

MAJOR IN BIOCHEMISTRY, DATA SCIENCE CONCENTRATION

The Data Science concentration in Biochemistry builds on the general biochemistry core set of courses (24 credits of primarily upper division courses) and includes 21 data science specific course credits. This option gives the student 3 “free elective” credits, which they can use to complete either data science elective, bioscience elective, or second semester physics courses. This concentration is designed to provide a solid background in biochemistry, molecular genetics and cell biology,

augmented with computer science, mathematics and statistics. The data science concentration is recommended for students interested in a career in life science data analysis. Students who graduate with this concentration obtain the skills necessary for organizing, analyzing and communicating the meaning of massive data sets.

Requirements Effective Fall 2021

A minimum grade of C (2.000) must be earned for BC 493 and all biochemistry (BC) and LIFE subject code lecture and laboratory courses at or above the 200-level required in the biochemistry major.

Freshman

		AUCC	Credits
BC 192	Biochemistry Freshman Seminar		2
CHEM 111	General Chemistry I (GT-SC2)	3A	4
CHEM 112	General Chemistry Lab I (GT-SC1)	3A	1
CHEM 113	General Chemistry II		3
CHEM 114	General Chemistry Lab II		1
CO 150	College Composition (GT-CO2)	1A	3
LIFE 102	Attributes of Living Systems (GT-SC1)	3A	4
LIFE 201B	Introductory Genetics: Molecular/Immunological/Developmental (GT-SC2)	3A	3
LIFE 203	Introductory Genetics Laboratory		2
MATH 155	Calculus for Biological Scientists I (GT-MA1)	1B	4
MATH 255	Calculus for Biological Scientists II	1B	4
Total Credits			31

Sophomore

CHEM 341	Modern Organic Chemistry I		3
CHEM 343	Modern Organic Chemistry II		3
CHEM 344	Modern Organic Chemistry Laboratory		2
CS 152	Introduction to Programming (CS0)-Python		2
LIFE 210	Introductory Eukaryotic Cell Biology		3
LIFE 212	Introductory Cell Biology Laboratory		2
STAT 158	Introduction to R Programming		1
Select one course from the following:			4
CS 163	CS1—No Prior Programming Experience		
CS 164	CS1—Prior Programming Experience		
Diversity and Global Awareness (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-global-awareness)		3E	3
AUCC Category 3 courses (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives) ¹		3B-3D	6
Total Credits			29

Junior

BC 401	Comprehensive Biochemistry I	4A	3
BC 403	Comprehensive Biochemistry II	4B	3
BC 404	Comprehensive Biochemistry Laboratory	4B	2
BZ 360	Bioinformatics and Genomics		3
CS 220	Discrete Structures and their Applications		4
DSCI 235	Data Wrangling		2

STAT 315	Intro to Theory and Practice of Statistics		3
Select one course from the following:			3
CO 300	Writing Arguments (GT-CO3)	2	
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)	2	
CO 302	Writing in Digital Environments (GT-CO3)	2	
JTC 300	Strategic Writing and Communication (GT-CO3)	2	
Select one course from the following:			2-3
BC 406A	Investigative Biochemistry: Protein Biochemistry		
BC 475	Mentored Research		
BC 487A	Internship		
BC 495	Independent Study		
BC 496	Group Study		
Select one course from the following:			5
PH 121	General Physics I (GT-SC1)	3A	
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	
Total Credits			30-31

Senior

BC 411	Physical Biochemistry		4
BC 463	Molecular Genetics		3
BC 465	Molecular Regulation of Cell Function		3
BC 493	Senior Seminar	4A,4C	1
DSCI 335	Inferential Reasoning in Data Analysis		3
STAT 341	Statistical Data Analysis I		3
Select one course from the following:			3
BC 499A	Thesis: Laboratory Research-Based	4C	
BC 499B	Thesis: Literature Based	4C	
AUCC Category 3 courses (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives) ¹			6
Electives ²			3-4
Total Credits			29-30

Program Total Credits:**120****Data Science Electives List**

Code	Title	Credits			
CS 345	Machine Learning Foundations and Practice	3	BMS 405	Nerve and Muscle-Toxins, Trauma and Disease	3
DSCI 369	Linear Algebra for Data Science	4	BMS 420	Cardiopulmonary Physiology	3
STAT 342	Statistical Data Analysis II	3	BMS 430	Endocrinology	3
			BMS 450	Pharmacology	3
			BMS 500	Mammalian Physiology I	4
			BSPM 462/BZ 462/ MIP 462	Parasitology and Vector Biology	5

Biosciences Electives List

Code	Title	Credits			
BC 467	Biochemistry of Disease	3	BZ 220	Introduction to Evolution	3
BIOM 306/BTEC 306	Bioprocess Engineering	4	BZ 311	Developmental Biology	4
BIOM 504/CBE 504	Fundamentals of Biochemical Engineering	3	BZ 346	Population and Evolutionary Genetics	3
BMS 300	Principles of Human Physiology	4	BZ 401	Comparative Animal Physiology	3
BMS 301	Human Gross Anatomy	5	BZ 440	Plant Physiology	3
BMS 305	Domestic Animal Gross Anatomy	4	BZ 455	Human Heredity and Birth Defects	3
BMS 325	Cellular Neurobiology	3	BZ 476/BZ 576	Genetics of Model Organisms	3
BMS 330	Microscopic Anatomy	4	CHEM 334	Quantitative Analysis Laboratory	1
BMS 345	Functional Neuroanatomy	4	CHEM 335	Introduction to Analytical Chemistry	3
BMS 360	Fundamentals of Physiology	4	CHEM 433	Clinical Chemistry	3
			ERHS 332	Principles of Epidemiology	3
			ERHS 450	Introduction to Radiation Biology	3

FSHN 350	Human Nutrition	3
FSHN 470	Integrative Nutrition and Metabolism	3
FTEC 350	Fermentation Microbiology	2
FTEC 360	Brewing Processes	4
FTEC 460	Brewing Science II	4
HES 319	Neuromuscular Aspects of Human Movement	4
HES 403	Physiology of Exercise	4
MIP 300	General Microbiology	3
MIP 302	General Microbiology Laboratory	2
MIP 342	Immunology	4
MIP 343	Immunology Laboratory	2
MIP 351	Medical Bacteriology	3
MIP 352	Medical Bacteriology Laboratory	3
MIP 420	Medical and Molecular Virology	4
MIP 425	Virology and Cell Culture Laboratory	2
MIP 443	Microbial Physiology	4
MIP 450	Microbial Genetics	3

NB 501	Cellular and Molecular Neurophysiology	2
VS 331	Histology	4

¹ Select from the list of courses in categories 3B-3D (six credits [two courses] must come from 3B; one course each from categories 3C and 3D) in the AUCC. Only 3 of the 6 credits required for Arts and Humanities may come from intermediate (L*** 200 and L*** 201) foreign language courses.

² Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300- to 400-level). Students are encouraged to fulfill their 3 free elective credits with additional Data Science electives, Bioscience electives or PH 122/PH 142 Physics II or apply them to a minor.

Major Completion Map

A minimum grade of C (2.000) must be earned for BC 493 and all biochemistry (BC) and LIFE subject code lecture and laboratory courses at or above the 200-level required in the biochemistry major.

Freshman

Semester 1

	Critical	Recommended	AUCC	Credits
BC 192				2
CHEM 111	X		3A	4
CHEM 112	X		3A	1
LIFE 102	X		3A	4
MATH 155	X		1B	4

Total Credits

15

Semester 2

	Critical	Recommended	AUCC	Credits
CHEM 113	X			3
CHEM 114	X			1
CO 150			1A	3
LIFE 201B	X		3A	3
LIFE 203	X			2
MATH 255	X		1B	4

Total Credits

16

Sophomore

Semester 3

	Critical	Recommended	AUCC	Credits
CHEM 341	X			3
CS 152	X			2
LIFE 210	X			3
LIFE 212	X			2
AUCC Category 3 courses (http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives)			3B, 3C, 3D	6

Total Credits

16

Semester 4

	Critical	Recommended	AUCC	Credits
CHEM 343	X			3
CHEM 344	X			2
STAT 158	X			1
Select one course from the following:				4
CS 163	X			
CS 164	X			

Diversity and Global Awareness (<http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#diversity-global-awareness>) 3E 3

Total Credits **13**

Junior

Semester 5		Critical	Recommended	AUCC	Credits
BC 401	Comprehensive Biochemistry I	X		4A	3
BC 404	Comprehensive Biochemistry Laboratory	X		4B	2
BZ 360	Bioinformatics and Genomics	X			3
CS 220	Discrete Structures and their Applications	X			4
STAT 315	Intro to Theory and Practice of Statistics	X			3

Total Credits **15**

Semester 6		Critical	Recommended	AUCC	Credits
BC 403	Comprehensive Biochemistry II	X		4B	3
DSCI 235	Data Wrangling	X			2

Select one course from the following: 3

CO 300	Writing Arguments (GT-CO3)		X	2	
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)		X	2	
CO 302	Writing in Digital Environments (GT-CO3)		X	2	
JTC 300	Strategic Writing and Communication (GT-CO3)		X	2	

Select one course from the following: 2-3

BC 406A	Investigative Biochemistry: Protein Biochemistry		X		
BC 475	Mentored Research		X		
BC 487A	Internship		X		
BC 495	Independent Study		X		
BC 496	Group Study		X		

Select one course from the following: 5

PH 121	General Physics I (GT-SC1)	X		3A	
PH 141	Physics for Scientists and Engineers I (GT-SC1)	X		3A	

Total Credits **15-16**

Senior

Semester 7		Critical	Recommended	AUCC	Credits
BC 411	Physical Biochemistry	X			4
BC 463	Molecular Genetics	X			3
BC 493	Senior Seminar	X		4A,4C	1
STAT 341	Statistical Data Analysis I	X			3

AUCC Category 3 courses (<http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives>) 3B, 3C, 3D 3

Total Credits **14**

Semester 8		Critical	Recommended	AUCC	Credits
BC 465	Molecular Regulation of Cell Function	X			3
DSCI 335	Inferential Reasoning in Data Analysis	X			3

Select one course from the following: 3

BC 499A	Thesis: Laboratory Research-Based	X		4C	
BC 499B	Thesis: Literature Based	X		4C	

AUCC Category 3 courses (<http://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives>) 3B, 3C, 3D 3

Electives² X 3-4

The benchmark courses for the 8th semester are the remaining courses in the entire program of study. X

Total Credits **15-16**

Program Total Credits: **120**