BIOMEDICAL AND HEALTH INFORMATICS, PHD

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Degree: Doctor of Philosophy (PhD)
Field of Study: Biomedical and Health Informatics

Program Overview
The PQHS faculty team is dedicated to mentoring PhD students in developing a career grounded in research that can be applied across many areas of biomedical, clinical and population health, and bioinformatics. We take time getting to know candidates and in cultivating junior colleagues who can expect that our interdisciplinary approach will offer a solid intellectual grounding for a future career.

The PhD BHI program builds on the BHI Master’s – or Master’s programs from other institutions – and offers a focus on core domain areas:

- Data analytics
- Biomedical, clinical and/or population health research
- Computational and system research design

The PhD program is a full-time, research oriented program, based in Cleveland, that typically takes four years (post-Master’s) to complete. PhD candidates take core requirements intended to support capabilities essential to the interdisciplinary research that this program advances. Additionally, there are courses at the 400 level and higher across these domain areas available for a tailored program, based on recommendations from the student’s mentorship/advisory committee and the student’s areas of interest. In total, there are 36 credits of coursework plus 18 of dissertation research, all in line with CWRU PhD program requirements.

All first-year full-time students in the PhD program are fully funded by the School of Medicine (Stipend, Tuition, and Health Insurance are included). After the conclusion of their first year, students will be supported by grants (research and training) held by their research mentor.

In addition to coursework in their first year, all students will do three research rotations chosen from an approved list of potential mentors. The purpose of a rotation is to provide students with exposure to the laboratory/scientific culture pervasive in that discipline and research group and to determine if the student-mentor fit is appropriate. Faculty members conduct their independent research and run their laboratories using a variety of styles. The rotation gives the student and faculty member an opportunity to determine if they have similar work styles and if the scientific culture and training will lead to successful training of the student. By the end of the first year, all students will choose a mentor and a lab in which to do their dissertation work.

Students will master the rigorous scientific and analytic methods necessary to be at the forefront of efforts to not only describe but also effectively evaluate and improve health. Exposure to cutting edge research will be facilitated by our department-wide seminar that includes talks by world-leading experts both from off- and on-campus. As part of their training, all students will participate in these seminars, including as speakers. This will help develop the necessary communication skills that are expected of successful researchers.

The PhD in Biomedical Health Informatics welcomes applicants from a diverse field of backgrounds and training experiences. Graduates from accredited universities and colleges will be considered for admission to the department. Applicants may apply straight from baccalaureate training, from advanced degree programs (MS, MPH, MD), or from the professional field. All applicants must satisfy both CWRU and department requirements for graduate admission.

Important Note: The program information contained on this page is current as of May 1st, 2023. For the most current information, we advise you to review the PhD in Biomedical and Health Informatics program handbook. You can find the most recent Program Handbook here.

PhD Policies
For PhD policies and procedures, please review the School of Graduate Studies section of the General Bulletin.

Program Requirements
Core Curriculum
All incoming PhD students take a required curriculum supplemented by additional coursework as determined by their mentoring or dissertation committees. The required curriculum contains courses that expose students to each of the required domains.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>PQHS 413</td>
<td>Introduction to Data Structures and Algorithms in</td>
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<tr>
<td></td>
<td>Python</td>
<td>15</td>
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<tr>
<td>PQHS 416</td>
<td>Computing in Biomedical Health Informatics</td>
<td></td>
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<tr>
<td>PQHS 431</td>
<td>Statistical Methods I</td>
<td></td>
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<tr>
<td>PQHS 432</td>
<td>Statistical Methods II</td>
<td></td>
</tr>
<tr>
<td>PQHS 490</td>
<td>Epidemiology: Introduction to Theory and Methods</td>
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Biomedical and Health Domain Courses:

- EBME 410  Medical Imaging Fundamentals
- MPHP 406  History and Philosophy of Public Health
- PQHS 440  Introduction to Population Health
- PQHS 451  A Data-Driven Introduction to Genomics and Human Health
- PQHS 465  Design and Measurement in Population Health Sciences
- PQHS 490  Epidemiology: Introduction to Theory and Methods

Computation and System Design Domain Courses:

- CSDS 410  Analysis of Algorithms
- PQHS 413  Introduction to Data Structures and Algorithms in Python
- CSDS 433  Database Systems
- CSDS 458  Introduction to Bioinformatics
- CSDS 477  Advanced Algorithms
- CSDS 493  Software Engineering
- PQHS 471  Machine Learning & Data Mining
- PQHS 427  Geospatial Analytics for Biomedical Health Applications
## Data Analytics Domain Courses:

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<th>Course</th>
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<tbody>
<tr>
<td>EBME 419</td>
<td>Applied Probability and Stochastic Processes for Biology</td>
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<tr>
<td>PQHS 453</td>
<td>Categorical Data Analysis</td>
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<td>PQHS 459</td>
<td>Longitudinal Data Analysis</td>
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<tr>
<td>PQHS 467</td>
<td>Comparative and Cost Effectiveness Research</td>
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<tr>
<td>PQHS 515</td>
<td>Secondary Analysis of Large Health Care Databases</td>
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<td>PQHS 426</td>
<td>An Introduction to GIS for Health and Social Sciences</td>
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## Required Research Courses:

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>IBMS 500</td>
<td>On Being a Professional Scientist: The Responsible Conduct of Research</td>
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<tr>
<td>IBMS 501</td>
<td>Responsible Conduct of Research for Advanced Trainees a</td>
</tr>
<tr>
<td>PQHS 444</td>
<td>Communicating in Population Health Science Research</td>
</tr>
<tr>
<td>PQHS 445</td>
<td>Research Ethics in Population Health Sciences</td>
</tr>
<tr>
<td>PQHS 501</td>
<td>Research Seminar</td>
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Electives c 13

Dissertation d 18

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<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>PQHS 701</td>
<td>Dissertation Ph.D.</td>
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### Second Year

#### Fall

- **PQHS 444**: Communicating in Population Health Science Research (1 hour)
- **PQHS 501**: Research Seminar (0 hours)
- Domain Area Course or Elective (3 hours)
- Elective (4 hours)
- Elective (4 hours)

**Hours**: 12

#### Spring

- **IBMS 500**: On Being a Professional Scientist: The Responsible Conduct of Research (1 hour)
- **PQHS 501**: Research Seminar (0 hours)
- Domain Area Course or Elective (3 hours)
- Elective (4 hours)
- Elective (4 hours)
- **PQHS 445**: Research Ethics in Population Health Sciences (0 hours)

**Hours**: 12

### Third Year

#### Fall

- **PQHS 501**: Research Seminar (0 hour)
- **PQHS 701**: Dissertation Ph.D. (1-9 hours)
- Elective (1 hour)

**Hours**: 2-10

#### Spring

- **PQHS 501**: Research Seminar (0 hours)
- **PQHS 701**: Dissertation Ph.D. (1-9 hours)

**Hours**: 1-9

### Fourth Year

#### Fall

- **PQHS 501**: Research Seminar (0 hours)
- **PQHS 701**: Dissertation Ph.D. (1-9 hours)

**Hours**: 1-9

#### Spring

- **PQHS 501**: Research Seminar (0 hour)
- **PQHS 701**: Dissertation Ph.D. (1-9 hours)

**Hours**: 1-9

**Total Hours**: 47-79

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### Important Note:

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