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## Master's of Science in Biostatistics

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### **Introduction**

Biostatistics involves the development and application of statistical techniques to scientific research in health-related fields including medicine, nursing, and public health. Students in the MS program receive state-of-the-art training in the latest statistical methodologies with focus on the design of research studies, modern statistical data analysis in health sciences research, and research in Biostatistical methodology. In addition, students are provided with tools with which to develop evidence-based clinical and healthcare policies and guidelines.

### **Competencies**

To graduate, a student must be able to demonstrate mastery of the following competencies:

Competency*
Evaluate the biostatistics content of scientific and biomedical journal articles. [C6]
Analyze moderately complex research data using statistical methods involving common linear statistical models. [C4]
Manage data using spreadsheet and database software. [C3]
Demonstrate use of standard statistical and graphics computer packages, including SAS, R, Microsoft Excel, and SPSS. [C3]
Evaluate new statistical methods presented in the literature. [C6]
Investigate the history, theoretic underpinnings, current applications, and active areas of inquiry of biostatistics. [C4]
Apply principles and theorems of advanced biostatistical operations. [C3]

\* Bracketed codes represent cognitive domain levels from Bloom's Taxonomy

Demonstration of the competencies is accomplished by successful completion of all MS curriculum activities.

### **Admission**

The MS program is available to students who have completed an undergraduate degree in biostatistics, statistics, mathematics, or a related discipline and possess competency in college-

level calculus, linear algebra, and statistics as evidenced by transcripts from postsecondary institutions attended. The following are required for admission:

- [Graduate application](#) submitted to the School of Interdisciplinary and Graduate Studies (SIGS).
- Non-refundable application fee.
- At least two letters of recommendation written within past twelve months, submitted as part of the [graduate application](#).
- Submission of GRE scores to SIGS. Applicants are required to score in the 60<sup>th</sup> percentile on the Quantitative test to be admitted.
- All postsecondary transcripts. Transcripts from institutions outside of the U.S.A. require a foreign credential evaluation.
- A statement of purpose submitted to the department office, which must include desired degree program.
- If an applicant's primary language is not English, one of the following:
  - Test of English as a Foreign Language (TOEFL) exam with a minimum score of 250 (after conversion for test type)
  - Passing the exit examination for the advanced level of the Intensive English as a Second Language Program at the University of Louisville
  - Degree from an accredited university in the U.S.A.

### **Curriculum**

#### **Faculty Advisor**

Upon admission to the MS program, the program director serves as the student's faculty advisor until a mentor for the student's project or thesis is identified. At this milestone, the mentor becomes the student's faculty advisor.

#### **Program of Study**

Upon admission to the MS program, the program director, working with the student as faculty advisor, develops a program of study for the student, which requires agreement by the student and the academic dean. Changes to a student's program of study, including coursework, milestones, and their anticipated timings, are made by the student's faculty advisor, working with the student, and formally signed by the student, the faculty advisor, the program director, and, for selected changes, the academic dean. This flexibility allows adapting programs of study to differing student then current capabilities and interests.

#### **Degree Requirements**

The MS program in biostatistics is 30 credit hours over three semesters for full-time students. Additional credit hours may be needed for remediation of missing or lacking student

capabilities encountered following matriculation or for capabilities outside the standard coursework required for an identified project or thesis.

A student may apply to continue beyond the required coursework to pursue the preparation and defense of a six credit-hour master’s thesis in an additional semester. The optional thesis requires permission of the program director and is available for those students intending to pursue a Ph.D. degree or wanting to pursue a research project that interests them. However, a master’s thesis is not a requirement for the degree. A student who pursues a thesis and subsequently does not successfully complete the thesis remains eligible for award of degree.

Award of degree from an accredited school of public health requires successful completion of the equivalent of three credit hours in:

- Instruction that introduces the students to the breadth of public health
- Instruction in epidemiology

Either or both of these requirements may be determined to have been met prior to matriculation by approval of the academic dean of a variance request submitted by the program director. The request for a variance in one or both requirements must be justified by (1) previous degrees received, such as an MPH or Dr.P.H., (2) previous coursework successfully completed, or (3) extensive experience in the public health workforce. In the absence of a variance for a requirement, the student’s program of study must include successfully completed coursework that satisfies the requirement.

For the MS in Biostatistics, the epidemiology requirement is met by the epidemiology elective included in the required coursework. However, the public health foundation requirement is not included in the required coursework and, in the absence of a variance, is met by including PHMS-523 Public Health in the U.S. on a co-curricular basis prior to graduation.

Coursework

<b>Semester</b>	<b>Course No.</b>	<b>Course Title</b>	<b>Credits</b>
Fall 1	PHST 661	Probability	3
	PHST 680	Biostatistical Methods I	3
	PHST 624	Clinical Trials I	2
	PHMS 523	Public Health in the U.S. <sup>1</sup>	(2)
	Semester Total		8 (10)
Spring 1	PHST 662	Mathematical Statistics	3
	PHST 681	Biostatistical Methods II	3
	PHST 684	Categorical Data Analysis	3
	PHST 625	Clinical Trials II	2
	Semester Total		11

Fall 2	PHST 683	Survival Analysis	3
	PHST xxx	Biostatistics Elective <sup>2</sup>	3
	PHEP xxx	Epidemiology Elective <sup>3</sup>	3
	PHST 675	Independent Study in Biostatistics	2
	Semester Total		<b>11</b>
<b>Degree Total</b>		<b>30</b>	
Spring 2	PHST 666	Master's Thesis Research (optional)	6
	Total		6
	<b>Degree Total with Optional Thesis</b>		<b>36</b>

1. PHMS 523 fulfills the accreditation requirement that all graduates from the School of Public Health and Information Science receive foundational instruction in public health
2. The biostatistics elective is chosen with the approval of a faculty advisor, typically from courses offered by the Department of Bioinformatics and Biostatistics (PHST courses)
3. The epidemiology elective is chosen with the approval of a faculty advisor from courses offered by the Department of Epidemiology and Population Health (PHEP courses)

Students in the 3-semester, non-thesis M.S. fulfill their degree requirements after the Fall semester of the second year of study.

### Optional Thesis

A student may apply to pursue preparation and defense of a master's thesis following completion of the required coursework. Pursuing an optional thesis requires permission of the program director. The thesis topic is approved by the major professor and thesis committee, chaired by the major professor. The student identifies a desired mentor to become his or her major professor, who is recommended by the program director and appointed by the academic dean. Following appointment, the major professor becomes the student's faculty advisor. Procedures for the thesis are given below.

### *Thesis Committee*

Working with the major professor, the student identifies at least two or more desired committee members. Including the major professor, at least two members of the committee are faculty in the Department of Bioinformatics and Biostatistics and at least one member is from outside the department. The committee members are recommended by the program director and appointed by the academic dean.

### *Thesis Preparation*

The thesis is prepared in format and binding according to the [guidelines](#) established by the School of Interdisciplinary and Graduate Studies.

### *Thesis Approval*

The thesis is submitted in completed form to the chair of the thesis committee at least fifteen working days before the last day of classes for the term in which the candidate expects to graduate. The candidate is not eligible for the final oral examination until the thesis has been accepted by the committee.

The thesis committee schedules an oral examination of the candidate, to which all faculty and students of the department are invited. The oral examination is scheduled at the convenience of the members of the thesis committee. Approval of the thesis is by majority vote of the committee.

### *Thesis Submission*

The following steps must be taken to submit the final copy of the thesis electronically after oral defense and approval of the committee:

1. Final document must be converted to a PDF (following the guidelines as noted above) and sent to SIGS and the department's administrative assistant.
2. Complete the "Electronic Thesis or Dissertation Submission" [form](#).
3. The signature page within the electronic version must have the names of the committee members typed under the signature line; the signatures cannot be scanned into the document.
4. Submit a signed signature page on white paper, with original signatures, to the School of Interdisciplinary and Graduate Studies, attention Courtney Kerr.
5. Submit the completed form (Nonexclusive License form), which will be provided after the review from the School of Interdisciplinary and Graduate Studies.

A copy of the final, signed thesis must also be deposited with the department office.

### **Accreditation**

The Program is accredited by the Council on Education for Public Health (CEPH).

The University of Louisville is accredited by the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC).

For more information, see the [School's accreditation webpage](#).