BIOLOGICAL DATA SCIENCES UNDERGRADUATE MAJOR (BS, HBS)

This major offers the following option(s):


The BDS undergraduate program provides trans-disciplinary education that intersects the life sciences, computer science, statistics, and mathematics.

Major Code: 858

- Apply the process of scientific investigation to real world biological datasets.
- Use appropriate quantitative and visual methods in scientific investigation.
- Demonstrate proficiency in using appropriate methods to organize and manipulate large datasets.
- Demonstrate effective communication and functioning in trans-disciplinary teams.
- Perform work in a professional and ethical manner.
- Apply the core concepts in the biological sciences, mathematics, statistics, and computer science to scientific investigation.

### Code Title Credits

#### Biological Science
Select one of the following biology series: 12

**Series 1**

- BI 221 *PRINCIPLES OF BIOLOGY: CELLS*
- & BI 222 *PRINCIPLES OF BIOLOGY: ORGANISMS*
- & BI 223 *PRINCIPLES OF BIOLOGY: POPULATIONS*

**Series 2**

- BI 204 *INTRODUCTORY BIOLOGY I*
- & BI 205 *INTRODUCTORY BIOLOGY II*
- & BI 206 *INTRODUCTORY BIOLOGY III*

- BI 311 GENETICS
- BI 445 EVOLUTION

#### Chemistry

- CH 231 GENERAL CHEMISTRY
- CH 261 *LABORATORY FOR CHEMISTRY 231*
- MTH 251 *DIFFERENTIAL CALCULUS*
- CS 161 INTRODUCTION TO COMPUTER SCIENCE I
- HHS 231 *LIFETIME FITNESS FOR HEALTH*

#### Mathematics

- MTH 251 *DIFFERENTIAL CALCULUS*
- & MTH 252 INTEGRAL CALCULUS
- MTH 231 ELEMENTS OF DISCRETE MATHEMATICS
- MTH 254 VECTOR CALCULUS I
- MTH 341 LINEAR ALGEBRA I

#### Statistics

- ST 351 INTRODUCTION TO STATISTICAL METHODS

#### Computer Science

- CS 161 & CS 162 INTRODUCTION TO COMPUTER SCIENCE I & II
- CS 261 DATA STRUCTURES

#### Biological Data Sciences

- BDS 211 USE AND ABUSE OF DATA: CRITICAL THINKING IN SCIENCE
- BDS 311 COMPUTATIONAL APPROACHES FOR BIOLOGICAL DATA
- BDS 406 SPECIAL PROJECTS
- BDS 411 ANALYSIS OF BIOLOGICAL DATA: CASE STUDIES
- BDS 491 CAPSTONE PROJECTS IN BIOLOGICAL DATA SCIENCE I
- BDS 492 CAPSTONE PROJECTS IN BIOLOGICAL DATA SCIENCE II

#### Experiential Learning

- Independent projects equivalent to at least 60 hours work

**Required Option** 29-37

Total credits required for graduation is 180

* Baccalaureate Core Course (BCC)
* Writing Intensive Course (WIC)

### Genomics Option

#### First Year

**Fall**

- CH 231 GENERAL CHEMISTRY
- CH 261 *LABORATORY FOR CHEMISTRY 231*
- MTH 251 *DIFFERENTIAL CALCULUS*
- CS 161 INTRODUCTION TO COMPUTER SCIENCE I
- HHS 231 *LIFETIME FITNESS FOR HEALTH*

**Credits**

- 15

**Winter**

- CH 232 GENERAL CHEMISTRY
- CH 262 *LABORATORY FOR CHEMISTRY 232*
- MTH 252 INTEGRAL CALCULUS
- CS 162 INTRODUCTION TO COMPUTER SCIENCE II
- WR 121 *ENGLISH COMPOSITION*

**Credits**

- 14

**Spring**

- CH 233 GENERAL CHEMISTRY
- CH 263 *LABORATORY FOR CHEMISTRY 233*
- MTH 231 ELEMENTS OF DISCRETE MATHEMATICS
- COMM 111 *PUBLIC SPEAKING*
- BDS 211 USE AND ABUSE OF DATA: CRITICAL THINKING IN SCIENCE

**Credits**

- 15

#### Second Year

**Fall**

- BI 221 *PRINCIPLES OF BIOLOGY: CELLS*
- MTH 254 VECTOR CALCULUS I
- CS 261 DATA STRUCTURES
- ST 351 INTRODUCTION TO STATISTICAL METHODS

**Credits**

- 16

**Winter**

- BI 222 *PRINCIPLES OF BIOLOGY: ORGANISMS*
- Bacc Core: Literature and the Arts
- ST 411 METHODS OF DATA ANALYSIS
- WR 327 *TECHNICAL WRITING*

**Credits**

- 14
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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| First Year
| Fall | BI 221 | PRINCIPLES OF BIOLOGY: CELLS | 4 |
| | CH 231 | GENERAL CHEMISTRY | 4 |
| | CH 261 | LABORATORY FOR CHEMISTRY 231 | 1 |
| | MTH 251 | DIFFERENTIAL CALCULUS | 4 |
| | WR 121 | ENGLISH COMPOSITION | 3 |
| | Credits | | 16 |
| Winter | BI 222 | PRINCIPLES OF BIOLOGY: ORGANISMS | 4 |
| | CS 161 | INTRODUCTION TO COMPUTER SCIENCE I | 4 |
| | MTH 231 | ELEMENTS OF DISCRETE MATHEMATICS | 4 |
| | BDS 211 | USE AND ABUSE OF DATA: CRITICAL THINKING IN SCIENCE | 3 |
| | Credits | | 15 |
| Second Year
| Fall | MTH 254 | VECTOR CALCULUS I | 4 |
| | CS 261 | DATA STRUCTURES | 4 |
| | ST 351 | INTRODUCTION TO STATISTICAL METHODS | 4 |
| | HHS 231 | LIFETIME FITNESS FOR HEALTH | 2 |
| | Credits | | 14 |
| Winter | Elective | | 3 |
| | EEI Elective: Env.Info | | 4 |
| | ST 411 | METHODS OF DATA ANALYSIS | 4 |
| | WR 327 | TECHNICAL WRITING | 3 |
| | PAC XXX | Physical Activity Course | 1 |
| | Credits | | 15 |
| Spring | MTH 256 | APPLIED DIFFERENTIAL EQUATIONS | 4 |
| | ST 412 | METHODS OF DATA ANALYSIS | 4 |
| | BDS 311 | COMPUTATIONAL APPROACHES FOR BIOLOGICAL DATA | 3 |
| | Bacc Core: Literature & The Arts | | 3 |
| | Credits | | 14 |
| Third Year
| Fall | BI 370 | ECOLOGY | 3 |
| | BI 311 | GENETICS | 4 |
| | MTH 341 | LINEAR ALGEBRA I | 3 |
| | Bacc Core: Cultural Diversity | | 3 |
| | Bacc Core: Social Processes & Institutions | | 3 |
| | Bacc Core: Contemporary Global Issues | | 3 |
| | Credits | | 16 |
| Winter | EEI Elective: Pop., Comm; Eco.Ecology | | 3 |
| | Bacc Core: Western Culture | | 3 |
| | Bacc Core: Social Processes & Institutions | | 3 |
| | Bacc Core: Difference, Power & Discrimination | | 3 |
| | Bacc Core: Contemporary Global Issues | | 3 |
| | Credits | | 15 |
| Spring | BI 445 | EVOLUTION | 3 |
| | EEI Elective: Pop., Comm; Eco.Ecology | | 4 |
| | BDS 411 | *ANALYSIS OF BIOLOGICAL DATA: CASE STUDIES | 3 |
| | Bacc Core: Science, Technology and Society | | 3 |
| | Credits | | 16 |
| Fourth Year
| Fall | EEI Elective: Env.Info | | 4 |
| | BDS 406 | SPECIAL PROJECTS | 1 |
| | Elective | | 4 |
| | Elective | | 4 |
| | Credits | | 14 |
| Winter | EEI Elective: Pop., Comm; Eco.Ecology | | 3 |
| | BDS 411 | *ANALYSIS OF BIOLOGICAL DATA: CASE STUDIES | 3 |
| | BDS 411 | *ANALYSIS OF BIOLOGICAL DATA: CASE STUDIES | 3 |
| | Elective | | 4 |
| | Elective | | 4 |
| | Credits | | 16 |
| Ecological and Environmental Informatics Option
| First Year
| Fall | BI 223 | PRINCIPLES OF BIOLOGY: POPULATIONS | 4 |
| | PAC XXX | Physical Activity Course | 1 |
| | ST 412 | METHODS OF DATA ANALYSIS | 4 |
| | BDS 311 | COMPUTATIONAL APPROACHES FOR BIOLOGICAL DATA | 3 |
| | Credits | | 15 |

Total Credits 180
### Biological Data Sciences Undergraduate Major (BS, HBS)

#### Credits
- Winter: 16
- Spring: 14
- Winter: 16
- Spring: 14
- Winter: 14
- Total Credits: 180

#### Computational Biology Option

**First Year**

**Fall**
- BI 221: Principles of Biology: Cells 4
- CH 231: General Chemistry 4
- CH 261: Laboratory for Chemistry 231 1
- MTH 251: Differential Calculus 4
- WR 121: English Composition 3
- Credits: 16

**Winter**
- BI 222: Principles of Biology: Organisms 4
- CS 161: Introduction to Computer Science I 4
- MTH 252: Integral Calculus 4
- COMM 111: Public Speaking 3
- Credits: 15

**Spring**
- BI 223: Principles of Biology: Populations 4
- CS 162: Introduction to Computer Science II 4
- MTH 231: Elements of Discrete Mathematics 4
- BDS 211: Use and Abuse of Data: Critical Thinking in Science 3
- Credits: 15

**Second Year**

**Fall**
- MTH 254: Vector Calculus I 4
- CS 261: Data Structures 4
- ST 351: Introduction to Statistical Methods 4
- Bacc Core: Cultural Diversity 3
- Credits: 15

**Winter**
- Elective 3
- Bacc Core: Western Culture 3
- ST 411: Methods of Data Analysis 4
- WR 327: Technical Writing 3
- HHS 231: Lifetime Fitness for Health 2
- Credits: 15

**Spring**
- MTH 256: Applied Differential Equations 4
- Elective 3
- ST 412: Methods of Data Analysis 4
- BDS 311: Computational Approaches for Biological Data 3
- PAC XXX: Physical Activity Course 1
- Credits: 15

**Third Year**

**Fall**
- BI 311: Genetics 4
- MTH 341: Linear Algebra I 3
- Elective 3
- Bacc Core: Social Processes & Institutions 3
- Elective 3
- Credits: 16

**Winter**
- CB Elective: Bio/Bioinfo/ST 3
- Elective 3
- CS 325: Analysis of Algorithms 4
- Bacc Core: Bacc Core: Science, Technology and Society 3
- Elective 3
- Credits: 16

**Spring**
- BI 445: Evolution 3
- Elective 3
- CB Elective: Adv. CS 4
- BDS 411: Analysis of Biological Data: Case Studies 3
- BOT 401: Research 1
- Credits: 14

**Fourth Year**

**Fall**
- CB Elective: Bio/Bioinfo/ST 3
- BDS 406: Special Projects 1
- Bacc Core: Contemporary Global Issues 3
- Elective 4
- MTH 427: Introduction to Mathematical Biology 3
- Credits: 14

**Winter**
- CB Elective: Adv. CS 3
- Bacc Core: Difference, Power & Discrimination 3
- Bacc Core: Literature & The Arts 3
- BDS 491: Capstone Projects in Biological Data Science I 3
- Elective 3
- Credits: 15

**Spring**
- CB Elective: Bio/Bioinfo/ST 3
- Elective 3
- BDS 492: Capstone Projects in Biological Data Science II 3
- CB Elective: Adv. CS 4
- Credits: 14

**Total Credits: 180**