

## **Dual Master of Science (MS) in Biostatistics-Decision Science and Doctor of Philosophy (PhD) in Applied and Industrial Mathematics**

Dual degrees in Biostatistics-Decision Science and Applied and Industrial Mathematics are offered by the College of Arts and Sciences and the School of Public Health and Information Sciences. Upon completion of the program, students will receive a PhD in Applied and Industrial Mathematics and an MS in Biostatistics-Decision Science.

### **Application Procedure**

To be admitted to the program, the student is required to apply to and be accepted by both the Department of Mathematics and the Biostatistics-Decision Science Program. A student seeking admission into this program must submit letters to both the Department of Mathematics and the Department of Bioinformatics and Biostatistics stating the intent to take advantage of the dual degree program, and stating whether the student is interested in the Biostatistics or the Decision Science concentration. Students must submit 2 recent letters of recommendation with their letter of intent. Applicants will receive written notification stating whether their admission request has been approved or disapproved.

### **Degree Requirements**

#### ***Required Courses***

The required courses for the dual degree program consist of all non-overlapping core courses for both the PhD in Applied and Industrial Mathematics and the MS in Biostatistics-Decision Science, as well as the requirements for either the Decision Science or Biostatistics concentration within the Biostatistics-Decision Science program.

#### ***Core Course Requirements for the PhD in Applied and Industrial Mathematics (24 credit-hours)***

Two sequences, each of six (6) credit-hours, chosen from

- Algebra - Mathematics 621 and 622
- Combinatorics - Mathematics 681 and 682
- Real Analysis - Mathematics 601 and 602

Two sequences, each of six (6) credit-hours, chosen from

- Mathematical Modeling - Mathematics 635 and 636
- Applied Statistics - Mathematics 665 and 667
- Probability and Mathematical Statistics - Mathematics 660 and 662

Courses taken in requirement of the mathematics component of the dual degree program can be used to satisfy the 6 to 9 credit-hours of electives required for the MS in Biostatistics-Decision Science.

*Core Course Requirements for the MS in Biostatistics-Decision Science (12 to 18 credit-hours)*

The following courses are required for both tracks.

- PHEP-511 Introduction to Public Health and Epidemiology (3 credit-hours)
- PHCI 631 Social and Behavioral Sciences in Health Care (2 credit-hours)
- Introduction to Environmental Health
- Health Economics
- PHDA 602 Biostatistics-Decision Science Seminar (4 credit-hours)
- PHST 661 and 662 Probability and Mathematical Statistics (6 credit-hours)\*

\* This requirement is waived if the student takes the Mathematics 660, 662 sequence listed above.

*Concentration Courses Requirements for the MS in Biostatistics-Decision Science (5 to 6 credit-hours)*

Biostatistics Concentration Requirements:

- Biostatistical Methods I and II - PHDA 680 and 681 (6 credit-hours)

Decision Science Concentration Requirements:

- Ethical Issues in Decision Making - PHDA 605 (2 credit-hours)
- Decision Analysis - PHDA 663 (3 credit-hours)

Courses taken to satisfy the Biostatistics-Decision Science component of the dual degree program can be applied to the 18 credit-hours of electives which are required for the PhD in Applied and Industrial Mathematics.

*Combined Industrial Internship, Practicum and Masters Thesis (6-8 credit-hours)*

The Industrial Internship required by the Department of Mathematics, and the Public Health Practicum and Masters thesis required for the MS can be satisfied by a single internship and technical report which simultaneously satisfies the requirements for both degrees. Specifically, the internship must both focus on public health so that it satisfies the Public Health Practicum (PHDA-603), and contain advanced mathematical content, so that it satisfies the PhD-level Industrial Internship (MATH-694). Likewise, the technical report must meet two requirements: it must satisfy the requirements for a Master's thesis for the MS degree (PHDA-666) and it must be written at an advanced mathematical level expected for the PhD-level Industrial Internship. The six to eight credit-hours of the internship will be divided evenly between the Department of Mathematics and the Biostatistics-Decision Science Program.

This requirement cannot be replaced by a previous master's thesis. This requirement must be satisfied as previously described, meeting the specifications of both departments.

*Dissertation and Qualifying Examinations*

In order for the student to fulfill the PhD requirements, the student must satisfy both the qualifying examination and dissertation requirements for the PhD in Applied and Industrial Mathematics. Failure to complete these requirements will not jeopardize the MS degree, if all its requirements have been satisfactorily completed.

*Special Considerations*

- Students who have already completed a Master's degree in the Department of Mathematics
- Credit requirements

To preserve the spirit of a dual degree, such students need to complete 36 credit-hours of courses as required for the MS in Biostatistics-Decision Science. Six (6) credit-hours from the previous master's degree coursework can be applied to this requirement. The remaining credit-hours must be chosen from the list of approved electives for the Department of Bioinformatics and Biostatistics, with preference given to courses in the Departments of Mathematics and Bioinformatics and Biostatistics.