BIOMETRY & STATISTICS (BTRY)

BTRY 3010 - Statistics I (4 Credits)
Crosslisted with STSCI 2200
Students will be able to perform a variety of basic statistical analyses including: t-tests, two-sample t-tests, tests for categorical data, and linear regression.
Prerequisites: MATH 1110 or equivalent.
Forbidden Overlaps: AEM 2100, BTRY 3010, BTRY 6010, CRP 1200, ENGRD 2700, HADM 2010, HADM 2011, ILRST 2100, ILRST 6100, MATH 1710, PSYCH 2500, PUBPOL 2100, PUBPOL 2101, SOC 3010, STSCI 2100, STSCI 2150, STSCI 2200. In addition, no credit for MATH 1710 if taken after ECON 3130, ECON 3140, MATH 4720, or any other upper-level course focusing on the statistical sciences.
Distribution Requirements: (DLS-AG, MQL-AG, OPHLS-AG), (SDS-AS)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Students will be able to design an experiment using randomization techniques.
- Students will be able to use R Markdown for reproducible research.
- Students will be able to produce effective graphical summaries of collected data.
- Students will learn how sampling distributions are determined and utilized for statistical analysis.
- Students will understand why some estimators are more desirable than others.
- Students will be able to perform a variety of basic statistical analyses including: t-tests, ANOVA, two-sample t-tests, tests for categorical data, linear regression, and multiple linear regression.
- Students will be able to assess the quality of a statistical analysis.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 3020 - Statistics II (4 Credits)
Crosslisted with STSCI 3200
Applies linear statistical methods to quantitative problems addressed in biological and environmental research. Methods include linear regression, inference, model assumption evaluation, the likelihood approach, matrix formulation, generalized linear models, single-factor and multifactor analysis of variance (ANOVA), and a brief foray into nonlinear modeling. Carries out applied analysis in a statistical computing environment.
Prerequisites: BTRY 3010 or equivalent.
Forbidden Overlaps: BTRY 3020, ILRST 2110, STSCI 2110, STSCI 3200
Distribution Requirements: (DLS-AG, OPHLS-AG)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Students will be able to design a statistical experiment using randomization techniques.
- Students will be able to analyze multivariate linear and nonlinear data that include quantitative and qualitative variables.
- Students will be able to apply generalized linear model, generalized additive models, and mixed effects models to appropriately collected data.
- Students will be able to formulate and evaluate parametric and nonparametric methods for determining model uncertainty.
- Students will be able to employ matrix methods to effectively design and implement linear models.
- Students will be able to assess the quality of a statistical analysis.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 3080 - Probability Models and Inference (4 Credits)
Crosslisted with STSCI 3080, ILRST 3080
This course provides an introduction to probability and parametric inference. Topics include: random variables, standard distributions, the law of large numbers, the central limit theorem, likelihood-based estimation, the method of moments, sampling distributions and confidence intervals.
Prerequisites: STSCI 2150 or STSCI 2200, MATH 1120 and MATH 2220 or their equivalents.
Forbidden Overlaps: BTRY 3080, ECON 3110, ECON 3130, ILRST 3080, ILRST 3110, MATH 4710, STSCI 3080, STSCI 3110
Distribution Requirements: (DLS-AG, OPHLS-AG), (ICE-IL), (SDS-AS)
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Students will be able to manipulate random variables and their distributions using differential and integral calculus.
- Students will be able to derive properties of standard probability.
- Students will be able to derive maximum likelihood estimators for standard probability distributions and discuss their properties.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 3090 - Financial Math for Actuarial Science (4 Credits)
Crosslisted with STSCI 3090
This course will cover financial mathematics and financial instruments relevant to exam FM offered by the Society of Actuaries. Topics on the present and accumulated value of future cash flows will be covered including the measurement of simple and compound interest, annuities, yield rates, amortization schedules, bonds.
Prerequisites: BTRY 3080 or permission from the instructor.
Distribution Requirements: (SMR-AS)
Last Four Terms Offered: Fall 2023, Fall 2022, Spring 2020, Spring 2018
Learning Outcomes:

- Apply the principles of financial mathematics.
- Understand the fundamentals of financial instruments.
- Have a strong background for studying for the SOA FM exam.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 3100 - Statistical Sampling (4 Credits)
Crosslisted with STSCI 3100, ILRST 3100
Theory and application of statistical sampling, especially in regard to sample design, cost, estimation of population quantities, and error estimation. Assessment of nonsampling errors. Discussion of applications to social and biological sciences and to business problems.
Prerequisites: STSCI 2150 or STSCI 2200/BTRY 3010 or equivalent, STSCI 3200/BTRY 3020 or BTRY 6020.
Distribution Requirements: (DLS-AG, OPHLS-AG), (ICE-IL), (SDS-AS)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Schedule of Classes (https://classes.cornell.edu/)

BTRY 4030 - Linear Models with Matrices (4 Credits)
Crosslisted with STSCI 4030
The focus of this course is the theory and application of the general linear model expressed in its matrix form. Topics will include: least squares estimation, multiple linear regression, coding for categorical predictors, residual diagnostics, anova decomposition, polynomial regression, model selection techniques, random effects and mixed models, maximum likelihood estimation and distributional theory assuming normal errors. Homework assignments will involve computation using the R statistical package.
Prerequisites: STSCI 2150 or STSCI 2200/BTRY 3010, BTRY 3080, MATH 1920, MATH 2210 or their equivalents, STSCI 3200/BTRY 3020 or BTRY 6020.
Distribution Requirements: (DLS-AG, OPHLS-AG), (SDS-AS), (STA-IL)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Students will be able to discuss the mathematical foundations of linear statistical models using matrix algebra.
- Students will be able to use diagnostic measures to assess the validity of a given statistical model.
- Students will be able to analyze data involving both fixed and random factors.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 4090 - Theory of Statistics (4 Credits)
Crosslisted with STSCI 4090
Introduction to classical theory of parametric statistical inference that builds on the material covered in BTRY 3080. Topics include: sampling distributions, principles of data reduction, likelihood, parameter estimation, hypothesis testing, interval estimation, and basic asymptotic theory.
Prerequisites: BTRY 3080 or MATH 4710 or equivalent and at least one introductory statistics course.
Forbidden Overlaps: BTRY 4090, ECON 3130, MATH 4720, STSCI 4090
Distribution Requirements: (DLS-AG, OPHLS-AG), (SDS-AS)
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Learning Outcomes:

- Describe the general principles of statistical estimation and testing.
- Design a statistical estimator in a principled way based on a description of a dataset.
- Analyze the theoretical properties of an estimator and a hypothesis test.
- Calculate and correctly interpret confidence intervals, p-values, statistical significance, and power.
- Recognize the general principles underlying common statistical procedures.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 4100 - Multivariate Analysis (4 Credits)
Crosslisted with STSCI 4100, ILRST 4100
This course is on the basics of multivariate statistical analysis. The focus ison the applied side, and the students will learn by examples of multiple real-life datasets. Studentswill learn to visualize the datasets and conduct simple statistical analysis using linear/nonlinearmethods. We will also cover web-scraping and data cleaning.
Prerequisites: STSCI 2100 or equivalent.
Distribution Requirements: (DLS-AG, OPHLS-AG), (ICE-IL), (SDS-AS)
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2016
Learning Outcomes:

- Prepares the students for real-life multivariate data analysis. The students will get their hands dirty in messy datasets and learn that each dataset calls for its own approach of analysis. They will get more familiar with manipulate datasets in R, collaborate with others, and enhance their skills in creative thinking and presentation.
- Students will be able to analyze multivariate data using modern statistical software.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 4110 - Categorical Data (3 Credits)
Crosslisted with STSCI 4110, ILRST 4110
Categorical data analysis, including logistic regression, log-linear models, stratified tables, matched pairs analysis, polytomous response, and ordinal data. Applications in biological, biomedical and social sciences.
Prerequisites: BTRY 3020, BTRY 6020, or equivalent with BTRY 3080 or MATH 4710 also highly recommended.
Distribution Requirements: (DLS-AG, OPHLS-AG), (ICE-IL), (SDS-AS)
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Schedule of Classes (https://classes.cornell.edu/)

BTRY 4140 - Applied Design (4 Credits)
Crosslisted with STSCI 4140, ILRST 4140
This course begins with a discussion of some general principles of experimental design. Classical designs are covered in detail, motivated by real data applications. These include completely randomized, randomized block, balanced incomplete block, split-plot, repeated measures and fractional factorial designs. If time permits rank-based nonparametric versions of the classical designs will also be covered.
Prerequisites: STSCI 3200 or equivalent.
Distribution Requirements: (ICE-IL), (OPHLS-AG), (SDS-AS)
Last Four Terms Offered: Spring 2022, Spring 2021, Spring 2020, Spring 2019
Learning Outcomes:

- Students will be able to explain the basic design principles such as randomization, blocking and stratification.
- Students will be able to determine an appropriate design based on design principles.
- Students will be able to apply standard designs to date using modern statistical software and interpret the results.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 4270 - Introduction to Survival Analysis and Loss Models (3 Credits)
Crosslisted with STSCI 4270
Develops and uses statistical methods appropriate for analyzing right-censored (i.e., incomplete) time-to-event data. Topics covered include nonparametric estimation (e.g., life table methods, Kaplan Meier estimator), nonparametric methods for comparing the survival experience of two or more populations, and semiparametric and parametric methods of regression for censored outcome data. Emphasis is given to applications in medicine and actuarial studies. Substantial use is made of the R statistical software package.
Prerequisites: BTRY 3080 or equivalent, MATH 1120 or equivalent, and MATH 2210 or equivalent.
Distribution Requirements: (DLS-AG, OPHLS-AG), (SDS-AS)
Last Four Terms Offered: Spring 2023, Fall 2019, Fall 2018, Fall 2017
Learning Outcomes:

- Students will be able to conduct appropriate nonparametric and parametric analyses of right-censored survival data using the R software language, including tabular and graphical methods (i.e., life tables and Kaplan Meier plots), hypothesis testing (e.g., logrank tests and Wald tests) and likelihood-based methods of regression (i.e., proportional hazards and accelerated failure time regression models).
- Students will be able to interpret the results of a statistical analysis involving right censored survival data as well as articulate the associated limitations of such analyses.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 4950 - Statistical Consulting (2 Credits)
Crosslisted with STSCI 4950
This course will give students the opportunity to apply the statistical knowledge gained in their courses to real-life problems. Students will be integrated in the Cornell Statistical Consulting Unit (CSCU) and be exposed to various areas in which statistical methods are applied. Students will gain experience in choosing appropriate statistical procedures and their implementations in various statistical software packages. They will also learn how to communicate effectively to understand the client's problem and to explain methods and results to non-statisticians.
Prerequisites: BTRY 3010 and BTRY 3020, or BTRY 6010 and BTRY 6020.
Last Four Terms Offered: Fall 2023, Fall 2022, Fall 2021, Fall 2020
Learning Outcomes:

- Integrate the statistical knowledge gained in courses and apply them to real-life problems.
- Learn to communicate effectively with clients to gather the information needed to make the link between the research questions to be addressed and the statistical methods.
- Research the application of statistical methodologies that are useful to clients and explain them to an audience of non-statisticians.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 4970 - Undergraduate Individual Study in Biometry and Statistics (1-3 Credits)
Consists of individual tutorial study selected by the faculty. Because topics usually change from year to year, this course may be repeated for credit.
Exploratory Studies: (CU-UG)

Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BTRY 4980 - Undergraduate Supervised Teaching (1-3 Credits)
Students assist in teaching a course appropriate to their previous training. Students meet with a discussion or laboratory section and regularly discuss objectives with the course instructor.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BTRY 4990 - Undergraduate Research (1-5 Credits)
Permits outstanding undergraduates to carry out independent study of suitable problems under appropriate supervision. Students cannot receive both pay and credit for the same hours of work.
Enrollment Information: Enrollment limited to: Statistics and Biometry undergraduate students.
Exploratory Studies: (CU-UG)

Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BTRY 5010 - Statistics I (4 Credits)
Crosslisted with STSCI 5200
Students will be able to perform a variety of basic statistical analyses including: t-tests, two-sample t-tests, tests for categorical data, and linear regression.
Prerequisites: MATH 1110 or equivalent.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Schedule of Classes (https://classes.cornell.edu/)

BTRY 5020 - Statistics II (4 Credits)
Crosslisted with STSCI 5201
Applies linear statistical methods to quantitative problems addressed in biological and environmental research. Methods include linear regression, inference, model assumption evaluation, the likelihood approach, matrix formulation, generalized linear models, single-factor and multifactor analysis of variance (ANOVA), and a brief foray into nonlinear modeling. Carries out applied analysis in a statistical computing environment.
Prerequisites: BTRY 3010 or equivalent.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Learning Outcomes:

- Students will be able to design a statistical experiment using randomization techniques.
- Students will be able to analyze multivariate linear and nonlinear data that include quantitative and qualitative variables.
- Students will be able to apply generalized linear model, generalized additive models, and mixed effects models to appropriately collected data.
- Students will be able to formulate and evaluate parametric and nonparametric methods for determining model uncertainty.
- Students will be able to employ matrix methods to effectively design and implement linear models.
- Students will be able to assess the quality of a statistical analysis.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 5090 - Theory of Statistics (4 Credits)
Crosslisted with STSCI 5090
Introduction to classical theory of parametric statistical inference that builds on the material covered in BTRY 3080. Topics include sampling distributions, principles of data reduction, likelihood, parameter estimation, hypothesis testing, interval estimation, and basic asymptotic theory.
Prerequisites: BTRY 3080 or MATH 4710, or equivalent and STSCI 2200 or equivalent.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BTRY 6010 - Statistical Methods I (4 Credits)
Crosslisted with ILRST 6100
Develops and uses statistical methods to analyze data arising from a wide variety of applications. Topics include descriptive statistics, point and interval estimation, hypothesis testing, inference for a single population, comparisons between two populations, one- and two-way analysis of variance, comparisons among population means, analysis of categorical data, and correlation and regression analysis. Introduces interactive computing through statistical software. Emphasizes basic principles and criteria for selection of statistical techniques.
Forbidden Overlaps: AEM 2100, BTRY 3010, BTRY 6010, CRP 1200, ENGRD 2700, HADM 2010, HADM 2011, ILRST 2100, ILRST 6100, MATH 1710, PSYCH 2500, PUBPOL 2100, PUBPOL 2101, SOC 3010, STSCI 2100, STSCI 2150, STSCI 2200. In addition, no credit for MATH 1710 if taken after ECON 3130, ECON 3140, MATH 4720, or any other upper-level course focusing on the statistical sciences.
Enrollment Information: Enrollment limited to: graduate students or permission of instructor.
Last Four Terms Offered: Fall 2024, Fall 2023, Fall 2022, Fall 2021
Learning Outcomes:

- Learn to develop and use statistical methods to analyze data arising from a wide variety of applications. Students should learn to apply methodologies which include descriptive statistics, point and interval estimation, hypothesis testing, inference for a single population, comparisons between two populations, one- and two-way analysis of variance, comparisons among population means, analysis of categorical data, and correlation and regression analysis.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 6020 - Statistical Methods II (4 Credits)
Crosslisted with STSCI 6020
Continuation of BTRY 6010. Emphasizes the use of multiple regression analysis, analysis of variance, and related techniques to analyze data in a variety of situations. Topics include an introduction to data collection techniques; least squares estimation; multiple regression; model selection techniques; detection of influential points, goodness-of-fit criteria; principles of experimental design; analysis of variance for a number of designs, including multi-way factorial, nested, and split plot designs; comparing two or more regression lines; and analysis of covariance. Emphasizes appropriate design of studies before data collection, and the appropriate application and interpretation of statistical techniques. Practical applications are implemented using a modern, widely available statistical package.
Prerequisites: BTRY 6010 or equivalent.
Enrollment Information: Enrollment limited to: graduate students or permission of instructor.
Last Four Terms Offered: Spring 2025, Spring 2024, Spring 2023, Spring 2022
Schedule of Classes (https://classes.cornell.edu/)

BTRY 6970 - Individual Graduate Study in Biometry and Statistics (1-4 Credits)
Individual tutorial study selected by the faculty. Because topics usually change from year to year, this course may be repeated for credit.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BTRY 7900 - Graduate-Level Dissertation Research (1-9 Credits)
Research at the Ph.D. level.
Enrollment Information: Enrollment limited to: Ph.D. candidates.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BTRY 7950 - Statistical Consulting (2 Credits)
By interacting with consultants from the Cornell Statistical Consulting Unit (CSCU) and their clients, students will learn to provide statistical consulting to researchers from a variety of disciplines. Students will gain experience in choosing and implementing appropriate statistical procedures as well as communicating effectively to understand the client's problem and to explain methodology and results to non-statisticians.
Prerequisites: STSCI 7170
Last Four Terms Offered: Fall 2023, Fall 2022, Fall 2021, Fall 2020
Learning Outcomes:

- Integrate the statistical knowledge gained in courses and apply them to real life problems.
- Learn to communicate effectively with clients to gather the information needed to make the link between the research questions to be addressed and the statistical methods.
- Research the application of statistical methodologies that are useful to clients and explain them to an audience of non-statisticians.

Schedule of Classes (https://classes.cornell.edu/)

BTRY 7980 - Graduate Supervised Teaching (2-4 Credits)
Students assist in teaching a course appropriate to their previous training. Students meet with a discussion section, prepare course materials, and assist in grading. Credit hours are determined in consultation with the instructor, depending on the level of teaching and the quality of work expected.
Prerequisites: at least two advanced courses in statistics and biometry.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BTRY 8900 - Master's Level Thesis Research (1-9 Credits)
Research at the M.S. level.
Enrollment Information: Enrollment limited to: MS candidates.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)

BTRY 9900 - Doctoral-Level Dissertation Research (1-9 Credits)
Thesis research for Ph.D. candidates after A exam has been passed.
Last Four Terms Offered: Spring 2025, Fall 2024, Spring 2024, Fall 2023
Schedule of Classes (https://classes.cornell.edu/)