

INFORMATION ABOUT STATISTICS COURSES AT HAVERFORD

Haverford College offers a wide range courses on statistical theory and applications. This document/website is intended to help students who are contemplating taking one or more statistics courses decide which would be best. It is, of course, very important for students also to discuss their course selections with their faculty advisors.

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QUICK INFORMATION: WHAT STATISTICS COURSES SHOULD I TAKE?

1. Introductory Statistics

There are 6 introductory statistics courses offered at Haverford. The courses, their corresponding pre-requisites and college division distributions are summarized in the following table:

Course	Pre-requisite	College Distribution	Comments
ECON 203*	ECON 105	SO/QU	Economics majors and minors are required to take either Econ 203 or Econ 204
ECON 204*	ECON 105 and MATH 114	SO/QU	
MATH 103	None	NA/QU	Designed for students with weak math backgrounds
MATH 203*	MATH 114	NA/QU	200-level math elective
PSYC 200	PSYC 100	SO/QU	Required for psychology major
SOCL 215*	None	SO/QU	Required for sociology major

- *** Normally students are not allowed to take more than one of the following four courses: ECON H203, ECON H204, MATH H203, and SOCL H215.** In special cases, and only with permission of the chair of the department offering the course, a student may take more than one of the above four courses.

2. Intermediate Applied Statistics Courses

- ECON H304: Introduction to Econometrics
Prerequisites: (i) one of the following: ECON H203, ECON H204 or Math H203; and (ii) MATH H114 (Calculus II).
- MATH H286: Applied Multivariate Statistical Analysis
Prerequisites: (i) Either ECON H204 or MATH H203, and (ii) MATH H215 (Linear Algebra). The course is more theoretical than ECON H304.
- **No student should take both ECON H304 and Math H286.**

3. Upper Level Theoretical Statistics Courses

- MATH H218: Probability and MATH H396: Advanced Topics in Probability and Statistics
Students who want to learn statistics theorems should take the MATH H218 and MATH H396 sequence. The pre-requisite for MATH H218 is MATH H121 (Calculus III), and the pre-requisite for MATH H396 is MATH H218.

[Detailed course descriptions](#) and [complete guidelines for choosing statistics courses](#) are available below.

DETAILED COURSE INFORMATION

Introductory Statistics Courses

Six elementary statistics courses are offered at Haverford:

- Economics H203: Statistical Methods in Economics
- Economics H204: Economic Statistics with Calculus
- Mathematics H103: Introduction to Probability and Statistics
- Mathematics H203: Statistical Methods and Their Applications
- Psychology H200: Experimental Methods and Statistics
- Sociology H215: Quantitative Methods

Economics H203: Statistical Methods in Economics and H204: Economic Statistics with Calculus. In both courses, the topics covered in the regular class meetings include descriptive statistics, elementary probability, random variables and sampling distributions, confidence intervals and hypothesis testing, and an introduction to regression analysis. In the lab portion of both courses, students work in small groups on a semester-long project in which they obtain and analyze primary data on a social or economic issue of their choosing. Students write an original research paper that presents their findings. In ECON H204, some of the topics are developed using differential and integral calculus; no calculus is used in ECON H203. These courses are substitutes for each other: all students majoring or minoring in economics are required to take one of these two courses, but no student should take both of them

Class and lab hours

- Three one-hour classes per week.
- One two-hour computer lab per week.

Pre-requisites

For ECON H203 ECON H105: Principles of Economics (or ECON B105: Principles of Economics, offered at Bryn Mawr).

For ECON H204 (i) ECON H105: Principles of Economics (or Econ B105: Principles of Economics, offered at Bryn Mawr), and (ii) MATH H114: Calculus II, or placement at or above the level of MATH H115: Enriched Calculus II.

Requirements fulfilled

Economics major

Economics majors must usually take either ECON H203 or ECON H204. With permission of the economics department chair, MATH H203 may be taken instead of ECON 203 or ECON 204.

Economics minor

Economics minors must usually take either ECON H203 or ECON H204. With permission of the economics department chair, MATH H203 may be taken instead of ECON 203 or ECON 204.

Mathematics major and minor

ECON H204 counts as one of the 200-level math electives.

College graduation requirements

Both courses count as one social science (SO) credit.

Both courses satisfy the quantitative reasoning (Q) requirement.

Frequency: Each of these courses is usually offered once per year.

Comparable courses offered at Bryn Mawr College

ECON B203: Statistical Methods in Economics is similar to ECON H203, except that ECON B203 does not include a lab. Students majoring or minoring in economics at Haverford may take ECON B203 instead of ECON H203.

Mathematics H103: Introduction to Probability and Statistics. This course covers descriptive statistics, probability, basic ideas of confidence intervals and hypothesis testing, and simple regression. It is *not* open for students with a score of 4 or 5 on the AP statistics exam.

Class and lab hours

Three one-hour classes per week.

No lab.

Pre-requisites: None.

Requirements fulfilled

Major and minor requirements

This course does not fulfill the requirements of any major or minor at Haverford College.

College graduation requirements

Counts as one natural science (NA) credit.

Satisfies the quantitative reasoning (Q) requirement.

Frequency: Usually offered once every other year.

Comparable courses offered at Bryn Mawr College

MATH B104: Elements of Probability and Statistics, is similar to MATH H103.

Mathematics H203: Statistical Methods and Their Applications. The topics covered in this course include descriptive statistics (both numerical and graphical), probability (including random variables, expected values and variances), sampling distributions, one-sample and two-sample inferences, chi-square tests on categorical data, and simple regression with inference on regression parameters and predicted values.

Class and lab hours

Two 1.5-hour classes per week.

One 1.5-hour lab per week.

Pre-requisites: MATH H114: Calculus II, or placement at or above the level of MATH H115: Enriched Calculus II.

Requirements fulfilled

Mathematics major

For the mathematics major, this course counts as one 200-level elective.

Mathematics minor

For the mathematics minor, this course counts as one 200-level elective.

Economics major and minor

With permission of the economics department chair, economics majors and minors may take MATH H203 instead of ECON H203 or ECON H204.

College graduation requirements

Counts as one natural science (NA) credit.

Satisfies the quantitative reasoning (Q) requirement.

Frequency: Usually offered once every year.

Comparable courses offered at Bryn Mawr College: None.

Psychology H200: Experimental Methods and Statistics. Topics covered in this course include experimental design and descriptive statistics, confidence intervals and hypothesis testing, regression, analysis of variance (one-way, two-way and repeated measure), and nonparametric inference.

Class and lab hours

Three one-hour classes per week.

One 1.5-hour lab per week.

Pre-requisites: PSYC H100: Foundations of Psychology.

Requirements fulfilled

Psychology major

This course is a requirement for the psychology major.

College graduation requirements

Counts as one social science (SO) credit.

Satisfies the quantitative reasoning (Q) requirement.

Frequency: Usually offered once every year.

Comparable courses offered at Bryn Mawr College

PSYC B205: Experimental Methods and Statistics, is similar to PSYC H200.

Sociology H215: Quantitative Methods. The topics covered in this course include descriptive statistics (including graphic representation), causal relationships and examination of interventions, probability, hypothesis testing and confidence intervals (one- and two-samples), sampling distributions, chi-square tests on categorical data, simple regression with inference on regression parameters. The students also learn to use statistical software and work on an original project using their own datasets and are expected to present the findings as a research paper.

Class and lab hours

Three one-hour classes per week.

No lab.

Pre-requisites: None.

Requirements fulfilled

Sociology major

This course is a requirement for the sociology major.

Sociology minor

This course is a requirement for the sociology minor.

College graduation requirements

Counts as one social science (SO) credit.

Satisfies the quantitative reasoning (Q) requirement.

Frequency: Usually offered once every year.

Comparable courses offered at Bryn Mawr College: None.

Intermediate and Advanced Statistics Courses

Four statistics courses at the intermediate or advanced level are offered at Haverford:

Economics H304: Introduction to Econometrics

Mathematics H218: Probability

Mathematics H286: Applied Multivariate Statistical Analysis

Mathematics H396: Advanced Topics in Probability and Statistics

Economics H304: Introduction to Econometrics.

This course covers many of the statistical techniques used in economic research and how to apply them to real world data to test economic hypotheses. The principle statistical framework developed in the course is multiple regression analysis using ordinary least squares. Once the basics of this technique are established, the course explores alternative techniques, such as weighted least squares, models with nonlinear forms, instrumental variables, and maximum likelihood estimation, which are often used when the fundamental assumptions of ordinary least squares are violated.

Class and lab hours

3 one-hour classes per week.

No lab.

Pre-requisites: (i) MATH H114: Calculus II, or equivalent; and (ii) one of the three following courses: ECON H203, ECON H204 or MATH H203.

Requirements fulfilled

Economics major

This course is a requirement for the economics major. With permission of the economics department chair, economics majors may take MATH H286 instead of ECON H304.

Economics minor

Economics minors are not required to take this course.

Mathematics major and minor

ECON H304 counts as one of the 200-level math electives.

College graduation requirements:

Counts as one social science (SO) credit.

Satisfies the quantitative reasoning (Q) requirement.

Frequency: Usually offered once every year.

Comparable courses offered at Bryn Mawr College

ECON B304: Introduction to Econometrics is similar to ECON H304. Students majoring in economics at Haverford may take ECON B304 instead of ECON H304.

Mathematics H218: Probability. The course introduces formal probability theory. Topics included: sample spaces, combinatorics, conditional probability, independence, discrete and continuous random variables, functions of random variables, expected value and variance, the moment generating function, and some basic limit theorems. After the probability theorems, the following commonly used distributions in statistics are introduced: Binomial, Poisson, Normal, Exponential, and Uniform.

Class and lab hours

Three one-hour classes per week.

No lab.

Pre-requisites: MATH H121: Multivariate Calculus.

Requirements fulfilled

Mathematics major

For the mathematics major, this course counts as one 200-level elective.

Mathematics minor

For the mathematics minor, this course counts as one 200-level elective.

College graduation requirements

Counts as one natural science (NA) credit.

Satisfies the quantitative reasoning (Q) requirement.

Frequency: Once every year.

Comparable courses offered at Bryn Mawr College: None.

Mathematics H286: Applied Multivariate Statistical Analysis. The course includes methods for choosing, fitting, and evaluating multiple regression models and analysis of variance models. It introduces statistical theory in multiple regression analysis and analysis of variance. A required computer lab, using R, is taught alongside this course.

Class and lab hours

Three 1.5 hour lectures/labs per week. The course is taught in a computer lab every day.

Pre-requisites: (i) MATH H215: Linear Algebra, and (ii) one of the following five courses: ECON H203, ECON H204, MATH H203, PSYC H200 or SOCL H215.

Requirements fulfilled

Mathematics major

For the mathematics major, this course counts as one 200-level elective.

Mathematics minor

For the mathematics minor, this course counts as one 200-level elective.

Economics major

With permission of the economics department chair, economics majors may take Math H286 instead of ECON H304.

College graduation requirements

Counts as one natural science (NA) credit.

Satisfies the quantitative reasoning (Q) requirement.

Frequency: Once every other year.

Comparable courses offered at Bryn Mawr College: None.

Mathematics H396: Advanced Topics in Probability and Statistics. Topics covered: estimation theory, hypothesis testing theory, chi-square distribution, t-distribution, F-distribution,

goodness-of-fit test and regression. Additional topics may include analysis of variance. Emphasis on the theory underlying statistics.

Class and lab hours

3 one-hour classes per week.

No lab.

Pre-requisites: MATH H218

Requirements fulfilled

Mathematics major

For the mathematics major, this course counts as one 300-level elective.

Mathematics minor

For the mathematics minor, this course counts as one 300-level elective.

College graduation requirements

Counts as one natural science (NA) credit.

Satisfies the quantitative reasoning (Q) requirement.

Frequency: Once every other year.

Comparable courses offered at Bryn Mawr College: None.

GUIDELINES FOR CHOOSING WHICH STATISTICS COURSES TO TAKE

Guidelines that apply to all students

- Normally students are **not allowed** to take more than one of the following four courses: ECON H203, ECON H204, MATH H203, and SOCL H215. In special cases, and only with permission of the chair of the department offering the course, a student may take more than one of the above four courses.
Although courses offered by different departments emphasize different statistical applications, the major topics covered in these courses are similar, and taking more than one of them would usually be redundant.
- No student should take both ECON H304 and Math H286.
Both ECON H304 and MATH H286 cover multiple regression analysis. ECON H304 emphasizes economic applications and MATH H286 emphasizes the statistical theory behind the methods. Note that ECON H304 counts as one of the 200-level math electives. And with permission of the economics department chair, economics majors may take Math H286 instead of ECON H304.

- Most students planning to take any of the 200-level statistics courses described above **should not** take MATH H103.

MATH H103 is an introductory statistics course designed for students with weak preparation in mathematics. The topics covered in MATH H103 overlap with any of the 200-level introductory statistics courses described above (ECON H203, ECON H204, MATH H203, PSYC H200, and SOCL H215). In most cases, students planning to take one of these 200-level introductory statistics courses should not take MATH H103. Occasionally, however, it may be advisable for a student with a weak mathematics background to take MATH H103 before taking a 200-level statistics course. Students considering this option should first consult with the corresponding departments.

Guidelines for students majoring or minoring in particular disciplines

Biology

Biology majors would benefit from taking either MATH H103: Introduction to Probability and Statistics, or MATH H203: Statistical Methods and Their Applications, depending upon their placement by the mathematics department. Students with minors in economics, psychology or sociology, or undertaking allied concentrations, could substitute discipline-specific statistics courses and are encouraged to discuss their interests with their major advisor or (for undeclared students) the chair of the biology department.

Economics

Courses on statistical methods in the Haverford economics curriculum

The standard introductory statistics course for students majoring or minoring in economics is either ECON H203: Statistical Methods in Economics, or ECON H204: Economic Statistics with Calculus. Economics majors typically take one of these courses during their sophomore year, while economics minors usually take one of these courses in the sophomore or junior year. ECON H105: Introduction to Economics is a prerequisite for both of these courses. In addition, MATH H114: Calculus II, or equivalent mathematics preparation, is a pre-requisite for ECON 204. The courses cover largely the same material, but ECON 204 moves a little more quickly and uses calculus in the development of several topics. With permission of the economics department chair, it may be possible for economics majors and minors to substitute MATH H203: Statistical Methods and Their Applications for ECON H203 or H204.

All economics majors are required to take ECON H304: Introduction to Econometrics; economics minors may take this course as an elective. The prerequisites for ECON H304 consist of MATH H114: Calculus II or equivalent, and one of these three courses: ECON

H203, ECON H204 or MATH H203. Economics majors usually take ECON H304 in their sophomore or junior year. This course builds on the foundation of statistical methods developed in ECON H203 or H204, and extends it to multiple regression and maximum likelihood estimation methods, with careful attention to issues that arise when fundamental assumptions are violated. With permission of the economics department chair, it may be possible for economics majors to substitute MATH H286: Applied Multivariate Statistical Analysis for ECON H304.

Advice to students considering majoring or minoring in economics

Students thinking of majoring or minoring in economics should not take MATH H103: Introduction to Probability and Statistics. If you major or minor in economics, you will study the material covered in that course when you take ECON 203 or ECON 204. In some cases it can be beneficial to see the same material in two different courses, but this is usually not such a case. In rare cases, it could be advisable for a student with weak preparation in math and quantitative methods to take MATH H103 before taking ECON H203 or H204. Any student considering doing so, however, should meet with the economics department chair to discuss whether it would be worthwhile in her or his case.

Students considering majoring or minoring in economics should also not take SOCL H215 (Quantitative Methods) because the overlap with ECON H203 and H204 is very large. For the same reason, economics majors and minor should not take MATH H203, unless they have received permission from the economics department chair to take that course in place of ECON H203 or H204.

Students majoring in economics who have completed ECON H304 and would like to take one or more additional courses on statistical methods are advised to consider MATH H218: Probability, Math H286: Applied Multivariate Statistical Analysis, and MATH H396: Advanced Topics in Probability and Statistics.

Mathematics

Besides MATH H103, the mathematics department offers four other statistics courses. Two of them, MATH H203 and MATH H286, are applied statistics courses with emphasis on applying statistical methods to real life data. Those two courses are computer lab-based. The other two courses, MATH H218 and MATH H396, are theoretical statistics courses, with emphasis on the theory underlying statistics.

Students who are interested in statistics and/or applied math should start with MATH H203 (or ECON H204). Then take MATH H286 after taking MATH H215 (Linear Algebra). It's better to take MATH H218 and MATH H396 in sophomore or junior year, after some vigorous math training. The department also strongly recommends students to learn programming skills. The recommended courses are: MATH H222: Scientific Computing and CMSC H105: Introduction to Computer Science.

Psychology

Students planning to major in psychology should take PSYC H200 (or PSYC B205 at Bryn Mawr). Students that have taken an advanced statistics course in other departments should discuss their plans with the psychology department chair or psychology major advisor.

Sociology

Students planning to major in sociology should take SOCL 215.