

# BIOMEDICAL DATA SCIENCE, PH.D.

## REQUIREMENTS

### MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (<http://guide.wisc.edu/graduate/#policiesandrequirements>), in addition to the program requirements listed below.

### MAJOR REQUIREMENTS

#### MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

#### Mode of Instruction Definitions

**Accelerated:** Accelerated programs are offered at a fast pace that condenses the time to completion. Students are able to complete a program with minimal disruptions to careers and other commitments.

**Evening/Weekend:** Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

**Face-to-Face:** Courses typically meet during weekdays on the UW-Madison Campus.

**Hybrid:** These programs combine face-to-face and online learning formats. Contact the program for more specific information.

**Online:** These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

### CURRICULAR REQUIREMENTS

#### Requirements Detail

Minimum Credit Requirement	51 credits
Minimum Residence Credit Requirement	32 credits
Minimum Graduate Coursework Requirement	Half of degree coursework (26 out of 51 total credits) must be completed in graduate#level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide.
Overall Graduate GPA Requirement	3.00 GPA required.
Other Grade Requirements	Ph.D. candidates should maintain a 3.0 GPA in all core curriculum courses and may not have any more than two Incompletes on their record at any one time.

**Assessments and Examinations** Students must complete an Oral Preliminary Exam, ideally taken in the students' third year.

**Language Requirements** No language requirements.

**Doctoral Minor/Breadth Requirements** All doctoral students are required to complete a minor.

### REQUIRED COURSES

Code	Title	Credits
<b>Core Topics</b>		
<i>Biostatistics</i>		6-8
Students select one of the following (Topics 1-2):		
Topic 1: Biostatistics Theory and Methods		
STAT 609 & STAT 610	Mathematical Statistics I and Introduction to Statistical Inference	
Topic 2: Biostatistical Methods		
STAT 849 & STAT 850	Theory and Application of Regression and Analysis of Variance I and Theory and Application of Regression and Analysis of Variance II	
<i>Computer Science/Informatics</i>		6-7
Students select one of the following (Topics 3-6):		
Topic 3: Machine Learning / AI		
COMP SCI 540 & COMP SCI 760	Introduction to Artificial Intelligence and Machine Learning	
Topic 4: Database Systems		
COMP SCI 564 & COMP SCI 764	Database Management Systems: Design and Implementation and Topics in Database Management Systems	
Topic 5: Optimization		
COMP SCI/I SY E/ MATH/STAT 525 & COMP SCI/ I SY E/MATH/ STAT 726	Linear Optimization and Nonlinear Optimization I	
Topic 6: Algorithms		
COMP SCI 577 & COMP SCI 787	Introduction to Algorithms and Advanced Algorithms	
<i>Additional Specializations</i>		6-8
Students select any of the above or following topics (Topics 1-11):		
Topic 7: Clinical Informatics		
I SY E 417 & B M I/I SY E 617	Health Systems Engineering and Health Information Systems	
Topic 8: Clinical Biostatistics		
B M I/STAT 641 & STAT/B M I 642	Statistical Methods for Clinical Trials and Statistical Methods for Epidemiology	
Topic 9: Statistical Computing		

Select two of the following courses:

STAT 627	Professional Skills in Data Science
STAT 771	Statistical Computing
STAT/ECON/ GEN BUS 775	Introduction to Bayesian Decision and Control I

#### Topic 10: Bioinformatics / Statistical Genomics

Select two of the following courses:

B M I/ COMP SCI 576	Introduction to Bioinformatics
B M I/ COMP SCI 776	Advanced Bioinformatics
B M I/STAT 877	Statistical Methods for Molecular Biology

#### Topic 11: Biomedical Image Analysis

Select two of the following courses:

COMP SCI 765	Data Visualization
COMP SCI 766	Computer Vision
B M I/ COMP SCI 767	Computational Methods for Medical Image Analysis
B M I/STAT 768	Statistical Methods for Medical Image Analysis

#### Biology Courses 6

Students consult with their advisor to select courses.

#### Research Ethics Course 1-2

B M I 826	Special Topics in Biostatistics and Biomedical Informatics (Topic: Ethics for Data Scientists)
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B M I 826 is recommended. If a student is unable to take B M I 826, one of the following courses may be substituted.

ONCOLOGY 715	Ethics in Science
BIOCHEM 729	Advanced Topics (Topic: Responsible Conduct of Research)
NURSING 802	Ethics and the Responsible Conduct of Research
SURG SCI 812	Research Ethics and Career Development
OBS&GYN 955	Responsible Conduct of Research for Biomedical Graduate Students
OBS&GYN 956	Advanced Responsible Conduct of Research for Biomedical Students

#### Second-Year Literature Seminar

B M I 881 & B M I 882	Biomedical Data Science Scholarly Literature 1 and Biomedical Data Science Scholarly Literature 2	4
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#### Third-Year Professional Skills Seminar

B M I 883 & B M I 884	Biomedical Data Science Professional Skills 1 and Biomedical Data Science Professional Skills 2	2
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#### Electives 6

Electives are selected in consultation with the student's faculty advisor.

#### Pre-Dissertator Research 6

Three semester#long research rotations (2 credits of B M I 899 Pre-dissertator Research per semester) concerning a substantive problem in biomedical data science, advised by a program faculty member in collaboration with a UW faculty member from the biological, biomedical, or population health sciences.

**Students take additional research and elective credits to reach 51 credits.**

**Total Credits 51**