Statistics

Nature of Program

Students interested in a major related to statistics should consider the interdepartmental bachelor of sciences degree in industrial mathematics and statistics. A minor in statistics is available to all University students with the option of either an applied statistics track or a mathematical statistics track.

FACULTY

INTERIM CHAIR

• Michael Maze - Ph.D. (Penn State U.)

PROFESSORS

• Erdogan Gunel - Ph.D. (SUNY-Buffalo)
  Bayesian inference, Biostatistics, Categorical data analysis
• E. James Harner - Ph.D. (Cornell U.)
  Chairperson. Bioinformatics, Statistical computing, Statistical modeling, Statistical learning
• William V. Thayne - Ph.D. (U. Illinois)
  Emeritus. Experimental design, Regression analysis, Statistical genetics
• Edwin C. Townsend - Ph.D. (Cornell U.)
  Emeritus. Experimental design, Regression analysis
• Stanley Wearden - Ph.D. (Cornell U.)
  Emeritus. Biostatistics, Statistical genetics, Population biology

ASSOCIATE PROFESSORS

• Daniel M. Chilko - M.S. (Rutgers U.)
  Emeritus. Statistical computing, Computer graphics
• Gerald R. Hobbs Jr. - Ph.D. (Kansas St. U.)
  Biostatistics, Nonparametric statistics, Regression analysis
• Robert Mnatskanov - Ph.D. (Moscow Inst. Electr. & Math.)
  Change-point problems, Non-parametric statistics, Mixture models, Statistical inverse problems

ASSISTANT PROFESSORS

• Mark Culp - Ph.D. (U. of Michigan)
  Computational statistics, Semi-supervised learning, Ensemble algorithms, Parallel programming, Nonparametric statistics
• Philip Turk - Ph.D. (Montana State U.)
  Statistical computing, Adaptive cluster sampling, Response surface methodology, Statistical applications to biological and environmentally-related problems

CLINICAL ASSISTANT PROFESSOR

• Huey Min Lee - Ph.D. (Johns Hopkins U.)
  Bioinformatics, Operations research, Statistical education

RESEARCH ASSISTANT PROFESSOR

• Yangqing Hu - Ph.D. (U. of Virginia)
  Design of clinical trials, Adaptive designs, Nonparametric statistics, Bioinformatics

INSTRUCTOR

• Sarah S. Quesen - M.P.H. (WVU)
  Biostatistics, Health and policy, Statistical education

RESEARCH ASSOCIATES

• Anthony Billings - M.S. (WVU); A.B.D. (CMU)
  Statistical computing, Statistical modeling, Robust estimation, Nonlinear dynamic systems, Statistical education
• Dajie Luo - M.S.
  Statistical programming, R development, Java programming, Statistical education
ADJUNCT PROFESSOR

- Michael E. Andrew - Ph.D. (U. of Wyoming)
  Experimental design and analysis, Epidemiological models, Statistical consulting, Multiple logistic regression

ADJUNCT ASSISTANT PROFESSORS

- Stacey Culp - Ph.D. (U. of Michigan)
  Functional data analysis, Statistical consulting
- Fekedulegn B. Desta - Ph.D.
  Ecological modeling, Nonlinear regression analysis, Multivariate modeling, Bio-statistics, Biometry, Statistical consulting

STATISTICS MINOR

MINOR CODE - U034

Students may choose from two minor tracks; completion of either track will be posted as a minor in statistics. A grade of C or higher in each course counted toward the minor is required. MATH 156 is a prerequisite for STAT 215; MATH 251 is a prerequisite for STAT 461.

MATHEMATICAL STATISTICS TRACK:

A grade of C or higher must be earned in all minor courses

<table>
<thead>
<tr>
<th>Core Courses:</th>
<th>6</th>
</tr>
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<tbody>
<tr>
<td>STAT 215</td>
<td>Intro Probability &amp; Statistics</td>
</tr>
<tr>
<td>STAT 461</td>
<td>Theory of Probability</td>
</tr>
</tbody>
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Upper-Division Electives |

Choose three of the following:

| STAT 217 | Industrial Statistics |
| STAT 312 | Intermediate Statistcl Methods |
| STAT 313 | Introductory Design & Analysis |
| STAT 316 | Forensic Statistics |
| STAT 331 | Sampling Methods |
| STAT 421 | Statistical Analysis System |
| STAT 445 | Data Analysis |
| STAT 462 | Theory of Statistics |

Total Hours |

(15)

APPLIED STATISTICS TRACK:

A grade of C or higher must be earned in all minor courses

<table>
<thead>
<tr>
<th>Core Course:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 211</td>
<td>Elemntry Statistical Inference</td>
</tr>
<tr>
<td>or STAT 215</td>
<td>Intro Probability &amp; Statistics</td>
</tr>
</tbody>
</table>

Upper-Division Electives: |

Choose four of the following:

| STAT 217 | Industrial Statistics |
| STAT 312 | Intermediate Statistcl Methods |
| STAT 313 | Introductory Design & Analysis |
| STAT 316 | Forensic Statistics |
| STAT 331 | Sampling Methods |
| STAT 421 | Statistical Analysis System |
| STAT 445 | Data Analysis |
| STAT 461 | Theory of Probability |
| STAT 462 | Theory of Statistics |

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 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. Intro Probability/Stat Infernc. 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 211. Elemtry Statistical Inference. 3 Hours.
PR: MATH 126 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. Intro Probability & 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.

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 298A-Z. Honors. 1 Hour.
CoReq: STAT 211. Advanced counting techniques, Bayes Theorem, applications of specific discrete and continuous probability distributions, additional statistical inferential methods, introduction to nonparametric statistics.

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 & 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.

STAT 421. Statistical Analysis System. 3 Hours.
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-CAP. 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 484. Research Presentations: Capst. 1 Hour.
PR: STAT 482 or STAT 491. Make a verbal presentation to the class based on the statistical analyses done on an applied problem from STAT 482 or STAT 491.

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

STAT 491. Prof 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:Capstone. 1-3 Hours.
PR: Consent.

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