DEPARTMENT OF MATHEMATICS AND STATISTICAL SCIENCES

Dr. Tor A. Kwembe, Professor and Chair
P.O. Box 17610
Telephone: (601) 979-2161
Fax: (601) 979-5852
E-mail: mathematics@jsums.edu
E-mail: tor.a.kwembe@jsums.edu

Faculty

Dr. D. Chen, Associate Professor
Dr. R. Gentry, Professor
Dr. T. A. Kwembe, Professor
Dr. C. Wafo Soh, Professor
Dr. N. Wang, Associate Professor
Dr. Y. Yan, Associate Professor
Dr. Z. Zhang, Professor

The Department of Mathematics and Statistical Sciences offers a doctoral degree concentration in computational mathematics and statistical sciences through the College of Science, Engineering and Technology's Ph.D. program in Computational Data-Enabled Sciences and Engineering (CDS&E). The Department also offers programs leading to the MST degree in mathematics designed for persons who wish additional preparation for mathematics teaching or mathematics supervision and the MS degree in Pure or Applied Mathematics for students who seek careers in academia, government, industry, or the business sector. The programs are designed for persons with adequate background in undergraduate statistics and mathematics beyond the calculus sequence.

Program Mission

In keeping with the mission and vision of the university, the Department of Mathematics and Statistical Sciences aims to equip its graduate with the necessary advanced mathematics and statistical knowledge and skills that prepares them to find solutions to mathematics or statistics problems arising in other academic fields and in areas outside the normal academic setting and to use this knowledge to solve society problems of challenge. The program aims for national and international distinction in preparing mathematics students for a spectrum of careers including academic and non-academic employment.

Program Objectives

1. To provide quality mathematics training at the doctoral and master's degree level.
2. To provide a learning and research friendly environment for all students.
3. To prepare students to recognize opportunities for advancing mathematics or statistical ideas arising in other fields.
4. To increase the pool of mathematicians seeking academic and non-academic employment.

Transfer of Credits

A course for which transfer credit is sought must have been completed with a grade of "B" or better. Departmental approval is required.

Time Limit

Students with adequate mathematics preparation at the undergraduate level will normally take two years to complete any of the Master's degree programs and a minimum of five years to complete the doctoral program. However, all students must complete their programs within eight years of starting coursework at Jackson State University or elsewhere.

Masters

- Mathematics (M.S.) (https://jsums-public.courseleaf.com/graduate/college-science-engineering-technology/department-mathematics-statistical-sciences/mathematics-ms/)

Doctoral

- Computational Mathematics and Data-Enabled Science & Engineering (Ph.D.) (https://jsums-public.courseleaf.com/graduate/college-science-engineering-technology/department-mathematics-statistical-sciences/computational-mathematics-data-enabled-science--engineering-phd/)

Course Descriptions

MATH 501 TOPICS IN GEOMETRY (3 Hours)
Prerequisite: Approval of department.
A survey of geometries and their structures. Emphasis is on both synthetic and analytic methods.

MATH 503 FOUNDATIONS OF MATH I (3 Hours)
The fundamental elements of set theory and finite mathematical structures; cardinals and ordinals; logical deduction, elements of probability; vectors and matrices, linear programming, theory of games and applications.

MATH 504 FOUNDATIONS OF MATH II (3 Hours)
The fundamental elements of set theory and finite mathematical structures; cardinals and ordinals; logical deduction, elements of probability; vectors and matrices, linear programming, theory of games and applications.

MATH 506 BASIC CONCPTS FOR TCHR I (3 Hours)
Prerequisite: Approval of department.
Higher mathematics for teachers, reviewing the fundamental areas of algebra, geometry and analysis, with stress on rigor and validity of ideas.

MATH 507 BASIC CONCPTS FOR TCH II (0.5-3 Hours)
Prerequisite: Approval of department.
Higher mathematics for teachers, reviewing the fundamental areas of algebra, geometry and analysis, with stress on rigor and validity of ideas.

MATH 510 TOPICS & ISSUES IN MATH (3 Hours)
This course is designed for in-service teachers who are interested in the renewal of teaching licenses and the pursuit of graduate studies in the teaching of mathematics. Emphasis is on individualized research dealing with the stages of development of mathematics, new trends in the teaching of mathematics, and the exploration of teaching theories resulting from the work of experimental psychologists such as Piaget, Aushel and Bruner. Because of the individualized nature of the course, students with diverse backgrounds in mathematics can be accommodated.

MATH 511 BASIC ABSTRACT ALGEBRA I (3 Hours)
Groups, (homomorphisms), rings, integral domains, modules and fields, elementary linear algebra, number theory.

MATH 513 LINEAR ALGEBRA I (3 Hours)
Vector spaces, matrices, linear transformations, determinants and linear equations. Selected topics on eigenvalues, canonical forms, inner products, inner product spaces, bilinear and quadratic forms.

MATH 531 BASIC REAL ANALYSIS I (3 Hours)
Prerequisite: Math 511 or approval of department.
Metric spaces, regulated functions and integrals; integrals of Riemann and Lebesgue; trigonometrical and Fourier series; differentiation and Stieltjes Integrals.

MATH 532 BASIC REAL ANALYSIS II (3 Hours)
Prerequisite: Math 511 or approval of department.
Metric spaces, regulated functions and integrals; integrals of Riemann and Lebesgue; trigonometrical and Fourier series; differentiation and Stieltjes Integrals.

MATH 535 INTRO MEAS & INTEGRTN I (3 Hours)
Prerequisite: Mathematics 531 or approval of department.
Lebesgue measure of linear sets, measurable functions, definite integral, convergence, integration and differentiation, spaces of functions, orthogonal expansions, multiple integrals and the Stieltjes Integral.

MATH 536 INTRO MEAS & INTEGRTN II (3 Hours)
Prerequisite: Mathematics 531 or approval of department.
Lebesgue measure of linear sets, measurable functions, definite integral, convergence, integration and differentiation, spaces of functions, orthogonal expansions, multiple integrals and the Stieltjes Integral.

MATH 541 BASIC COMPLEX ANALYSIS I (3 Hours)
Complex numbers, sets and functions; limits and continuity; analytic functions of a complex variable, elementary functions; integration; power and Laurent series, calculus of residues, conformal representation, special topics.

MATH 542 BASIC COMPLEX ANALYS II (3 Hours)
Complex numbers, sets and functions; limits and continuity; analytic functions of a complex variable, elementary functions; integration; power and Laurent series, calculus of residues, conformal representation, special topics.

MATH 543 NUMERICAL ANALYSIS (3 Hours)
This is an introductory course on Numerical Analysis. It is made of five related modules: M1) floating-point arithmetic, M2) root-finding algorithms, M3) numerical solution of systems of equations, M4) interpolation problems and M5) numerical integration.

MATH 551 BASIC GENERAL TOPOLOGY I (3 Hours)
Prerequisite: Mathematics 223 and approval of department.
Elementary set theory, ordinals and cardinals; topological spaces; cartesian products; connectedness; special topologies; separation axioms; covering axioms, metric spaces; convergence; compactness; function spaces; spaces of continuous functions and complete spaces; homotopy; maps into spheres; topology of En; homotopy type; introduction to algebraic topological ideas.

MATH 563 EXPERIMENTAL DESIGN I (3 Hours)
Prerequisite: Mathematics 272.
Experimental Design: Completely randomize design; randomize block designs, factorial experiments split plot design. confounding.

MATH 567 NON-PARAMETRIC STATS I (3 Hours)
Prerequisite: Mathematics 562 and approval of department.
Problems of estimating testing hypotheses when the functional form of the underlying distribution is unknown. Robust methods; sign test, rank test and confidence procedures based on these tests; tests based on permutations of observations. Non-parametric tolerance limits; large sample properties of the tests, multi sample problems; ranking methods in analysis of variance; Bivariate and multivariate procedures, efficiency comparisons.

MATH 571 NUMERICAL ANALYSIS I (3 Hours)
Prerequisite: Approval of department.
Introduction to Matlab, approximate differentiation, local truncation error and order, Euler¿s method, Runge-Kutta methods, embedded Runge-Kutta methods, stiff equations and implicit methods, explicit multi-step methods, implicit multi-step methods, shooting method, finite element method, finite difference methods for partial differential equations.

MATH 577 ORDINARY DIF EQUATIONS I (3 Hours)
Ordinary differential equations: basic theorems of existence, uniqueness, and continuous dependence of the solutions; linear differential equations and systems; stability theory; topology of integral curves; differential equations in the complex domain, asymptotic integration; boundary value problems. Partial differential equations; equations of first order method of characteristics, Hamilton-Jacobi theory; equations of second order-classification according to type; elliptic equations-potential equation, maximum principle, characteristics, and other topics of interest.

MATH 578 ORDINARY DIF EQUATION II (3 Hours)
Ordinary differential equations: basic theorems of existence, uniqueness, and continuous dependence of the solutions; linear differential equations and systems; stability theory; topology of integral curves; differential equations in the complex domain, asymptotic integration; boundary value problems. Partial differential equations; equations of first order method of characteristics, Hamilton-Jacobi theory; equations of second order-classification according to type; elliptic equations-potential equation, maximum principle, characteristics, and other topics of interest.

MATH 579 PARTIAL DIFF EQUATIONS I (3 Hours)
Prerequisite: Mathematics 577 or departmental approval.
Linear equations with constant coefficients in two independent variables, applications, eigenfunction expansions, homogeneous and nonhomogeneous equations. Fourier series, existence, solution uniqueness and representation, Initial boundary value problems, Laplace's equation, and special topics.

MATH 584 INDEPENDENT STUDY (3 Hours)
Prerequisite: Departmental consent.
Intensive study and research of a subject selected in accordance with student needs and arranged in consultation with the staff. Topics will vary. Student will make periodic reports on his/her reading and will-prepare a scholarly paper on a problem.

MATH 599 THESIS (3 Hours)
The candidate for the Master's degree must present a Thesis embodying the results of his research. The candidate chooses his problem, but approval by his adviser is required.

MATH 628 ADVD PARTIAL DIFF EQUATIONS I (3 Hours)
This course covers representation formulas for Laplace's equation, heat equation, and wave equation' theory of general nonlinear first-order partial differential equations; solvability of uniformly second order ellipitc, parabolic, and hyperbolic equations; theory of Sobolev spaces.

MATH 629 ADVND PARTIAL DIF EQUATIONS II (3 Hours)
This course is a continuation of MATH 628 and covers the theory and qualitative analysis techniques for nonlinear higher-order partial differential equations including calculus of variations, monotonicity methods, fixed point methods, methods of sub-solutions and super-solutions, nonexistence, geometric properties of solutions, gradient flows, Hamilton-Jacobi equations, and system of conservation laws.

MATH 670 COMPUTATIONAL METHODS N MATH I (3 Hours)
This course is designed to give an overview of the design, analysis and implementation of the most fundamental numerical techniques of MATH 543 in numerical linear algebra, the interpolation of functions, and the evaluation of integrals. This course in most part will depend on programming with MATLAB and/or C++. While we present many MATLAB examples throughout the course, students are strongly advised to have some previous programming experience in any computer programming language.

MATH 671 COMPUTATNL METHODS IN MATH II (3 Hours)
This course is a continuation of MATH 670. Topics covered includes introduction to mathematical and computational problems arising in the context of molecular biology. Theory and applications of combinatories, probability, statistics, geometry, and topology to problems ranging from sequence determination to structure analysis. The course depends on parallel and distributed programming.

MATH 673 QUANTITATIVE EXPLORATN OF DATA (3 Hours)
This course covers how to analyze and mine data with the Structured Query Language (SQL). Understand SQL fundamentals, and then advance into the uses of SQL data analysis and data mining with real applications. Learn to use Microsoft Excel to further analyze, manipulate and present your data exploration and data-mining findings in tabular and graphical formats. Students will be exposed to Extreme Science and Engineering Discovery Environment (XSEDE).

MATH 700 TPCS N MATH & STATS A N CDS&E (3-6 Hours)
The course may be repeated for credit. It covers current trends and challenges of mathematical and statistical applications in CDS&E.

MATH 827 NUMERICAL SOLUTN OF DIF EQUATI (3 Hours)
Ordinary differential equations:Runga-Kutta and predictor-corrector methods; stability theory, Richardson extrapolation, sitff equations, boundary value problems. Partial equations, boundary value problems. Partial differential equations: stablity, accuracy and convergence, Von Neumann and CFL conditions, finite difference solutions of hyperbolic and parabolic equations. Finite differences and finite element solution of elliptic equations.