MASTER OF SCIENCE IN
STATISTICS, APPLIED
STATISTICS CONCENTRATION

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The Department of Statistics offers the Master of Science in Statistics with specialization in a variety of areas of application. The degree program consists of a core of statistics courses covering statistical theory, linear models, and statistical consulting, and further coursework in the field of application and in statistics. The program offers an additional degree for students earning an advanced degree in the area of application.

To be eligible for this program, students must be pursuing an advanced degree in a department other than Statistics at the Urbana-Champaign campus. Students interested in economic statistics should apply for admission to a department other than Statistics at the Urbana-Champaign campus. Full statements of degree requirements are available from the head of the unit offering a specialization or from the Graduate Advisor of the Department of Statistics.

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Other Requirements

Other requirements may overlap.

A concentration is not required.

Minimum 500-level Hours Required: 12
Overall: 20
Minimum GPA: 3.0

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 410/</td>
<td>Statistics and Probability II (or equivalent</td>
<td>4</td>
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<tr>
<td>MATH 464</td>
<td>proficiency)</td>
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</tr>
<tr>
<td>STAT 425</td>
<td>Applied Regression and Design</td>
<td>4</td>
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<tr>
<td>or STAT 424</td>
<td>Analysis of Variance</td>
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<tr>
<td>STAT 427</td>
<td>Statistical Consulting (or experience in applied</td>
<td>0-4</td>
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<td></td>
<td>statistics)</td>
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<tr>
<td>or STAT 59/</td>
<td>STAT Internship</td>
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<tr>
<td>STAT 571</td>
<td>Multivariate Analysis (if not used to fulfill</td>
<td></td>
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<tr>
<td></td>
<td>another requirement</td>
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<td></td>
<td>Total hours</td>
<td>32-36</td>
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Courses

STAT 510 Mathematical Statistics I credit: 4 Hours.

STAT 511 Mathematical Statistics II credit: 4 Hours.
Bayes estimates, minimaxity, admissibility; maximum likelihood estimation, consistency, asymptotic efficiency; testing and confidence intervals; Neyman-Pearson lemma, uniformly most powerful tests; likelihood ratio tests and large-sample approximation; nonparametrics. Prerequisite: STAT 510.

STAT 525 Computational Statistics credit: 4 Hours.
Various topics, such as ridge regression; robust regression; jackknife, bootstrap, cross-validation and resampling plans; E-M algorithm; projection pursuit, all with a strong computational flavor. Same as CSE 525. May be repeated if topics vary. Prerequisite: STAT 425, STAT 426, and STAT 511; or consent of instructor.

STAT 530 Bioinformatics credit: 4 Hours.
Same as ANSC 543, CHBE 571, and MCB 571. See CHBE 571.

STAT 534 Advanced Survival Analysis credit: 4 Hours.
Introduction to the analysis of time-to-event outcomes. Topics include censoring, discrete survival, parametric models, nonparametric one- and K-sample methods, Cox regression, regression diagnostics, time-dependent covariates, and multivariate survival outcomes. Emphasis on key underlying concepts. Counting process-based theoretical justification and practical implementation will also be discussed. 4 graduate hours. No professional credit. Prerequisite: STAT 410, STAT 425, and knowledge of R.

STAT 538 Clinical Trials Methodology credit: 4 Hours.
The topics of the course focus on clinical trials designs and inferential techniques that are commonly used in the pharmaceutical industry. Topics include fixed sample designs for normal and survival data, two-sided group sequential design, Pocock's and O'Brien-Fleming boundaries, general theory of group sequential design, alpha and beta spending functions, one-sided designs with early stopping to accept the null hypothesis, non-inferiority designs, and inferential techniques. Computing in SAS will be emphasized. 4 graduate hours. No professional credit. Prerequisite: STAT 410, STAT 425, and familiarity with SAS.

STAT 542 Statistical Learning credit: 4 Hours.
Modern techniques of predictive modeling, classification, and clustering are discussed. Examples of these are linear regression, nonparametric regression, kernel methods, regularization, cluster analysis, classification trees, neural networks, boosting, discrimination, support vector machines, and model selection. Applications are discussed as well as computation and theory. Same as CSE 542. Prerequisite: STAT 410 and STAT 425.

STAT 543 Appl. Multivariate Statistics credit: 4 Hours.
Same as CPSC 543. See CPSC 543.
STAT 545  Spatial Statistics  credit: 4 Hours.
Theory and methods for analyzing univariate and multivariate spatial and spatio-temporal data. Covers both fundamental theories and cutting-edge research advances for geostatistics, and statistical methods for aggregated data and point processes. Real data examples will be provided in class and statistical software will be used to illustrate the data analysis. 4 graduate hours. No professional credit. Prerequisite: STAT 425 or equivalent.

STAT 551  Theory of Probability I  credit: 4 Hours.
Same as MATH 561. See MATH 561.

STAT 552  Theory of Probability II  credit: 4 Hours.
Same as MATH 562. See MATH 562.

STAT 553  Probability and Measure I  credit: 4 Hours.
Measures and probabilities; integration and expectation; convergence theorems and inequalities for integrals and expectations; independence; convergence in probability, almost surely, and mean; Three Series Theorem; laws of large numbers. Prerequisite: MATH 447 or consent of instructor.

STAT 554  Probability and Measure II  credit: 4 Hours.
Measure extensions, Lebesque-Stieltjes measure, Kolmogorov consistency theorem; conditional expectation, conditional probability, martingales; distribution functions and characteristic functions; convergence in distribution; Central Limit Theorem; Brownian Motion. Credit is not given for both STAT 554 and either MATH 561 or MATH 562.

STAT 555  Applied Stochastic Processes  credit: 4 Hours.
Same as MATH 564. See MATH 564.

STAT 558  Risk Modeling and Analysis  credit: 4 Hours.
Same as MATH 563. See MATH 563.

STAT 571  Multivariate Analysis  credit: 4 Hours.
Inference in multivariate statistical populations emphasizing the multivariate normal distribution; derivation of tests, estimates, and sampling distributions; and examples from the natural and social sciences. Prerequisite: STAT 410 and MATH 415, or consent of instructor.

STAT 575  Large Sample Theory  credit: 4 Hours.
Limiting distribution of maximum likelihood estimators, likelihood ratio test statistics, U-statistics, M-, L-, and R-estimators, nonparametric test statistics, Von Mises differentiable statistical functions; asymptotic relative efficiencies; asymptotic expansions. Same as ECON 578. Prerequisite: STAT 511 and either MATH 561 or STAT 554.

STAT 578  Topics in Statistics  credit: 4 Hours.
May be repeated if topics vary. Prerequisite: Consent of instructor.

STAT 587  Hierarchical Linear Models  credit: 4 Hours.
Same as PSYC 587 and EPSY 587. See EPSY 587.

STAT 588  Covar Struct and Factor Models  credit: 4 Hours.
Same as EPSY 588, PSYC 588, and SOC 588. See PSYC 588.

STAT 590  Individual Study and Research  credit: 0 to 8 Hours.
Directed reading and research. Approved for letter and S/U grading. May be repeated with approval. Prerequisite: Consent of instructor.

STAT 593  STAT Internship  credit: 0 to 8 Hours.
Supervised, off-campus experience in a field in which statistical science plays an important role. Approved for letter and S/U grading. Prerequisite: STAT 425 and consent of instructor.

STAT 595  Preparing Future Faculty  credit: 2 Hours.
Prepares Ph.D. students who are interested in an academic career to develop a successful academic career path, and to prepare graduate students for their future roles as teachers, and researchers. The course will focus on profession, job search, research, teaching and service. The course will involve guest panels, small and large group presentations and interactive Q&A with student participation.

STAT 599  Thesis Research  credit: 0 to 16 Hours.
Approved for S/U grading only. May be repeated. Prerequisite: Consent of instructor.