STATISTICS

Overview and Contact Information

Statistics is used in most professions, in most sectors of the economy, and in a great many academic areas. Each year some students enter graduate programs in statistics, or in allied fields (business, economics, education, or psychology). Many students enter the job market and later pursue advanced degrees.

Contact Information

Jennifer Paulhus, Chair
Connell Heady, Academic Department Coordinator

415A Clapp Laboratory
413-538-2162
https://www.mtholyoke.edu/academics/find-your-program/statistics

Learning Goals

We welcome all students into the Statistics major, and we aim to create an inclusive, supportive environment for everyone. Statistics majors have the following learning goals:

- Communicate statistical concepts and their interpretation, with statistical colleagues and with a wider audience
- Describe key statistical methods and the reasoning behind them
- Use appropriate statistical and computational methods to explore data and draw conclusions
- Ask questions about new methods and applications, learn new techniques, and make new discoveries
- Incorporate “big picture” reasoning, including ethics, practicality, and creativity, into statistical practice
- Develop the independence to approach new problems, and the ability to collaborate effectively.

Faculty

This area of study is administered by the Department of Mathematics and Statistics:

Jennifer Paulhus, Professor of Mathematics

Chassidy Bozeman, Associate Professor of Mathematics, Teaching Fall Only

Timothy Chumley, Associate Professor of Mathematics on the John Stewart Kennedy Foundation

Alanna Hoyer-Leitzel, Associate Professor of Mathematics

Lidia Mrad, Associate Professor of Mathematics, On Leave 2026-2027

Marie Ozanne, Associate Professor of Statistics

Dylan Shepardson, Robert L. Rooke Associate Professor of Mathematics, Teaching Spring Only

Laura Tupper, Associate Professor of Statistics

Isabelle Beaudry, Assistant Professor of Statistics

Tori L. Day, Assistant Professor of Mathematics

Erin Griffin-Bishop, Assistant Professor of Mathematics

Laura Lyman, Clare Booth Luce Assistant Professor of Statistics

Corrine Yap, Assistant Professor of Mathematics

Derek Young, Assistant Professor of Mathematics

Kenneth Mulder, Visiting Associate Professor in Mathematics and Statistics

Ishfaaq Mohammed Imtiyas, Visiting Assistant Professor in Statistics

Benjamin Pittman-Polletta, Visiting Assistant Professor in Statistics

Cristian Rodriguez Avila, Visiting Assistant Professor in Mathematics

Elvin Shrestha, Visiting Assistant Professor in Mathematics

Requirements for the Major

A minimum of 36 credits:

Code	Title	Credits
As a prerequisite for MATH-203:		
MATH-101	Calculus I	
MATH-102	Calculus II	
MATH-203	Calculus III	4
MATH-211	Linear Algebra	4
As a prerequisite for STAT-242:		
STAT-140	Introduction to the Ideas and Applications of Statistics	
STAT-242	Intermediate Statistics	4
STAT-340	Applied Regression Methods	4
MATH-342	Probability	4
STAT-343	Mathematical Statistics	4
12 additional credits in mathematics or statistics at the 200-level or above [1]		12
Total Credits		**36**

[1] A 300-level course that contains substantial mathematical or statistical content in another discipline may be used to fulfill at most 4 credits toward the major with prior departmental approval.

Students considering developing a special major in statistics and economics should consult the Special Major (http://catalog.mtholyoke.edu/areas-study/special-major/) chapter.

Requirements for the Minor

A minimum of 16 credits:

Code	Title	Credits
At least one 200-level course in statistics		4
At least one 300-level course in statistics		4

Two additional courses in mathematics or statistics at the 200 level or above	8
Total Credits	**16**

Additional Specifications

Substitutions are possible with the permission of the department. Students planning a minor in statistics should consult one of the statistics advisors.

With departmental permission, students who have already completed one 100-level exploration course may elect to enroll in a second exploration course at the 200-level so that it may be counted toward the minor.

Course Advice

Beginning the Study of Statistics

A natural way to begin if you have not studied statistics is with STAT-140, Introduction to the Ideas and Applications of Statistics.

A 200-level course in statistics is a good choice if you have taken an advanced placement statistics course or have taken the equivalent of a 100-level statistics course.

Advice to Students with Special Interests

Actuarial science

Students interested in this area should plan to cover the material that is included in the first two actuarial exams as part of their undergraduate program. This material is included in Calculus I (MATH-101), Calculus II (MATH-102), Calculus III (MATH-203), Probability (MATH-342), and Mathematical Statistics (STAT-343), along with Macroeconomic Theory (ECON-211), Microeconomic Theory (ECON-212), and Economics of Corporate Finance (ECON-215). Students are also encouraged to obtain experience through an internship.

Biostatistics, public health, or natural resources

Students interested in these areas should include substantial work in biology, chemistry, geology, and/or environmental studies in their programs.

Economics or business

Many students with these interests design a special major (http://catalog.mtholyoke.edu/areas-study/special-major/) in mathematics and economics or a special major (http://catalog.mtholyoke.edu/areas-study/special-major/) in statistics and economics.

Engineering

Students interested in engineering often double-major in mathematics and physics and/or participate in one of the College's five-year, dual-degree programs with Dartmouth's Thayer School of Engineering, or California Institute of Technology, or the University of Massachusetts (see the Other Degree and Certificate Programs chapter).

Graduate school

Students preparing for graduate school in statistics or mathematics often participate in an undergraduate research program in the summer after the junior year and continue with an honors thesis in the senior year. Students considering graduate work in statistics at the level of a Ph.D. are encouraged to include abstract algebra and especially MATH-301.

Teaching certification

Students interested in pursuing certification for middle school or secondary school should major in mathematics rather than statistics. However, there is increasing emphasis on statistics in secondary school, and any of the applied courses would provide good preparation.

Course Offerings

STAT-107 Foundations of Data and Visualization
Not Scheduled for This Year. Credits: 4
Pictures, plots, and visualizations can be incredibly effective ways to understand information, tell stories, and make arguments. But how do you know if a picture is telling the truth? How do you make a picture that tells your story? In this course, we'll explore ways to understand, critique, and create different types of data visualizations: things you'll see in the news and generate in your future jobs. We'll also focus on building foundational skills and comfort with data, code, and tools that will prepare you not just for future statistics and data science courses, but also for the ever-growing quantitative component of work in the humanities and social sciences.
Applies to requirement(s): Math Sciences
Advisory: This course is intended for students with little or no college-level experience in statistics, computing, or mathematics. Students who have taken (or are concurrently taking) STAT-140, DATA-113, or equivalent, or scored 4 or higher on the AP Statistics exam, are typically not eligible, but may consult with the instructor.

STAT-140 Introduction to the Ideas and Applications of Statistics
Fall and Spring. Credits: 4
This course provides an overview of statistical methods, their conceptual underpinnings, and their use in various settings taken from current news, as well as from the physical, biological, and social sciences. Topics will include exploring distributions and relationships, planning for data production, sampling distributions, basic ideas of inference (confidence intervals and hypothesis tests), inference for distributions, and inference for relationships, including chi-square methods for two-way tables and regression.
Applies to requirement(s): Math Sciences
Advisory: 2 years of high school algebra.

STAT-242 Intermediate Statistics
Fall and Spring. Credits: 4
In this course, students will learn how to analyze data arising from a broad array of observational and experimental studies. Topics covered will include exploratory graphics, description techniques, the fitting and assessment of statistical models, hypothesis testing, and communication of results. Specific topics may include multiple regression, ANOVA, and non-linear regression. Statistical software will be used.
Applies to requirement(s): Math Sciences
Prereq: STAT-140 or equivalent.

STAT-244 Intermediate Topics in Statistics

STAT-244NF Intermediate Topics in Statistics: 'Infectious Disease Modeling'
Spring. Credits: 4
Infectious disease has plagued humanity since time immemorial. Statistical models serve a critical role in improving understanding of the progression and proliferation of infection in a population, as well as the impact of interventions in stopping the spread of disease. In this course, we will explore regression and compartmental model-based approaches, which will be motivated by some of the most impactful epidemics and pandemics in recent history, including HIV/AIDS, Ebola, Zika, and COVID-19. R statistical software will be used.
Applies to requirement(s): Math Sciences
Prereq: STAT-140.

STAT-244SC Intermediate Topics in Statistics: 'Computational Statistics'
Not Scheduled for This Year. Credits: 4
Computation is now an essential component of several modern statistical methods. This course will introduce students to computationally intensive techniques in statistics and explore the role of computation as a tool for discovery. Specifically, it will emphasize simulation-based, rather than calculus-based, approaches in statistical theory. Topics may include sampling algorithms, numerical analysis, and missing data. All data analysis in the course will be performed using R software. Research applications will be emphasized through assignments and student-defined projects.
Applies to requirement(s): Math Sciences
Prereq: STAT-140.
Advisory: Students should have experience with the programming language R.

STAT-295 Independent Study
Fall and Spring. Credits: 1 - 4
Restrictions: Contact instructor for independent study declaration form and signatures.
Instructor permission required.
Advisory: The permission of the department is required for independent work to count toward the major or minor.

STAT-331 Design of Experiments
Spring. Credits: 4
How do you get informative research results? By doing the right experiment in the first place. We'll look at the techniques used to plan experiments that are both efficient and statistically sound, the analysis of the resulting data, and the conclusions we can draw from that analysis. Using a framework of optimal design, we'll examine the theory both of classical designs and of alternatives when those designs aren't appropriate. On the applied side, we'll use R to explore real-world experimental data from science, industry, and everyday life; and we'll discuss key principles for working with expert (and not-so-expert) collaborators to help them set up the experiments they need.
Applies to requirement(s): Math Sciences
Prereq: STAT-242.

STAT-340 Applied Regression Methods
Fall and Spring. Credits: 4
This course includes methods for choosing, fitting, evaluating, and comparing statistical models; introduces statistical inference; and analyzes data sets taken from research projects in the natural, physical, and social sciences.
Applies to requirement(s): Math Sciences
Prereq: MATH-211 and STAT-242.

STAT-343 Mathematical Statistics
Spring. Credits: 4
This course is an introduction to the mathematical theory of statistics and to the application of that theory to the real world. Topics include probability, random variables, special distributions, introduction to estimation of parameters, and hypothesis testing.
Applies to requirement(s): Math Sciences
Prereq: MATH-102 and MATH-342.

STAT-344 Seminar in Statistics and Scientific Research

STAT-344ND Seminar in Statistics and Scientific Research: 'Analysis of Neural Data'
Not Scheduled for This Year. Credits: 4
Neuroscience addresses big questions about the mind by studying the structure and function of the brain -- questions like: How do we remember, learn, and make decisions? Why do we feel emotions and experience consciousness? What causes mental illness? This increasingly means analyzing datasets that are large, complex, high dimensional, and time varying. Neural data analysis employs a unique set of concepts and approaches drawing on statistics, mathematics, physics, and computer science. In this course, we will apply these techniques to real neural datasets through hands-on activities and a final independent project. Possible topics include statistical modeling of neuronal spiking data; analysis of high-dimensional data with spatial structure (e.g., EEG, fMRI); and techniques in time series analysis (e.g., autoregressive modeling, time-frequency decomposition, network connectivity, causality).
Crosslisted as: NEURO-309ND
Applies to requirement(s): Math Sciences
Prereq: STAT-242.
Advisory: Students who have completed courses in allied fields on research methods (e.g., PSYCH-204 and NEURO-221) or computational and mathematical techniques (e.g., COMSC-335 and PHYS-205) may also be qualified. Contact the instructor to discuss.

STAT-344SM Seminar in Statistics and Scientific Research: 'Survey Sampling'
Fall. Credits: 4
Students will explore statistical techniques for analyzing complex survey designs. Sample surveys are used to obtain data on demography, health, and development; to measure attitudes and beliefs; to estimate natural resources; to evaluate the impact of social programs; and other uses. The proper analysis of these surveys is crucial to their utility. We will cover topics including survey design, estimation, statistical properties of estimators, poststratification, imputation, and survey error. We will also apply these methods by using real (and often messy) survey data through assignments and projects. Data analysis will be performed through R programming. Background should include estimation, confidence intervals and hypothesis testing.
Applies to requirement(s): Math Sciences
Prereq: STAT-242 or both STAT-140 and MATH-342.

STAT-344TM Seminar in Statistics and Scientific Research: 'Time Series Analysis'
Not Scheduled for This Year. Credits: 4
Time series -- data collected across time -- show up in a vast range of application areas, from climate to economics to music. But they can have special behaviors, like seasonality, memory, and directionality, that require some special treatment! We'll look at tools for describing, modeling, and predicting time series behavior. Topics include decomposition, ARIMA, exponential smoothing, dynamic regression, and a foray into the frequency domain. We'll apply these concepts using real datasets in R.
Applies to requirement(s): Math Sciences
Prereq: STAT-242 and MATH-211.
Advisory: Previous or concurrent registration in STAT-340 (or other multiple regression experience) is recommended.

STAT-351 Bayesian Statistics
Not Scheduled for This Year. Credits: 4
Bayesian statistics refers to a statistical paradigm that has its roots in Bayes' theorem, where prior belief and data can be combined to update our understanding of a particular problem in what is known as the posterior. In this class, you can expect to combine your knowledge of probability and statistics to develop and apply Bayesian thinking to statistical modeling. Possible topics include conjugate families, posterior simulation, regression and classification, and hierarchical modeling. R statistical software will be used.
Applies to requirement(s): Math Sciences
Prereq: MATH-342 and STAT-242.
Advisory: Students may substitute another 200-level Statistics course for STAT-242 with instructor permission.

STAT-395 Independent Study
Fall and Spring. Credits: 1 - 8
Restrictions: Contact instructor for independent study declaration form and signatures.
Instructor permission required.
Advisory: The permission of the department is required for independent work to count toward the major or minor.