LS 2910 Outdoor Leadership 1(3) Introduces the skills necessary to lead others in a backcountry environment. Focus is on wilderness travel skills, minimum impact, group dynamics, leadership skills and decision making. Course also includes certification in Wilderness First Aid.

LS 3470 Advanced Alpine Skiing 1(3) Advanced downhill snow skiing instruction in such techniques as mogul skiing, check turns, freestyle, and racing. There is an additional fee for course. Taught over Christmas break. Credit is awarded for spring semester. (Contact Department of Parks, Recreation and Tourism Management in October.) Preq: LS 1470.

LS 3560 Riflery II 1(2) Students build upon skills previously learned in the basic riflery course, and learn advanced skills, such as using ballistic software and chronographs, precision long range shooting and advanced reloading.

LS 3580 Advanced Shotgun Skeet 1(2) Introduces students who have taken the basic shotgun course to the shotgun game of Skeet. Students learn the rules and techniques necessary to competitively participate in Skeet.

LS 3890 Intermediate Tennis 1(3) Develops skills necessary to play at a competitive level of tennis. Students learn mechanically sound tennis skills, court positioning, court movement, proper shot selection, and strategic insight into the game. Preq: LS 1890.

MATHEMATICAL SCIENCES


MATH 1020 Business Calculus I 3(3) Intuitive approach to the concepts and applications of calculus. Topics include functions and graphing, differentiation, and integration. Applications from social, biological, and management sciences are presented. Not open to students who have received credit for MATH 1060. Preq: Any MATH or STAT course or a score of 60 or higher on the Clemson Mathematics Placement Test.

MATH 1030 Elementary Functions 3(2) Gateway course for MATH 1060. Comprehensive treatment of functions and analytic geometry with applications including polynomial, rational, algebraic, exponential, logarithmic, and trigonometric functions. Not open to students who have received credit for MATH 1050. To be taken Pass/No Pass only. Preq: Any MATH or STAT course or a score of 65 or higher on the Clemson Mathematics Placement Test. Coreq: MATH 1031.

MATH 1031 Elementary Functions Laboratory 0(2) Non-credit laboratory to accompany MATH 1030. Coreq: MATH 1030.

MATH 1040 Precalculus and Introductory Differential Calculus 4(4) Relevant precalculus and algebra review, limits, continuity and introduction to differential calculus. The combination of MATH 1040 and MATH 1070 covers the same calculus material as MATH 1060. MATH 1040 alone cannot be substituted for any calculus course. To be taken Pass/No Pass only. Open to students who have received credit for MATH 1060. Preq: Any MATH or STAT course or a score of 65 or higher on the Clemson Mathematics Placement Test.

MATH 1050 Precalculus 5(4) Extensive treatment of topics chosen to prepare students for the study of calculus. Special emphasis is given to polynomial, rational, exponential, logarithmic, and trigonometric functions and their graphs, as well as basic and analytic trigonometry. Students who have received credit for any other mathematical sciences course will not be allowed to enroll in or receive credit for MATH 1050. To be taken Pass/No Pass only. Coreq: MATH 1051.

MATH 1051 Precalculus Laboratory 0(2) Non-credit laboratory to accompany MATH 1050. Coreq: MATH 1050.

MATH 1060 Calculus of One Variable I 4(4) Topics include analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, exponential and logarithmic functions. Includes Honors sections. Preq: Score of 80 or better on the Clemson Calculus Placement Test.

MATH 1070 Differential and Integral Calculus 4(4) Continuation of MATH 1040. Successful completion of MATH 1040 and MATH 1070 is equivalent to the completion of MATH 1060. Continuation of differential calculus and an introduction to integral calculus. Not open to students who have received credit for MATH 1060. Preq: MATH 1040.

MATH 1080 Calculus of One Variable II 4(4) Topics include transcendental functions, applications of integration, integration techniques, indefinite integrals, improper integrals, parametric equations, polar coordinates, and infinite series. Includes Honors sections. Preq: MATH 1060 or MATH 1070.

MATH 1110 Calculus II for Biologists 4(4) Selected topics from integral calculus, eigenvalues and eigenvectors of matrices and differential equations are used to encourage the use of mathematics, computational tool and biological science in the study of relevant biological models. Credit toward a degree will be given for only one of MATH 1080 and MATH 1110. Preq: MATH 1060 or MATH 1070.

MATH 1150 Contemporary Mathematics for Elementary School Teachers I 3(3) Cooperative learning groups, manipulatives, and concrete models are used to demonstrate logical reasoning, problem-solving strategies, sets and their operations, numeration systems, properties and operations of whole numbers, number theory, prime and composite numbers, divisibility, common factors and multiples. Open to Elementary, Early Childhood, and Special Education majors only. Preq: Any MATH or STAT course or a score of 50 or higher on the Clemson Mathematics Placement Test.

MATH 1160 Contemporary Mathematics for Elementary School Teachers II 3(3) Continuation of MATH 1150. Manipulatives and concrete models are used for properties, operations, and problem solving for integers, elementary fractions, rational numbers, and real numbers. Selected topics in statistics and probability are introduced with a hands-on approach to learning. Restricted to Elementary, Early Childhood, and Special Education majors. Preq: MATH 1150.

MATH 1170 Mathematics for Elementary School Teachers I 3(2) Problem-solving strategies, logic, algebraic thinking, sets, relations, functions, numeration systems, whole numbers, integers, number theory, fractions, decimals, applications of percent, real numbers with their computational algorithms and properties are explored. Content, according to state standards, is taught with appropriate methodology for teaching K–6. Preq: MATH 1010. Coreq: MATH 1171.

MATH 1171 Mathematics for Elementary School Teachers I Laboratory 0(2) Non-credit laboratory to accompany MATH 1170. Coreq: MATH 1170.

MATH 1180 Mathematics for Elementary School Teachers II 3(2) Simple probability and descriptive statistics are reviewed. Two- and three-dimensional geometry including polygons, polyhedra and their properties, congruence, similarity, and constructions; coordinate system; standard measurement, area, surface area, volume; and motion geometry are explored. Content, according to State standards, is taught with appropriate methodology for teaching K–6. Preq: MATH 1170. Coreq: MATH 1181.

MATH 1181 Mathematics for Elementary School Teachers II Laboratory 0(2) Non-credit laboratory to accompany MATH 1180. Coreq: MATH 1180.

MATH 1190 Introduction to Discrete Methods 3(3) Topics normally include elementary logic and methods of proof; sets, functions, and relations; graphs and trees; combinatorial circuits and Boolean algebra.
### Courses of Instruction

**MATH 1290 Problem Solving in Discrete Mathematics 3(2)** Problem-solving approach to learning mathematics is applied to topics in modern discrete mathematics. Typical selection of topics includes logic and proof, sets, relations, functions, mathematical induction, graphs and trees, counting techniques, recursion equations. For Bachelor of Science and Bachelor of Arts majors in Mathematical Sciences only. Credit may not be received for both MATH 3190 and MATH 1290. Preq: MATH 1060 or MATH 1070. Coreq: MATH 1291.

**MATH 1291 Problem Solving in Discrete Mathematics Laboratory 0(2)** Non-credit laboratory to accompany MATH 1290. Coreq: MATH 1290.

**MATH 1900 Problem Solving in Mathematics 3(2)** Functions and graphs, mathematical modeling, and applications. Applications from management and life and social sciences are presented. Specific topics include linear, quadratic, polynomial, exponential, and logarithmic functions with emphasis on problem solving. Students who have received credit for any other mathematical sciences course will not be allowed to enroll in or receive credit for MATH 1900. To be taken Pass/No Pass only. Coreq: MATH 1991.

**MATH 2060 Calculus of Several Variables 4(4)** Topics include real valued functions of several variables, multiple integration, differential calculus of functions of several variables, vector field theory. Includes Honors sections. Preq: MATH 1080 or MATH 1110.

**MATH 2070 Business Calculus II 3(3)** Introduction to the calculus of several variables, differential calculus and optimization of several variables, multiple integrals. Topics from the management sciences are used to illustrate the above concepts. May not be taken by students who have passed MATH 2060. Preq: MATH 1020 with a C or better or MATH 1070 or MATH 1090.

**MATH 2080 Introduction to Ordinary Differential Equations 4(4)** Introduction to the study of differential equations and their application to physical problems. Topics include exact, series, and numerical solutions; solutions by means of Laplace transforms; and solutions of systems of differential equations. Includes Honors sections. Preq: MATH 2060.

**MATH 2100 Applied Matrix Algebra 3(3)** Introduction to the basic principles of matrix algebra with applications to the behavioral and managerial sciences. Major areas of application include linear programming, directed graphs, and game theory. Preq: MATH 1020 or MATH 1060 or MATH 1070.

**MATH 2160 Geometry for Elementary School Teachers 3(3)** Formal treatment of the basic concepts of geometry. Open to Elementary, Early Childhood, and Special Education majors only. Preq: MATH 1160.

**MATH 2160 Intermediate Mathematics Computing 3(3)** Intermediate-level introduction in using computers to solve problems in the mathematical sciences. Fundamental concepts of procedural programming including flow control, modular construction, primitive data structures, recursion, and graphics are applied to problems in applied mathematics, probability, statistics, discrete mathematics, and operations research. Preq: MATH 1080 or MATH 1110.

**MATH 2500 Introduction to Mathematical Sciences 1(1)** Introduction to areas of study, degree options, career choices, and professional development in mathematical sciences. Includes guidelines and requirements for portfolio development and an introduction to ethical issues. Preq: Sophomore standing.

**MATH 2990 Creative Inquiry-Mathematical Sciences 1-3(1-3)** In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of three credits. Preq: Consent of faculty member/mentor.

**MATH 3020 Statistics for Science and Engineering 3(3)** Introduction to the calculus of several variables, multiple integration, differential calculus and optimization of several variables, vector field theory. Includes Honors sections. Preq: MATH 1060 or MATH 1070.

**MATH 3110 Linear Algebra 3(3)** Introduction to the calculus of several variables, differential calculus and optimization of several variables, vector field theory. Includes Honors sections. Preq: MATH 1080 or MATH 1110.

**MATH 3150 Advanced Topics in Mathematics for Elementary Teachers 3(3)** Course builds and expands upon content from previous elementary mathematics courses. Covers investigation of two- and three-dimensional shapes; scale and scale factor; ratio and proportional reasoning; relationships between perimeter, area, surface area and volume; relationships between fractions, decimals, and percents. Open to Elementary, Early Childhood, and Special Education majors only. Preq: MATH 2160.

**MATH 3200 College Geometry 3(3)** Theorems and concepts more advanced than those of high school geometry. Treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. Preq: MATH 1060 or MATH 1070.

**MATH 3310 Linear Algebra 3(3)** Introduction to the calculus of several variables, differential calculus and optimization of several variables, vector field theory. Includes Honors sections. Preq: MATH 1080 or MATH 1110.

**MATH 3900 Creative Inquiry—Mathematics 1-3(1-3)** In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of three credits. Preq: Consent of faculty member/mentor.

**MATH 4000* Theory of Probability 3(3)** Principal topics include combinatorial theory, probability axioms, random variables, expected values, special discrete and continuous distributions, joint distributions, correlation, conditional expectation, law of large numbers, central limit theorem. Includes Honors sections. Preq: MATH 2060.

**MATH 4020* Statistics for Science and Engineering II 3(3)** Principal topics include simple linear regression, multiple regression and correlation analysis, one-way analysis of variance, multiple comparison, multifactor analysis of variance, experimental design. Computation and interpretation of results are facilitated through use of statistical software packages. Preq: MATH 3020.

**MATH 4030* Introduction to Statistical Theory 3(3)** Principal topics include sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypotheses, likelihood ratio methods, regression and correlation analysis, introduction to analysis of variance. Includes Honors sections. Preq: MATH 4000.

**MATH 4060* Sampling Theory and Methods 3(3)** Probability-based treatment of sampling methodology. Theory and application of estimation techniques are covered, using simple and stratified random sampling, cluster sampling, and systematic sampling. Preq: MATH 4000; and one of MATH 3020 or STAT 2300 or STAT 3090.

**MATH 4070* Regression and Time-Series Analysis 3(3)** Theory and application of the regression and time series models and techniques. Approaches to empirical model building and data analysis are covered. Computation and interpretation of results are facilitated through the use of interactive statistical packages. Preq: MATH 3110 and MATH 4000; and one of MATH 3020 or STAT 2300 or STAT 3090.
MATH 4080* Exploration and Analysis of Secondary Mathematics 3(3) In-depth exploration and analysis of important underlying ideas in the secondary mathematics curriculum. An emphasis is placed on reasoning and proof as students investigate topics in algebra, geometry, probability, statistics, and calculus. Preq: MATH 2060.

MATH 4100 Number Theory 3(3) Introduction to the theory of integers and related number systems. Topics include historical development, principle of mathematical induction, divisibility, primes, congruences, number-theoretic functions, primitive roots, quadratic residues, and diophantine equations. Preq: MATH 1080 or MATH 3110.

MATH 4110* Introduction to Combinatorics 3(3) Introductory course in combinatorial analysis. Topics include enumeration, graph theory, posets, and extremal combinatorics. Preq: MATH 3110; and either MATH 1190 or MATH 3190.

MATH 4120* Algebra I 3(3) Provides a first introduction to algebra with topics including modular arithmetic, ring theory, and group theory. Preq: MATH 3110 and MATH 3190, each with a C or better.

MATH 4130* Algebra II 3(3) A continuation of MATH 4120. Topics may include advanced group theory (including Sylow theorems, some classification of groups); advanced ring theory; field theory; and Galois theory. Preq: MATH 4120 with a C or better.

MATH 4140* Discrete Mathematical Structures I 3(3) Applies theoretical concepts of sets, functions, binary relations, graphs, Boolean algebras, propositional logic, semigroups, groups, homomorphisms, and permutation groups to computer characteristics and design, words over a finite alphabet and concatenation, binary group codes, and other communication or computer problems. Includes Honors sections. Preq: MATH 3110.

MATH 4300 Actuarial Science Seminar I 1(1) Problem-solving seminar to prepare students for the Society of Actuaries’ Exam P or the Casualty Actuarial Society’s Exam I (Probability). Preq: MATH 4000.

MATH 4310 Theory of Interest 3(3) Comprehensive treatment of the theory of interest including from a calculus-based continuous viewpoint. Topics include simple and compound interest and discount, nominal and effective rates, force of interest, basic and general annuities, yield rates, amortization and sinking funds, and applications to bonds, mortgages, and other securities. Preq: MATH 2060.

MATH 4320 Actuarial Science Seminar II 1(1) Problem-solving seminar to prepare students for the Society of Actuaries’ Exam FM or the Casualty Actuarial Society’s Exam 2 (Financial Mathematics). Preq: MATH 4310.

MATH 4340* Advanced Engineering Mathematics 3(3) Fourier series, Laplace and Fourier transforms, and numerical methods for solving initial value and boundary value problems in partial differential equations are developed. Applications to diffusion wave and Dirichlet problems are given. Matrix methods and special functions are utilized. Preq: MATH 2080.

MATH 4350* Complex Variables 3(3) Elementary functions, integration and differentiation of analytic functions, Taylor and Laurent series, contour integration and residue theory, conformal mapping, Schwartz-Christoffel transformation. Includes Honors sections. Preq: MATH 3020.

MATH 4400* Linear Programming 3(3) Introduction to linear programming covering the simplex algorithm, duality, sensitivity analysis, network models, formulation of models, and the use of simplex codes to solve, interpret, and analyze problems. Includes Honors sections. Preq: MATH 2060 and MATH 3110.

MATH 4420* Advanced Mathematical Programming 3(3) Theory, methodology, and applications of integer and nonlinear programming. Topics include model development, computer solutions, branch and bound, unconstrained and constrained optimization algorithms, complexity and convergence analysis. Case studies are included. Preq: MATH 4400.

MATH 4500 Introduction to Mathematical Models 3(3) Includes a study of the modeling process and examples of existing models chosen from physical, biological, social, and management sciences, depending on the instructor. Written and oral report is required for at least one of the models studied. May be repeated for a maximum of six credits. Preq: MATH 3600 or MATH 3650; and one of MATH 3020 or STAT 2300 or STAT 3090.

MATH 4530 Advanced Calculus I 3(3) Basic properties of the real number system, sequences and limits, continuous functions, uniform continuity, and differentiation. Includes Honors sections. Preq: MATH 2060 and MATH 3190, each with a C or better.

MATH 4540* Advanced Calculus II 3(3) Continuation of MATH 4530. Material includes Riemann integrals and improper integrals, infinite series, sequences and series of functions. Includes Honors sections. Preq: MATH 4530 with a C or better.

MATH 4550* Topics in Geometry 3(3) Continuation of MATH 4540. Topics include historical development, principles of geometry and related number systems. Topics include non-Euclidean geometries, such as hyperbolic geometry, elliptic geometry, and projective geometry. Includes Honors sections. Preq: MATH 4540.

MATH 4600* Introduction to Numerical Analysis I 3(3) Introduction to the problems of numerical analysis emphasizing computational procedures and applications. Topics include sources of error and conditioning, matrix methods, systems of linear equations, nonlinear equations, interpolation and approximation by splines, polynomials, and trigonometric functions. Preq: MATH 2060 or MATH 2070; and MATH 3600 or MATH 3650.

MATH 4630* Mathematical Analysis I 3(3) Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity, and convergence. Integration, differentiation, functions of several real variables, implicit function theory. Includes Honors sections. Preq: MATH 2060.

MATH 4810 Seminar in Mathematics 1-3(1-3) Attention is focused on mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis is on independent study and student use of previously acquired mathematical skills. Open to students by invitation only for a maximum of three credits. Preq: Consent of instructor.

MATH 4820 Undergraduate Research 3(3) Independent research conducted under the supervision and guidance of a faculty member. May be repeated for a maximum of six credits. Includes Honors sections.

MATH 4910 Independent Study 3(3) Independent study or internship in mathematical sciences under faculty supervision. A written report and oral presentation of the results of the independent study or internship are required. May be repeated for a maximum of six credits.

MATH 4920 Professional Development 1(1) Issues in professional development in the Mathematical Sciences. Individual portfolios are evaluated and critiqued for continued career use. To be taken Pass/No Pass only.

MATH 4990 Creative Inquiry—Mathematical Sciences 1-3(1-3) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of three credits. Preq: Consent of faculty member/mentor.

MECHANICAL ENGINEERING


ME 2000 Sophomore Seminar 1(1) Seminars address the Mechanical Engineering program, the profession, best student practices, and career paths. Invited presenters and faculty provide lectures and demonstrations. Preq or concurrent enrollment: ME 2010 with a C or better.