

DEPARTMENT OF MATHEMATICS AND STATISTICS

Department Objectives

- To prepare students to pursue graduate programs in mathematics or statistics;
- To prepare students for careers in mathematics education;
- To provide entry-level training for those wishing to pursue careers in actuarial science or business;
- To provide the courses to meet the requirements of General Studies;
- To provide the courses to meet the service functions for departments requiring knowledge of mathematics.

Department Policies

- Placement in the proper course is of utmost importance to the student and the Department. The ACT math score is used to place traditional entering freshmen in our entry level college mathematics courses. Consult the departmental course listings for information on minimal ACT math score requirements for our entry level courses.
- Students who have completed a full year of Calculus in high school may start in Calculus II or Calculus III.
- CLEP Examination must be taken before completing higher level courses.
- All majors and endorsements must be completed with no grade below a "C."
- Math 090 credit will not count toward any university degrees.
- Students will not be allowed to earn credit for either MATH 090 or MATH 101 after earning credit for any General Studies mathematics class. Students will not be allowed to earn credit for MATH 102 or MATH 123 after earning credit for MATH 115. Students will not be allowed to earn credit for MATH 102 after earning credit for MATH 123. Students will not be allowed to earn credit for both STAT 235 and STAT 241.

Mathematics Major

Three options are available in this major:

1. Mathematics (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/mathematics-statistics/mathematics-ba>) - Bachelor of Arts Degree
or Mathematics (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/mathematics-statistics/mathematics-bs>) - Bachelor of Science Degree
2. Mathematics Comprehensive (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/mathematics-statistics/mathematics-comprehensive-bs>) - Bachelor of Science Degree
3. Mathematics 6-12 Teaching Field Endorsement (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/mathematics-statistics/mathematics-6-12-teaching-field-endorsement>) - Bachelor of Science in Education Degree

The minor in Mathematics (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/mathematics-statistics/mathematics-minor>) is available for students pursuing majors in other disciplines. The Elementary Education Major has a specially defined minor in Mathematics (<http://catalog.unk.edu/catalog-archive/2019-2020/undergraduate/departments-programs/mathematics-statistics/mathematics-elementary-education-minor>).

TBD, Chair

Professor: Barton Willis

Associate Professor: Jia Huang, Katherine Kime, Amy Nebesniak, Jacob Weiss

Assistant Professor: Derek Boeckner, Scott Gensler, Theodore Rupnow, Nathan Vander Werf

Senior Lecturer: Julieta Johnston, Margaret Michener, Patty Reifenrath, Kaye Sorensen

Lecturer: Paul Bonk

Mathematics (MATH)

MATH 90 – Elementary Algebra 3 credit hours

This course deals with elementary concepts of algebra which are usually taught at the 9th grade level. Emphasis is placed on developing functional competence in the several areas of algebra which are covered, and the content includes some practical applications. Not a General Studies course. Credit will not count toward any UNK degree. Placement: Math ACT score of 16 or less.

MATH 101 – Intermediate Algebra 3 credit hours

The course which includes a study of the properties of real numbers, polynomials, fundamental operations, factoring, exponents, and radicals, linear and quadratic equations, and other selected topics, all of which are necessary for the study of college algebra. Not a General Studies course. Prerequisite: MATH 090 or Math ACT Score of 17 or greater and one year of high school algebra. Students may not enroll in MATH 101 after earning credit for any General Studies Mathematics class.

MATH 102 – College Algebra 3 credit hours

A college level algebra course which includes a study of linear equations and inequalities, relations and functions, graphing of linear and quadratic functions, polynomial and rational functions, logarithmic and exponential functions, systems of equations, matrices, sequences and series, and other selected topics all of which are necessary for the study of calculus. Prerequisite: MATH 101 or Math ACT Score of 20 or greater and two years of high school algebra. Students may not enroll in MATH 102 after earning credit for MATH 115 or MATH 123..

MATH 103 – Plane Trigonometry 3 credit hours

Study of trigonometric functions. Prerequisite: MATH 102 or Math ACT Score of 22 or greater and two years of high school algebra

MATH 104 – Concepts in Mathematics and Statistics 3 credit hours

An algebra course designed specifically for students going into elementary education. Many of the topics are similar to topics found in a traditional college algebra course. However, topics from the areas of probability and statistics have been included to give the prospective elementary teacher the necessary background to meet state and national curriculum standards for elementary mathematics. Prerequisite: MATH 101 or Math ACT Score of 20 or greater and 4 years of high school mathematics.

MATH 106 – Mathematics for Liberal Arts 3 credit hours

An enrichment course investigating the structure, aesthetics and philosophy of mathematics and its cultural relevance.

Prerequisite: MATH 101 or Math ACT Score of 17 or greater and 2 years of high school algebra.

MATH 115 – Calculus I with Analytic Geometry 5 credit hours

Limits and continuity, differentiation of algebraic and trigonometric functions, elementary integration (with applications) of algebraic and trigonometric functions.

Prerequisite: MATH 103 or Math ACT score of 23 or above 4 yrs HS Math including 2 yrs algebra 1 yr geom and sr level pre-calc.

MATH 120 – Finite Mathematics 3 credit hours

An introduction to modern mathematical concepts, with applications. Includes logic, set theory, probability, vectors, matrices, linear programming, and game theory.

Prerequisite: MATH 102 or Math ACT score of 22 or greater and two years of high school algebra.

MATH 123 – Applied Calculus I 3 credit hours

The concepts of calculus with emphasis on applications to the areas of business, biology, economics, and the social and behavioral sciences. Credit cannot be received for both MATH 115 and 123.

Prerequisite: MATH 102 or Math ACT score 22/above 4 yrs HS math including 2 yrs algebra 1 yr geom sr level precalc course Students may not enroll in MATH 123 after earning credit for MATH 115.

MATH 202 – Calculus II with Analytic Geometry 5 credit hours

A continuation of MATH 115 including the differentiation and integration of transcendental functions, methods of formal integration with applications, series.

Prerequisite: MATH 115 or Math ACT score of 25 or greater and one year of high school calculus.

MATH 230 – Math for Elementary Teachers I 3 credit hours

In this course, preservice teachers develop knowledge of mathematics important for the effective teaching of PK-6 students. The mathematical topics investigated in the course include problem solving, the number system, alternate base systems, operations with whole numbers and integers, introductory number theory concepts, and data analysis. In all of these topics, preservice teachers learn to develop appropriate mathematical explanations, understand student reasoning about mathematics, and communicate mathematical reasoning.

Prerequisite: MATH 102 or MATH 104 or Math ACT score of 20 or greater and four years of high school mathematics including two years of algebra and one year of geometry and a senior level mathematics course.

MATH 250 – Foundations of Math 3 credit hours

Topics of sets and symbolic logic are studied with the objective of using them in the detailed study of the nature of different types of proofs used in mathematics. Also, the processes of problem solving are studied for developing strategies of problem solving.

Prerequisite: MATH 115 or MATH 123

MATH 260 – Calculus III 5 credit hours

A continuation of MATH 202. Vector calculus, partial derivatives and multiple integrals.

Department Consent Required

Prerequisite: MATH 202 or equivalent preparation

MATH 305 – Differential Equations 3 credit hours

Methods of solution and applications of common types of differential equations.

Prerequisite: MATH 260

MATH 310 – College Geometry 3 credit hours

Mathematical systems and re-examination of Euclidean geometry from an advanced viewpoint.

Prerequisite: MATH 250

MATH 330 – Math for Elementary Teachers II 3 credit hours

In this course, preservice teachers further develop knowledge of mathematics important for the effective teaching of PK-6 students. The mathematical topics investigated in the course include operations with rational numbers (e.g., fractions and decimals), proportional reasoning (e.g., percents, ratios), two-dimensional and three-dimensional geometric figures, and measurement (e.g., length, area, volume, angles). In all of these topics, preservice teachers learn to develop appropriate mathematical explanations, understand student reasoning about mathematics, and communicate mathematical reasoning.

Prerequisite: MATH 230

MATH 350 – Abstract Algebra 3 credit hours

An introduction to modern algebra, including a brief study of groups, rings, integral domains and fields.

Prerequisite: MATH 250 or permission of instructor.

MATH 365 – Complex Analysis 3 credit hours

Complex analysis is an introduction to the theory of complex variables and the calculus of analytic functions. Topics covered include the calculus of residues, the Cauchy Integration theorem, and the extension of exponential, logarithmic, and trigonometric functions to the complex plane.

Prerequisite: MATH 260

MATH 399 – Internship 1-4 credit hours

On the job experience designed to complement the major. Internship experiences are available only in selected areas. Consult with the departmental advisor. MATH 399 is a credit/no credit course.

Total Credits Allowed: 4.00

MATH 400 – History of Mathematics 3 credit hours

An introduction to the history of mathematics from its primitive origins to modern-day mathematics.

Prerequisite: MATH 115

MATH 404 – Theory of Numbers 3 credit hours

Properties of integers, congruencies, primitive roots, arithmetic functions, quadratic residues, and the sum of squares.

Prerequisite: MATH 250 or permission of instructor.

MATH 413 – Discrete Mathematics 3 credit hours

Topics include mathematical induction, recursion relations, counting principles, and discrete probability. Additional topics may include graph theory.

Prerequisite: MATH 250

MATH 420 – Numerical Analysis 3 credit hours

The solution of nonlinear equations, interpolation and approximation, numerical integration, matrices and system of linear equations, and numerical solution of differential equations.

Prerequisite: MATH 260 or permission of instructor

MATH 430 – Middle School Mathematics 3 credit hours

Topics will build on the foundations of MATH 230 and MATH 330 be focused toward the middle school math curriculum: algebraic structures including variables and functions, introductory number theory, probability, statistics, geometry, and problem solving.

Prerequisite: MATH 115 or MATH 202 or MATH 230 or MATH 260.

MATH 440 – Linear Algebra 3 credit hours

Vector spaces, linear transformations, matrices, and determinants.

Prerequisite: MATH 115 or MATH 202 or MATH 260

MATH 460 – Advanced Calculus I 3 credit hours

Functions, sequences, limits, continuity, differentiation and integration.

Prerequisite: MATH 250 and MATH 260

MATH 470 – Methods in Middle and High School Mathematics**Teaching 3 credit hours**

In this course, preservice teachers develop research-based knowledge and instructional practices that facilitate mathematics learning for grades 6-12 students. The topics investigated in the course include mathematics instructional methodology, research literature, diversity and equity, mathematics standards and curricula, assessment, and the development of effective mathematics lesson plans and curricular units. In addition, preservice teachers examine the importance of continuously improving teaching of mathematics through teacher reflection, instructional leadership, and professional development.

Prerequisite: MATH 430 and admission to Teacher Education.

MATH 490 – Special Topics in Mathematics 1-3 credit hours

Topics chosen from the areas of mathematics appropriate to the student's program and will involve both formal lectures and independent study.

Total Credits Allowed: 3.00

MATH 495 – Independent Study in Mathematics 1-3 credit hours

An individual investigation by the student of topics not included in the normal mathematics offerings.

Department Consent Required

Total Credits Allowed: 3.00

Prerequisite: MATH 260

MATH 496 – Mathematics Seminar 1 credit hour

Topics not included in the normal mathematics offerings are presented by the students.

Prerequisite: MATH 260 or permission of instructor.

Statistics (STAT)

STAT 235 – Introduction to Statistics for Social Sciences 3 credit hours

An introduction to statistics for educational and sociological research.

The course will include descriptive statistics, normal distribution and an introduction to correlation and hypothesis testing.

Prerequisite: Completion of MATH 101 or MATH 102 or MATH 115 or MATH 123 or Math ACT score of 20 or greater. Students may not enroll in STAT 235 after earning credit for STAT 241.

STAT 241 – Elementary Statistics 3 credit hours

An introduction to statistics for sciences and business. The course will include graphing techniques, descriptive statistics, elementary probability models, estimation and hypothesis testing, and an introduction to correlation and regression.

Prerequisite: MATH 101 or MATH 102 or MATH 123 or MATH 115 or ACT Math score of 20 or greater

STAT 345 – Applied Statistics I 3 credit hours

Descriptive statistics; statistical inference using the binomial, normal, F and Chi Square distributions; and analysis of variance topics. Recommended for departmental majors as the beginning applied statistics course.

Prerequisite: MATH 115 or MATH 123

STAT 399 – Internship 1-4 credit hours

On the job experience designed to complement the major. Internships are available only in selected areas. Consult with departmental advisor. (Credit/No Credit)

Total Credits Allowed: 4.00

Prerequisite: MATH 115 or MATH 123

STAT 441 – Probability and Statistics 3 credit hours

The mathematical development of discrete and continuous probability distributions including multivariate distributions, moments and moment generating functions, the special discrete and continuous probability distributions, the normal distribution, sampling distributions, and hypothesis testing.

Prerequisite: MATH 260

STAT 442 – Mathematical Statistics 3 credit hours

A continuation of STAT 441. The further mathematical development of special probability densities, functions of random variables, sampling distributions, decision theory, point and interval estimators, hypotheses testing, and covariance.

Prerequisite: STAT 441

STAT 495 – Independent Study in Statistics 1-3 credit hours

An individual investigation by the student of topics not included in the normal statistics offerings.

Department Consent Required

Total Credits Allowed: 3.00