DEPARTMENT OF MATHEMATICS AND STATISTICAL SCIENCES

Dr. Tor A. Kwembe
Department Chair

Mrs. Alicia K. Jefferson
Undergraduate Program Coordinator

Just Hall of Science Building, Room #225
JSU Box 17610
Jackson, MS 39217-0410
Phone: (601)979-2161
Email: mathematics@jsums.edu
website: http://www.jsums.edu/math/

Faculty of Department

R. Gentry, T. A. Kwembe, C. Wafo Soh, Z. Zhang, D. Chen, B. Diatta, J. Talley, N. Wang, C. Wright, Y. Yan, A. Jefferson.

Introduction/Mission

The Department of Mathematics and Statistical Sciences prepares students for jobs that require quantitative, analytical, and critical mathematics and statistical skills. We ready our learners for graduate studies and research of international excellence spanning broadly pure mathematics, computational and applied mathematics, statistics, and mathematics education. We foster collaborations with high-tech industries and government agencies with the goal of creating career paths for our students. We strive to showcase the relevance and pervasiveness of mathematics in the modern economy through regular outreach activities.

The Department of Mathematics and Statistical Sciences offers the Bachelor of Science Degree in Mathematics (BS), with concentrations in various areas of Pure and Applied Mathematics, the Bachelor of Science in Education Degree in Mathematics Education (BS Ed), and the Bachelor of Science Degree in Statistics (BS). Our graduates pursue advanced studies in mathematics or statistics, seek careers as mathematicians or statisticians in emerging high-tech industries and federal agencies or teach mathematics at the secondary level.

Objectives

The objectives of the Department of Mathematics and Statistical Sciences are as follows:

- To develop the quantitative skills of students who enjoy the enterprise of problem solving, statistical analysis, data visualization and the reward of discovery.
- To encourage students to pursue advanced training in mathematics or statistics commensurate with their goals and talents.
- To illustrate the role of mathematics and statistics in research, quantitative exploration of data, data analytics and visualization, and related areas of scientific endeavor.
- To prepare effective teachers of mathematics and competent mathematicians and statisticians for work in business, government, and industry.

- To offer courses in mathematics or statistics for students entering the University with mathematics or statistics deficiencies.
- To offer courses essential for those students pursuing study in major fields other than mathematics or statistics, including those that elect to minor in mathematics or statistics.

Accreditation

The Bachelor of Science in Education Degree in Mathematics Education (BS Ed) is accredited by the Council for the Accreditation of Educator Preparation (CAEP).

Elementary Education Majors

Elementary Education majors who are seeking a content knowledge area in mathematics must complete the following courses:

Code	Title	Hours
MATH 111	COLLEGE ALGEBRA	3
MATH 112	PLANE TRIGONOMETRY	3
MATH 226	CONCEPTS & STRUCS OF MATH I	3
MATH 306	ELEMENTARY CONCEPTS OF GEOMETR	3
MATH 493	HIST IN MATH CLASSROOM I	3
MATH Electives 300-400 Level		6
Total Hours		**21**

Substitute courses must be approved by the Department of Mathematics and Statistical Sciences.

Minor Requirements

The Mathematics or Statistics minor requires a minimum of 21 semester hours in Mathematics or Statistics coursework. Students seeking a minor in Mathematics must complete 12 credit hours with a minimum grade of "C" in each course of the Calculus Sequence and 9 semester hours of coursework in mathematics beyond the Calculus Sequence. Those seeking a minor in Statistics must complete MATH 241 CALCULUS I WITH LABORATORY and 18 semester hours of statistics or data analysis courses with the approval of the Department of Mathematics and Statistical Sciences.

Bachelors

- Mathematics (B.S.) (https://jsums-public.courseleaf.com/undergraduate/college-science-engineering-technology/department-mathematics-statistical-sciences/mathematics-bs/)
- Mathematics Education (B.S.Ed.) (https://jsums-public.courseleaf.com/undergraduate/college-science-engineering-technology/department-mathematics-statistical-sciences/mathematics-education-bsed/)
- Statistics (B.S.) (https://jsums-public.courseleaf.com/undergraduate/college-science-engineering-technology/department-mathematics-statistical-sciences/statistics-bs/)

Course Descriptions

MATH 001 DEVELOPMENTAL MATHEMATICS (3 Hours)
This course is designed to improve the students¿ mastery of the fundamental operations of arithmetic, including whole numbers, fractions, decimals, mixed numbers and percentages. Emphasis is placed on number manipulation and applications relating to process.

MATH 002 BASIC CONCEPTS/N MATH II (3 Hours)

MATH 003 INTEGRATED INTERMEDIATE ALGEBRA (3 Hours)

MATH 103 College Algebra with Corequisite Support (3 Hours)
This course is a corequisite Math course in which the Intermediate Math course is coupled with the credit-bearing College Algebra course (IHL Policy 608E). Students will engage in extra time for mandatory labs and tutoring to help them master the content necessary to successfully complete MATH 103. Upon successfully completing this course, students will receive credit for the Intermediate Math and the College Algebra course. The course will consist of an accelerated refresher on linear equations and inequalities and their graphs, absolute value equations and inequalities, exponents, and polynomials, factoring, rational expressions, radicals, and quadratic equations; followed by an analysis of graphs and functions; polynomial functions; rational, power, and root functions; inverse, exponential, and logarithmic functions with integrated refresher content as necessary.

MATH 111 COLLEGE ALGEBRA (3 Hours)
Prerequisite: MATH 004 with a grade of ¿C¿ or better or the equivalent and Test Standing.
The function concepts, solving quadratic equations, graphing the quadratic function, inequalities, absolute value, absolute inequalities, Fundamentals theorem of Algebra, roots, factors, systems of equations and matrices, math induction and Binomial Theorem, arithmetic and geometric progressions, logarithms, complex numbers, partial fractions, and applications of all topics.

MATH 112 PLANE TRIGONOMETRY (3 Hours)
Prerequisite: MATH 111 with a grade of ¿C¿ or better.
Right and oblique triangular solutions, identities, trigonometric equations, systems of angular measurements, and applications.

MATH 114 Quantitative Reasoning (3 Hours)
Prerequisite: Test Standing
MATH 113 (3) Quantitative Reasoning. Quantitative Reasoning is a general education course designed for students in non-STEM degree pathways. The course empowers students' reasoning with data in relation to real-life situations, arts, health, science, and social issues. It enhances critical thinking and quantitative literacy while developing awareness about rules or principles guiding the understanding and evaluation of real-life problems. It is designed to teach students a wide range of general mathematics. Problem-solving and critical thinking skills, along with the use of technology, will be emphasized and reinforced throughout the course in solving applied problems. Topics include: algebra, concepts of set theory, modeling, geometry, measurement, probability, statistics, simple regression analysis, and making predictions with data.

MATH 118 ALGEBRA II & TRIGONOMTRY (5 Hours)
Prerequisite: Test Standing, MATH 004 or equivalent.
Polynomial equations, exponents and radicals, logarithms, quadratic equations, inequalities, complex numbers, permutations and combinations, probability, determinants, simultaneous linear equations, induction, binomial theorem, progressions and series, triangular solutions, identities, trigonometric equations, systems of angular measurement applications.

MATH 217 INTRODUCTORY FINITE MATH (3 Hours)
Prerequisite: MATH 111.
Introductory ideas for students of education, compound statements, sets and subsets, partitions and counting, elementary probability theory.

MATH 221 CALCULUS I INDUST OR BUS (3 Hours)
Prerequisite: MATH 111.
Functions, limits, continuity, differentiation, applications, basic analytic geometry, algebraic, exponential and logarithmic functions, integration, applications, series and sequences, improper integral. Specific applications.

MATH 226 CONCEPTS & STRUCS OF MATH I (3 Hours)
Prerequisite: MATH 111 with a grade of ¿C¿ or better.
Study of various numeration systems, rational and real numbers, fraction and decimal algorithms, ratios, percentages, consumer mathematics, introduction to problem-solving and logic, use of patterns and Venn diagrams.

MATH 241 CALCULUS I WITH LABORATORY (3 Hours)
Functions, limits, continuity, differentiation, limiting forms, applications, properties of continuous functions, analytical geometry and integration. The laboratory component is designed to reinforce the lecture component with activities requiring the use of technology in the form of computers with selected software and graphing utilities.

MATH 242 CALCULUS II WITH LABORATORY (3 Hours)

MATH 243 CALCULUS III WITH LABORATORY (3 Hours)
Infinite Sequences and Series, Tests of Convergence or Divergency, Power Series, Vectors and the Geometry of Space, Vector Valued- Functions, Partial Derivatives: Chain rule, Directional Derivatives, Gradient, Tangent Planes and Differentials. The laboratory component is designed to reinforce the lecture component with activities requiring the use of technology in the form of computers with selected software and graphing utilities.

MATH 244 CALCULUS IV WITH LABORATORY (3 Hours)
Continuation of Functions of several variables and partial differentiation; multiple integrals, vector calculus and integration in vector fields. The laboratory component is designed to reinforce the lecture component with activities requiring the use of technology in the form of computers with selective software and graphing utilities.

MATH 271 ELEMENTARY STATISTICS I (3 Hours)
Prerequisite: MATH 112.
Introduction, frequency distributions, location measures, variation, symmetry, skewness, peakedness, index numbers, probability, theoretical distributions, sampling, estimation, tests of hypotheses, non-parametric tests, linear regression, coefficient of correlation, time series analysts.

MATH 303 INT TO SET THEO & LOGC I (3 Hours)
Prerequisite: MATH 231, with a grade of ¿C¿ or better.
Sets and relations, natural number sequence, extension of natural number to reals, logic, informal axiomatics, Boolean algebra, interval and set theory, algebraic theories, first order theories.

MATH 306 ELEMENTARY CONCEPTS OF GEOMETR (3 Hours)
Prerequisite: Department approval.
Basic notions of lines, angles, triangles, circles and proofs. Stress is placed on synthetic methodology and reasoning.

MATH 307 PROBLTY & STATISTICS/ENGINEERG (3 Hours)
Prerequisite: MATH 232.
Introduction to concepts of probability and statistics required to solve problems in various disciplines; mathematical basis for probability and statistics includes axioms of probability, continuous sampling distributions, and discrete probability, hypothesis testing, confidence intervals, probability estimations for risk assessment, data processing and statistical inference, statistical techniques of data analysis, simple and multiple regression model development; stochastic processes, emphasis is on the application of probability, statistics and reliability to rational decision making, data analysis and model estimation in engineering context.

MATH 311 ABSTRACT ALGEBRA I (3 Hours)
Prerequisite: MATH 303.
Basic concepts of modern algebra, preliminaries, elementary ideas of groups, rings, integral domains and fields.

MATH 321 MODERN GEOMETRY I (3 Hours)
Prerequisite: MATH 232.
Euclidean, non-Euclidean, projective and affine geometrics with emphasis on the appropriate postulates and the postulational method. Transformation theory.

MATH 331 LINEAR ALGEBRA & MATRIX THEORY (3 Hours)
Prerequisite: MATH 303.
A theoretical study of equations, matrices, vector spaces, inner product spaces linear transformations bilinear and quadratic forms, and eigenvalues.

MATH 351 ADVANCED CALCULUS I (3 Hours)
Prerequisite: MATH 233.
Sets and functions, continuity, integration, convergence, differentiation, and applications to geometry and analysis, differential geometry, and vector calculus.

MATH 355 PROBABILITY&STATISTICS I (3 Hours)
Prerequisite: MATH 233.
Random variables, conditional probability and stochastic independence, special distributions.

MATH 356 PROBABILITY & STATS II (3 Hours)
Prerequisite: MATH 355.
Estimations, order statistics, limiting distributions, statistical hypotheses, variance, normal distribution theory, point and interval estimation, sampling, regression and correlation.

MATH 368 DIFFERENTIAL EQUATIONS (3 Hours)
Prerequisite: MATH 233.
Introduction to differential equations, first-order differential equations, higher-order differential equations, series solutions of linear equations, the Laplace transform and systems of linear first-order differential equations.

MATH 399 PROBLM SLVG FOR PRE S MATH TEA (0 Hours)
This course includes topics pertinent to success in problem solving for Secondary Mathematics Education majors: arithmetic and basic algebra, geometry, trigonometry, analytic geometry, functions and their graphs, calculus, probability and statistics, discrete mathematics, linear algebra, computer science, and mathematical reasoning and modeling. In addition to review of content that pertains to the aforementioned topics, students will investigate test taking skills and methods of problem solving. Underlying focus will be to develop students' mathematical communication skills through regular class participation and peer evaluation activities.

MATH 402 MTHDS OF TCHNG MATH IN SECD SC (3 Hours)
Prerequisite: Department approval.
Materials and sources of value to prospective teachers of high school, middle school and junior high school mathematics, reports, current articles, state-adopted textbooks, yearbooks and histories, special problems in teaching geometry and algebra.

MATH 403 SEMINAR IN MATHEMATICS (3 Hours)
Prerequisite: Department approval.
The provisions to the student of an opportunity to discuss pertinent trends and ideas in mathematics, and to evaluate the experience he has had through study and practice during his previous years of training in mathematics.

MATH 404 NMBR THEORY&CRYPTOGRAPHY (3 Hours)
Prerequisite: MATH 331 or department approval.
Topics in elementary number theory, finite fields, and quadratic residues. Cryptography public key, primality and factoring, elliptic curves.

MATH 411 ABSTRACT ALGEBRA II (3 Hours)
Prerequisite: MATH 311.
Groups rings, integral domains, modules, vector spaces, fields, linear transformations, special topics in group, ring, and field theory.

MATH 415 PARTIAL DIFF EQUATIONS I (3 Hours)
Prerequisite: MATH 368.
Heat equations, Laplace¿s equation, Fourier series, wave equation, Strum-Liouville eigenvalue problems, nonhomogeneous problems, method of Green¿s functions, infinite domain problems and the methods of characteristics for wave equations.

MATH 431 REAL ANALYSIS I (3 Hours)
Prerequisite: MATH 233.
Real number system, basics, numerical sequences and series, continuity, differentiation, Reimann-Stieltjes integral, sequences and series of functions, special series, functions of several variables, the Lebesgue theory.

MATH 435 THE TEACHING OF MATHEMATICS (3 Hours)
Prerequisite: Department approval.
Theory of arithmetical meanings, learning and rational, applied meanings, current trends.

MATH 436 TEACHNG OF ARITHMETIC II (3 Hours)

MATH 441 COMPLEX ANALYSIS I (3 Hours)
Prerequisite: MATH 233.
Complex numbers and representations, point sets, sequences, functions, analytic functions of one complex variable, elementary functions, integration, power series, calculus of residues, conformal representation, applications.

MATH 451 GENERAL TOPOLOGY I (3 Hours)
Prerequisite: MATH 303.
Elementary set theory, ordinals and cardinals, topological spaces, cartesian products, connectedness, special topologies, separation and covering axioms, metric spaces, convergence, compactness, function spaces, compete spaces, elementary homotopy and homology theory.

MATH 466 OPERATIONS RESEARCH (3 Hours)
Prerequisite: MATH 355.
Learning programming, network analysis, PERT-CPM, dynamic programming, queuing theory and decision analysis.

MATH 493 HIST IN MATH CLASSROOM I (3 Hours)
Prerequisite: Department approval.
Historical development of numbers and numerals, computation, geometry, algebra, trigonometry, calculus, modern mathematics.

STAT 115 Introductory Statistics (3 Hours)
Prerequisite: Test standing-ACT or SAT mathematics scores or departmental approval.
This course is designed for business, science, liberal arts, public health, behavioral health, economics, and education majors. Topics studied include descriptive measures for empirical data, theory of probability, probability distributions, sampling distributions of statistics from large and small samples, estimation theory, hypothesis testing, correlation, and regression.

STAT 272 DATA ANALYSIS (3 Hours)
Prerequisite: Math 271 with a grade of "C" or better or department approval.
STAT 272 (3) Data Analysis. This course covers simple linear regression, mulltiple linear regression, and analysis of variance(ANOVA). Rationale: To enhance content delivery and student mastery of the introductory statistics content and align the course requirements for the new BS degree in statistics and to also enable a seamless implementation of the 2+2 agreement with community colleges and students transfer to CSET and JSU in general.

STAT 300 REGRESSION ANALYSIS (3 Hours)
Prerequisite: : STAT 272, with a grade of "C" or better.
STAT 300 (3) Regression Analysis. This course covers multiple regression including variable selection procedures, detection and effects of multicolinearity, identification and effects of influential observations, residual analysis, use of transformations, non-linear regression, the use of indicator variables, logistic regression, and the use of R or SAS.

STAT 323 NONPARAMETRIC STATISTICS (3 Hours)
This course covers distribution-free analysis of location and scale measures, nonparametric comparison procedures, association and contingency tables, goodness-of-fit, and tests of randomness, one sample and two sample problems. It also uses statistical packages to perform various tests and conduct nonparametric analysis and enhance students' abilities to process distribution-free data.

STAT 350 COMPTNL STATS AND DATA MNGT (3 Hours)
This course covers R, SAS, SPSS, S-Plus, computational statistics packages and other big data statistical computational packages with emphasis on reading, manipulating and summarizing data and implementations of simulation and bootstrapping.

STAT 357 ACTUARIAL SCI EXAM:PROB/EXAM I (3 Hours)
This course will cover basic elements of probability, addition and multiplicaton rules, conditional probability, independent events, Bayes' Rules, univariate probability distributions, multivariate probability distributions. It is designed for students who intend to take actuarial sciences Exam 1/Probability.

STAT 408 TIME SERIES ANALYSIS (3 Hours)
This course covers the methods for analyzing data collected over time, review of multiple regression analysis, elementary forecasting methods, moving averages and exponential smoothing. Autoregressive-moving average (Box-Jenkins) models: identification, estimation, diagnostic checking, and forecasting, transfer function models and intervention analysis, and introduction to multivariate time series methods will also be covered.

STAT 414 MULTIVARIATE DATA ANALYSIS (3 Hours)
This course is primarily designed to expose students to conducting multivariate data analysis using real life data. This course will also serve to enhance the statistical analysis backgrounds of the students and expose the students to the use of statistical packages such as R, SAS, or SPSS to learn varous methods of analyzing multivariate data. This course covers topics including, multivariate normal; multiple and partial correlation, principal components analysis, factor analysis, discriminant analysis, logistic regression, cluster analysis, etc.

STAT 418 SEMINAR IN STATISTICS (3 Hours)
The provisions to the student of an opportunity to discuss pertinent trends and ideas in statistics and to evaluate the experience he/she has had through study and practice during his/her previoius years of training in statistics. It also provide students with the opportunity to discuss new trends and ideas in statistics by first exposing them to scholarly trends in the application of statisitcs to other academic and emerging fields of computational data-enabled science and engineering. This includes supervised activities on research projects identified on an individual or small group basis.

STAT 455 EXPERIMENTAL DESIGN (3 Hours)
This course covers the principles of statistical experimental design with applications, randomized complete and incomplete block designs, Latin square designs, and analysis of covariance, split-plot-design, factorial and fractional designs.