, Confluent (Degenerate) Hypergeometric Function of the Second Kind, Elliptic Integral of the First Kind, Elliptic Integral of the Second Kind, Elliptic Integral of the Third Kind, Error Function, Hypergeometric Function, Incomplete Gamma Function, Bessel Functions, Bessel Function of the First Kind, Bessel Function of the Second Kind, Modified Bessel Function of the First Kind, Modified Bessel Function of the Second Kind, Parabolic Cylinder Function, Whittaker Function, Chebyshev Polynomial of the First Kind, Chebyshev Polynomial of the Second Kind, Gegenbauer Polynomial, Hermite Polynomial, Laguerre Polynomial, Legendre Polynomial. Prerequisite: MATH 333 + MATH 231

MATH 432 Functional Analysis 3 (2 + 2+0) credit-hours.

Holder and Minkowski inequality, different metric spaces, normal spaces, different Banach spaces, Riez, Fisher theorem, Hana, Banach theorem. Hilbert spaces and normalized systems, introduction to bounded and linear operators on different spaces. Applications. Prerequisite: MATH 485 + MATH 383

MATH 367 Number Theory 3 (2 + 2+0) credit-hours.

well ordering principal, divisibility, Euclidean algorithm, prime numbers and the fundamental theorem of arithmetic, Fermat numbers, Linear Diophantine Equations, Congruence, Residue Systems, systems of linear Congruence, special Congruence, number theoretic functions, phythagorean triples. Prerequisite: MATH 234

MATH 468 Graph theory 3 (2 + 2+0) credit-hours.

Definition of a graph, vertex set, edge set, loops, order of a graph, degree of a graph, subgraph, Types of graph, Trees, bipartite graph, complete graph, directed graph, multigraph, Connectivity of a graph, operations on graphs, complement of a graph, union, join, product of graphs, homomorphic graphs, eulerian and Hamilonian graphs, planar graphs, Euler formula, Graph coloring, line graphs. Prerequisite: MATH 233

MATH 485 Complex Analysis 3 (2 + 2+0) credit-hours.

Complex number, Polar and Cartesian representation of Complex number, Continuity, Limits of Complex functions, Analytic functions, Cauchy-Riemann Theory, Harmonic functions, exponential, trigonometric, hyperbolic and logarithmic functions. Complex integration, path integration ,Cauchy theory, integral Cauchy formula, boundness of abstract value of analytic function, representation of analytic function by series, Taylor and Lauran Series, Zeros, Singular points, Residue Theorem, Applications in real and improper integrals calculations. Prerequisite: MATH 383

MATH 444 Rings and Fields 3 (2 + 2+0) credit-hours

Rings: definitions – basic properties of rings – subring – fields – division ring – integral domain – characteristic of the ring – Ideals – quotient ring – unique factorization – Gauss lemma – maximal ideals – Gauss primes – quadratic integers – ideal fractions – ideal classes – relations in ring – adjoining elements –polynomial rings – Euclidean rings – ring homomorphism – ring endomorphism – Fields: algebraic elements – field extension.
Prerequisite: MATH 344