

BIostatISTICS, DOCTOR OF PHILOSOPHY (PH.D.)

Program goal

The mission of the VCU Department of Biostatistics is to improve human health through methodological research, the education of graduate students and health science researchers in biostatistical methods and applications, and collaborative health sciences research. Faculty members conduct methodological research motivated by collaborative alliances, which in turn contributes to and enhances the department's educational mission. By focusing on the integration of methodological and collaborative research, students develop strong biostatistical and communication skills, enabling them to assume leadership positions in academia, government and industry.

Student learning outcomes

This training program is designed to help students achieve the following learning outcomes:

1. The successful candidate will understand the modern and advanced literature of biostatistical concepts, ideas and methods, to which the candidate will contribute by developing new (or extending existing) biostatistical methods through scholarly peer-reviewed publications.
2. The successful candidate will demonstrate the ability to effectively collaborate with both biostatistical and health science researchers, specifically with respect to planning and designing research studies and also in analyzing data from a broad spectrum of research questions.
3. The successful candidate will develop fluency in several computational languages, will exhibit proficiency in standard computational and analytic procedures and will demonstrate the ability to computationally solve new and complex problems.
4. The successful candidate will display exceptional written and oral communication skills in terms of explaining biostatistical concepts, methods and results to both biostatistical and non-biostatistical health sciences researchers.

VCU Graduate Bulletin, VCU Graduate School and general academic policies and regulations for all graduate students in all graduate programs

The VCU Graduate Bulletin website documents the official admission and academic rules and regulations that govern graduate education for all graduate programs at the university. These policies are established by the graduate faculty of the university through their elected representatives to the University Graduate Council.

It is the responsibility of all graduate students, both on- and off-campus, to be familiar with the VCU Graduate Bulletin as well as the **Graduate School website** and academic regulations in individual school and department publications and on program websites. However, in all cases, the official policies and procedures of the University Graduate Council, as published on the VCU Graduate Bulletin and Graduate School websites, take precedence over individual program policies and guidelines.

Visit the academic regulations section for additional information on academic regulations for graduate students.

Degree candidacy requirements

A graduate student admitted to a program or concentration requiring a final research project, work of art, thesis or dissertation, must qualify for continuing master's or doctoral status according to the degree candidacy requirements of the student's graduate program. Admission to degree candidacy, if applicable, is a formal statement by the graduate student's faculty regarding the student's academic achievements and the student's readiness to proceed to the final research phase of the degree program.

Graduate students and program directors should refer to the following degree candidacy policy as published in the VCU Graduate Bulletin for complete information and instructions.

Visit the academic regulations section for additional information on degree candidacy requirements.

Graduation requirements

As graduate students approach the end of their academic programs and the final semester of matriculation, they must make formal application to graduate. No degrees will be conferred until the application to graduate has been finalized.

Graduate students and program directors should refer to the following graduation requirements as published in the Graduate Bulletin for a complete list of instructions and a graduation checklist.

Visit the academic regulations section for additional information on graduation requirements.

Other information

School of Medicine graduate program policies

The School of Medicine provides policies applicable to all programs administratively housed in the school. Information on **doctoral programs** is available elsewhere in this chapter of the Graduate Bulletin.

Apply online today. (<https://www.vcu.edu/admissions/apply/graduate/>)

Admission requirements

| Degree: | Semester(s) of entry: | Deadline dates: | Test requirements: |
|---------|-----------------------|--|--------------------|
| Ph.D. | Fall preferred | Applications received prior to Jan 15 given priority consideration | GRE |

In addition to the general admission requirements of the VCU Graduate School (<http://bulletin.vcu.edu/graduate/study/admission-graduate-study/admission-requirements/>), applicants must complete the verbal, quantitative and analytical writing sections of the Graduate Record Exam. The following mathematics courses or their equivalents are required for admission: MATH 307, MATH 310, STAT 309 and STAT 212. MATH 507 and an additional graduate-level math analysis course are recommended for students interested in completing the Ph.D. program.

Degree requirements

In addition to the general VCU Graduate School graduation requirements (<http://bulletin.vcu.edu/academic-regs/grad/graduation-info/>), Ph.D. students must complete a minimum total of 78 credit hours (59 didactic

hours, plus eight hours each of seminar and consulting, and at least three credit hours of research). More specifically, required courses include BIOS 513, BIOS 514, BIOS 524, BIOS 601, BIOS 602, BIOS 606, BIOS 615, BIOS 631, BIOS 647, BIOS 653, BIOS 654 and one of OVPR 601, OVPR 602 or OVPR 603. Students must take at least 18 credits of additional BIOS, STAT or MATH courses, with at least two being BIOS courses and at least two being at the 600 level, and one graduate-level non-BIOS, STAT or MATH course. Ph.D. students must also take eight semesters each of BIOS 603 and BIOS 690. In addition, Ph.D. students will participate in the summer student training program at least twice and present at the Biostatistics Student Research Symposium each fall.

Qualifying exam

Students pursuing the Ph.D. degree must pass a two-part qualifying examination administered after completion of their first-year courses. Part A (the theoretical examination) covers material from the following first-year courses: BIOS 513, BIOS 514, BIOS 653 and BIOS 654. Part B (the applied examination) covers material from the following first-year courses: BIOS 524, BIOS 601, BIOS 602 and BIOS 606.

Each part of the exam is graded as pass or fail. A student must pass both Part A and Part B of the qualifying exam at the Ph.D. level to continue in the Ph.D. program. A student who does not pass either Part A or Part B of the qualifying examination at the Ph.D. level will have one opportunity to retake that part of the qualifying examination.

Dissertation proposal defense

Students pursuing the Ph.D. degree who have passed the qualifying exam must pass a defense of their dissertation proposal that will consist of both written and oral components. For the written component of the dissertation proposal defense the student will produce a detailed report and description of the proposed research plan. For the oral component of the dissertation proposal defense the student will present the dissertation proposal to their dissertation committee and respond to any feedback or questions.

The proposal defense will be scheduled as soon as the student is ready after passing both parts of the qualifying examination. This could be as early as Year 2, with students required to defend before December of their fourth year.

Each part of the exam is graded as pass or fail. A student must pass both Part A and Part B of the dissertation proposal defense to continue toward their final dissertation defense. A student who does not pass both Part A and Part B of the dissertation proposal defense may choose to complete the requirements for an M.S. degree.

Admission to candidacy

A student must pass both parts A and B of their qualifying examination, must identify a dissertation adviser and committee and must pass both the written and oral components of the dissertation proposal defense before they can be admitted to candidacy.

Dissertation

A comprehensive dissertation reporting the results of original research is required for the Ph.D. degree.

Final examination

All Ph.D. candidates must defend their dissertations at a final oral examination. A public presentation will precede a Ph.D. defense closed to

all but the student's committee. Questions are restricted to the topic of the dissertation for the Ph.D. candidate.

Course requirements

| Course | Title | Hours |
|--|--|-------|
| Required core courses | | |
| BIOS/STAT 513 | Mathematical Statistics I | 3 |
| BIOS/STAT 514 | Mathematical Statistics II | 3 |
| BIOS 524 | Biostatistical Computing | 3 |
| BIOS 601 | Analysis of Biomedical Data I | 3 |
| BIOS 602 | Analysis of Biomedical Data II | 3 |
| BIOS 603 | Biostatistical Consulting (1 credit course taken 8 semesters) | 8 |
| BIOS 606 | Clinical Trials | 3 |
| BIOS 615 | Advanced Inference | 4 |
| BIOS 647 | Survival Analysis | 3 |
| BIOS 653 | Biostatistical Methods I | 4 |
| BIOS 654 | Biostatistical Methods II | 4 |
| BIOS 690 | Biostatistical Research Seminar (1 credit course taken 8 semesters) | 8 |
| Required additional courses | | |
| BIOS 631 | Mixed Models and Longitudinal Data Analysis | 4 |
| OVPR 601 or OVPR 602 or OVPR 603 | Scientific Integrity Responsible Scientific Conduct Responsible Conduct of Research | 1 |
| | Select one additional 600-level course (non-BIOS, non-STAT or non-MATH) with approval of program director. Suggested courses topics include: | 3 |
| | Epidemiology and community health (EPID) | |
| | Social and behavioral health (SBHD) | |
| | Health care policy and research (HCPR) | |
| | Bioinformatics (BNFO) | |
| Elective courses | | |
| | At least 18 credits must come from the courses listed below (at least two must be BIOS courses; at least two must be at the 600-level) or others selected with approval of program director. | 18 |
| BIOS 535 | Behavioral Measurement | |
| BIOS 549 | Spatial Data Analysis | |
| BIOS 632 | Multivariate Analysis | |
| BIOS 635 | Structural Equation Modeling | |
| BIOS 649 | Advanced Spatial Data Analysis | |
| BIOS 658 | Statistical Methods for High-throughput Genomics Data I | |
| BIOS 667 | Statistical Learning and Data Mining | |
| BIOS 668 | Statistical Methods for High-throughput Genomic Data II | |
| BIOS 688 | Applied Bayesian Biostatistics | |
| BIOS 691 | Special Topics in Biostatistics | |
| MATH 640 | Mathematical Biology I | |
| STAT 613 | Stochastic Processes | |
| STAT 614 | Stochastic Processes | |
| STAT/OPER 636 | Machine Learning Algorithms | |

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|------------------------------|--------------------------------------|----|
| STAT 642 | Design and Analysis of Experiments I | |
| STAT 645 | Bayesian Decision Theory | |
| STAT 675 | Time Series Analysis I | |
| Dissertation research | | |
| BIOS 697 | Directed Research in Biostatistics | 3 |
| Total Hours | | 78 |

The minimum total of graduate credit hours required for this degree is 78.

Contact

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Program website: [biostatistics.vcu.edu](http://www.biostatistics.vcu.edu) (<http://www.biostatistics.vcu.edu/>)