

Course Descriptions

Mathematics (MATH)

See *Department of Mathematics and Statistics*, [click here](#)

MATH 0900 Elements of Algebra 3
Review of elementary algebra in preparation for MATH 1010. Remedial class not carrying USU or transfer credit. Remedial fee required. Graded Pass/Fail *only*. (F,Sp,Su)^{DE}

MATH 1010 Intermediate Algebra 4
Linear equations and inequalities, polynomials and exponents, rational expressions, roots and radicals, quadratic equations, lines and systems of linear equations. Prerequisite: One of the following within the Math prerequisite acceptability time limit: (1) C- or better in MATH 0900, (2) Math ACT score between 18 and 22 (Math SAT score between 480 and 530) and satisfactory Math Placement Test score, (3) Math ACT score of at least 23 (Math SAT score of at least 540), or (4) satisfactory score on Math Placement exam. Course fee required. (F,Sp,Su)^{DE}

MATH 1030 QL Quantitative Reasoning 3
Exploration of contemporary mathematical thinking, motivated by its application to problems in modern society. Emphasizes development of skill in analytical reasoning. Prerequisite: C or better in MATH 1010, or Math ACT score of at least 23 (Math SAT score of at least 540), or satisfactory score on Math Placement Test within the Math prerequisite acceptability time limit. (F,Sp)

MATH 1050 QL College Algebra 4
Functions: graphs, transformations, combinations, and inverses. Polynomial, rational, exponential, logarithmic functions, and applications. Systems of equations and matrices. Partial fractions. Graphing calculator required. Prerequisite: C or better in MATH 1010, or Math ACT score of at least 23 (Math SAT score of at least 540), or AP calculus score of at least 3 on the AB exam, or satisfactory score on Math Placement Test within the Math prerequisite acceptability time limit. (F,Sp,Su)^{DE}

MATH 1060 Trigonometry 2
Trigonometric functions, equations, identities, and applications. Graphing calculator required. Prerequisite: C or better in MATH 1010 (or MATH 1050), or Math ACT score of at least 23 (Math SAT score of at least 540), or AP calculus score of at least 3 on the AB exam, or satisfactory score on Math Placement Test within the Math prerequisite acceptability time limit. May be taken concurrently with MATH 1050. (F,Sp,Su)^{DE}

MATH 1100 QL Calculus Techniques 3
Techniques of elementary calculus, differentiation, integration, elementary optimization, and introduction to partial derivatives. Applications in business, social science, and natural resources. Graphing calculator required. Prerequisite: C- or better in MATH 1050 or Math ACT score of at least 25 (Math SAT score of at least 580) or satisfactory score on Math Placement Test within the Math prerequisite acceptability time limit. (F,Sp,Su)^{DE}

MATH 1210 QL Calculus I 4
Analytic geometry, differential and integral calculus, transcendental functions, and applications. Graphing calculator required. Prerequisite: C- or better in MATH 1050 and 1060, or Math ACT score of at least 27 (Math SAT score of at least 620), or AP Calculus score of at least 3 on AB exam or satisfactory score on Math Placement Test within the Math prerequisite acceptability time limit. (F,Sp,Su)^{DE}

MATH 1220 QL Calculus II 4
Integration, infinite series, introduction to vectors, and applications. Graphing calculator required. Prerequisite: C- or better in MATH 1210, or AP score of at least 4 on Calculus AB exam or at least 3 on Calculus BC exam. (F,Sp,Su)^{DE}

MATH 2020 QI Introduction to Logic and Geometry 3
Logic; introduction to algebraic geometry and Euclidean geometry. MATH 2020 is a mathematics content course, not a methods course. Prerequisite: C- or better in MATH 1050 or Math ACT score of at least 25 (Math SAT score of at least 580) or satisfactory score on Math Placement Test within the Math prerequisite acceptability time limit. Course fee required. (F,Sp,Su)^{DE}

MATH 2210 QI Multivariable Calculus 3
Vector calculus, multiple integration, partial derivatives, line and surface integrals. The theorems of Green, Gauss, and Stokes. Prerequisite: C- or better in MATH 1220 or AP Calculus score of 5 on BC exam. (F,Sp,Su)^{DE}

MATH 2250 QI Linear Algebra and Differential Equations 4
Linear systems, abstract vector spaces, matrices through eigenvalues and eigenvectors, solution of ode's, Laplace transforms, first order systems. Prerequisites: C- or better in MATH 1220; or AP Calculus score of 5 on BC exam and C- or better in MATH 2210. (F,Sp,Su)^{DE}

MATH 2260 Internship and Cooperative Studies 1-6[®]
Lower-division internship/cooperative work experience. (F,Sp,Su)

MATH 2270 QI Linear Algebra 3
Solutions of linear systems, matrix operations, matrix factorization, vector spaces, subspaces, linear independence, bases, linear transformations, eigensystems, orthogonality, Gram-Schmidt orthogonalization, and projections. Prerequisites: C- or better in MATH 1220; or AP Math score of 5 on calculus BC exam and C- or better in MATH 2210. (F,Sp)

MATH 2280 QI Ordinary Differential Equations 3
Analytic solution techniques for ordinary differential equations. Initial value and boundary value problems and applications. Higher-order scalar equations, first-order linear systems, and Laplace transforms. Prerequisite: C- or better in MATH 2270. (F,Sp)

MATH 2910 Directed Reading and Conference 1-3[®]
Prerequisite: Prior arrangement with specific instructor. (F,Sp,Su)^{DE}

MATH 3110 Modern Geometry 3
Euclidean and non-Euclidean geometry, with emphasis on historical significance of parallel postulate. Axiomatic development of geometry and theorems. Prerequisite: C- or better in MATH 1220. (Sp)^{DE}

MATH 3300 School Laboratory for Mathematics Teachers Level I 1
Provides preservice mathematics teachers with supervised experiences working with teachers and students in middle and secondary schools. Activities coordinated with other Level I professional education courses. Graded Pass/Fail *only*. (F,Sp)^{DE}

MATH 3310 Discrete Mathematics 3
Logic and axiomatics, sets, functions, counting methods, recurrence relations, graph theory, Boolean algebras, combinatorial circuits, automata, grammars, and languages. Prerequisite: C- or better in MATH 1220. (F,Sp,Su)^{DE}

MATH 4200 CI Foundations of Analysis 3
Fundamental concepts of analysis studied from a rigorous point of view. Rigorous development of the real number system and calculus. Emphasis on learning how to construct proofs. Prerequisites: C- or better in MATH 2210, 2250; or C- or better in MATH 2210, 2270, 2280. (F,Sp)^{DE}

MATH 4230 QI Applied Mathematics in Biology* 3**
Formulation, analysis, and experimental tests of mathematical models in biology. Combines mathematics, computing, experimental design, and statistical analysis while applying the scientific method to biological systems. Lectures, recitations, and a laboratory. Prerequisites: C- or better in BIOL 1620 and MATH 2250; or permission of instructor. Programming experience recommended. Also taught as BIOL 4230. (Sp)

MATH 4250 Advanced Internship/Co-op 1-6[®]
An internship/cooperative work experience which has been determined by the department to be at the 4000-level. (F,Sp,Su)

MATH 4300 School Laboratory for Mathematics Teachers Level II 1
Provides preservice mathematics teachers with supervised experiences working with teachers and students in middle and secondary schools. Activities coordinated with other Level II professional education courses. Graded Pass/Fail *only*. (F,Sp)^{DE}

MATH 4310 CI Introduction to Algebraic Structures 3
First course in theory of algebraic structures. Topics include elementary group and ring theory. Prerequisites: C- or better in MATH 2210, 2270, 2280; or C- or better in MATH 2210, 2250. (F,Sp)^{DE}

Course Descriptions

MATH 4400 History of Mathematics and Number Theory 3
Chronological parallel of math history with civilization, evolution of mathematical thought, historical foundations of numbers, computation, geometry, algebra, trigonometry, and calculus. Introduction to number theory. Prerequisites: At least one of MATH 4200 and 4310 with a C- or better, and concurrent enrollment in the other. (Sp)^{DE}

MATH 4500 Methods of Secondary School Mathematics Teaching 3
(dual listing 6500)
A teaching methods course required of all prospective secondary school mathematics teachers. To receive graduate credit for the dual-listed MATH 6500 course, students must complete an extra project. Students having a Methods of Secondary Math Teaching Methods course on their transcripts will not be allowed to apply MATH 6500 credit toward a master's degree. Prerequisites (for MATH 4500): MATH 3110; and one of MATH 4200 or 4310. Prerequisites (for MATH 6500): Matriculation into the Master's of Education Plan C program, the Master's of Mathematics program, or the USOE Alternative Route to Licensure Program. (F,Sp)^{DE}

MATH 4700 Engineering Mathematics and Statistics 3
Advanced engineering mathematics and statistics including: random variables; distributions; central limit theory; hypothesis testing; Anova; quality control; Fourier series; introductory analytic and numerical methods for elliptic, parabolic, and hyperbolic PDEs; and modern software packages. Prerequisites: C- or better in MATH 2210; C- or better in MATH 2250 or 2280. (F,Sp)

MATH 4910 Directed Reading and Conference 1-3®
Registration requires prior arrangement with specific instructor. (F,Sp,Su)^{DE}

MATH 5010 Capstone Mathematics, Statistics, and Technology for Teachers 3
Builds on competencies gained from prior courses and incorporates technologies available for teaching and learning mathematics to analyze and interrelate mathematical concepts. Applications in secondary school mathematics curricula. Prerequisites: C- or better in MATH 3310; and successful completion of, or concurrent enrollment in, MATH 3110, 4200, 4310, 4400, and 5710. (F)^{DE}

MATH 5110 Differential Geometry 3
Introduction to geometry of curves and surfaces in three dimensions, using graphic and symbolic software. Prerequisites: C- or better in MATH 2210, 2250; or C- or better in MATH 2210, 2270, 2280. (Alt F)

MATH 5210 Introduction to Analysis I 3
One and several variable calculus from an advanced point of view. Proofs of all main theorems in calculus. Prerequisite: C- or better in MATH 4200 or 5510. (F)

MATH 5220 Introduction to Analysis II 3
Continuation of MATH 5210. Rigorous development of multivariable advanced calculus. Prerequisite: C- or better in MATH 5210. (Sp)

MATH 5270 Complex Variables 3
Basic theory and applications of complex variables for mathematics, physics, and engineering students. Topics include analytic functions, contour integration, and residue theorem conformal mappings. Prerequisites: C- or better in MATH 2210, 2250; or C- or better in MATH 2210, 2270, 2280. (Sp)^{DE}

MATH 5310 Introduction to Modern Algebra* 3**
Continuation of MATH 4310. Topics include: Sylow theory for finite groups, factorization theory for commutative rings, and Galois theory. Prerequisite: C- or better in MATH 4310. (Sp)

MATH 5340 Theory of Linear Algebra 3**
Vector space theory, linear transformations and matrices, eigenvalues and eigenvectors, inner product spaces, orthogonality, canonical forms, and Hermitian matrices. Prerequisite: C- or better in MATH 2250 or 2270; or consent of instructor. (F)

MATH 5410 Methods of Applied Mathematics 3
Basic modeling and qualitative understanding, including dimensional analysis (Buckingham Pi theorem). Asymptotic solutions, perturbation approaches, boundary layers in differential equations, variational calculus, Hamilton's principle, and conservation of energy. Emphasizes practical approaches to science and engineering problems. Prerequisites: C- or better in MATH 2210, 2250; or C- or better in MATH 2210, 2270, 2280. (F)

MATH 5420 Partial Differential Equations 3
Modeling with partial differential equations, diffusion, and wave equations. Classical solution techniques including: maximum principles, separation of variables (eigenfunctions), method of characteristics, Fourier and Laplace transforms, and singularity methods (Green's Functions). Emphasizes understanding and solving physical equations. Prerequisite: C- or better in MATH 2250 or 2280. (Sp)

MATH 5460 Introduction to the Theory and Application of Nonlinear Dynamical Systems 3
Qualitative behavior of nonlinear maps and ordinary differential equations. Stability of solutions, bifurcation theory, chaos, and applications. Prerequisite: C- or better in MATH 2250 or 2280. (Sp)

MATH 5510 Introduction to Topology 3
Elementary point-set topology, topological spaces, separation axioms, metric spaces, compactness, connectedness, order topology, countability axioms, continuity, and homeomorphisms. Prerequisite: C- or better in MATH 4200. (Alt F)

MATH 5570 Actuarial Math I* 3**
Introduction to theory of risk and its application to construction and analysis of models for insurance systems. Prerequisites: C- or better in MATH 5710, STAT 3000, and permission of instructor. (F)

MATH 5580 CI Actuarial Math II* 3**
Continuation of MATH 5570. Prerequisite: C- or better in MATH 5570. (Sp)

MATH 5610 Computational Linear Algebra and Solution of Systems of Equations 3
Numerical solutions of systems of linear and nonlinear equations, methods for eigensystems, least squares problems, finding roots of functions and nonlinear systems, constrained and unconstrained optimization. Prerequisites: C- or better in MATH 2210, C- or better in MATH 2250 or 2270, and a high-level programming language. (F)

MATH 5620 Numerical Solution of Differential Equations 3**
Numerical solution of differential equations, initial and boundary value problems, finite difference, finite element, and spectral methods (FFT) applied to ODEs and PDEs. Prerequisites: C- or better in MATH 2210; C- or better in MATH 2250 or 2270; C- or better in MATH 2280; and a high-level programming language. (Sp)

MATH 5640 Optimization* 3**
One-semester introductory survey of optimization, including both continuous and combinatorial problems. Topics include: linear programming, constrained and unconstrained optimization, network models, dynamic programming, and integer programming. Prerequisites: C- or better in MATH 2210; C- or better in MATH 2250 or 2270; and a high-level programming language. (Sp)

MATH 5710 Introduction to Probability 3
Discrete and continuous probability, random variables, distribution and density function, joint distributions, conditional probabilities and expectations, Bayes' theorem, moments, moment generating functions, inequalities, convergence in probability and distribution, and central limit theorem. Prerequisites: C- or better in MATH 2210; and C- or better in MATH 2250 or 2270. (F,Sp)

MATH 5720 Introduction to Mathematical Statistics 3
Basic theory of point and interval estimation and hypothesis testing. Topics include: sufficiency and completeness; method-of-moments, best unbiased, maximum likelihood, Bayes', and empirical Bayes' estimators; Neyman-Pearson lemma; and likelihood ratio tests. Prerequisite: C- or better in MATH 5710. (Sp)

MATH 5740 Actuarial Financial Mathematics 3**
Introduces fundamental concepts of financial mathematics, focusing on applications to non-life insurance. Topics include interest theory, cash flows and yield rates, annuities, portfolio insurance, and derivatives. Also includes discussion of probability models for underlying assets. Prerequisites: MATH 1220 and STAT 3000. (Sp)

MATH 5760 Stochastic Processes* 3
Application of stochastic processes to engineering and science. Topics include Markov chains, Poisson processes, renewal theory, and Brownian motion. Prerequisite: C- or better in MATH 5710. (F)

Course Descriptions

MATH 5810	Topics in Mathematics	1-3[®]	
MATH 5820	Topics in Mathematics	1-3[®]	
Prerequisite: Permission of instructor. (F,Sp,Su) ^{DE} (F,Sp,Su)			
MATH 5910	Directed Reading and Conference	1-3[®]	
Prerequisite: Prior arrangement with a specific instructor. (F,Sp,Su)			
MATH 5950	Honors Senior Project	1-4	
A senior project required for completion of the departmental honors program. Prerequisite: Permission of instructor. (F,Sp,Su)			
MATH 6110	Differential Geometry*	3	
MATH 6120	Differential Geometry*	3	
Topics include manifolds, calculus on manifolds, tensor calculus and differential forms, Lie groups, Riemannian geometry, deRham's Theorem, and Hodge theory. Prerequisite: C- or better in MATH 5110 or 5220; MATH 6110 must be completed prior to MATH 6120. (F) (Sp)			
MATH 6210	Real Analysis*	3	
MATH 6220	Real Analysis*	3	
Measure theory, abstract integration, differentiation, introduction to functional analysis, Hilbert and Banach spaces. Prerequisite: C- or better in MATH 5210; MATH 6210 must be completed prior to 6220. (F) (Sp)			
MATH 6250	Graduate Internship/Cooperative Studies*	1-6[®]	
Graduate internship/cooperative work experience. (F,Sp,Su)			
MATH 6270	Complex Variables*	3	
Analytic functions, singular points, conformal maps, harmonic functions, analytic continuation, Residue theory. Prerequisite: C- or better in MATH 5210 or 5270. (Sp)			
MATH 6310	Modern Algebra*	3	
MATH 6320	Modern Algebra*	3	
Algebraic structures, including vector spaces, groups, rings, algebras, and modules. Topics include: category theory, elementary commutative ring theory, and algebraic geometry. Prerequisite: C- or better in MATH 5310; MATH 6310 must be completed prior to 6320. (F) (Sp)			
MATH 6340	Multilinear Algebra and Matrix Theory*	3	
MATH 6350	Multilinear Algebra and Matrix Theory*	3	
Permutation groups and representations, tensor spaces, symmetry classes of tensors, generalized matrix functions, matrices and graphs, and combinatorial matrix algebra. Prerequisite: C- or better in MATH 5340; MATH 6340 must be completed prior to 6350. (F) (Sp)			
MATH 6410	Ordinary Differential Equations I*	3	
Existence-uniqueness theory, linear equations and systems, nonlinear equations, and stability. Prerequisite: C- or better in MATH 5210. (F)			
MATH 6420	Partial Differential Equations I*	3	
Introduction to the theory of partial differential equations, including existence and uniqueness. Prerequisite: C- or better in MATH 5220 or 6410. (Sp)			
MATH 6440	Ordinary Differential Equations II*	3	
Asymptotic behavior, periodicity, boundary value problems, and perturbation methods. Prerequisite: C- or better in MATH 6410. (Sp)			
MATH 6450	Partial Differential Equations II*	3	
Advanced existence and uniqueness theorems, behavior of solutions, Sobolev spaces. Prerequisites: C- or better in MATH 6210; and C- or better in MATH 5420 or 6420. (Sp)			
MATH 6470	Advanced Asymptotic Methods*	3	
Theory of asymptotics and perturbations. Boundary layers for ordinary and partial differential equations. Free boundary problems, shocks, multiple-scale methods, and WKB methods. Prerequisite: C- or better in MATH 5420. (Sp)			
MATH 6500	Methods of Secondary School (dual listing 4500) Mathematics Teaching	3	
A teaching methods course required of all prospective secondary school mathematics teachers. To receive graduate credit, students must complete an extra project. Students having a Methods of Secondary Math Teaching Methods course on their transcripts will not be allowed to apply credit for this course toward a master's degree. Prerequisites: Matriculation into the Master's of Education Plan C program, the Master's of Mathematics program, or the USOE Alternative Route to Licensure Program. (F,Sp) ^{DE}			
MATH 6510	Topology*	3	
MATH 6520	Topology*	3	
Homotopy theory, fundamental groups, covering spaces, singular homology with applications to spheres and Euclidean spaces, CW complexes, cohomology ring, and Poincare duality. Prerequisites: C- or better in MATH 4310, 5510; and C- or better in MATH 5310 or consent of instructor. MATH 6510 must be completed prior to 6520. (F) (Sp)			
MATH 6610	Matrix Computations***	3	
Computational aspects of matrix theory, focusing on numerical methods for solving linear systems, least squares problems, and eigenvalue problems. Prerequisites: C- or better in MATH 5210 or 5610, and experience with a high-level programming language. (F)			
MATH 6620	Numerical Analysis*	3	
Numerical solution of ordinary and partial differential equations. Prerequisite: C- or better in MATH 6610 or consent of instructor. (Sp)			
MATH 6640	Optimization*	3	
Unconstrained problems, smooth function methods, linearly constrained problems, linear and quadratic programming, nonlinearly constrained methods, and practicalities. Prerequisite: C- or better in MATH 5220 or consent of instructor. (Sp)			
MATH 6750	Probability Theory*	3	
MATH 6760	Probability Theory*	3	
Probability spaces, random variables, distribution functions, expectations, independence, modes of convergence, limit theorems, and applications. Prerequisite: C- or better in MATH 5210; MATH 6750 must be completed prior to 6760. (F) (Sp)			
MATH 6810	Topics in Mathematics (Topic)*	3[®]	
MATH 6820	Topics in Mathematics (Topic)*	3[®]	
Prerequisite: Consent of instructor. (F) (Sp)			
MATH 6910	Directed Reading and Conference*	1-3[®]	
Prerequisite: Prior arrangement with specific instructor. (F,Sp,Su)			
MATH 6970	Thesis	1-9[®]	
Graded Pass/Fail only. (F,Sp,Su)			
MATH 6990	Continuing Graduate Advisement	1-9[®]	
Graded Pass/Fail only. (F,Sp,Su)			
MATH 7110	Geometry (Topic)*	3[®]	
MATH 7120	Geometry (Topic)*	3[®]	
(F) (Sp)			
MATH 7210	Analysis (Topic)*	3[®]	
MATH 7220	Analysis (Topic)*	3[®]	
(F) (Sp)			
MATH 7310	Algebra (Topic)*	3[®]	
MATH 7320	Algebra (Topic)*	3[®]	
(F) (Sp)			
MATH 7410	Differential Equations (Topic)*	3[®]	
MATH 7420	Differential Equations (Topic)*	3[®]	
(F) (Sp)			
MATH 7510	Topology (Topic)*	3[®]	
MATH 7520	Topology (Topic)*	3[®]	
(F) (Sp)			

Course Descriptions

MATH 7610
MATH 7620
 (F) (Sp)

Numerical Analysis (Topic)*
Numerical Analysis (Topic)*

3[®]
3[®]

MATH 7970 **Dissertation Research**
 Graded Pass/Fail only. (F,Sp,Su)

1-15[®]

MATH 7750
MATH 7760
 (F) (Sp)

Probability (Topic)*
Probability (Topic)*

3[®]
3[®]

MATH 7990 **Continuing Graduate Advisement**
 Graded Pass/Fail only. (F,Sp,Su)

1-9[®]

MATH 7810
MATH 7820
 (F) (Sp)

Topics in Mathematics (Topic)*
Topics in Mathematics (Topic)*

3[®]
3[®]

[®]Repeatable for credit. Check with major department for limitations on number of credits that can be counted for graduation.
^{®E}This course may be available through Regional Campuses and Distance Education (RCDE), and may be offered through multiple delivery methods. Current RCDE offerings may be viewed at: <http://distance.usu.edu/>

*This course will be taught as needed. For information about availability, contact the Department of Mathematics and Statistics.

**Taught 2010-2011.
 ***Taught 2009-2010.

MATH 7910
 (F,Sp,Su)

College Teaching Internship

3[®]

Statistics (STAT)

See Department of Mathematics and Statistics, [click here](#)

STAT 1040 QL Introduction to Statistics 3

Descriptive and inferential statistical methods. Emphasis on conceptual understanding and statistical thinking. Examples presented from many different areas. Prerequisite: C or better in MATH 1010 or Math ACT score of at least 23 (Math SAT score of at least 540) within the Math prerequisite acceptability time limit; or satisfactory score on Math Placement Test. (F,Sp,Su)^{DE}

STAT 2000 QI Statistical Methods 3

Introduction to statistical concepts, graphical techniques, probability, distributions, estimation, one and two sample testing, chi-square tests, and simple linear regression. Prerequisite: C- or better in MATH 1050 or Math ACT score of at least 23 (Math SAT score of at least 540) within the Math prerequisite acceptability time limit; or satisfactory score on Math Placement Test. (F,Sp)^{DE}

STAT 2250 Internship and Cooperative Studies 1-6

Lower-division internship/cooperative work experience in statistics. (F,Sp,Su)

STAT 2300 QL Business Statistics 4

Descriptive and inferential statistics, probability, sampling, estimation, tests of hypotheses, linear regression and correlation, chi-square tests, analysis of variance, and multiple regression. Prerequisite: C- or better in MATH 1050 or Math ACT score of at least 25 (Math SAT score of at least 580) within the Math prerequisite acceptability time limit; or satisfactory score on Math Placement Test. (F,Sp,Su)^{DE}

STAT 2950 Directed Reading and Conference 1-3[®]

Prerequisite: Prior arrangement with specific instructor. (F,Sp,Su)

STAT 3000 QI Statistics for Scientists 3

Introduction to statistical concepts, graphical techniques, discrete and continuous distributions, parameter estimation, hypothesis testing, and chi-square tests. Prerequisite: C- or better in MATH 1100 or 1210. (F,Sp,Su)^{DE}

STAT 4250 Advanced Internship/Co-op 1-6[®]

Advanced educational work experience in statistics. Prerequisite: Approval of instructor. (F,Sp,Su)

STAT 4500 Methods of Teaching Statistics in Secondary and Middle School 3

Teaching methods course required for all prospective mathematics and statistics composite teaching majors. Corequisite: MATH 4500. Prerequisites: MATH 3110; MATH 4200 or 4310; STAT 2000 or 3000. (F,Sp)

STAT 4950 Directed Reading and Conference 1-3[®]

Prerequisite: Prior arrangement with specific instructor. (F,Sp,Su)

STAT 5100 CI/QI Linear Regression and Time Series 3

Methods for prediction and hypothesis testing in multiple linear regression models, including analysis of variance and covariance, logistic regression, introduction to time series, and signal processing. Prerequisite: C- or better in STAT 2000 or 3000. (F)^{DE}

STAT 5120 Categorical Data Analysis 3

Analysis of categorical data, contingency tables, goodness of fit, random sampling, log-linear and logistic regression models, and sampling for proportions, as well as stratified and cluster sampling. Prerequisite: C- or better in STAT 5100. (F)

STAT 5200 Design of Experiments 3

Design, analysis, and interpretation of experiments, split plots, incomplete blocks, confounding, fractional factorials, nested designs, two- and three-way analysis of variance, covariance, and multiple regression. Prerequisite: C- or better in STAT 2000 or 3000. (Sp)^{DE}

STAT 5300 QI Statistical Process Control 3

Techniques and applications of statistics in modern management of industrial processes. Control charts, acceptance sampling, design of industrial experiments, and analysis of process failures. Prerequisite: C- or better in STAT 2000 or 3000. This course is not currently being offered. For information about when it may be offered, contact the department.

STAT 5410 Applied Spatial Statistics 3 (dual listing 6410)

Explores spatial point patterns, spatially continuous data, area (grid) data, nearest neighbor distances, K function, complete spatial randomness, variogram, kriging, correlogram, and Moran's I. For graduate (6000-level credit), a major project is required. Prerequisite: C- or better in STAT 3000. Knowledge of a statistical package (e.g., S-Plus, R, SAS, etc.) or any programming language (e.g., C/C++, FORTRAN, etc.) is *strongly recommended*. (F)

STAT 5570 Statistical Bioinformatics 3 (dual listing 6570)

Introduction to current statistical issues in bioinformatics, primarily gene expression and sequence analysis, using bioconductor tools. Topics include data normalization and visualization, differential expression, annotation, scoring alignments, HMMs, and phylogenetic trees. For graduate (6000-level) credit, major project required. Prerequisite: C- or better in STAT 5100 or 5200. (Sp)

STAT 5600 CI Applied Multivariate Statistics 3

Introduction to multivariate statistical procedures for data analysis. Topics include MANOVA, principal component analysis, factor analysis, clustering, and classification. Prerequisite: C- or better in STAT 5100. (Sp)

STAT 5810 Topics in Statistics 1-3[®]

STAT 5820 Topics in Statistics 1-3[®]

Prerequisite: Consent of instructor. (F)^{DE} (Sp)^{DE}

STAT 5890 CI Problem Solving in Statistics 3

Capstone course for Statistics majors, applying course material covered in the undergraduate major. Prerequisite: Permission of instructor. (Sp)

STAT 5940 Directed Reading and Conference 1-3[®]

Prerequisite: Prior arrangement with specific instructor. (F,Sp,Su)

STAT 5950 Senior Honors Project 1-4

A senior project, required for completion of the departmental honors program and developed under the direction of a departmental faculty member. Prerequisite: Permission of instructor. (F,Sp,Su)

STAT 5970 Seminar 1-3[®]

Review of current literature and developments in the field of statistics. (F,Sp)

STAT 6100 Advanced Regression Analysis* 3

Explores the following topics in the theory of linear models: least squares estimation, the general linear hypothesis, regression diagnostics for multicollinearity, outliers, and influential points. Also includes discussion of robust regression, nonlinear regression, generalized linear models, ACE, generalized additive models, and regression models for survival data. Prerequisites: C- or better in MATH 5720 and STAT 5100. (F)

STAT 6180 Time Series** 3

The domain and frequency domain time series analysis, including Box-Jenkins methods, spectral analysis and filtering, introduction to state space methodology. Prerequisites: C- or better in STAT 5100, MATH 5720.

STAT 6190 Wavelet Methods for Time Series** 3

Explores time series models, time and frequency domain analysis, discrete wavelet transform, and wavelet ANOVA, as well as applications in physics and finance. Prerequisites: C- or better in MATH 5720 and STAT 5100. (Sp)

Course Descriptions

<p>STAT 6200 Analysis of Unbalanced Data and Complex Experimental Designs* 3</p> <p>Examines means and effects models, estimability, and type I-IV hypotheses. Contrasts and sums of squares. Generalized linear models for experimental data. Linear mixed models. Generalized linear mixed models. Analysis of complex experimental designs. Nonreplicated experiments. Tests for additivity. Half-normal plots. Prerequisite: C- or better in STAT 5200. (Sp)</p>	<p>STAT 6710 Mathematical Statistics I 3</p> <p>Modes of convergence of random variables, laws of large numbers, characteristic functions, and the central limit theorem. Prerequisite: C- or better in MATH 5720. (F)</p>
<p>STAT 6250 Graduate Internship/Co-op*** 1-8®</p> <p>Educational work experience at the graduate level. Prerequisite: Permission of instructor.</p>	<p>STAT 6720 Mathematical Statistics II 3</p> <p>Consistency, loss functions, risk, and notions of optimality of estimations. Hypothesis testing and confidence regions. Large sample theory, notions of robustness. Prerequisite: C- or better in STAT 6710. (Sp)</p>
<p>STAT 6410 Applied Spatial Statistics 3</p> <p>(dual listing 5410)</p> <p>Explores spatial point patterns, spatially continuous data, area (grid) data, nearest neighbor distances, K function, complete spatial randomness, variogram, kriging, correlogram, and Moran's I. For graduate (6000-level credit), a major project is required. Prerequisite: C- or better in STAT 3000. Knowledge of a statistical package (e.g., S-Plus, R, SAS, etc.) or any programming language (e.g., C/C++, FORTRAN, etc.) is <i>strongly recommended</i>. (F)</p>	<p>STAT 6740 Bayesian Statistics** 3</p> <p>Conditional probability, Bayes' theorem, conjugate and objective priors, Bayesian inference and decision theory, model averaging, multi-parameter and hierarchical models, sampling and numerical integration methods, linear models, generalized linear models, and models for correlated data. Prerequisites: MATH 5720 and STAT 5100. (Sp)</p>
<p>STAT 6530 Modern Nonparametric Statistics** 3</p> <p>Examines topics in resampling methods including: the jackknife and the bootstrap, bias, variance, and confidence intervals. Also explores the following topics in smoothing methods: histograms, kernel density estimates, and local polynomial regression. Includes testing procedures using ranks and empirical cumulative distribution functions. Prerequisites: C- or better in MATH 5710 and STAT 3000. (Sp)</p>	<p>STAT 6810 Topics in Statistics (Topic)*** 3®</p> <p>STAT 6820 Topics in Statistics (Topic)*** 3®</p> <p>Prerequisite: Permission of instructor. (F) (Sp)</p>
<p>STAT 6550 Statistical Computing*** 3</p> <p>Survey of algorithms and tools for modern statistical computing. Topics include simulation design and implementation, algorithms for linear regression and subset selection, smoothing algorithms, fast fourier transform, EM algorithm, numerical methods for maximum likelihood estimation, and neural networks. Prerequisites: C- or better in MATH 5720 and knowledge of a programming language. (Sp)</p>	<p>STAT 6890 Practical Statistical Consulting*** 1-3®</p> <p>Introduction to statistical consulting for graduate students, for faculty in other research departments, and for business, industry, and government. Prerequisite: Permission of instructor. (F,Sp,Su)</p>
<p>STAT 6560 Graphical Methods*** 3</p> <p>Statistical graphics and scientific visualization of one, two, and higher dimensional data. Well-chosen and designed graphics are vital in exploratory data analysis, model diagnostics, and data presentation. Includes specific methods and general principles, such as effective use of color and motion. Prerequisites: C- or better in STAT 3000 and programming experience. (F)</p>	<p>STAT 6910 Seminar in Statistics*** 1-3®</p> <p>Review of current literature and developments in statistics. Prerequisite: Permission of instructor. (F,Sp)</p>
<p>STAT 6570 Statistical Bioinformatics 3</p> <p>(dual listing 5570)</p> <p>Introduction to current statistical issues in bioinformatics, primarily gene expression and sequence analysis, using bioconductor tools. Topics include data normalization and visualization, differential expression, annotation, scoring alignments, HMMs, and phylogenetic trees. For graduate (6000-level) credit, major project required. Prerequisite: C- or better in STAT 5100 or 5200. (Sp)</p>	<p>STAT 6950 Directed Reading and Conference*** 1-4®</p> <p>Prerequisite: Prior arrangement with specific instructor. (F,Sp,Su)</p>
<p>STAT 6600 Multivariate Analysis 3</p> <p>Statistical methods for analyzing multivariate data and the theory behind them. Topics include multivariate normal distribution and multivariate distributions derived from it, multivariate t-tests, regression, MANOVA, principal components and factor analysis, multidimensional scaling, classification, and cluster analysis. Prerequisites: C- or better in MATH 5720. This course is not currently being offered. For information about when it may be offered, contact the department.</p>	<p>STAT 6970 Thesis and Research 1-6®</p> <p>Outlining and conducting research in statistics. Thesis preparation. Graded Pass/Fail only. (F,Sp,Su)</p>
<p>STAT 6650 Statistical Learning: Multivariate Statistical Analysis for Bioinformatics, Data Mining, and Machine Learning** 3</p> <p>Explores supervised learning, linear methods for regression and classification, model assessment and selection, model inference and averaging, additive models, boosting, neural networks, support vector machines, and unsupervised learning. Prerequisites: C- or better in MATH 5720 and STAT 5100. Programming experience in R or a related language is <i>strongly recommended</i>. (F)</p>	<p>STAT 6990 Continuing Graduate Advisement 1-9®</p> <p>Graded Pass/Fail only. (F,Sp,Su)</p>
	<p>STAT 7110 Linear Models (Topic)*** 3®</p> <p>STAT 7120 Linear Models (Topic)*** 3®</p> <p>(F) (Sp)</p>
	<p>STAT 7180 Time Series Analysis (Topic)*** 3®</p> <p>STAT 7190 Time Series Analysis (Topic)*** 3®</p> <p>(F) (Sp)</p>
	<p>STAT 7210 Experimental Design (Topic)*** 3®</p> <p>STAT 7220 Experimental Design (Topic)*** 3®</p> <p>(F) (Sp)</p>
	<p>STAT 7310 Business and Industrial Statistics (Topic)*** 3®</p> <p>STAT 7320 Business and Industrial Statistics (Topic)*** 3®</p> <p>(F) (Sp)</p>
	<p>STAT 7510 Nonparametric Statistics (Topic)*** 3®</p> <p>STAT 7520 Nonparametric Statistics (Topic)*** 3®</p> <p>(F) (Sp)</p>
	<p>STAT 7550 Computational and Graphical Statistics (Topic)*** 3®</p> <p>STAT 7560 Computational and Graphical Statistics (Topic)*** 3®</p> <p>(F) (Sp)</p>

Course Descriptions

STAT 7610	Multivariate Statistics (Topic)***	3[®]	STAT 7810	Topics in Statistics (Topic)	1-3[®]
STAT 7620	Multivariate Statistics (Topic)***	3[®]	STAT 7820	Topics in Statistics (Topic)	1-3[®]
(F) (Sp)			(F) (Sp)		
STAT 7710	Mathematical Statistics (Topic)***	3[®]	STAT 7970	Dissertation Research	1-15[®]
STAT 7720	Mathematical Statistics (Topic)***	3[®]	Graded Pass/Fail only. (F,Sp,Su)		
(F) (Sp)					
STAT 7730	Bayesian Statistics and		STAT 7990	Continuing Graduate Advisement	1-9[®]
	Decision Theory (Topic)***		Graded Pass/Fail only. (F,Sp,Su)		
STAT 7740	Bayesian Statistics and	3[®]			
	Decision Theory (Topic)***	3[®]			
(F) (Sp)					

[®] Repeatable for credit. Check with major department for limitations on number of credits that can be counted for graduation.

^{DE} This course may be available through Regional Campuses and Distance Education (RCDE), and may be offered through multiple delivery methods. Current RCDE offerings may be viewed at: <http://distance.usu.edu/>

*Taught 2010-2011.

**Taught 2009-2010.

***This course will be taught as needed. For information about availability, contact the Department of Mathematics and Statistics.