Statistics

Nature of Program
A Minor in Statistics is available to any undergraduate students at WVU. The Statistics Minor requires 15 credit hours not counted toward another minor with a grade of C- or higher in each course. If you are interested in pursuing a Minor, please contact your academic advisor.

Students interested in a major related to statistics should consider the interdepartmental bachelor of sciences degree in industrial mathematics and statistics.

FACULTY

CHAIR
• Michael Mays - Ph.D. (Penn State University)

PROFESSORS
• Erdogan Gunel - Ph.D. (SUNY-Buffalo)
  Bayesian inference, Biostatistics, Categorical data analysis
• Robert Mnatsakanov - Ph.D. (Moscow Stat Institute of Electronics and Mathematics)
  Nonparametric statistics, Statistical Inverse Problems, Mixture Models, Change-set Problems

ASSOCIATE PROFESSORS
• Mark V. Culp - Ph.D. (University of Michigan)
  Statistical Machine Learning, Computational Statistics, Semi-supervised and Multi-view Learning
• Kenneth J. Ryan - Ph.D. (Iowa State University)
  Experimental Design, Statistical Machine Learning, Bioinformatics

TEACHING ASSOCIATE PROFESSOR
• Huei Miin Lee - Ph.D. (Johns Hopkins University)
  Bioinformatics, Operations research, Statistical education

ASSISTANT PROFESSORS
• Stacey Culp - Ph.D. (University of Michigan)
  Statistics Education, Statistical Consulting
• Casey Jelsema - Ph.D. (Western Michigan U.)
  Spatial Statistics, Mixed Effects Models, Bayesian hierarchical modeling, constrained inference, bootstrap methods, environmental statistics, microbiome, statistical computation
• Erin Leatherman - Ph.D. (Ohio State)
  Prediction and Design for Computer and Physical Experiments

TEACHING INSTRUCTOR
• Anthony Billings - M.S. (WVU); A.B.D. (CMU)
  Statistical computing, Statistical modeling, Robust estimation, Nonlinear dynamic systems, Statistical education

PROFESSOR EMERITUS
• E. James Harner - Ph.D. (Cornell University)
  Bioinformatics, Statistical computing, Statistical modeling, Statistical learning
• William V. Thayne - Ph.D. (University of Illinois)
  Experimental Design, Statistical Genetics, Regression Analysis
• Edwin C. Townsend - Ph.D. (Cornell University)
  Experimental Design, Regression Analysis

ASSOCIATE PROFESSOR EMERITUS
• Daniel M. Chilko - M.S. (Rutgers University)
  Statistical Computing, Computer Graphics
• Gerald R. Hobbs Jr. - Ph.D. (Kansas State University)
  Biostatistics, Nonparametric statistics, Regression analysis
Minor Learning Goals

STATISTICS

Undergraduate courses in statistics, and sequences of statistics courses leading to a minor in statistics or a major in Industrial Mathematics and Statistics, provide a foundation of statistical literacy, statistical reasoning, and statistical thinking. Our aim is for all of our students to be challenged and encouraged in their statistical course work. In particular, we enable our students to:

• Appreciate the inherent variation and uncertainty of information, and understand that statistics can be a resource for improved decision making;
• Develop critical thinking skills for application of statistics in novel situations;
• Effectively communicate the results of statistical analysis;
• Become responsible and competent practitioners of statistics in order to attain personal goals, either in a profession or in further educational experiences.

STATISTICS MINOR

MINOR CODE - U034

The Statistics minor requires 15 hours not counted toward another minor.

Minimum grade of C- is required in all courses applied toward the minor.

Core Course: 3

<table>
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<tr>
<th>Course</th>
<th>Description</th>
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<tr>
<td>STAT 211</td>
<td>Elementary Statistical Inference</td>
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<tr>
<td>or STAT 215</td>
<td>Introduction to Probability and Statistics</td>
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<tr>
<td>or ECON 225</td>
<td>Elementary Business and Economics Statistics</td>
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Upper-Division Electives: 12

One STAT course numbered 200 or above or one MATH course numbered 126 or above

Select 9 STAT credits numbered 300 or above

Total Hours: 15

COURSES

STAT 111. Understanding Statistics. 3 Hours.
Introduction to basic concepts and ideas of statistics. Methodologies and case studies to prepare students to understand the use of statistics in the mass media and professional publications in their major field of study. Not open to students who have earned credit for STAT 211 or STAT 215.

STAT 191. First-Year Seminar. 1-3 Hours.
Engages students in active learning strategies that enable effective transition to college life at WVU. Students will explore school, college and university programs, policies and services relevant to academic success. Provides active learning activities that enable effective transition to the academic environment. Students examine school, college and university programs, policies and services.

STAT 201. Applied Statistical Modeling. 3 Hours.
PR: MATH 121 or higher. Introduction to modeling in the social, behavioral, and health sciences. Descriptive statistics, probability, discrete/continuous distributions, random variables, sampling distributions, t-tests, regression, correlation, categorical models, repeated measures, one- and two-way ANOVA, covariance models.

STAT 205. Introductory Probability and Statistical Inference. 3 Hours.
PR: MATH 150 or equivalent. Probability, random variables, expectation, random sampling, descriptive statistics, sampling distributions, estimation, hypothesis testing, linear regression, and nonparametric statistics.

STAT 210. Statistics for the Health Sciences. 3 Hours.
PR: MATH 124 or MATH 125 or MATH 113 or MATH 126 and Consent. This course may not be used as credit toward a math major or minor. Statistical inference, selecting appropriate statistical methods for data sets, interpreting results from commonly used statistical tests, evaluating reported statistical analysis in medical and health care literature, statistical calculations, interpreting SAS and SPSS output from commonly used procedures.

STAT 211. Elementary Statistical Inference. 3 Hours.
PR: MATH 122 or higher. (Not open to students who have completed STAT 215.) Basic concepts of descriptive and inferential statistics: descriptive measures, random variables, sampling distributions, estimation, tests of hypotheses, chi-square tests, regression and correlation. (Equivalent to ECON 225.)

STAT 215. Introduction to Probability and Statistics. 3 Hours.
STAT 217. Industrial Statistics. 3 Hours.
PR: STAT 215 or equivalent. Statistical methods for solving industrial problems including statistical quality and process control, reliability modeling, sequential analysis, and time series analysis. Methodology for these problems will utilize a statistical software program.

STAT 222. Numerical and Symbolic Methods in Mathematics and Statistics. 3 Hours.
PR: MATH 156. Data manipulation, data visualization in two and three dimensions including animation, and scientific programming using a high-level language, symbolic manipulators, and other packages. Applications to problems in mathematics and statistics. (Equivalent to MATH 222.).

STAT 293A-Z. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

STAT 298. Honors. 1-3 Hours.
PR: Students in the Honors Program and consent by the honors director. Independent reading, study or research.

STAT 312. Intermediate Statistical Methods. 3 Hours.
PR: STAT 211 or STAT 215 or equivalent. Extension of basic concepts of statistical inference: estimation and hypothesis testing for more than two populations, multiple regression and correlation, curvilinear regression, analysis of variance and covariance.

STAT 313. Introductory Design and Analysis. 3 Hours.
PR: STAT 312. Introduction to the linear model, the complete and fractional factorial experiment, and the completely random, randomized complete block, Latin square, and split-plot experimental designs.

STAT 316. Forensic Statistics. 3 Hours.

STAT 331. Sampling Methods. 3 Hours.
PR: STAT 211 or STAT 215 or equivalent. Methods of sampling from finite populations, choice of sampling unit and sample survey design. Estimation of confidence limits and optimum sample size. Single and multi-stage sampling procedures.

PR: (STAT 211 or STAT 215 or equivalent) and (CS 110 or equivalent). Introduction to the use of the Statistical Analysis System (SAS), a statistical computer program. Students will perform statistical data analysis, data file modifications, and statistical report writing.

STAT 423. Bioinformatics Computing. 3 Hours.
PR: STAT 312. Introduction to R computing within a bioinformatics context. Topics include: R packages, data structures, objects, and data input/output; R data Visualization; R/Perl text processing; accessing bioinformatics databases; and R interfaces to Perl, Java, and SQL databases.

STAT 443. Computational Genomics. 3 Hours.
PR: STAT 312. Introduction to computational genomics and bioinformatics based on probabilistic and statistical models. DNA sequence analysis, multiple sequence alignment, signaling in DNA, gene expression analysis, phylogenetic trees, and linkage disequilibrium. The use of R/Bioconductor computational tools.

STAT 445. Data Analysis. 3 Hours.
PR: STAT 312 or equivalent. Computer analyses of simulated or real unbalanced data using a matrix approach to linear models. The techniques will include least squares analysis of variance and covariance, multiple and polynomial regression, and multiple discrimination.

STAT 461. Theory of Probability. 3 Hours.
PR: MATH 251. Theoretical coverage of probability, random variables, and discrete and continuous probability distributions. Expected value, moment generating functions, and special probability distributions. Random sampling and distributions of certain functions of random variables. The Central Limit Theorem.

STAT 462. Theory of Statistics. 3 Hours.

STAT 482. Statistics Practicum. 1 Hour.
PR: STAT 313. A capstone experience core course. Students are expected to: research and design (optionally) a study, do independent statistical analyses of a data set, and present the results in both verbal and written forms.

STAT 490. Teaching Practicum. 1-3 Hours.
PR: Consent. Teaching practice as a tutor or assistant.

STAT 491. Professional Field Experience: Capstone. 1-18 Hours.
PR: Consent. (May be repeated up to a maximum of 18 hours.) Prearranged experiential learning program, to be planned, supervised, and evaluated for credit by faculty and field supervisors. Involves temporary placement with public or private enterprise for professional competence development.

STAT 493A-Z. Special Topics. 1-6 Hours.
PR: Consent. Investigation of topics not covered in regularly scheduled courses.

STAT 494A-Z. Seminar. 1-3 Hours.
PR: Consent. Presentation and discussion of topics of mutual concern to students and faculty.
STAT 495. Independent Study. 1-6 Hours.
Faculty supervised study of topics not available through regular course offerings.

STAT 496. Senior Thesis. 1-3 Hours.
PR: Consent.

STAT 498. Honors. 1-3 Hours.
PR: Students in Honors Program and consent by the honors director. Independent reading, study or research.