

MAJOR IN BIOCHEMISTRY, ASBMB CONCENTRATION

The American Society for Biochemistry and Molecular Biology (ASBMB) concentration in Biochemistry is composed of a "core" set of courses comprised of 24 credits of primarily upper division coursework (22/24 credits are 400-level), along with a total of 9 "bioscience elective" credits selected from a list provided by the department. This option gives the student 13 "free elective" credits, which they can use to pursue a minor, a double major, and/or other academic interests. Thus, this concentration is designed to provide a broad background in biochemistry and can be tailored to meet the individual needs of specific students.

The ASBMB concentration is recommended for students considering teaching and/or research as a career. Students who graduate from this program can state on their resume that they graduated from an "ASBMB program." If desired, students can take a 1-hour ASBMB exam during the spring semester of their senior year. Students who pass the exam will additionally receive degree certification from ASBMB. Accreditation (and certification) by ASBMB confirms that our undergraduate degree program meets very high standards, and thus will enhance the credentials of our graduating seniors.

Learning Objectives

Upon successful completion, students will be able to:

1. Explain how DNA is packaged, replicated, repaired, transcribed, and translated in both eukaryotes and prokaryotes.
2. Compare and contrast the regulatory mechanisms of transcription and translation in eukaryotes and prokaryotes.
3. Describe and discuss the molecular architecture of nucleic acids and proteins along with the non-covalent interactions responsible for stabilizing the structure of these macromolecules.
4. Outline the salient features of the central pathways of glycolysis, gluconeogenesis, citric acid cycle, pentose phosphate pathway, fatty acid metabolism, ketogenesis, urea cycle, amino acid and nucleotide metabolism and explain the principles of electron transport, ATP synthesis, and their regulation.
5. Develop critical thinking skills for concepts related to cellular functions and their regulation mechanism.
6. Perform a wide-array of biochemical techniques and discuss how these tools are currently being used in biochemical research.
7. Communicate biochemical concepts to other scientists in written and oral form.
8. Make informed ethical judgments regarding research conduct and the practice of biochemistry.

Requirements Effective Fall 2026

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
Select one group from the following:			8
Group A:			
MATH 155	Calculus for Biological Scientists I (GT-MA1)	1B	
MATH 255	Calculus for Biological Scientists II	1B	
Group B:			
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	
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
LIFE 210	Introductory Eukaryotic Cell Biology		3
LIFE 212	Introductory Cell Biology Laboratory		2

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	
AUCC Category 3 courses (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives) ¹		3B-3D	6
Bioscience Elective (see list below)			3
Elective			3
Total Credits			30
Junior			
BC 360	Responsible Conduct in Biochemical Research		1
BC 401	Comprehensive Biochemistry I	4A	3
BC 403	Comprehensive Biochemistry II	4B	3
BC 404	Comprehensive Biochemistry Laboratory	4B	2
Select one course from the following:			5
PH 122	General Physics II (GT-SC1)	3A	
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	
Select one course from the following:			3
STAT 301	Introduction to Applied Statistical Methods		
STAT 307	Introduction to Biostatistics		
STAT 315	Intro to Theory and Practice of Statistics		
Bioscience Elective (see list below)			3
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		1C	3
Advanced Writing (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)		2	3
Electives			3
Total Credits			29
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
BC 499A or 499B	Thesis: Laboratory Research-Based	4C	3
	Thesis: Literature Based		
Bioscience Elective (see list below)			3
AUCC Category 3 courses (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives) ¹		3B-3D	6
Electives ²			7
Total Credits			30
Program Total Credits:			120

Biosciences Electives List – Select a minimum of 9 credits in consultation with advisor

A minimum of 3 credits must be selected from Group A; a maximum of 6 credits may be selected from group B; a maximum of 3 credits may be selected from Group C.

Code	Title	Credits
Group A – Select 3-9 credits from the following:		
BMS 300	Principles of Human Physiology	4
BMS 301	Human Gross Anatomy	5
BMS 305	Domestic Animal Gross Anatomy	4
BMS 330	Microscopic Anatomy	4

BMS 345	Functional Neuroanatomy	4
BMS 360	Fundamentals of Physiology	4
BMS 420	Cardiopulmonary Physiology	3
BMS 430	Endocrinology	3
BMS 450	Pharmacology	3
BMS 500	Mammalian Physiology I	4
ERHS 332	Principles of Epidemiology	3
FSHN 350	Human Nutrition	3
HES 319	Neuromuscular Aspects of Human Movement	4
HES 403	Physiology of Exercise	3

VS 331	Histology	4
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Group B – Select 0-6 credits from the following:

BC 467	Biochemistry of Disease	3
BIOM 504/CBE 504	Fundamentals of Biochemical Engineering	3
BMS 325	Cellular Neurobiology	3
BMS 405	Nerve and Muscle-Toxins, Trauma and Disease	3
BSPM 462/BZ 462/ MIP 462	Parasitology and Vector Biology	5
BZ 220	Introduction to Evolution	3
BZ 311	Developmental Biology	4
BZ 360	Bioinformatics and Genomics	4
BZ 401	Comparative Animal Physiology	3
BZ 440	Plant Physiology	3
BZ 455	Human Heredity and Birth Defects	3
CHEM 433	Clinical Chemistry	3
ERHS 450	Introduction to Radiation Biology	3
FSHN 470	Advanced Human Nutrition and Metabolism	3
FTEC 350	Fermentation Microbiology	3
FTEC 460	Brewing Science II	5
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	3
MIP 450	Microbial Genetics	3
NB 501	Cellular and Molecular Neurophysiology	2

Group C – Select 0-3 credits from the following:

BC 406A	Investigative Biochemistry: Protein Biochemistry	2
BC 441	3D Molecular Models for Biochemistry	1
BC 475	Mentored Research	3
BC 484	Supervised College Teaching	Var.
BC 487A	Internship	Var.
BC 495	Independent Study	Var.
BC 496	Group Study	Var.

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).

Major Completion Map

Distinctive Requirements for Degree Program:

TO PREPARE FOR FIRST SEMESTER: The curriculum for the Biochemistry major - ASBMB concentration assumes students enter college prepared to begin a year-long calculus sequence (either MATH 155/MATH 255 or MATH 160/MATH 161) in the first semester of their first year. Entering students who are not prepared to take calculus should instead take the pre-calculus requirements in the first semester. LIFE 102 requires high school chemistry as a prerequisite; CHEM 111 requires Algebra II as a prerequisite (this prerequisite is met by having Algebra II by test credit, transfer credit, or placement out of MATH 117 and MATH 118 on Math Placement Exam).

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	Biochemistry Freshman Seminar				2
CHEM 111	General Chemistry I (GT-SC2)	X		3A	4
CHEM 112	General Chemistry Lab I (GT-SC1)	X		3A	1
LIFE 102	Attributes of Living Systems (GT-SC1)	X		3A	4
Select one course from the following:					4
MATH 155	Calculus for Biological Scientists I (GT-MA1)		X	1B	
MATH 160	Calculus for Physical Scientists I (GT-MA1)		X	1B	

Total Credits**15****Semester 2**

		Critical	Recommended	AUCC	Credits
CHEM 113	General Chemistry II	X			3
CHEM 114	General Chemistry Lab II	X			1
CO 150	College Composition (GT-CO2)			1A	3
LIFE 201B	Introductory Genetics: Molecular/Immunological/Developmental (GT-SC2)	X		3A	3
LIFE 203	Introductory Genetics Laboratory	X			2
Select one course from the following:					4
MATH 161	Calculus for Physical Scientists II (GT-MA1)		X	1B	

MATH 255	Calculus for Biological Scientists II		X	1B	
Total Credits					16
Sophomore					
Semester 3		Critical	Recommended	AUCC	Credits
CHEM 341	Modern Organic Chemistry I	X			3
LIFE 210	Introductory Eukaryotic Cell Biology	X			3
LIFE 212	Introductory Cell Biology Laboratory	X			2
AUCC Category 3 courses (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives)				3B, 3C, 3D	3
Elective					3
Total Credits					14
Semester 4		Critical	Recommended	AUCC	Credits
CHEM 343	Modern Organic Chemistry II	X			3
CHEM 344	Modern Organic Chemistry Laboratory	X			2
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	
AUCC Category 3 courses (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives)				3B, 3C, 3D	3
Bioscience Elective (See List on Concentration Requirements Tab)			X		3
Total Credits					16
Junior					
Semester 5		Critical	Recommended	AUCC	Credits
BC 360	Responsible Conduct in Biochemical Research	X			1
BC 401	Comprehensive Biochemistry I	X		4A	3
Select one course from the following:					5
PH 122	General Physics II (GT-SC1)		X	3A	
PH 142	Physics for Scientists and Engineers II (GT-SC1)		X	3A	
Select one course from the following:					3
STAT 301	Introduction to Applied Statistical Methods		X		
STAT 307	Introduction to Biostatistics		X		
STAT 315	Intro to Theory and Practice of Statistics		X		
Advanced Writing (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing)				2	3
Total Credits					15
Semester 6		Critical	Recommended	AUCC	Credits
BC 403	Comprehensive Biochemistry II	X		4B	3
BC 404	Comprehensive Biochemistry Laboratory		X	4B	2
Bioscience Elective (See List on Concentration Requirements Tab)		X			3
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)				1C	3
Elective					3
PH 122 or PH 142 must be completed by the end of Semester 6.					
Total Credits					14
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
AUCC Category 3 courses (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives)				3B, 3C, 3D	3
Electives					4
Total Credits					15

Semester 8	Critical	Recommended	AUCC	Credits
BC 465 Molecular Regulation of Cell Function	X			3
Select one course from the following:				3
BC 499A Thesis: Laboratory Research-Based	X		4C	
BC 499B Thesis: Literature Based	X		4C	
Bioscience Electives (See List on Concentration Requirements Tab)	X			3
AUCC Category 3 courses (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#Foundations-Perspectives)	X		3B, 3C, 3D	3
Electives	X			3
The benchmark courses for the 8th semester are the remaining courses in the entire program of study.	X			
Total Credits				15
Program Total Credits:				120