

# DOCTOR OF PHILOSOPHY IN NATURAL SCIENCES: BIOMEDICAL AND HEALTH INFORMATICS

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## Student Learning Outcomes

Students graduating from this program will:

- Demonstrate a thorough degree of knowledge in the disciplines
- Demonstrate an ability to use proper investigation techniques for the disciplines
- Use oral and written forms of communication to convey their ideas

## Program Structure

**Total Credits Required for Graduation:** 42\*

**Residency requirements:** Ph.D. students must satisfy the doctoral residency requirement by satisfactory completion of at least 18 credits in no more than 24 consecutive months. When satisfying the residency requirement, all Ph.D. students are subject to the following restrictions:

- The doctoral residency requirement must be satisfied no later than the end of the semester in which the student completes his or her comprehensive examinations.
- Students must achieve a cumulative graduate grade-point average of at least 3.0 in all courses counted toward satisfying the residency requirement.

\* *Specific disciplines may require more credit hours for graduation. See discipline specific coursework requirements for more information on total credit hours required for graduation.*

## Program Requirements

The coursework requirements encompass:

- A minimum of 12 credit hours of coursework within the primary area, accompanied by at least 12 dissertation hours. The primary disciplines retain the flexibility to potentially request more than the minimum credit hours.
- A minimum of 9 credit hours within a secondary discipline area, with the secondary discipline also having the option to specify additional credit hours beyond the minimum.
- A minimum of 30 classroom credits is required beyond the baccalaureate, including fundamental and advanced courses along with seminars.
- Any primary area discipline can be combined with any secondary area discipline.

## Participating Disciplines

Participating disciplines encompass a range of fields, including:

- Biomedical and Health Informatics
- Cell Biology and Biophysics
- Chemistry
- Geosciences
- Mathematics
- Molecular Biology and Biochemistry
- Oral and Craniofacial Sciences
- Pharmaceutical Science
- Pharmacology
- Physics

## Student Learning Outcomes

Students graduating from this program will:

- Demonstrate a thorough degree of knowledge in the discipline
- Demonstrate an ability to use proper investigation techniques for the discipline
- Use oral and written forms of communication to convey their ideas

## Biomedical and Health Informatics

Students with a Biomedical and Health Informatics primary discipline will complete a minimum of 48 credit hours, including 21 credit hours in the primary discipline, 9-12 hours in a secondary discipline, and 6 credit hours of electives. At least 12 hours of dissertation credit in the primary discipline are required.

The core 21 hours of primary discipline coursework must include the 18 hours listed below: 6 credit hours should be taken from Biostatistics; 6 credit hours should be taken from Research Methodology area and 6 credit hours should be taken from the Informatics area. Courses taken to meet this requirement may be adjusted to reflect the courses taken in the chosen secondary discipline.

### Primary Discipline Program Requirements

Code	Title	Credits
<b>Biostatistics options below:</b>		<b>6</b>
MEDB 5501	Applied Biostatistics I *	
MEDB 5502	Applied Biostatistics II *	
MEDB 5503	Biostatistics III-Mixed-Effects Models	
MEDB 5535	Quantitative Aspects of Epidemiologic Research	
<b>Research Methodology options below:</b>		<b>6</b>
MEDB 5510	Clinical Research Methodology	
MEDB 5561	Responsible Conduct of Research	
<b>Informatics options below:</b>		<b>6</b>
MEDB 5520	Introduction to Medical Informatics	
MEDB 5521	Clinical Bioinformatics	
MEDB 5525	Social Determinants of Health	
COMP-SCI 5565	Introduction to Statistical Learning	
COMP-SCI 5590	Special Topics (Machine Learning)	
Electives (3 cr. hrs. of Biomed plus 6 cr. hrs. of any-discipline)		9
Dissertation		12

\* Required Course

**Total Credit Hours: 48**

### Secondary Discipline Program Requirements

Code	Title	Credits
A minimum of 9 credit hours, as listed below:		9
MEDB 5501	Applied Biostatistics I	3
MEDB 5502	Applied Biostatistics II	3
MEDB 5510	Clinical Research Methodology	3
Depending on prior coursework, the below may be substituted:		
MEDB 5511	Principles and Applications of Epidemiology	
MEDB 5514	Human Genome Epidemiology	
MEDB 5520	Introduction to Medical Informatics	
MEDB 5535	Quantitative Aspects of Epidemiologic Research	

## Admission Requirements

The GRE test is required in most cases for primary discipline applicants. Applicants to the co-discipline must meet the requirements of their intended primary discipline.

## Discipline Overview

Biomedical and Health Informatics is the “scientific field that deals with biomedical information, data, and knowledge – their storage, retrieval, and optimal use for problem solving and decision making. It accordingly touches on all basic and applied fields in biomedical science and is closely tied to modern information technologies, notably in the areas of computing and communication, i.e. medical computer science.” (Definition from Stanford University, Medical Informatics.) The National Center for Biotechnology Information defines Bioinformatics as the “field of science in which medicine, biology, computer science, and information technology merge to form a single discipline. The ultimate goal of the field is to enable the discovery of new biological insights as well as to create a global perspective from which unifying principles in biology and health can be discerned.”

## Curriculum Overview

The goal of the Biomedical and Health Informatics Ph.D. discipline is to train researchers to contribute to the translation of basic science findings into patient care and ultimately into community standards and policy. Given the diversity of specialties that are included in the field of biomedical and health informatics, individual training will vary depending on the student's career goals. Graduates of this discipline will be able to apply knowledge and skills in the area of biomedical and health informatics by: generating a research hypothesis; proposing, conducting, and reporting research; performing appropriate statistical analysis; and, communicating scientific information.

## Admissions

Applicants must meet both the general and the discipline specific criteria for admission and be recommended for admission by the doctoral faculty review groups in at least two disciplines. Upon approval by the graduate dean, students are admitted to the School of Graduate Studies.