



# BS in BIOINFORMATICS (282021) MAP Sheet

Department of Biology

For students entering the degree program during the 2014–2015 curricular year.

UNIVERSITY CORE AND GRADUATION REQUIREMENTS				PROGRAM REQUIREMENTS (67 total hours)		
<b>UNIVERSITY CORE REQUIREMENTS</b>				<b>Complete the following:</b>		
<u>Requirements</u>	<u>#Classes</u>	<u>Hours</u>	<u>Classes</u>	Bio 130*	Biology	4.0
<b>Doctrinal Foundation</b>				Bio 165	Introduction to Bioinformatics	3.0
Book of Mormon	2	4.0	Rel A 121 and 122	Bio 370	Bioethics	2.0
New Testament	1	2.0	Rel A 211 or 212	Bio 420	Evolutionary Biology	2.0
Doctrine and Covenants	1	2.0	Rel C 324 or 325	Bio 421	Evolutionary Biology Lab	1.0
<b>The Individual and Society</b>				Bio 465	Bioinformatics & Proteomics	3.0
Citizenship				MMBio 240	Molecular Biology	3.0
American Heritage	1–2	3–6.0	from approved list	PWS 340	Genetics	3.0
Global & Cultural Awareness	1	3.0	from approved list	<b>Complete one course from the following:</b>		
<b>Skills</b>				Bio 365	Computational Biology	3.0
Effective Communication				C S 418	Bioinformatics	3.0
First-Year Writing	1	3.0	from approved list	<b>Complete the following:</b>		
Adv Written & Oral Communication	1	3.0	Engl 316	C S 142	Intro to Computer Programming	3.0
Quantitative Reasoning	0–1	0–3.0	from approved list	C S 235	Data Structures & Algorithms	3.0
Languages of Learning (Math or Language)	1	4.0	Math 112* or 113*	C S 236	Discrete Structures	3.0
<b>Arts, Letters, and Sciences</b>				C S 240	Adv. Programming Concepts	4.0
Civilization 1 and 2	2	6.0	from approved list	C S 360	Internet Programming	3.0
Arts	1	3.0	from approved list	Chem 105*	General College Chemistry	4.0
Letters	1	3.0	from approved list	Chem 106	General College Chemistry	3.0
Scientific Principles & Reasoning				Math 112*	Calculus 1	4.0
Biological Science	1	4.0	Bio 130*	Math 113*	Calculus 2	4.0
Physical Science	2	7.0	Chem 105* plus one course from approved list	<b>Complete the following:</b>		
Social Science	1	3.0	from approved list	Stat 151	Introduction to Bayesian Statistics	3.0
<b>Core Enrichment: Electives</b>				Stat 201	Statistics for Engineers & Scientists	3.0
Religion Electives	3–4	6.0	from approved list	<b>Complete 6 hours from the following upper-division electives in computer science, chemistry, mathematics, statistics, or biology:</b>		
Open Electives	Variable	Variable	personal choice	Bio 450	Conservation Biology	3.0
<b>GRADUATION REQUIREMENTS:</b>				Bio 463	Genetics of Human Disease	3.0
Minimum residence hours required		30.0		Bio 468	Genomics	3.0
Minimum hours needed to graduate		120.0		Bio 555	Evolutionary & Ecological Modeling	2.0
				Bio 560	Population Genetics	4.0
				C S 312	Algorithm Design & Analysis	3.0
				C S 340	Software Design & Testing	3.0
				C S 450	Intro to Digital Signal & Image Proc	3.0
				C S 452	Database Modeling Concepts	3.0
				C S 470	Intro to Artificial Intelligence	3.0
				C S 478	Tools for Machine Learning & Data Mining	3.0
				C S 484	Parallel Processing	3.0
				Chem 351	Organic Chemistry	3.0
				Chem 352	Organic Chemistry	3.0
				Chem 353	Organic Chemistry Lab - Nonmajors	2.0V
				Chem 481	Biochemistry	3.0
				Chem 482	Mechanisms of Molecular Biology	3.0
				Chem 489	Structural Biochemistry	3.0
				Chem 584	Biochemistry Laboratory/Proteins	3.0
				Chem 586	Biochemistry Laboratory/Nucleic Acids	3.0
				Math 313	Elementary Linear Algebra	3.0
				Math 334	Ordinary Differential Equations	3.0
				Math 410	Intro to Numerical Methods	3.0
				Math 411	Numerical Methods	3.0
				Math 431	Probability Theory	3.0
				Math 450	Combinatorics	3.0
				MMBio 360	Microbial Genetics	4.0
				MMBio 465	Virology	3.0
				PDBio 360	Cell Biology	3.0
				PDBio 362	Advanced Physiology	3.0
				PDBio 482	Developmental Biology	3.0
				PDBio 582	Developmental Genetics	3.0
				Stat 424	Statistical Computing	3.0
				Stat 431	Experimental Design	3.0
				Stat 435	Nonparametric Statistical Methods	3.0

FOR UNIVERSITY CORE QUESTIONS CONTACT THE ADVISEMENT CENTER ♦ FOR PROGRAM QUESTIONS SEE YOUR FACULTY ADVISOR

\*THESE CLASSES FILL BOTH UNIVERSITY CORE AND PROGRAM REQUIREMENTS (12 hours overlap)

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2014–2015

**Suggested Sequence of Courses:**

**FRESHMAN YEAR**

<u>1st Semester</u>	
C S 142 (FWSpSu)	3.0
First-Year Writing or A Htg 100 (FWSpSu)	3.0 (3.0)
Quantitative Reasoning (If needed)	0–3.0
Bio 130 (FW) (Biological Science)	4.0
Rel A 121 (FWSpSu)	2.0
<b>Total Hours</b>	<b>12–15.0</b>

2nd Semester

A Htg 100 (FWSpSu) or First-Year Writing	3.0 (3.0)
Bio 165 (W)	3.0
Chem 105	4.0
Math 112 (FWSpSu)	4.0
Rel A 122 (FWSpSu)	2.0
<b>Total Hours</b>	<b>15.0</b>

**SOPHOMORE YEAR**

<u>3rd Semester</u>	
MMBio 240 (FWSp)	3.0
Chem 106	3.0
Math 113	4.0
General elective	3.0
Religion elective	2.0
<b>Total Hours</b>	<b>15.0</b>

4th Semester

Bio 370	2.0
C S 235	3.0
PWS 340 (FWSp)	2.0
Global & Cultural Awareness elective	3.0
Stat 151	3.0
Rel A 211 or 212 (FWSpSu)	2.0
<b>Total Hours</b>	<b>15.0</b>

**JUNIOR YEAR**

<u>5th Semester</u>	
C S 236	3.0
Stat 201	3.0
General electives	4.0
Rel C 324 or 325 (FWSpSu)	2.0
Arts or Letters elective	3.0
<b>Total Hours</b>	<b>15.0</b>

6th Semester

Chem 351	3.0
C S 240	3.0
Adv. Written & Oral Communication	3.0
Religion elective (FWSpSu)	2.0
Civilization 1 elective	3.0
<b>Total Hours</b>	<b>14.0</b>

**SENIOR YEAR**

<u>7th Semester</u>	
Bio 365	3.0
Civilization 2 elective	3.0
Social Science elective	3.0
Religion elective (FWSpSu)	2.0
Physical Science elective	3.0
General elective	2.0
<b>Total Hours</b>	<b>16.0</b>

8th Semester

Bio 420 (FWSp)	2.0
Bio 421 (FWSp)	1.0
Bio 465	3.0
Major electives	6.0
Arts or Letters elective	3.0
<b>Total Hours</b>	<b>15.0</b>

**THE DISCIPLINE:**

Bioinformatics is an interdisciplinary program offering substantial training in both the biological sciences and the physical and mathematical sciences with an emphasis on computer programming coupled with genetics and molecular biology. Students are expected to acquire programming, databasing, and operating system skills coupled with a foundation in mathematics and statistics. In addition, students will be well trained in molecular biology and genetics and can pursue individual interests in a variety of areas (chemistry, physics, bioengineering, computer science, molecular biology, genetics, etc.).

**RESEARCH OPPORTUNITIES:**

Undergraduates majoring in bioinformatics are expected to participate in research training both on and off campus. The bioinformatics faculty has substantial research programs in phylogenetics, biophysics, ecological modeling, and proteomics with developing programs in biodiversity informatics and biotechnology/agricultural genomics. Students are encouraged to participate in one of these bioinformatic research programs. For a further description of research opportunities and research groups on campus see our website at <http://bioinformatics.byu.edu>

**INTERNSHIPS, CO-OP ED, PRACTICAL EXPERIENCE:**

The bioinformatics major offers an abundance of internship opportunities off campus in addition to working with faculty on campus as described above. Students have worked at federal research labs (NIH, NCBI, NCI), at other universities, and at private biotech and pharmaceutical companies seeking summer interns in bioinformatics. The bioinformatics major offers placement assistance for such programs and encourages students to gain a variety of external research experiences.

**CAREERS:**

The bioinformatics major is designed to develop the skills of those students with interests in both computer science and the biological sciences and to merge these interests in the area of bioinformatics or computational biology. The breadth of skills acquired will provide students with exciting options from graduate school, professional school (medical, dental, law), to employment opportunities directly out of this undergraduate program, especially with biotechnology companies.

**FINANCING:**

Students in this major may apply for university, college, and department scholarships. A limited number of research or teaching assistant positions for undergraduate students also exist.

**Note:** This degree program requires a minimum of 120.0 hours for graduation. Students are encouraged to complete an average of 15 credit hours each semester or 30 credit hours each year, which could include spring and/or summer terms. Taking fewer credits substantially increases the cost and the number of semesters to graduate.

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