

UNDERGRADUATE COURSES OF STUDY

MATHEMATICS

MATH 101.SURVEY OF MATHEMATICS

This course is designed for liberal arts majors. Students will be introduced to non-algebraic mathematical ideas from a variety of fields, such as business, computer science, and the social sciences. Topics may include but are not limited to routes and networking; scheduling; modular arithmetic and check digit schemes; voting and elections; fair division; and apportionment. (General Education – Scientific and Mathematical Reasoning and Core Academic Skills) *Three credit hours.*

MATH 114.PRECALCULUS

This course is designed to prepare students for calculus. The course begins with a review of some topics from algebra functions and their graphs including algebraic functions, inverse functions, exponential and logarithmic functions. The remainder of the course is devoted to an introduction to trigonometry. Specific topics from trigonometry include right triangle trigonometry, graphing trigonometric functions, and trigonometric identities and equations. *Three credit hours.*

MATH 121.MATHEMATICAL APPLICATIONS

This course prepares students for the quantitative reasoning tasks they may encounter in subsequent coursework. It presents a variety of mathematical topics with a focus on their applications. Topics include linear and quadratic functions, systems of linear equations, elementary linear programming, exponential and logarithmic functions, and the mathematics of finance. (The course may not be taken by students who have successfully completed MATH 141). (General Education – Scientific and Mathematical Reasoning and Core Academic Skills) *Three credit hours.*

MATH 123.CALCULUS AND ITS APPLICATIONS

An intuitive presentation of the concepts of calculus interwoven with numerous real-world applications of mathematical models. Topics include algebraic, exponential, and logarithmic functions, limits, continuity, derivatives, and integrals. Applications in the Physical, Life and Social Sciences, Business, and Medicine. (Not intended for Mathematics majors. May not be taken by students who have successfully completed MATH 141.) Competence in college level algebra is necessary for successful completion of the course. (MATH 121 or MATH 114 is suggested for those without adequate mathematical background.) (General Education – Scientific and Mathematical Reasoning and Core Academic Skills) *Three credit hours.*

MATH 125.INTRODUCTION TO DISCRETE MATHEMATICS

Mathematical concepts useful to computer science majors. Topics include number operations, counting principles, sets, relations, functions, arrays, number systems, Boolean algebra, and graph theory. *Three credit hours.*

MATH 134.INTRODUCTION TO MATHEMATICAL PROOF

This course introduces theoretical mathematics and proof techniques using examples from logic, set theory, number theory, calculus, and algebra. Prerequisite: MATH 141. *Three credit hours.*

MATH 141.SINGLE VARIABLE CALCULUS I

Limits, continuity, the derivative, the chain rule, implicit differentiation, applications of the derivative, and the Mean Value Theorem. Definite and indefinite integration, the Fundamental Theorem of Calculus, and an introduction to integration through u-substitution. Students must have a thorough knowledge of precalculus such as is covered in MATH 114, including proficiency with algebra and the trigonometric functions. Students without such a background are strongly advised to take MATH 114. (General Education – Scientific and Mathematical Reasoning and Core Academic Skills) *Four credit hours.*

MATH 142.SINGLE VARIABLE CALCULUS II

This course covers techniques of integration, improper integrals, applications of the integral, infinite sequences and series, power series, Taylor's Theorem, and parametric and polar curves. Prerequisite: "C" or better in MATH 141. (General Education – Scientific and Mathematical Reasoning) *Four credit hours.*

MATH 200.INTRODUCTION TO MODELING AND SIMULATION

Modeling with differential equations in a variety of fields including Ecology, Physics, Biology, and Business. Qualitative analysis of such models, and approximation via numerical methods and with simulation software. Prerequisites: “C” or better in MATH 121 or MATH 123 or MATH 141. Previous programming experience is recommended. *Three credit hours.*

MATH 203.MATHEMATICS FOR ELEMENTARY TEACHERS

This course provides some of the content necessary for elementary school teachers. Topics covered include problem solving, intuitive geometry, and measurement. May be taken by only Early Childhood Education, Elementary Education, and Special Education majors. *Three credit hours.*

MATH 208.APPLIED LINEAR ALGEBRA

This course provides an introductory overview of linear algebra. Topics include vector and matrix algebra, solutions of systems of linear equations, basis and dimension, eigenvalues and eigenvectors, and matrix decompositions. Students will use technology to apply course content to solve problems in business, computing, and the sciences. Prerequisites: “C” or better in CIS 130 and a “C” or better in MATH 123, MATH 125, or MATH 141. *Three credit hours.*

MATH 211.STATISTICAL METHODS I

This course introduces students to elementary data analysis including graphical methods and descriptive measures; correlation and simple linear regression; the Normal distribution as a model; and the sampling distributions of statistics. Confidence intervals and tests of hypotheses for one mean and one proportion are presented. Bias and sampling plans as well as differences between observational studies and designed experiments are discussed as time allows. (General Education – Scientific and Mathematical Reasoning and Core Academic Skills) *Three credit hours.*

MATH 212. STATISTICAL METHODS II

This course is a continuation of MATH 211. It covers comparing parameters of two or more populations, analysis of count data by means of multinomial distributions and contingency tables, elementary experimental design, analysis of variance methods, inferences for simple linear regression models, and additional topics as time allows. Students make frequent use of a statistical software package. Prerequisite: MATH 211, or MATH 311, or a comparable course with instructor permission. (General Education – Scientific and Mathematical Reasoning and Core Academic Skills) *Three credit hours.*

MATH 213.SUPERVISED MACHINE LEARNING

This course is an overview of machine learning techniques that use labeled data to train an algorithm to make predictions about unlabeled data. It introduces both linear regression and to classification techniques including logistic regression, K-nearest neighbors, support vector machines, tree-based methods, and neural networks. Prerequisites: DSCI 230, MATH 208, and MATH 211. *Three credit hours.*

MATH 214.UNSUPERVISED MACHINE LEARNING

This course gives an overview of machine learning techniques that are commonly applied to unlabeled data sets. It introduces the K-means Clustering and Hierarchical Clustering algorithms as well as the use of Principal Component Analysis. Prerequisites: DSCI 230, MATH 208, and MATH 211. *Three credit hours.*

MATH 241.MULTIVARIABLE CALCULUS

Vectors in $\mathbb{R}^2$ and $\mathbb{R}^3$, functions of several variables, partial differentiation, multiple integrals, applications of multivariable calculus, divergence, curl, line and surface integrals, Green’s Theorem and Stokes’ Theorem. Prerequisite: “C” or better in MATH 142. *Four credit hours.*

MATH 242.DIFFERENTIAL EQUATIONS

This course covers basic theory and solutions of ordinary linear differential equations. The course includes applications in mechanics and vibrations as well as power series solutions at ordinary points and at regular singular points. Introduction to Laplace transform methods and systems of ordinary differential equations are also covered. Prerequisites: MATH 241. *Four credit hours.*

MATH 270/390.TOPICS IN MATHEMATICS AND STATISTICS

This elective course allows for a flexible offering of various mathematical and statistical topics which are not a part of the regular course offerings. Special topics will be announced in advance. This course may be taken for additional credit as the topic changes. To repeat the course to improve a grade; the topic, the course number, and the credit hours must be the same. This course will not be offered more than once a semester. Prerequisite: Instructor permission. *One to three credit hours.*

MATH 290.MATHEMATICS PRACTICUM

Designed to give students practical experience in tutoring mathematics. Elective credit only. Graded as Pass/Fail. By permission of Department Chair. *One credit hour.*

MATH 300.NUMERICAL ANALYSIS

An introduction to scientific computing. The use of numerical methods in solving equations, systems of linear equations, and differential equations. Numerical integration. (Cross-listed as CIS 300.) Students are encouraged to take CIS 102 or CIS 202. Prerequisites: MATH 142 ("C" or better) and CIS 130. *Three credit hours.*

MATH 308.LINEAR ALGEBRA

This course is an introductory study of vector spaces. Topics include systems of linear equations, determinants, matrices, linear transformations, and eigenvalues. Prerequisites: "C" or better in MATH 134 and MATH 142, or instructor approval. *Three credit hours.*

MATH 311.MATHEMATICAL STATISTICS

A calculus-based introduction to both the theory and applications of probability and statistics. Topics include elementary data analysis, probability distributions and density functions, estimation, hypothesis testing, and simple linear regression. Students will make frequent use of a statistical software package. Prerequisite: "C" or better in MATH 142 or instructor approval. *Three credit hours.*

MATH 325.DISCRETE MATHEMATICS

This course is an introduction to the mathematics of enumeration to include counting, inclusion-exclusion, generating functions, and recursion, basic graph theory (paths, circuits, planarity, trees, colorings), and Boolean algebra. It explores numerous applications to a wide variety of disciplines such as computer science, engineering, operations research, biology, chemistry, and political science. Prerequisites: "C" or better in MATH 134 and MATH 142. *Three credit hours.*

MATH 350.MATHEMATICS HISTORY

A study of mathematics with a historical perspective. Emphasis on the development of mathematics from ancient to near-modern times. Required for secondary certification mathematics majors. Prerequisite: "C" or better in MATH 142. *Three credit hours.*

MATH 351.GEOMETRY

This course is a formal study of geometry. Topics include a modern axiomatic development of Euclidean geometry, the historical development of non-Euclidean geometries, proof techniques, constructions, and applications. Prerequisites: "C" or better in MATH 134 and MATH 142. *Three credit hours.*

MATH 390/270.TOPICS IN MATHEMATICS

This elective course allows for a flexible offering of various mathematical and statistical topics which are not a part of the regular course offerings. Special topics will be announced in advance. This course may be taken for additional credit as the topic changes. To repeat the course to improve a grade; the topic, the course number, and the credit hours must be the same. This course will not be offered more than once a semester. Prerequisite: Instructor permission. *One to three credit hours.*

MATH 406, 407, 408, 409, 410.RESEARCH IN MATHEMATICS

This course allows students to receive credit for research on topics in mathematics. A maximum of four credit hours may be used toward major program requirements. This course may be repeated for additional credit. Prerequisites: Junior or senior standing, a minimum overall GPA of 3.0, and instructor permission. *Zero to four credit hours.*

MATH 421.ABSTRACT ALGEBRA I

An introduction to algebraic systems, groups, rings, integral domains, and polynomial rings. Prerequisites: "C" or better in either MATH 308 or MATH 325, or instructor permission. *Three credit hours.*

MATH 422.ABSTRACT ALGEBRA II

A continuation of MATH 421 including fields, ideals, quotient rings, vector spaces, linear transformations and field extensions. Prerequisite: MATH 421. *Three credit hours.*

MATH 431.ANALYSIS I

A careful study of the real functions of a real variable. Topics include topology of the line, sequences, limits, continuity, differentiation, and the Riemann integral. Prerequisites: "C" or better in MATH 308 or MATH 325, or instructor permission. *Three credit hours.*

MATH 432.COMPLEX ANALYSIS

An introduction to complex analysis including analytic functions, Cauchy's Theorem and Formula, Taylor and Laurent series, contour integration, and residue calculus. Prerequisite: "C" or better in MATH 431 or instructor permission. *Three credit hours.*

MATH 450.TECHNOLOGY IN SECONDARY MATHEMATICS

This course examines integrating instructional technologies (calculators, data collectors and computers) into the secondary mathematics curriculum. The curriculum focuses on problem solving in Pre-Algebra, Elementary and Advanced Algebra, and Geometry. Prerequisite: Junior or senior status. *Three credit hours.*

MATH 451.SECONDARY MATHEMATICS METHODS

Strategies and techniques which are essential to the effective teaching of mathematics in secondary schools are covered in this course. Primary topics include planning, presentation, and evaluation. Clinical experience is required. Prerequisites: MATH 241, EDUC 202, EDUC 351. Corequisite: EDUC 329 or EDUC 429. *Three credit hours.*

MATH 490.MATHEMATICS INTERNSHIP

Designed to give students practical work experience in a field related to their major. The student will work through an approved agency or business under the supervision of professional employees and a major advisor. Credit hours awarded is determined on a case-by-case basis by the Department Chair and mathematics faculty. Course grade will be determined based on the written evaluations by the field supervisor and written report rendered by the student. Prerequisites: 15 credit hours in major area and instructor permission. Juniors and seniors only. *One to four credit hours.*

MATH 499.CAPSTONE COURSE–MATHEMATICS

This course is designed to be taken during a student's final spring semester at Lander. It will include a review of some major topics in mathematics, a discussion of topics relevant to careers in mathematics (e.g. resumes and interviewing), and opportunities to communicate mathematical ideas both orally and in a written format. Completion of program assessment requirements is also an integral part of this course and performance on assessment components will be reflected in the course grade. This course is open to all seniors and to juniors who are in the dual-degree engineering program. *One credit hour.*