BIOLOGY, BACHELOR OF SCIENCE

Requirements

Total Course Requirements for the Bachelor's Degree

See the "Requirements for the Bachelor's Degree (https://catalog.csudh.edu/general-information/baccalaureate-degrees-undergraduate-studies/)" in the University Catalog for complete details on general degree requirements. A minimum of 40 units, including those required for the major, must be upper division.

Elective Requirements

Completion of elective courses (beyond the requirements listed below) to reach a total of a minimum of 120 units.

General Education Requirements (49 units)

See the "General Education (https://catalog.csudh.edu/general-education/)" requirements in the University Catalog or the Class Schedule for the most current information on General Education requirements and course offerings.

Graduation Writing Assessment Requirement

See the "Graduation Writing Assessment Requirement (https://catalog.csudh.edu/general-information/baccalaureate-degrees-undergraduate-studies/gwar-certifying-courses/)" in the University Catalog.

Minor Requirements

Single field major, no minor required. However, for students who wish to complete the Biochemistry minor, Organic Chemistry is considered a prerequisite class for both programs and therefore can be double counted for both major and minor requirements.

Major Requirements (76-84 units)

Students must select one of the options listed.

All courses applied to the B.S. in Biology must be passed with a grade of "C" or better.

Cellular and Molecular Biology Option (76-81 units)

Code	Title	Hours
Lower Division R	equirements	
BIO 120	Principles of Biology I	3
BIO 121	Principles of Biology Lab I	1
BIO 122	Principles of Biology II	3
BIO 123	Principles of Biology II Lab	1
BIO 124	Principles of Biology III	3
BIO 125	Principles of Biology Lab III	1
BIO 220	Molecular Biology	3
BIO 221	Molecular Biology Laboratory	1
CHE 110	General Chemistry I	5
CHE 112	General Chemistry II	5
MAT 131	Elementary Statistics and Probability	3
MAT 171	Survey of Calculus for Management and Life Sciences	4-5
or MAT 191	Calculus I	
Select one of the	following:	8-10

			6-81
	elect a minimun emistry Course	n of 10 additional units of upper division Biology or es	10
•	& BIO 327	and General Microbiology Laboratory	10
	BIO 326	General Microbiology	
	BIO 314 & BIO 315	Developmental Biology and Developmental Biology Lab	
	BIO 312 & BIO 313	Animal Physiology and Animal Physiology Laboratory	
	BIO 310 & BIO 311	Plant Physiology and Plant Physiology Laboratory	
Se	lect one of the	following:	4
	CHE 302 & CHE 303	Organic Chemistry II and Organic Chemistry Lab II	
	& CHE 313	Organic Chemistry II and Organic Chemistry Laboratory II	
Se	elect one of the CHE 312	•	4-5
0	CHE 300 & CHE 301	Organic Chemistry I and Organic Chemistry Lab I	4.5
	CHE 310 & CHE 311	Organic Chemistry I and Organic Chemistry Lab I	
Se	lect one of the	following:	4-5
BI	0 490	Senior Project	3
	or BIO 440	Molecular Genetics	
ВΙ	0 421	Advanced Molecular Biology	3
BI	0 342	Cell And Genetics Lab	1
BI	0 340	Genetics	3
BI	0 320	Cell Biology	3
Up	per Division Re		
	PHY 130 & PHY 132	General Physics I and General Physics II	
	& PHY 122	and Elements Of Physics II	
	PHY 120	Elements Of Physics I	

Ecology and Environmental Biology Option (76-81 units)

Code	Title	Hours
Lower Division R	equirements	
BIO 120	Principles of Biology I	3
BIO 121	Principles of Biology Lab I	1
BIO 122	Principles of Biology II	3
BIO 123	Principles of Biology II Lab	1
BIO 124	Principles of Biology III	3
BIO 125	Principles of Biology Lab III	1
BIO 220	Molecular Biology	3
BIO 221	Molecular Biology Laboratory	1
CHE 110	General Chemistry I	5
CHE 112	General Chemistry II	5
MAT 131	Elementary Statistics and Probability	3
MAT 171	Survey of Calculus for Management and Life Sciences	4-5
or MAT 191	Calculus I	
Select one of the	following:	8-10
PHY 120 & PHY 122	Elements Of Physics I and Elements Of Physics II	

BIO 340

Genetics

PHY 130	General Physics I	
& PHY 132	and General Physics II	
Upper Division I		
BIO 312	Animal Physiology	3
BIO 313	Animal Physiology Laboratory	1
BIO 330	Botany	3
BIO 331	Botany Laboratory	1
BIO 332	Ecology	3
BIO 333	Ecology Laboratory	1
BIO 340	Genetics	3
BIO 490	Senior Project	3
Select one of th	e folowing:	4-10
CHE 310 & CHE 311	Organic Chemistry I and Organic Chemistry Lab I	
CHE 300 & CHE 301	Organic Chemistry I and Organic Chemistry Lab I	
CHE 312 & CHE 313	Organic Chemistry II and Organic Chemistry Laboratory II	
CHE 302	Organic Chemistry II	
& CHE 303	and Organic Chemistry Lab II	
CHE 316 & CHE 317	Survey of Organic Chemistry and Survey of Organic Chemistry Laboratory	
	ım of 9-15 additional units of upper division Biology, ropology or Earth Science courses approved by a	9-15
Total Hours	7	2-87
		2-87
Microbiology 0	ption (79-84 units)	
Microbiology () Code	Option (79-84 units) Title	72-87 Hours
Microbiology 0 Code Lower Division I	Option (79-84 units) Title Requirements	lours
Microbiology 0 Code Lower Division I BIO 120	Option (79-84 units) Title Requirements Principles of Biology I	lours
Microbiology 0 Code Lower Division I BIO 120 BIO 121	Title Herenits Principles of Biology I Principles of Biology Lab I	Hours 3
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122	Option (79-84 units) Title Requirements Principles of Biology I Principles of Biology Lab I Principles of Biology II	3 1 3
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123	Option (79-84 units) Title Requirements Principles of Biology I Principles of Biology Lab I Principles of Biology II Principles of Biology II Lab	3 1 3
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124	Pption (79-84 units) Title Requirements Principles of Biology I Principles of Biology Lab I Principles of Biology II Principles of Biology II Lab Principles of Biology III	3 1 3 1 3
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125	Pption (79-84 units) Title Requirements Principles of Biology I Principles of Biology Lab I Principles of Biology II Principles of Biology II Lab Principles of Biology III Principles of Biology III Principles of Biology Lab III	3 1 3 1 3
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220	Option (79-84 units) Title Requirements Principles of Biology I Principles of Biology Il Principles of Biology II Principles of Biology II Lab Principles of Biology III Principles of Biology III Molecular Biology	3 1 3 1 3 3 1 3 3
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221	Option (79-84 units) Title Requirements Principles of Biology I Principles of Biology Lab I Principles of Biology II Principles of Biology II Lab Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Laboratory	3 1 3 1 3 1 3
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110	Principles of Biology I Principles of Biology II Lab Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology General Chemistry I	3 1 3 1 3 1 3 1 5
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112	Principles of Biology I Principles of Biology II Lab Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology General Chemistry I General Chemistry II	3 1 3 1 3 1 3 1 5
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110	Principles of Biology I Principles of Biology II Lab Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Molecular Biology Laboratory General Chemistry I General Chemistry II Elementary Statistics and Probability Survey of Calculus for Management and Life	3 1 3 1 3 1 3 1 5
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171	Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology II Lab Principles of Biology III Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Laboratory General Chemistry I General Chemistry II Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences	3 1 3 1 3 1 5 5 3 3
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171 or MAT 191	Interest of Biology I Principles of Biology I Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology III Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Molecular Biology Laboratory General Chemistry I General Chemistry II Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences Calculus I	3 1 3 1 3 1 5 5 3 4-5
Microbiology 0 Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171 or MAT 191 Select one of th	Intile Requirements Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology II Lab Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Molecular Biology General Chemistry I General Chemistry II Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences Calculus I e following:	3 1 3 1 3 1 5 5 3 3
Microbiology O Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171 or MAT 191 Select one of th PHY 120 & PHY 120	Intile Requirements Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology III Principles of Biology III Principles of Biology III Principles of Biology Lab Principles of Biology Lab Principles of Biology Lab Principles of Biology III Principles of Biology Laboratory General Chemistry I General Chemistry I Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences Calculus I e following: Elements Of Physics I and Elements Of Physics II	3 1 3 1 3 1 5 5 3 4-5
Microbiology O Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171 or MAT 191 Select one of th PHY 120	Intile Requirements Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology II Lab Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Molecular Biology General Chemistry I General Chemistry II Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences Calculus I e following: Elements Of Physics I	3 1 3 1 3 1 5 5 3 4-5
Microbiology O Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171 or MAT 191 Select one of th PHY 120 & PHY 122 PHY 130	Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology III Principles of Biology III Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Laboratory General Chemistry I General Chemistry II Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences Calculus I e following: Elements Of Physics I and Elements Of Physics II General Physics II and General Physics II	3 1 3 1 3 1 5 5 3 4-5
Microbiology O Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171 or MAT 191 Select one of th PHY 120 & PHY 122 PHY 130 & PHY 132	Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology III Principles of Biology III Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Laboratory General Chemistry I General Chemistry II Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences Calculus I e following: Elements Of Physics I and Elements Of Physics II General Physics II and General Physics II	3 1 3 1 3 1 5 5 3 4-5
Microbiology O Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171 or MAT 191 Select one of th PHY 120 & PHY 132 PHY 132 Upper Division I	Intile Requirements Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology III Principles of Biology III Principles of Biology III Principles of Biology Lab III Molecular Biology Molecular Biology Molecular Biology Molecular Biology Laboratory General Chemistry I General Chemistry II Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences Calculus I e following: Elements Of Physics I and Elements Of Physics II General Physics II Requirements	3 1 3 1 3 1 5 5 3 4-5 8-10
Microbiology O Code Lower Division I BIO 120 BIO 121 BIO 122 BIO 123 BIO 124 BIO 125 BIO 220 BIO 221 CHE 110 CHE 112 MAT 131 MAT 171 or MAT 191 Select one of th PHY 120 & PHY 122 PHY 130 & PHY 132 Upper Division I BIO 320	Intile Requirements Principles of Biology I Principles of Biology I Principles of Biology II Principles of Biology II Principles of Biology II Principles of Biology III Principles of Biology III Principles of Biology Lab Principles of Biology Lab Principles of Biology Lab Principles of Biology Lab III Molecular Biology Molecular Biology Molecular Biology Laboratory General Chemistry I Elementary Statistics and Probability Survey of Calculus for Management and Life Sciences Calculus I e following: Elements Of Physics I and Elements Of Physics II General Physics II Requirements Cell Biology	3 1 3 1 3 1 5 5 3 4-5 8-10 3 3 3

BIO 425	Medical Bacteriology	2
BIO 435	Medical Bateriology Laboratory	2
BIO 426	Immunology	3
BIO 436	Immunology Laboratory	1
BIO 490	Senior Project ¹	3
Select one of the	following:	4-5
CHE 310 & CHE 311	Organic Chemistry I and Organic Chemistry Lab I	
CHE 300 & CHE 301	Organic Chemistry I and Organic Chemistry Lab I	
Select one of the	following:	4-5
CHE 312 & CHE 313	Organic Chemistry II and Organic Chemistry Laboratory II	
CHE 302 & CHE 303	Organic Chemistry II and Organic Chemistry Lab II	
Electives		
Select a minimum	n of 9 units from the following:	9
BIO 420	Histotechnique	
& BIO 419	and Histotechnique Laboratory	
BIO 421	Advanced Molecular Biology	
BIO 422 & BIO 424	Histology and Histology Laboratory	
BIO 428	Virology	
BIO 458 & BIO 459	Human Parasitology and Human Parasitology Laboratory	
BIO 491	Seminar in Biological and Biomedical Research	
CHE 450 & CHE 451	Biochemistry I and Biochemistry I Lab	
CHE 450	Biochemistry I	
& CHE 456	and Clinical Chemistry	
Total Hours		79-84

BIO 490 Senior Project: Major students may substitute this course for General Education Area E. Please contact the University Advisement Center to request the course substitution.

Program Learning Outcomes

Upon successful completion of the B.A. and B.S. Programs in Biology, a degree recipient will be able to:

- describe the detail the major unifying themes of biology, such as evolution, energy flow and transformation, homeostasis, genetic information storage and utilization, structure-function relationships, and hierarchies of organization;
- 2. apply scientific reasoning to generate and test hypotheses by designing and executing experiments using appropriate methods in the laboratory or in the field;
- 3. analyze and interpret quantitative biological data;

3

- 4. communicate scientific information in a variety of written and oral formats;
- 5. discuss the relevance of scientific research to society from a historic and a modern perspective, including the ethical implications of scientific research and of new technology; and
- find, read, understand, critically evaluate, summarize, and use scientific information.

Cellular and Molecular Biology Option 4-Year Degree Roadmap

Course	- Title	Hours
First Year		
Fall		
MAT 131	Elementary Statistics and Probability (satisfies GE Area B4)	3
GE Area A1 Oral Commu	nication	3
GE Area A3 Logic/Critica	al Thinking	3
GE Area C1 Arts Course		3
GE Area D1 Perspectives	s on Indiividuals, Groups, and Society	3
	Hours	15
Spring		
GE Area A2 Written Com	munication	3
GE Area C2 Letters Cour	se	3
GE Area C1 or C2		3
GE Area D2 Global and F	•	3
CHE 108	Introduction to College Chemistry	5
a 17	Hours	17
Second Year Fall		
HIS 101	History Of United States	3
POL 101	History Of United States American Institutions	3
BIO 120	Principles of Biology I (may meet GE Area B2 for BIO	3
	majors)	
BIO 121	Principles of Biology Lab I (may meet GE Area B3 for BIO majors)	1
CHE 110	General Chemistry I (May meet GE Area B1 and B3 for BIO majors)	5
-	Hours	15
Spring		
GE Area F Ethnic Studies	s	3
BIO 122	Principles of Biology II	3
BIO 123	Principles of Biology II Lab	1
CHE 112	General Chemistry II	5
MAT 171	Survey of Calculus for Management and Life Sciences	4
	Hours	16
Third Year		
Fall		
BIO 124	Principles of Biology III	3
BIO 125	Principles of Biology Lab III	1
CHE 310	Organic Chemistry I	4
CHE 311	Organic Chemistry Lab I	1
BIO 220 BIO 221	Molecular Biology	3 1
	Molecular Biology Laboratory Studies in the Humanities	3
GL Alea OS Ilitegrative S	Hours	16
Spring	nouis	10
BIO 320	Cell Biology	3
BIO 340	Genetics (satisfies GE Area B5)	3
BIO 342	Cell And Genetics Lab	1
CHE 312	Organic Chemistry II	3
CHE 313	Organic Chemistry Laboratory II	2
GE Area D3 Integrative S	Studies in the Social Sciences	3
	Hours	15
Fourth Year		
Fall		
BIO UD requirement lect	ure	3
BIO UD requirement lab		1
BIO 421	Advanced Molecular Biology (or major elective)	3
Major Elective		4

PHY 120	Elements Of Physics I	4
	Hours	15
Spring		
BIO 440	Molecular Genetics (or major elective)	3
BIO 490	Senior Project (satisfies GWAR requirement; May also satisfy GE Area E, see major advisor)	3
PHY 122	Elements Of Physics II	4
Major Elective		3
	Hours	13
	Total Hours	122

2-Year Roadmap (transfer students)

Course	Title	Hours
First Year		
Fall		
GE Area C3 Integrative Stu	dies in the Humanities	3
BIO 124	Principles of Biology III	3
BIO 125	Principles of Biology Lab III	1
BIO 220	Molecular Biology	3
BIO 221	Molecular Biology Laboratory	1
CHE 310	Organic Chemistry I	4
CHE 311	Organic Chemistry Lab I	1
	Hours	16
Spring		
GE Area D3 Integrative Stu	idies in the Social Sciences	3
BIO 320	Cell Biology	3
BIO 340	Genetics (satisfies GE Area B5)	3
BIO 342	Cell And Genetics Lab	1
CHE 312	Organic Chemistry II	3
CHE 313	Organic Chemistry Laboratory II	2
	Hours	15
Second Year		
Fall		
BIO 421	Advanced Molecular Biology (or major elective)	3
PHY 120	Elements Of Physics I	4
BIO UD requirement lectur	e	3
BIO UD requirement lab		1
Major Elective		4
	Hours	15
Spring		
BIO 440	Molecular Genetics (or major elective)	3
BIO 440 BIO 490	Molecular Genetics (or major elective) Senior Project (satisfies GWAR requirement; May also satisfy GE Area E if needed, see major advisor)	
	Senior Project (satisfies GWAR requirement; May also	3
BIO 490	Senior Project (satisfies GWAR requirement; May also satisfy GE Area E if needed, see major advisor)	3
BIO 490 PHY 122	Senior Project (satisfies GWAR requirement; May also satisfy GE Area E if needed, see major advisor)	3 3 4 4 14

ECOLOGY AND ENVIRONMENTAL BIOLOGY OPTION

4- Year Degree Roadmap

3 1	
Course Title	Hours
First Year	
Fall	
GE Area A1 Oral Communication	3
GE Area A3 Logic/Critical Thinking	3
GE Area C1 Arts Course	3
GE Area D1 Perspectives on Indiividuals, Groups, and Society	3

Biology, Bachelor of Science

MAT 131	Elementary Statistics and Probability (satisfies GE Area B4)	3
	Hours	15
Spring		
GE Area A2 Written Comm	nunication	3
GE Area C2 Letters Cours	e	3
Additional lower division	GE in Area C1 or C2	3
GE Area D2 Global and Hi	istorical Perspectives	3
CHE 108	Introduction to College Chemistry	5
	Hours	17
Second Year		
Fall		
HIS 101	History Of United States	3
POL 101	American Institutions	3
BIO 120	Principles of Biology I (may meet GE Area B2 for BIO majors)	3
BIO 121	Principles of Biology Lab I (May meet GE Area B3 for BIO majors)	1
CHE 110	General Chemistry I (May meet GE Area B1 and B3 for BIO majors)	5
	Hours	15
Spring		
GE Area F Ethnic Studies		3
BIO 122	Principles of Biology II	3
BIO 123	Principles of Biology II Lab	1
CHE 112	General Chemistry II	5
MAT 171	Survey of Calculus for Management and Life Sciences	4
	Hours	16
Third Year		
Fall		
BIO 124	Principles of Biology III	3
BIO 125	Principles of Biology Lab III	1
CHE 310	Organic Chemistry I	3-4
or CHE 316	or Survey of Organic Chemistry	0 4
CHE 311	Organic Chemistry Lab I	1
or CHE 317	or Survey of Organic Chemistry Laboratory	
BIO 220	Molecular Biology	3
BIO 221	Molecular Biology Laboratory	1
GE Area C3 Integrative St	rudies in the Humanities	3
	Hours	15-16
Spring		
BIO 332	Ecology	3
BIO 333	Ecology Laboratory	1
BIO 340	Genetics (satisfies GE Area B5)	3
CHE 312	Organic Chemistry II (or major elective)	3
CHE 313	Organic Chemistry Laboratory II (or major elective)	2
GE Area D3 Integrative St	tudies in the Social Sciences	3
	Hours	15
Fourth Year		
Fall		
BIO 312	Animal Physiology	3
BIO 313	Animal Physiology Laboratory	1
BIO 330	Botany	3
BIO 331	Botany Laboratory	1
PHY 120	Elements Of Physics I	4
Major Elective		4
	Hours	16
Spring		
BIO 490	Senior Project (satisfies GWAR requirement; May also satisfy GE Area E, see major advisor)	3
PHY 122	Elements Of Physics II	4
Major Elective		3
•		

Total Hours	122-123
Hours	13
Major Elective	3

2-Year Roadmap (transfer students)

Course	Title	Hours
First Year		
Fall		
GE Area C3 Integrative Stu	dies in the Humanities	3
BIO 124	Principles of Biology III	3
BIO 125	Principles of Biology Lab III	1
BIO 220	Molecular Biology	3
BIO 221	Molecular Biology Laboratory	1
CHE 310 or CHE 316	Organic Chemistry I or Survey of Organic Chemistry	3-4
CHE 311 or CHE 317	Organic Chemistry Lab I or Survey of Organic Chemistry Laboratory	1
	Hours	15-16
Spring		
GE Area D3 Integrative Stu	dies in the Social Sciences	3
BIO 340	Genetics (satisfies GE Area B5)	3
BIO 332	Ecology	3
BIO 333	Ecology Laboratory	1
CHE 312	Organic Chemistry II (or major elective)	3
CHE 313	Organic Chemistry Laboratory II (or major elective)	2
	Hours	15
Second Year		
Fall		
BIO 312	Animal Physiology	3
BIO 313	Animal Physiology Laboratory	1
BIO 330	Botany	3
BIO 331	Botany Laboratory	1
PHY 120	Elements Of Physics I	4
Major Elective		4
	Hours	16
Spring		
BIO 490	Senior Project (GWAR satisfying course; May also satisfy GE Area E if needed, see major advisor)	3
PHY 122	Elements Of Physics II	4
Major Elective		3
Major Elective		3
Elective to meet 120 units		3
	Hours	16
	Total Hours	62-63

Microbiology Option 4-Year Degree Roadmap

Course	Title	Hours
First Year		
Fall		
GE Area A1 Oral Communication		
GE Area A3 Logic/Critical Thinking		
GE Area C1 Arts Courses		
GE Area D1 Perspectives on Indiividuals, Groups, and Society		
MAT 131	Elementary Statistics and Probability (satisfies GE Area B4)	3
	Hours	15
Spring		
GE Area A2 Written Communication		3
GE Area C2 Letters Course		
GE Area C1 or C2		

	d Historical Perspectives	3 5
CHE 108	Introduction to College Chemistry	
	Hours	17
Second Year		
Fall	ur a garage to the con-	_
HIS 101	History Of United States	3
POL 101	American Institutions	3
BIO 120	Principles of Biology I (may meet GE Area B2 for BIO majors)	3
BIO 121	Principles of Biology Lab I (may meet GE Area B3 for BIO majors)	1
CHE 110	General Chemistry I (may meet GE Areas B1 and B3 for BIO majors)	5
	Hours	15
Spring		
GE Area F Ethnic Stu	dies	3
BIO 122	Principles of Biology II	3
BIO 123	Principles of Biology II Lab	1
CHE 112	General Chemistry II	5
MAT 171	Survey of Calculus for Management and Life Sciences	4
	Hours	16
Third Year		
Fall		
BIO 124	Principles of Biology III	3
BIO 125	Principles of Biology Lab III	1
CHE 310	Organic Chemistry I	4
CHE 311	Organic Chemistry Lab I	1
BIO 220	Molecular Biology	3
BIO 221	Molecular Biology Laboratory	1
GE Area C3 Integrativ	re Studies in the Humanities	3
	Hours	16
Spring		
BIO 320	Cell Biology	3
BIO 340	Genetics (satisfies GE Area B5)	3
Major Elective		3
CHE 312	Organic Chemistry II	3
CHE 313	Organic Chemistry Laboratory II	2
GE Area D3 Integrativ	ve Studies in the Social Sciences	3
	Hours	17
Fourth Year		
Fall		
BIO 324	Microbiology with Clinical Applications	3
BIO 325	Microbiology with Clinical Applications Laboratory	1
BIO 426	Immunology	3
BIO 436	Immunology Laboratory	1
Major Elective		4
PHY 120	Elements Of Physics I	4
	Hours	16
Spring		
BIO 425	Medical Bacteriology	2
BIO 435	Medical Bateriology Laboratory	2
BIO 490	Senior Project (satisfies GWAR requirement; May meet GE Area E, see major advisor)	3
	·· , ··· · , · · · · · · · · · · · · ·	
Major Elective		- 4
Major Elective	Elements Of Physics II	
Major Elective PHY 122	Elements Of Physics II Hours	4

2- Year Roadmap (transfer students)

Course	Title	Hours
First Year		
Fall		
GE Area C3 Integrative Stu	dies in the Humanities	3
BIO 124	Principles of Biology III	3
BIO 125	Principles of Biology Lab III	1
BIO 220	Molecular Biology	3
BIO 221	Molecular Biology Laboratory	1
CHE 310	Organic Chemistry I	4
CHE 311	Organic Chemistry Lab I	1
	Hours	16
Spring		
GE Area D3 Integrative Stu	dies in the Social Sciences	3
BIO 320	Cell Biology	3
BIO 340	Genetics (satisfies GE Area B5)	3
Major Elective		3
CHE 312	Organic Chemistry II	3
CHE 313	Organic Chemistry Laboratory II	2
	Hours	17
Second Year		
Fall		
BIO 324	Microbiology with Clinical Applications	3
BIO 325	Microbiology with Clinical Applications Laboratory	1
BIO 426	Immunology	3
BIO 436	Immunology Laboratory	1
Major Elective		4
PHY 120	Elements Of Physics I	4
	Hours	16
Spring		
BIO 425	Medical Bacteriology	2
BIO 435	Medical Bateriology Laboratory	2
BIO 490	Senior Project (satisfies GWAR requirement; May also	3
	satisfy GE Area E, see major advisor)	
Major Elective		3
PHY 122	Elements Of Physics II	4
	Hours	14
	Total Hours	63