AMS 101-C Applied Precalculus

Presents applied topics in functions, discrete dynamical systems, trigonometry, and linear algebra designed to improve students’ skills for analyzing problems in the social and natural sciences. Not for credit in addition to any MAT course numbered 125 or higher or to any AMS course numbered 151 or higher.
Prerequisite: Satisfaction of entry skill in mathematics requirement; level 2+ or higher on the mathematics placement examination
3 credits

AMS 102-C Elements of Statistics

The use and misuse of statistics in real-life situations; basic statistical measures of central tendency and of dispersion, frequency distributions, elements of probability, binomial and normal distributions, small and large sample hypothesis testing, confidence intervals, chi square test, and regression. May not be taken by students with credit for AMS 110, 310, 311, 312; ECO 329; POL 201; PSY 201; or SOC 202.
Prerequisite: Satisfaction of entry skill in mathematics requirement (Skill 1) or satisfactory completion of D.E.C. C
3 credits

AMS 110 Probability and Statistics in the Life Sciences

A survey of probability theory and statistical techniques with applications to biological and biomedical situations. Topics covered include Markov chain models; binomial, Poisson, normal, exponential, and chi square random variables; tests of hypotheses; confidence intervals; t tests; and analysis of variance, regression, and contingency tables. May not be taken for credit in addition to AMS 310.
Prerequisite: AMS 151 or MAT 125 or 131 or 141
3 credits

AMS 151-C Applied Calculus I

A review of functions and their applications; analytic methods of differentiation; interpretations and applications of differentiation; introduction to integration. Intended for CEAS majors. Not for credit in addition to MAT 125 or 126 or 131 or 141.
Prerequisite: B or higher in MAT 125, or level 3 on the mathematics placement examination, or B or higher in MAT 122 and coregistration in MAT 130
3 credits

AMS 161-C Applied Calculus II

Analytic and numerical methods of integration; interpretations and applications of integration; differential equations models and elementary solution techniques; phase planes; Taylor series and Fourier series. Intended for CEAS majors. Not for credit in addition to MAT 127 or 128 or 142.
Prerequisite: C or higher in AMS 151 or MAT 131 or 141, or level 7 on the mathematics placement examination
3 credits

AMS 201 Matrix Methods and Models

Basic properties of matrix algebra, matrix norms, eigenvalues, solving systems of equations; applications to economics, growth models, Markov chains, regression, linear programming. Computer software packages used. May not be taken by students with credit for MAT 201 or AMS 210.
Prerequisite: AMS 151 or MAT 122, 123, 125, 131 or 141
3 credits

AMS 210 Applied Linear Algebra

Prerequisite: AMS 151 or MAT 131 or 141 or corequisite MAT 126
3 credits

AMS 261 Applied Calculus III

Vector algebra and analytic geometry in two and three dimensions; multivariable differential calculus and tangent planes; multivariable integral calculus; optimization and Lagrange multipliers; vector calculus including Green’s and Stokes’ theorems. May not be taken for credit in addition to MAT 203 or 205.
Prerequisite: AMS 161 or MAT 127 or 132 or 142
3 credits

AMS 300 Writing in Applied Mathematics

See Requirements for the Major in Applied Mathematics and Statistics, Upper Division Writing Requirement.
Prerequisite: WRT 102; AMS major; U3 or U4 standing
1 credit, SU grading

AMS 301 Finite Mathematical Structures

An introduction to graph theory and combinatorial analysis. The emphasis is on solving applied problems rather than on theorems and proofs. Techniques used in problem solving include generating functions, recurrence relations, and network flows. This course develops the type of mathematical thinking that is fundamental to computer science and operations research.
Prerequisite: AMS 210 or MAT 211 or AMS 361 or MAT 303
3 credits

AMS 303 Graph Theory

Paths and circuits, trees and tree-based algorithms, graph coloring, digraphs, network flows, matching theory, matroids, and games with graphs.
Prerequisite: AMS 301
3 credits

AMS 310 Survey of Probability and Statistics

A survey of data analysis, probability theory, and statistics. Stem and leaf displays, box plots, schematic plots, fitting straight line relationships, discrete and continuous probability distributions, conditional distributions, binomial distribution, normal and t distributions, confidence intervals, and significance tests. May not be taken for credit in addition to ECO 329.
Prerequisite: AMS 201 or 210 or MAT 211
3 credits

AMS 311 Probability Theory

Probability spaces, random variables, moment generating functions, algebra of expectations, conditional and marginal distributions, multivariate distributions, order statistics, law of large numbers. Corequisite: MAT 203 or 205 or AMS 261
3 credits

AMS 312 Mathematical Statistics

Estimation, confidence intervals, Neyman Pearson lemma, likelihood ratio test, hypothesis testing, chi square test, regression, analysis of variance, nonparametric methods.
Prerequisite: AMS 311
3 credits

AMS 315 Data Analysis

Statistical analysis of data. Exploratory data analysis. Estimation. Parametric and nonparametric hypothesis tests. Power. Robust techniques. Use and interpretation of statistical computer packages, such as SPSS.
Prerequisite: AMS 102 or 310
3 credits

AMS 318 Theory of Interest

Actuarial mathematics including the arithmetical and algebraic problems posed by calculation of simple and compound interest. Considers investment risks created by variable interest rates, inflation, changing foreign currency exchange rates, and changes in tax laws. Develops problem solving skills adopting both deterministic and stochastic approaches and taking into account the perspectives of the consumer and the investor.
Prerequisite: AMS 310
3 credits

AMS 321 Computer Projects in Applied Mathematics

The simulation methodology for a variety of applied mathematical problems in numerical linear and nonlinear algebra, statistical modeling, and numerical differentiation and integration. Graphical representation of numerical solutions.
Prerequisites: AMS 210 or 261 or MAT 203; prior programming experience in C, FORTRAN, or Java
3 credits

AMS 322 Groundwater Modeling

Basic numerical models and solution methods for modeling groundwater flow. Finite difference methods for steady state and transient single-phase, solute transport and multi-phase flow in confined and unconfined aquifer systems.
Prerequisites: AMS 161 or MAT 127 or 132 or 142; AMS 210 or MAT 211; programming experience in FORTRAN, Pascal, C, or Modula 3
3 credits

AMS 326 Numerical Analysis

Prerequisites: AMS 210 or MAT 211; programming experience in Pascal, FORTRAN, or C
3 credits

AMS 331 Mathematical Modeling

Investigation of the process of translating real-world problems into mathematical models. Six to eight unconnected problems are studied in detail. These are chosen to illustrate various methods of formulation and solution, and generally find their origins in the physical and biological sciences.
Prerequisites: AMS 210 or MAT 211; AMS 310 or 311
3 credits

AMS 335 Game Theory

Introduction to game theory fundamentals with special emphasis on problems from economics and political science. Topics include strategic games and Nash equilibrium, games in coalition form and the core, bargaining theory, measuring power in voting systems, problems of fair division, and optimal and stable matching. This course is offered as both AMS 335 and ECO 355.
Prerequisites: MAT 126 or 131 or 141 or AMS 151; C or higher in ECO 303
3 credits
AMS 341 Operations Research I: Deterministic Models
Linear programming with a view toward its uses in economics and systems analysis. Linear algebra and geometric foundations of linear programming: simplex method and its variations; primal dual programs; formulation and interpretation of linear programming models, including practical problems in transportation and production control. Optional computer projects. AMS 341 and 342 may be taken in either order, though it is recommended that AMS 341 be taken first.
Prerequisites: AMS 210 or MAT 211
3 credits

AMS 342 Operations Research II: Stochastic Models
Methods and techniques for stochastic modeling and optimization, with applications to queuing theory, Markov chains, inventory theory, games, and decisions. AMS 341 and 342 may be taken in either order, though it is recommended that AMS 341 be taken first.
Prerequisites: AMS 210 or MAT 211; AMS 311
3 credits

AMS 345 Computational Geometry
The design and analysis of efficient algorithms to solve geometric problems that arise in computer graphics, robotics, geographical information systems, manufacturing, and optimization. Topics include convex hulls, triangulation, Voronoi diagrams, visibility, intersection, robot motion planning, and arrangements. This course is offered as both AMS 345 and CSE 355.
Prerequisites: AMS 301; programming knowledge of C or C++ or Java
3 credits

AMS 351 Applied Algebra
Topics in algebra: groups, informal set theory, relations, homomorphisms. Applications: error correcting codes, Burnside’s theorem, computational complexity, Chinese remainder theorem. This course is offered as both AMS 351 and MAT 312.
Prerequisite: AMS 210 or MAT 211
Advisory Prerequisite: MAT 200 or CSE 113
3 credits

AMS 361 Applied Calculus IV: Differential Equations
Homogeneous and inhomogeneous linear differential equations; systems of linear differential equations; solution with power series and Laplace transforms; partial differential equations and Fourier series. May not be taken for credit in addition to the equivalent MAT 303.
Prerequisite: AMS 161 or MAT 127 or 132 or 142
1/2 credits

AMS 373 Analysis of Algorithms
Mathematical analysis of a variety of computer algorithms including searching, sorting, matrix multiplication, fast Fourier transform, and graph algorithms. Time and space complexity. Upper-bound, lower-bound, and average-case analysis. Introduction to NP completeness. Some machine computation is required for the implementation and comparison of algorithms. This course is offered as AMS 373, CSE 373, and MAT 373.
Prerequisites: MAT 211 or AMS 210; CSE 214
3 credits

AMS 394 Statistical Laboratory
Designed for students interested in statistics and their applications. Basic statistical techniques including sampling, design, regression, and analysis of variance are introduced. Includes the use of statistical packages such as SPSS and SAS. Students translate realistic research problems into a statistical context and perform the analysis.
Prerequisite: One AMS course (AMS 102 or 110 or 310 or 315 recommended)
3 credits

AMS 410 Actuarial Mathematics
Integrates calculus and probability with risk assessment and insurance in a quantitative manner to prepare students for the first actuarial examination.
Prerequisites: AMS 261 or MAT 203 or 205; AMS 310; AMS 311 or 315
3 credits

AMS 421 Statistical Quality Control and Design of Experiments
Online techniques that determine and control the quality of mass-manufactured products on a real-time basis by means of statistical analysis. Offline use and applications of the design-of-experiment and Taguchi methods to optimize a product and a process design. The concept of total quality management. Histograms, tests for normality, variables, and attribute control charts, orthogonal arrays, and signal-to-noise arrays. Z-transform for the evaluation of the percentage of nonconforming parts, tests for special causes. Z-bar-R charts, and process capability analysis. Acceptance quality level and laboratory inspection. This course offered as both AMS 421 and MEC 421.
Prerequisite: MEC 317
3 credits

AMS 441 Business Enterprise
Explores the strategy and technology of business enterprises. Integrates the practice of engineering and quantitative methods with the operations of a business in today’s globalized environment, whether in product development, financial management, or e-commerce.
Prerequisites: AMS 210, AMS 261, or CSE 355.
3 credits

AMS 475 Undergraduate Teaching Practicum
Students assist the faculty in teaching by conducting recitation or laboratory sections that supplement a lecture course. The student receives regularly scheduled research and change from semester to semester. May include applied mathematics, statistics, or operations research electives (AMS 487, CSE 487, MEC 499, ESE 499, ESM 499, EST 499, ISE 487) may be counted toward engineering technical elective requirements.
Prerequisites: Permission of instructor and department
3 credits

AMS 487 Research in Applied Mathematics
An independent research project with faculty supervision. Permission to register requires a B average and the agreement of a faculty member to supervise the research. May be repeated once. Only three credits of research electives (AMS 487, CSE 487, MEC 499, ESE 499, ESM 499, EST 499, ISE 487) may be counted toward engineering technical elective requirements.
Prerequisites: Permission of instructor and department
0-3 credits

AMS 492 Topics in Applied Mathematics
Treatment of an area of applied mathematics that expands upon the undergraduate curriculum. Topics may include applied mathematics, statistics, or operations research and change from semester to semester. Semester supplements to this Bulletin contain specific description when course is offered. May be repeated for credit once, as the topic changes.
Prerequisite: Permission of instructor
3 credits