MATHEMATICS

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MAJOR IN MATHEMATICS

The major provides the basic mathematical tools for applications in business and industry, such as actuarial science, computer work, statistics, operations research, teaching mathematics at the secondary school level, or pursuing graduate studies in mathematics, statistics, or related fields.

Additional elective courses in mathematics and the area of application should be chosen in consultation with a departmental adviser and can be selected to further career or graduate school objectives.

MATHEMATICS COURSES

Entry into 100 level mathematics courses is based on the results of the mathematics placement process used by Southern. Additional information about the placement process is available at SouthernCT.edu/placement

Students may not receive credits toward graduation for both MAT 139 and 150 or both MAT 178 and 250 or both MAT 221 and 320.

Students may not receive more than 3 credits toward graduation from among MAT 100, 100P, 101, and 102 (formerly 119). Students taking both MAT 120 and MAT 122 can receive at most 4 credits toward graduation.
The department offers the following:

Data Science, B.S.
Mathematics, B.A.
Mathematics, B.S - Concentration: Applied
Mathematics 7-12, B.S.
Mathematics 7-12, Post-Baccalaureate Teacher Certification
Minor in Data Science
Minor in Mathematics
MATHEMATICS, B.S. - CONCENTRATION: APPLIED

120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

Liberal Education Program

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, courses in the major and/or cognate may also satisfy LEP requirements. These shared courses are recommended below to fulfill both areas, although the course credits are only counted once towards the 120 credits required for graduation.

Tier 1 - Quantitative Reasoning:
MAT 150 - Calculus I (‘C-’ or better)

Writing Requirements (‘W-Courses’)

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.

MAJOR REQUIREMENTS

45 Credits Required
In those mathematics courses which the student applies toward the major in mathematics, he/she must have a GPA of 2.0 and, at most, one grade below C-.

Requirements:
• MAT 150 - Calculus I
• MAT 151 — Calculus II (‘C-’ or better)
• MAT 221 — Intermediate Applied Statistics
• MAT 245 — Differential Equations
• MAT 250 — Foundations of Mathematics: An Introduction (‘C-’ or better)
• MAT 252 — Calculus III (‘C-’ or better)
• MAT 322 — Numerical Analysis I
• MAT 372 — Linear Algebra (‘C-‘ or better)
• MAT 378 — Discrete Mathematics
• MAT 488 — Seminar in Mathematical Modeling

Select one:
• MAT 321 — Mathematical Statistics
• MAT 325 — Design of Experiments
• MAT 326 — Regression Analysis
• MAT 328 — Time Series Analysis
• MAT 329 — Bayesian Analysis and Decision Making

Select two:
• MAT 375 — Abstract Algebra I
• MAT 450 — Analysis
• MAT 480 — Topology

COGNATE REQUIREMENTS

9 Credits Requirement

Requirements:

Select one:
CSC 152 — Computer Programming I
DSC 101 — Data Science II

Select two cognate courses beyond those used to satisfy the Liberal Education Program Requirements from any of the following areas of application. Selections must be approved through memo from the Mathematics department to the Registrar’s Office.

• Biology
• Chemistry
• Computer Science
• Earth Science
• Economics
• Physics
• or other approved area

FREE ELECTIVES

Remaining credits to reach Overall Credits Required (listed above).
MATHEMATICS 7-12, B.S.

This program has a separate admission process. Please consult the admission requirements for this program on the College of Education page for more information.

Overall GPA of 2.7 Required
120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

Liberal Education Program

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, courses in the major and/or cognate may also satisfy LEP requirements. These shared courses are recommended below to fulfill both areas, although the course credits are only counted once towards the 120 credits required for graduation.

Tier 1 – Quantitative Reasoning:
MAT 150 – Calculus I (‘C+’ or better)

Tier 2 – American Experience (select one):
HIS 110 – United States History I
HIS 111 – United States History II

Tier 2 - Creative Drive
MAT 260 - Geometry and the Arts

Tier 2 – Mind and Body:
SHE 203 – School Health

Tier 2 - Social Structure, Conflict, and Consensus
EDU 200 - Teachers, Schools, and Society (’C’ or better)

Tier 3 – Capstone:
MAT 496 – Student Teaching Seminar - Mathematics

Writing Requirements (“W-Courses”)

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.
MAJOR REQUIREMENTS

69 Credits Required

Mathematics Requirements
42 Credits Required
A grade of C+ or better is required in MAT 151. Furthermore, in those MAT courses which the student applies toward the major, he/she must have a minimum GPA of 2.3, no grade below a C-, and in at least 50% of the courses must have a grade of B- or better. Note that for certification candidates, MAT GPA is calculated using MAT 150 and all required MAT courses shown below (this includes replacement grades - only one grade replacement will be dropped). This GPA will be calculated by the Mathematics Certification Coordinator and, in most cases, will not match the area GPA.

Requirements:
- MAT 150 – Calculus I (‘C+’ or better)
- MAT 151 – Calculus II (‘C+’ or better)
- MAT 221 - Intermediate Applied Statistics
- MAT 250 – Foundations of Mathematics: An Introduction (‘C-’ or better)
- MAT 252 – Calculus III (‘C-’ or better)
- MAT 260 - Geometry and the Arts
- MAT 300 – History of Mathematics
- MAT 360 – Foundations of Geometry
- MAT 372 – Linear Algebra (‘C-’ or better)
- MAT 375 – Abstract Algebra I
- MAT 378 – Discrete Mathematics
- MAT 405 – Elementary Mathematics from an Advanced Standpoint
- MAT 408 - Technology for Teaching Secondary Math Education (‘C’ or better)

Education Requirements
27 Credits Required

Requirements:
- EDU 316 - Child Development and Psychology for Educators (‘C’ or better)
- EDU 413 – Secondary Education (‘C’ or better)
- EDU 471 - Supporting English Learners for School Success (formerly IDS 471) (‘C’ or better)
- MAT 490 – Teaching Mathematics in the Secondary School (‘C’ or better)
- MAT 494 – Student Teaching (Mathematics)
- MAT 496 – Student Teaching Seminar (Mathematics)
- RDG 470 - Literacy in the Content Areas (‘C’ or better)
- SED 482 – Teaching Exceptional Students in the Secondary Education Classroom (‘C’ or better)

Non-Course Requirements:
Module 1: Behavioral Difficulties (Social and Emotional Development)
Module 2: Dyslexia Required

COGNATE REQUIREMENTS

12 Credits Required
EDU 200 - Teachers, Schools, and Society (’C’ or better)
   HIS 110
or
   HIS 111
   – United States History I or II
   SHE 203
   – School Health
Select one:
CSC 152 – Computer Programming I
DSC 101 - Data Science II

FREE ELECTIVES

Students must take remaining credits to reach Overall Credits Required (listed above).
MATHEMATICS, B.A.

120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

Liberal Education Program

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, courses in the major and/or cognate may also satisfy LEP requirements. These shared courses are recommended below to fulfill both areas, although the course credits are only counted once towards the 120 credits required for graduation.

Tier 1 - Quantitative Reasoning:
MAT 150 - Calculus I (‘C-’ or better)

Writing Requirements (‘W-Courses’)

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.

MAJOR REQUIREMENTS

41 Credits Required

In those mathematics courses which the student applies toward the major in mathematics, he/she must have a GPA of 2.0 and, at most, one grade below C-.

Requirements:

• MAT 150 - Calculus I (‘C-’ or better)
• MAT 151 - Calculus II (‘C-’ or better)
• MAT 221 - Intermediate Applied Statistics
• MAT 250 - Foundations of Mathematics: An Introduction
• MAT 252 - Calculus III (‘C-’ or better)
• MAT 372 - Linear Algebra (‘C-’ or better)
• MAT 375 - Abstract Algebra I
• MAT 450 - Analysis

Select one:
• MAT 488 - Seminar in Mathematical Modeling
• MAT 498 - Seminar in Mathematics

Select, with approval of a departmental advisor, three courses from:
• MAT 245 - Differential Equations
• MAT 300 - History of Mathematics
• MAT 320 - Probability
• MAT 321 - Mathematical Statistics
• MAT 322 - Numerical Analysis I
• MAT 325 - Design of Experiments
• MAT 326 - Regression Analysis
• MAT 328 - Time Series Analysis
• MAT 329 - Bayesian Analysis and Decision Making
• MAT 360 - Foundations of Geometry
• MAT 370 - Number Theory
• MAT 376 - Abstract Algebra II
• MAT 378 - Discrete Mathematics
• MAT 398 - Special Topics in Mathematics
• MAT 405 - Elementary Mathematics from an Advanced Standpoint
• MAT 480 - Topology
• MAT 488 - Seminar in Mathematical Modeling
• MAT 498 - Seminar in Mathematics

COGNATE REQUIREMENTS

3 Credits Required

Select one:

CSC 152
- Computer Programming I
  DSC 101
- Data Science II

FREE ELECTIVES

Remaining credits to reach Overall Credits Required (listed above).
DATA SCIENCE, B.S.

The B.S. in Data Science equips students with the skills and technology required to successfully work with the enormous amounts of data now generated by business, industry, and the sciences. The major itself is interdisciplinary, combining mathematics, statistics, computer science, and information systems into a coherent curriculum covering data exploration and analysis, data manipulation, data transmission and storage, prediction, machine learning, and visualization and presentation.

120 Overall Credits Required

LIBERAL EDUCATION PROGRAM AND WRITING REQUIREMENTS

Liberal Education Program

Students must complete a comprehensive three-tiered Liberal Education Program (LEP). View all requirements of the tiers on the Liberal Education Program.

While the choice of courses that fulfill the requirements is generally left up to students, courses in the major and/or cognate may also satisfy LEP requirements. These shared courses are recommended below to fulfill both areas, although the course credits are only counted once towards the 120 credits required for graduation.

Tier 1 - Quantitative Reasoning:
MAT 122 - Precalculus or MAT 150 - Calculus I

Tier 3 - Connections
DSC 490 - Data Science Capstone Project

Writing Requirements (“W-Courses”)

Three W-courses are required. These may not be taken until after a student has passed ENG 112 — Writing Arguments. W-courses may count toward LEP, major, or cognate requirements, as well as free electives. Course sections that meet this requirement are designated by section numbers ending in “W”.

Transfer students who enter with 60 to 89 credits are required to pass two W-courses, while transfer students who enter with 90 credits or more must pass one W-course.

MAJOR REQUIREMENTS

70 Credits Required
Requirements:
DSC 100 - Data Science I
DSC 101 - Data Science II
DSC 490 - Data Science Capstone Project
CSC 212 - CS 2: Data Structures
CSC 229 - Object - Oriented Programming
CSC 235 - Web and Database Development
CSC 321 - Algorithm Design and Analysis
CSC 330 - Software Design and Analysis
CSC 335 - Database Systems
CSC 463 - Distributed and Parallel Computing
CSC 477 - Data Mining
CSC 481 - Artificial Intelligence
  or MAT 428 - Mathematical Foundations in Machine Learning
MAT 122 - Precalculus
MAT 150 - Calculus I
MAT 151 - Calculus II
MAT 178 - Elementary Discrete Mathematics
MAT 221 - Intermediate Applied Statistics
MAT 326 - Regression Analysis
MAT 328 - Time Series Analysis
MAT 329 - Bayesian Analysis and Decision Making
MAT 372 - Linear Algebra
MAT 429 - Modern Nonparametric Statistics

FREE ELECTIVES

Remaining credits to reach Overall Credits Required (listed above).
MATHEMATICS 7-12, POST-BACCALAUREATE TEACHER CERTIFICATION

The Post-Baccalaureate Teacher Certification Programs offer a defined set of courses beyond the undergraduate degree to prepare candidates for Connecticut teacher certification, though they do not lead to a degree. These programs require a bachelor's degree for admittance. However, since these programs are composed of undergraduate coursework, they are offered as undergraduate programs. These programs can be pursued on a full-time or part-time basis.

Candidates must maintain good standing throughout the teacher education program and meet all State requirements for certification (state licensure exam, online modules, etc.) in order to be recommended for certification to the State Department of Education. Students are responsible for familiarizing themselves with Connecticut's teacher certification regulations and keeping abreast of changes to those regulations. If state regulations change before completion of a certification program, students will be required to meet these new regulations in order to receive the University's recommendation for certification to the State Department of Education.

33 Credits Required

GPA of 2.7 Required

Requirements:

EDU 200 - Teachers, Schools, and Society
EDU 316 - Child Development and Psychology for Educators
EDU 471 - Supporting English Learners for School Success
MAT 408 - Technology for Teaching Secondary Math Education
MAT 490 - Teaching Mathematics in the Secondary School
MAT 494 - Student Teaching - Mathematics
MAT 496 - Service Learning for Mathematics Education
RDG 470 - Literacy in Content Areas
SED 482 - Teaching Exceptional Students in Secondary Education Classroom
SHE 203 - School Health

Non-Course Requirements:
Module 1: Behavioral Difficulties (Social and Emotional Development)
Module 2: Dyslexia Required
COURSES

**DSC 100 - Data Science I**
This course acts as the stepping stone to the realm of data science. Students will learn concepts from data science using python as the programming language. Course contents include: computing and programming, python language fundamentals, basic concepts from linear algebra, statistics, and probability for data science, and topics from various stages of the data science pipeline. Provides the necessary bases for students to develop an understanding of data science from a technical perspective and to move forward to advanced topics.
Prerequisite(s): Grade of 'C' or better in MAT 112 or placement in MAT 122 or higher.
Last Offered: Spring 2021
3 credits

**DSC 101 - Data Science II**
An introduction to the data science life cycle. Topics include data extraction, and decision making using machine learning methods including regression, classification, clustering, and anomaly detection. Python language and related tools will be used for solving data science problems.
Prerequisite(s): DSC 100
Last Offered: Spring 2021
3 credits

**DSC 490 - Data Science Capstone Project**
Culminating project that revolves around a student-selected data problem. Course activities parallel the various stages of the data science lifecycle. These include project conception, data acquisition, data cleaning and transformation, visualization, model building and evaluation, and presentation of findings.
Prerequisite(s): Departmental permission, 6 of 8 Tier 2 complete (Honors Coll.: 15cr. HON or 45 cr. total), and prior or concurrent completion of all Tier 1 (Honors Coll.: T1MC and T1QR only).
Last Offered: not yet offered
3 credits

**MAT 001 - Elementary Algebra Emporium**
No Description Available
Last Offered: Summer 2019
0 credits

**MAT 095 - Elementary Algebra**
Linear equations, polynomials, straight lines, graphing, exponents, and word problems.
Last Offered: Summer 2017
3 credits

**MAT 100 - Intermediate Algebra**
Topics include linear, quadratic, polynomial, and basic rational and radical functions with graphing and word problems.
Prerequisite(s): 'C-' or better in MAT 095 or appropriate mathematics placement.
Last Offered: Spring 2021
3 credits

**MAT 102 - Intermediate Algebra (Extended)**
Solutions to linear equations and inequalities, polynomials, quadratic equations, exponential equations, graphing, rational and radical expressions, and functions.
Prerequisite(s): MAT 095 or MAT 101 or appropriate mathematics placement.
Last Offered: Summer 2017
3 credits

**MAT 103 - Mathematics for Liberal Arts**
Intended for the student whose major field of study requires no specific mathematical preparation. Topics include probability, statistics, and aspects of consumer mathematics. Other topics chosen by the instructor could include critical thinking/problem solving, geometry, graph theory, linear and exponential models, and voting theory.
Prerequisite(s): MAT 100 or MAT 100P or MAT 102, or appropriate mathematics placement.
Last Offered: Spring 2021
3 credits
MAT 105 - Mathematics for Elementary Education I
Problem solving, mathematical reasoning, sets, whole numbers, numeration systems, number theory and integers. Required of all students in an elementary school certification program. Does not satisfy the Liberal Education Program Quantitative Reasoning requirement.
Prerequisite(s): MAT 100 or MAT 100P or MAT 102 or appropriate mathematics placement.
Last Offered: Spring 2021
3 credits

MAT 106 - Mathematics for Elementary Education II
Geometry, measurement, rational numbers, irrational numbers, ratio, proportion, percent, problem solving, mathematical reasoning and connections, probability and statistics. Required of all students in an elementary school certification program.
Prerequisite(s): "C-" or better in MAT 105.
Last Offered: Spring 2021
3 credits

MAT 107 - Elementary Statistics
Topics include measures of central tendency and measures of variation; elements of probability; random variables; introduction to estimation and hypothesis testing; linear regression analysis.
Prerequisite(s): MAT 100 or MAT 100P or MAT 102 or appropriate mathematics placement.
Last Offered: Spring 2021
3 credits

MAT 108 - Mathematics for the Natural Sciences
Elementary mathematical modeling using linear functions, exponential functions, and power functions. Additional topics include logarithms, curve sketching, and curve fitting. Examples from the natural sciences.
Prerequisite(s): MAT 100 or MAT 100P or MAT 102 with a grade of ‘C-’ or better or appropriate mathematics placement.
Last Offered: Spring 2021
3 credits

MAT 112 - Algebra for Business and the Sciences
Advanced Intermediate Algebra course that includes concepts from Precalculus. Topics include multiple perspectives of functions: verbal, numerical, algebraic, and graphical and the various notations used to represent functions. Polynomial, absolute value, rational, and radical families of functions will be covered.
Prerequisite(s): 'C-' or better in MAT 100 or MAT 100P, MAT 102 or placement at the appropriate level.
Last Offered: Spring 2021
3 credits

MAT 120 - College Algebra
Algebraic problem solving and quantitative reasoning skills needed for business and social science majors; equations and inequalities in one variable; linear, quadratic, exponential, and logarithmic functions; systems of linear equations in two variables.
Prerequisite(s): C- or better in MAT 112 or appropriate mathematics placement.
Last Offered: Spring 2021
3 credits

MAT 122 - Precalculus
Functions and their graphs, polynomial functions and their zeros, exponential and logarithmic functions, trigonometric functions and analytic trigonometry. Function modeling of data and problems from the sciences.
Prerequisite(s): ‘C-’ or better in MAT 112 or MAT 120, or appropriate mathematics placement.
Last Offered: Spring 2021
4 credits
MAT 125 - Applied Business Mathematics
Topics include exponential and logarithmic functions, systems of linear equations and matrices, linear inequalities, linear programming, Leontief models, limits, continuity, derivatives, and extrema of functions, interest and annuities, break-even, optimization, and other business applications will be emphasized.
Prerequisite(s): 'C-' or better in MAT 112 or MAT 120 or MAT 122 or MAT 124 or appropriate math placement.
Last Offered: Spring 2021
3 credits

MAT 139 - Short Course in Calculus
A one-semester course emphasizing techniques and applications in business and social sciences; functions and models, the derivative, exponential and logarithmic functions, integration.
Prerequisite(s): 'C-' or better in MAT 120, 122, 124, 125, or appropriate mathematics placement.
Last Offered: Spring 2021
3 credits

MAT 150 - Calculus I
Functions, limits, differentiation of algebraic and trigonometric, exponential, and logarithmic functions with applications, indeterminate forms, elementary integrations, Riemann sums.
Prerequisite(s): 'C-' or better in MAT 122 or appropriate mathematics placement.
Last Offered: Spring 2021
4 credits

MAT 151 - Calculus II
Continuation of MAT 150. Calculus of inverse trigonometric functions, techniques, and applications of integration, numerical integration, improper integrals, integration with polar coordinates, parametric curves, infinite sequences and series, power series, Taylor’s formula, vectors in two and three-dimensions.
Prerequisite(s): 'C-' or better in MAT 150.
Last Offered: Spring 2021
4 credits

MAT 178 - Elementary Discrete Mathematics
Set theory, logic, methods of proof, relations and functions, mathematical induction, recursion, graph theory, and algorithms.
Prerequisite(s): MAT 139 or MAT 150 or appropriate mathematics placement; and CSC 152 or DSC 101.
Last Offered: Spring 2021
3 credits

MAT 207 - Mathematics for Middle School Teachers
Examines the concepts of functions and patterns, geometry, counting principles, recursion, and statistical analysis while modeling middle school mathematics teaching.
Prerequisite(s): MAT 106 (or MAT 105 with departmental permission).
Last Offered: Spring 2021
3 credits

MAT 221 - Intermediate Applied Statistics
A treatment of statistics concentrating on techniques used in science and industry. Topics include probability, sampling distributions, estimation, hypothesis testing, regression analysis, and correlation. Use of appropriate calculator is required.
Prerequisite(s): MAT 120 or MAT 122 or appropriate mathematics placement. MAT 139 or MAT 150 recommended.
Last Offered: Spring 2021
4 credits

MAT 245 - Differential Equations
Study of ordinary differential equations. Thorough investigation of first order equations. Additionally, second order linear equations with constant coefficients, systems of differential equations, Laplace transforms, and numerical methods.
Prerequisite(s): 'C-' or better in MAT 151.
Last Offered: Fall 2020
3 credits
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
<th>Prerequisite(s)</th>
<th>Last Offered</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 250</td>
<td>Foundations of Mathematics</td>
<td>A bridge between the calculus and upper level mathematics courses. Logic, sets, relations, functions, methods of proof.</td>
<td>“C-” or better in MAT 151.</td>
<td>Spring 2021</td>
<td>4</td>
</tr>
<tr>
<td>MAT 252</td>
<td>Calculus III</td>
<td>Continuation of MAT 151. Vector-valued functions, three-dimensional geometry, functions of several variables, partial differentiation with applications, double and triple integrals with applications, vector calculus.</td>
<td>'C-' or better in MAT 151.</td>
<td>Spring 2021</td>
<td>4</td>
</tr>
<tr>
<td>MAT 260</td>
<td>Geometry and the Arts</td>
<td>The purpose of the course is to provide students with an adequate geometric background allowing them to understand basic Euclidean geometry. The course will enable students with basic tools for geometric reasoning and proof and will promote their geometric thinking skills. Throughout the course, students will explore and appreciate the use of geometry in the arts. They will identify, analyze, replicate and produce art work using geometric figures and transformations.</td>
<td>MAT 103 or higher.</td>
<td>Spring 2021</td>
<td>3</td>
</tr>
<tr>
<td>MAT 300</td>
<td>History of Mathematics</td>
<td>History of mathematics from earliest days to the discovery of calculus, the proliferation of mathematics in modern times, and the implications of these developments for the present day.</td>
<td>MAT 139 or MAT 150.</td>
<td>Fall 2020</td>
<td>3</td>
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<tr>
<td>MAT 320</td>
<td>Probability</td>
<td>Post-calculus introduction to mathematical probability theory. Topics include Probability Axioms, Conditional Probability, Probability Distributions, Random Variables, Probability Densities, Multivariate Distributions and Densities, Markov Chains, Sampling Distributions, Central Limit Theorem.</td>
<td>'C-' or better in both MAT 250 and MAT 252.</td>
<td>Fall 2019</td>
<td>4</td>
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<tr>
<td>MAT 321</td>
<td>Mathematical Statistics</td>
<td>Mathematical development of sampling distributions, estimation of parameters, confidence intervals, hypothesis testing, introduction to nonparametric methods.</td>
<td>MAT 320.</td>
<td>Spring 2019</td>
<td>3</td>
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<tr>
<td>MAT 322</td>
<td>Numerical Analysis I</td>
<td>Topics include approximate solutions of equations, polynomial approximations of functions, interpolation, numerical integration and their corresponding techniques of error analysis. Computers and calculators are used.</td>
<td>CSC 152 or DSC 101, and “C-” or better in MAT 151.</td>
<td>Fall 2020</td>
<td>4</td>
</tr>
<tr>
<td>MAT 325</td>
<td>Design of Experiments</td>
<td>Fundamental concepts in the design of experiments: review of statistical inference, completely randomized designs, randomized block designs, Latin Square designs, factorial experiments, confounding, and fractional replications.</td>
<td>MAT 221 or MAT 321.</td>
<td>Spring 2020</td>
<td>3</td>
</tr>
</tbody>
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MAT 326 - Regression Analysis

Model building and analysis focusing on regression. Topics include method of least squares, ANOVA, model assumptions, interferences about parameters, residual analysis, model adequacy, dummy variables, non-linear terms, pitfalls, and limitations.
Prerequisite(s): MAT 221 or MAT 321.
Last Offered: Spring 2021
3 credits

MAT 328 - Time Series Analysis

A continuation of a data science class, which will equip students with various forecasting techniques and knowledge on modern statistical methods for analyzing time series data. Although the course will have a theoretical component it will be practical and exercise-driven. The analyses will be performed using the freely available package ASTSA, which accompanies the book. Both R and RStudio will be required for this class.
Prerequisite(s): 'C-' or better in MAT 326 and MAT 372.
Last Offered: not yet offered
3 credits

MAT 329 - Bayesian Analysis and Decision Making

An introduction to Bayesian analysis and inference. It covers many of the topics covered in a standard frequentist survey course from a Bayesian perspective. Topics include gathering datasets, summarizing datasets, probability, Bayes Theorem, Bayesian inference for discrete random variables, Bayesian inference for continuous random variables, comparing Bayesian and frequentist approaches to inference, Bayesian prediction intervals for single mean and single proportion, Bayesian inference for two means and two proportions, and Bayesian inference for linear regression.
Prerequisite(s): MAT 221.
Last Offered: Fall 2020
3 credits

MAT 342 - Statistical Decision Making in the Twenty-First Century

MAT 342 is a second course in statistics and focuses on analyzing data, interpreting results and critically analyzing underlying assumptions. The course presumes knowledge of the following concepts in a prior course: probability, descriptive statistics and statistical inference. A software package is required.
Prerequisite(s): MAT 107, MAT 221, 6 of 8 Tier 2 complete (Honors Coll.: 15 cr. HON or 45 cr. total), and prior or concurrent completion of all Tier 1 (Honors Coll.: T1MC and T1QR only).
Last Offered: Spring 2019
3 credits

MAT 360 - Foundations of Geometry

Introduction to the geometries of Bolyai-Lobachevsky and Riemann and their mathematical significance, critique of Euclid, axiomatic approach to geometry with modern standards of rigor, introduction to metamathematics.
Prerequisite(s): “C-” or better in MAT 250.
Last Offered: Spring 2021
3 credits

MAT 370 - Number Theory

Introduction to mathematical reasoning and rigor. Prime numbers, divisibility, the Fundamental Theorem of Arithmetic, congruencies and modular arithmetic, fundamental number theoretic functions, and an introduction to Diophantine equations.
Prerequisite(s): MAT 178 or MAT 250.
Last Offered: Fall 2020
3 credits

MAT 372 - Linear Algebra

Course emphasizes matrices, systems of linear equations, vector spaces, elementary properties of linear transformation, eigenvalues, and applications.
Prerequisite(s): 'C-' or better in MAT 150.
Last Offered: Spring 2021
3 credits
MAT 375 - Abstract Algebra I
Introduction to the study of algebraic structures. Topics include binary operations, abstract groups, cyclic and permutation groups, homomorphisms, isomorphisms, normal subgroups, quotient groups, and a brief introduction to rings and fields. Prerequisite(s): 'C-' or better in both MAT 250 and MAT 372.
Last Offered: Fall 2020
3 credits

MAT 376 - Abstract Algebra II
Study of rings, and fields. Topics include rings, ideals, homo-morphisms, polynominal rings, integral domains, divisibility, irreducibility criteria, field extensions, finite fields, geometric constructions and elements of Galois Theory. Prerequisite(s): MAT 375.
Last Offered: Spring 2019
3 credits

MAT 378 - Discrete Mathematics
Rigorous introduction to the basic elements of discrete mathematics: recursion, combinatorics, and graph theory. Prerequisite(s): CSC 152 or DSC 101, 'C-' or better in MAT 151, and 'C-' or better in MAT 250 or MAT 178.
Last Offered: Spring 2021
3 credits

MAT 398 - Special Topics in Mathematics
Examination of developments, issues and/or creative work in the field of mathematics. Prerequisite(s): Departmental permission
Last Offered: Spring Break 2018
1 to 6 credits

MAT 405 - Elementary Mathematics from an Advanced Standpoint
An examination of the theoretical bases for fundamental mathematics topics which are normally taught in secondary school. Prerequisite(s): 'C-' or better in MAT 250, junior status and mathematics major.
Last Offered: Fall 2020
3 credits

MAT 408 - Technology for Teaching Secondary Math Education
Mathematics-specific technology tools for the secondary mathematics teacher for lesson preparation and presentations. Techniques for integrating dynamic computer software, the graphing calculator and its applications in teaching. Designing technology-based activities for mathematics instruction. Prerequisite(s): Departmental permission.
Last Offered: Spring 2021
3 credits

MAT 428 - Mathematical Foundations in Machine Learning
A broad introduction to machine learning by using the tools of basic knowledge of programming and probability theory, including classification; support vector machines; neural networks; clustering; feature selection; ensemble learning and reinforcement learning. The course will also discuss recent applications of machine learning, such as to computer science, data mining, bioinformatics and so on. Prerequisite(s): 'C-' or better in MAT 221 and MAT 372.
Last Offered: not yet offered
3 credits

MAT 429 - Modern Nonparametric Statistics
Covers nonparametric statistical analysis and inference. Topics include empirical distribution functions, inference using bootstrapping, permutation tests, density estimation and nonparametric linear regression. Prerequisite(s): 'C-' or better in MAT 221 and MAT 372.
Last Offered: not yet offered
3 credits
MAT 450 - Analysis
Theoretical foundations of functions of one real variable: limits, continuity, differentiability, Riemann integral.
Prerequisite(s): “C-” or better in both MAT 250 and MAT 252.
Last Offered: Spring 2020
3 credits

MAT 480 - Topology
Metric spaces and fundamental concepts, topological spaces, subspaces and product spaces, countability properties, separation properties, compactness and connectedness.
Prerequisite(s): “C-” or better in both MAT 250 and 372.
Last Offered: Spring 2021
3 credits

MAT 488 - Seminar in Mathematical Modeling
The process of constructing and using mathematical models. Investigations focus on deterministic, probabilistic, and axiomatic models in the physical, social, and life sciences. Emphasis on independent work and on student written and oral presentations.
Prerequisite(s): MAT 221 or MAT 321, and CSC 152 or DSC 101, and ‘C-’ or better in MAT 252 and MAT 372.
Last Offered: Spring 2021
3 credits

MAT 490 - Teaching Mathematics in the Secondary School
Methods of teaching mathematics grades 7-12. Lesson and unit planning, classroom management, learning styles, tasks, assessment, incorporating technology, state and national standards. This course has a required field experience component. For secondary certification candidates only.
Prerequisite(s): Departmental permission.
Last Offered: Fall 2020
3 credits

MAT 494 - Student Teaching — Mathematics
Guided observation and supervised student teaching in grades 7-12 in cooperating schools. Twelve-week course.
Prerequisite(s): MAT 490.
Last Offered: Spring 2021
9 credits

MAT 496 - Service Learning for Mathematics Education
Student teachers design, analyze, and reflect on teaching techniques to be used in the field. Student teachers also perform case studies that encompass and address various issues and demonstrate positive impact on the learning of their secondary students. This course is taken concurrently with MAT 494, Student Teaching (Mathematics).
Prerequisite(s): Departmental permission, 6 of 8 Tier 2 complete (Honors Coll.: 15 cr. HON or 45 cr. total), and prior or concurrent completion of all Tier 1 (Honors Coll.: T1MC and T1QR only).
Last Offered: Spring 2021
3 credits

MAT 497 - Internship
A supervised internship offering practical business, industry or government experience which relates to the student’s specialization.
Last Offered: Spring 2020
3 or 6 credits

MAT 499 - Independent Study
Provides properly qualified students with an opportunity for independent study and careful discussion from an advanced standpoint of selected topics in undergraduate mathematics.
Prerequisite(s): Departmental permission.
Last Offered: Spring 2020
1 to 4 credits