

Biological Data Sciences (BDS)  
 Department of Botany and Plant Pathology  
 Oregon State University  
 Version 3 (updated for 2022-2023 academic year)

**Major requirements: 180 total credits; 51 BaccCore; 60+ upper division; 36+ in major w/ 24+ upper division)**

**Core foundational courses (67 credits; 19 count towards Bacc Core requirements)**

<b>Discipline</b>	<b>Course Name</b>	<b>Course Number</b>	<b>Cr</b>
<b>Biological Science</b> 5 classes; 19 credits	Introductory Biology	BI 221*, 222*, 223*	12
	Genetics	OR BI 204, 205, 206	
	Evolution	BI 311 BI 445	4 3
<b>Chemistry</b> 1 class + lab; 5 credits	General Chemistry	CH 231*, 261 (lab and lecture)	5
<b>Mathematics</b> 4 classes; 15 credits	Calculus	MTH 251*, 252	8
	Vector Calculus	MTH 254	4
	Linear Algebra I	MTH 341	3
<b>Statistics</b> 3 classes; 12 credits	Intro Stats	ST 351	4
	Methods data analysis	ST 411, 412	8
<b>Biological Data Sciences</b> 6 classes; 16 credits	Critical Thinking	BDS 211	3
	Comp Approaches Biol Data	BDS 311	3
	Special Projects	BDS 420	1
	Case Studies of Biol Data	BDS 411^ (WIC)	3
	Capstone in BDS I	BDS 491	3
	Capstone in BDS II	BDS 492	3
<b>Experiential Learning</b>	Independent projects Equivalent to at least 60 hours work	May be taken for credit as 401 or 403 or for no credit as 003 or 004	

\*Bacc Core Course

^ Writing Intensive Course

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**Genomics option (GEN; 42-49 option elective credits; 32-39 general elective credits)**

Students in the Genomics Option complete courses series in general and organic chemistry and biochemistry as well as courses in two categories covering topics in biology and computational biology/genomics.

<b>Chemistry</b> 4-5 classes + 2 labs; 18-19 credits	CH 232*, CH 233*, CH 262, CH 263. General Chemistry (4, 4, 1, 1) CH 331, CH 332. Organic Chemistry (4, 4) <b>OR</b> CH 334-336. Organic Chemistry (3, 3, 3)
<b>General Biochemistry</b> 2-3 classes: 7-9 credits	BB 450, 451. General Biochemistry series (4, 3) <b>OR</b> BB 490, 491, 492. Biochemistry series (3, 3, 3)
<b>Molecular Biology</b> 1 class: 4 credits	BB 314. Cell and Molecular Biology (4)
<b>Biological Data Sciences</b> 1 class; 4 credits	BDS 310. Foundations of Biological Data Sciences (4) <b>OR</b> CS 161 (4) OR CS 162 (4)
<b>Advanced Molecular, Organismal or Cell, physiology</b> Choose 1 class; 3-5 credits	BOT 313. Plant Structure (4) BOT 331. Plant Physiology (4) BOT 332. Lab. Tech. in Plant Biology (3) BB 315. Molecular Biology Lab (3) BB 360. Introduction to Neuroscience (3) BB 460. Advanced Cell Biology (3) MB 302. General Microbiology (3) & MB 303. General Microbiology lab (2) MB/BHS 320. Human Bacteriology (4) MB/BHS 340. Human Virology (4) MB 415. Immunology (3) BHS 316. Principles of Immunology (3) BHS 329. Mech. Disease: Intro to Gen. Pathology (3) Z 425. Embryology and Development (5) Z 438. Behavioral Neurobiology (3) Z 423. Environmental Physiology (3) Z 431. Vertebrate Physiology I (4) <b>OR</b> other course with advisor approval
<b>Biocomputing or Genomics</b> Choose 2 classes; 6-8 credits	BDS/CS 446. Networks in Computational Biology (3) BDS 472. Adv. Comp for Biol Data Analysis (3) BDS 474. Intro to Genome Biology (3) BDS 475. Comparative Genomics (4) BDS 477. Pop. Genomics (3) BDS 478. Functional Genomics (3) BI 454. Evolutionary Genomics (3) BB 485. Applied Bioinformatics (3) MB 305. Lab & Comp. Skills in Microbiology (2) MB 420. Microbial Genomes, Biochemistry & Diversity (3) ST 415. Design and Analysis of Planned Experiments (3) CS 261. Data structures (4)

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	<b>OR</b> other course with advisor approval
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**Ecological and environmental informatics (EEI; 39-44 option elective credits; 37-42 general elective credits)**

Students in the Ecological and Environmental Informatics Option take classes in general population and community ecology as well as courses in categories covering topics in modeling and environmental informatics.

<b>Mathematics/ Statistics</b> 2 classes; 7 credits	MTH 256. Applied Differential Equations (4) <b>AND</b> one of the following: MTH 420. Models and Methods of Applied Mathematics (3), MTH 427. Introduction to Mathematical Biology (3), <b>OR</b> ST 415. Design and Analysis of Planned Experiments (3)
<b>General Ecology</b> 1 class: 3 credits	BI 370. Ecology (3)
<b>Genome Biology</b> 1 class: 3 credits	BDS 474. Intro to Genome Biology (3)
<b>Biological Data Sciences</b> 1 class; 4 credits	BDS 310. Foundations of Biological Data Sciences (4) <b>OR</b> CS 161 (4) OR CS 162 (4)
<b>Population, Community, and Ecosystem Ecology</b> 4 classes; 12-15 credits	BDS 477. Pop. Genomics (3) & 3 classes <b>AND</b> at least one of the following: BI 351. Marine Ecology (3), BI 358. Symbioses and the Environment (3), BI 481. Biogeography (3), BI 495. Disease Ecology (3), BOT 341. Plant Ecology (4), BOT 413. Forest Pathology (3), BOT 440. Field Methods in Plant Ecology (4), FES 341. Forest Ecology (3), FW 321. Applied Community and Ecosystem Ecol (3), FW 360. Origins of F&W Management-Evolution, Genetics, and Ecology (3) FW 370. Conservation Genetics (4) FW 456. Freshwater Ecology and Conservation (5), FW 479. Wetlands and Riparian Ecology (3), MB 436. The Human Microbiome (3) <b>OR</b> MB 448. Microbe-Environment Interactions (3)  <b>AND</b> at least one of the following: BI 483. Population Biology (3), BI 454. Evolutionary Genomics (3), BI 456. Phylogenetics (3), BOT 445. Advanced Population Ecology (3)

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	FW 320. Introductory Population Dynamics (4) FW 433. Population Dynamics for Conservation (4) <b>OR</b> other class with advisor approval
<b>Physical Environmental Sci</b> Choose 1 class; 3-4 credits	CSS 205. Soil Science* (4) ATS 201. Climate Science* (4) GEO 202. Earth Systems Science* (4) OC 201. Oceanography* (4) OC 332. Coastal Oceanography (3) OC 340. Biological Oceanography (4) GEO 221. Environmental Geology (4) <b>OR</b> other class with advisor approval
<b>Environmental Informatics</b> Choose 2 classes; 7-8 credits	GEOG 201. Foundations of Geospatial Science and GIS* (4) FE 209. Forest Photogrammetry and Remote Sensing (4) FE 444. Forest Remote Sensing and Photogrammetry (4) <b>OR</b> FE 257. GIS and Forest Engineering Applications (4) AND one of the following: GEOG 360. GIScience I: Geographic Information Systems and Theory (4) GEOG 380. Remote Sensing I: Principles and Applications (4) FW 303. Survey of Geographic Information Systems in Natural Resources (3) <b>OR</b> CROP/HORT 414. Precision Agriculture (4) <b>OR</b> other class with advisor approval

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**Computational Biology (CB: 34-36 option elective credits; 45-48 general elective credits)**

Students in the Computational Biology Option take classes in computer science, bioinformatics, statistics, and mathematical biology.

<p><b>Mathematics</b> 3 classes; 11 credits</p>	<p>MTH 231. Discrete Math (4) MTH 256. Applied Differential Equations (4), MTH 427. Introduction to Mathematical Biology (3)</p>
<p><b>Genome Biology</b> 1 class: 3 credits</p>	<p>BDS 474. Intro to Genome Biology (3)</p>
<p><b>Biology/Biocomputing and Statistics</b> Choose at least 3 classes with at least one from Biology/Bioinformatics and one from Statistics; 9-10 credits</p>	<p>BDS 472. Adv. Comp for Biol Data Analysis (3) BDS 475. Comparative Genomics (4) BDS 477. Pop. Genomics (3) BDS 478. Functional Genomics (3) BI 454. Evolutionary Genomics (3) BI 456. Phylogenetics (4) MB 420. Microbial Genomes, Biochemistry &amp; Diversity (3) BB 485. Applied Bioinformatics (3) <b>OR</b> BDS/CS 446. Networks in Computational Biology (3), <b>AND</b> one of the following: ST 413. Methods of Data Analysis (4), ST 415. Design and analysis of planned experiments (3), <b>OR</b> ST 431. Sampling Methods (3), <b>OR</b> other class with advisor approval</p>
<p><b>Computer Science</b> 2 classes; 8 credits</p>	<p>CS 162. Intro to Comp. Sci. (4); has prerequisite(s) that are not part of the option requirement CS 261. Data structures (4)</p>
<p><b>Advanced Computer Science</b> Choose at least 1 class (3-4 credits)</p>	<p>CS 325. Analysis of Algorithms (4) CS 331. Introduction to Artificial Intelligence (4) CS 361. Software Engineering I (4), CS 362. Software Engineering II (4), CS 420. Graph Theory (3), CS 434. Machine Learning (4), CS 458. Intro Info. Visual (4), CS 475. Intro Parallel Program (4), <b>OR</b> other class with advisor approval</p>