

# Statistics

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## College of Arts & Sciences

The Department of Statistics offers programs of study leading to the degrees of Master of Science (Plan A or B available), Doctor of Philosophy, and Master of Applied Statistics (Online). The M.S. degree is professionally oriented for the student who plans a career in government, business or industry and is preparatory for the Ph.D. The Ph.D. program offers a broad training in both statistical theory and methods while affording options to suit the student's interests. The statistics Ph.D. is well-suited for academic, business, government and industrial positions. In addition to formal course work and research training, the advanced student has opportunities to gain valuable practical experience by participating in consulting activities under faculty supervision. Master of Applied Statistics is an innovative online professional graduate degree which is designed to train professional, practice-oriented statisticians who have both data analytic and computing skills.

Both, the M.S. and the Ph.D. program offer a Mathematical Statistics track, as well as a Biostatistics track. The latter tracks are designed for students who envision a future at the interface of Statistics and the Life Sciences.

Course work is available in areas associated with statistics such as biological modeling, probability, inference, experimental design and analysis, computational statistics, nonparametric methods, Bayesian analysis, mixed modeling, multivariate analysis, survival analysis, clinical trials, and many other selected topics of the student's choice.

The University of Kentucky is represented on the Committee on Statistics of the Southern Regional Education Board.

### **Admission Requirements**

Students with an undergraduate major in any of the mathematical, physical, biological, social or applied sciences are encouraged to apply.

The minimum GRE and GPA admissions requirements for the M.S. and Ph.D. programs in Statistics are the same as for the Graduate School. However, the number of admissions is limited and admissions decisions are made on a competitive basis. All M.S. applicants must have successfully completed a three or four semester sequence in calculus and a course in linear algebra and have good communication skills. In addition, all Ph.D. applicants must have mastered the equivalent of MA 471G. All Master of Applied Statistics applicants must have completed two semesters of calculus and a course in statistical methodology. Students wishing to apply for teaching assistantships and/or fellowships must submit three letters of recommendation.. Applicants wishing to be admitted directly to the Ph.D. program must have an M.S. in Statistics and the permission of the Director of Graduate Studies.

Please see the [departmental website](#) for up-to-date information and answers to frequently asked questions about the admissions process.

## **Master of Science**

The Statistics Department offers the degree of Master of Science with (Plan A) or without (Plan B) a thesis, and in two different tracks: a Mathematical Statistics track and a Biostatistics track.

### *Shared Core (Required for all students)*

- STA 602 (4) Introduction to Statistical Methods
- STA 603 (4) Introduction to Linear Models and Experimental Design
- STA 605 (3) Computational Inference
- STA 606 (3) Theory of Statistical Inference I
- STA 623 (3) Theory of Probability
- STA 632 (3) Longitudinal Data Analysis

### *Mathematical Statistics Track*

Curriculum requirements for the Mathematical Statistics track are the shared core courses above, plus the following courses:

- STA 607 (3) Theory of Statistical Inference II
- STA 624 (3) Applied Stochastic Processes
- STA 643 (3) Advanced Experimental Design

### *Biostatistics Track*

Curriculum requirements in the Biostatistics track are the shared core courses above, plus:

- STA 635 (3) Survivability and Life Testing
- STA 653 (3) Clinical Trials
- STA 665 (3) Analysis of Categorical Data
- STA 693 (2) Biostatistical Practicum, 1 unit course in each of the two semesters in the second year

Programs of study for Plan B require a total of at least 35 semester hours. Students will typically fulfill this requirement by taking electives (additional courses besides the shared core and track requirements) in the Fall and Spring of their second year. Programs of study for Plan A (with thesis) require a total of at least 29 semester hours which are satisfied by either of the two course lists above.

The electives can be selected from the menu of courses listed below. Before the end of the second semester, the M.S. candidate must present a proposed plan of study for approval by the Director of Graduate Studies. There are no formal minor requirements.

### **Comprehensive Exams**

All master's candidates are required to pass a comprehensive departmental written examination on the content of the courses STA 602, STA 603, STA 605, STA 606, and STA 623. This examination is normally administered in late May/early June. It is truly comprehensive also in the sense that all parts must be taken together: If a student decides not to take a part of the examination, that part is automatically counted as failed. Students taking the comprehensive exam will receive either a pass at the doctoral level, a pass at the master's level, or a failure. The examination may be repeated only once. Successful completion of the comprehensive examination at the doctoral level is required for admission into the PhD program.

### **Electives**

The electives may be chosen from any course in the following menu that is NOT used as a track requirement.

- MA 471G (3) Advanced Calculus I
- STA 607 (3) Theory of Statistical Inference II
- STA 612 (3) Sequential Analysis
- STA 616 (3) Design and Analysis of Sample Surveys
- STA 621 (3) Nonparametric Inference
- STA 624 (3) Applied Stochastic Processes
- STA 626 (3) Time Series Analysis

- STA 630 (3) Bayesian Inference
- CPH 631 (3) Design and Analysis of Health Survey
- STA 635 (3) Survivability and Life Testing
- CPH 636 (3) Data Mining in Public Health
- STA 643 (3) Advanced Experimental Design
- STA 644 (3) Advanced Linear and Nonlinear Models
- STA 653 (3) Clinical Trials
- STA 661 (3) Multivariate Analysis I
- STA 662 (3) Resampling and Related Methods
- CPH 664 (3) Design and Analysis of Clinical Trials
- STA 665 (3) Analysis of Categorical Data

Any course on this list NOT required for the chosen track may be used as an elective. Thus, for example, STA 665 would count as an elective for the Mathematical Statistics track, but it is a track requirement for the Biostatistics track. Similarly, STA 624 would be an elective for the Biostatistics track but is a track requirement for the Mathematical Statistics track.

\* A student who takes both STA 653 and CPH 664 may only receive credit towards the degree for one of these two courses.

## **Doctor of Philosophy**

The core curriculum in statistics is designed to provide doctoral candidates with a firm foundation in probability theory, inference, and classical methodology. In addition, the theory and application of computational statistics, biostatistics, and state-of-the-art inferential procedures are an integral part of the core curriculum.

Students in the doctoral program in statistics will choose one of two areas of specialization, 1) mathematical statistics/probability or 2) biostatistics. The requirements for these areas of specialization are:

### *Mathematical Statistics/Probability*

- STA 701 – Advanced Statistical Inference I
- STA 703 – Advanced Probability
- STA 705 – Advanced Computational Inference
- STA 707 – Advanced Data Analysis
- STA 702 – Advanced Statistical Inference II

### *Biostatistics*

- STA 701 - Advanced Statistical Inference I
- STA 703 - Advanced Probability
- STA 705 - Advanced Computational Inference
- STA 707 - Advanced Data Analysis
- STA 709 - Advanced Survival Analysis

All students must take an additional six elective courses chosen by the student and approved by the DGS. These courses must be chosen from among STA 612, STA 616, STA 621, STA 624, STA 626, STA 630, STA 635, STA 643, STA 644, STA 653, STA 661, STA 662, STA 665, CPH 631, CPH 636, and CPH 664. STA 695 will also be considered on a case by case basis. If a student completes both STA702 and STA709, the student may choose their official track and count the non-required course as an elective. Note that STA715 (reading course) may not be used to satisfy elective requirements. Students must successfully complete a common written exam over STA 701 and STA 703 plus respective prerequisites.

\* A student who takes both STA 653 and CPH 664, may only receive credit towards the degree for one of these two courses.

Students must pass a uniform written exam over STA 701 and STA 703 plus respective prerequisites. This exam will normally be offered in January and students will usually sit for the written examination at the beginning of the Spring semester in the third year of the program. The uniform exam can be repeated once. After completion of tract course requirements and successful completion of the written exam, students must also successfully complete an oral qualifying exam which is scheduled through the Graduate School and administered by the student's advisory committee. A significant part of this exam is to be a dissertation proposal.

Areas of current research interest can be found by going to the Department of Statistics faculty web page <https://stat.as.uky.edu/>.

All students, master's and doctoral, will be required to take part in an internship program. This will usually consist of teaching (three or six semester hours) or an equivalent amount of work in a research assistantship working with researchers across campus.

### Master of Applied Statistics

The Master of Applied Statistics is a thirty hour, online, Plan B, professional graduate degree that can be completed in a summer and two consecutive semesters or on a part-time basis. The program is unique in that it uses data visualization and statistical computing to teach fundamental concepts in statistical inference to students with a career-oriented focus on data analysis

#### Core Courses (Required for all students)

- STA 645(3) Computational Theory and Data Visualization
- STA 646(4) Foundations of Probability and Inference
- STA 647(2) Statistical Computing with SAS
- STA 648(4) Regression Modeling
- STA 649(4) Design of Experiments

The electives can be selected from the menu of courses listed below.

- STA 650(3) Applied Multivariate Analysis
- STA 651(1) Advanced Programming with R
- STA 652(3) Advanced Statistical Modeling
- STA 654(3) Applied Bayesian Analysis
- STA 656(3) Statistical Quality Control
- STA 659(3) Advanced Statistical Methods (subtitle required)

### Graduate Courses

STA 417G	Principles Of Operations Research II (Same As MA 417G)	(3)
STA 422G	Basic Statistical Theory II	(4)
STA 515	Mathematical Programming And Extensions (Same As MA 515)	(3)
STA 524	Probability (Same AS Or 524)	(3)
STA 525	Introductory Statistical Inference (Same as OR 525)	(3)
STA 570	Basic Statistical Analysis	(4)
STA 580	Biostatistics I	(3)
STA 600	Communicating In Statistics	(0)
STA 602	Introduction To Statistical Methods	(4)
STA 603	Introduction To Linear Models And Experimental Design	(4)

STA 605	Computational Inference	(3)
STA 606	Theory Of Statistical Inference I	(3)
STA 607	Theory Of Statistical Inference II	(3)
STA 612	Sequential Analysis	(3)
STA 616	Design And Analysis Of Sample Surveys	(3)
STA 621	Nonparametric Inference	(3)
STA 623	Theory Of Probability	(3)
STA 624	Applied Stochastic Processes (Same As OR 624)	(3)
STA 626	Time Series Analysis (Same As ECO 790)	(3)
STA 630	Bayesian Inference	(3)
STA 632	Longitudinal Data Analysis	(3)
STA 635	Survivability And Life Testing	(3)
STA 643	Advanced Experimental Design	(3)
STA 644	Advanced Linear And Nonlinear Models	(3)
STA 645	Computational Theory And Data Visualization	(3)
STA 646	Foundations Of Probability And Inference	(4)
STA 647	Statistical Computing With SAS	(2)
STA 648	Regression Modeling	(4)
STA 649	Design Of Experiments	(4)
STA 650	Applied Multivariate Analysis	(3)
STA 651	Advanced Programming With R	(1)
STA 652	Advanced Statistical Modeling	(3)
STA 653	Clinical Trials (Same As BST 713)	(3)
STA 654	Applied Bayesian Analysis	(3)
STA 656	Statistical Quality Control	(3)
STA 659	Advanced Statistical Methods (Subtitle Required)	(3)
STA 661	Multivariate Analysis I	(3)
STA 662	Resampling And Related Methods	(3)
STA 665	Analysis Of Categorical Data (Same As Bst 763)	(3)
STA 671	Regression And Correlation	(2)
STA 672	Design And Analysis Of Experiments (2)	
STA 673	Distribution-Free Statistical Inference And Analysis Ofcategorical Data	(2)
STA 675	Survey Sampling	(2)
STA 676	Quantitative Inheritance In Plant Populations (Same As PLS 676)	(3)
STA 677	Applied Multivariate Methods	(3)
STA 679	Design And Analysis Of Experiments II	(3)
STA 681	Biostatistics II (Same As CPH 630)	(3)
STA 690	Seminar In Statistics	(1)
STA 691	Special Topics In The Planning And Analysis Of Experiments	(1-3)
STA 692	Statistical Consulting	(3)
STA 693	Biostatistical Practicum	(1-2)
STA 695	Special Topics In Statistical Theory (Subtitle Required)	(1-3)
STA 700	Foundations Of Probability And Inference	(3)
STA 701	Advanced Statistical Inference I	(3)
STA 702	Advanced Statistical Inference II	(3)
STA 703	Advanced Probability	(3)
STA 704	Advanced Probability - Stochastic Processes	(3)
STA 705	Advanced Computational Inference	(3)
STA 707	Advanced Data Analysis	(3)
STA 709	Advanced Survival Analysis	(3)

STA 715	Readings In Statistics And Probability	(1-6)
STA 748	Master's Thesis Research	(0)
STA 749	Dissertation Research	(0)
STA 767	Dissertation Residency Credit	(2)
STA 768	Residence Credit For Master's Degree	(1-6)
STA 769	Residence Credit For The Doctor's Degree	(0-12)