

## DEPARTMENTAL REQUIREMENTS FOR ALL

### CONCENTRATIONS IN THE BIOCHEMISTRY MAJOR:

These courses are departmental requirements for the major.

These courses both meet and exceed all AUCC Category 3A and Category 4 requirements.

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

#### **BIOCHEMISTRY:**

\_\_\_ BC 192 [2]      \_\_\_ BC 401 [3]

\_\_\_ BC 403 [3]      \_\_\_ BC 404 [2]

\_\_\_ BC 411 [4]      \_\_\_ BC 493 [1]

#### **BIOLOGICAL SCIENCES:**

\_\_\_ LIFE 102 [4]      \_\_\_ LIFE 203 [2]

\_\_\_ LIFE 201B [3]      \_\_\_ LIFE 212 [2]

\_\_\_ LIFE 210 [3]

#### **CHEMISTRY:**

\_\_\_ CHEM 111 [4]      \_\_\_ CHEM 112 [1]

\_\_\_ CHEM 113 [3]      \_\_\_ CHEM 114 [1]

\_\_\_ CHEM 341 [3]      \_\_\_ CHEM 343 [3]

#### **PHYSICS:**

\_\_\_ PH 121 [5]    or    \_\_\_ PH 141 [5]

And

\_\_\_ PH 122 [5]    or    \_\_\_ PH 142 [5]

#### **STATISTICS:**

\_\_\_ STAT 301 [3]    or    \_\_\_ STAT 307 [3]    or

\_\_\_ STAT 315 [3]

#### **MATHEMATICS:**

\_\_\_ MATH 155 [4]    or    \_\_\_ MATH 160 [4]

And

\_\_\_ MATH 255 [4]    or    \_\_\_ MATH 161 [4]

### Departmental Requirements for Each Concentration in the Biochemistry Major:

#### **ASBMB CONCENTRATION**

##### **BIOCHEMISTRY:**

\_\_\_ BC 360 [1]      \_\_\_ BC 463 [3]

\_\_\_ BC 465 [3]      \_\_\_ BC 499A [3] or

\_\_\_ BC 499B [3]

#### **BIOSCIENCE ELECTIVES (9 credits)**

A complete list of bioscience electives can be found on pg. 3-4

#### **HEALTH AND MEDICAL**

#### **SCIENCES CONCENTRATION**

##### **PHYSIOLOGY:**

\_\_\_ BMS 300 [4]    or    \_\_\_ BMS 360 [4]

##### **ANATOMY:**

\_\_\_ BMS 301 [5]    or    \_\_\_ BMS 305 [4]

##### **RESEARCH:**

\_\_\_ BC 406 [2]      \_\_\_ BC 487 [3]

\_\_\_ BC 475 [3]      \_\_\_ BC 495 [var]

##### **BIOCHEMISTRY:**

\_\_\_ BC 463 [3]

\_\_\_ BC 465 [3]

\_\_\_ BC 467 [3]

\_\_\_ BC 499A [3]    or    \_\_\_ BC 499C [3]

#### **PRE-PHARMACY CONCENTRATION**

##### **PHYSIOLOGY:**

\_\_\_ BMS 300 [4]    or    \_\_\_ BMS 360 [4]

\_\_\_ BMS 301 [5]

\_\_\_ BMS 302 [2]

##### **MICROBIOLOGY:**

\_\_\_ MIP 300 [4]      \_\_\_ MIP 302 [2]

##### **PUBLIC SPEAKING AND ECONOMICS:**

\_\_\_ SPCM 200 [3]      \_\_\_ ECON 202 [3]

##### **BIOCHEMISTRY:**

\_\_\_ BC 463 [3]    or    \_\_\_ BC 465 [3]

\_\_\_ BC 499A [3]    or    \_\_\_ BC 499D [3]

#### **DATA SCIENCE CONCENTRATION**

##### **COMPUTER SCIENCE/DATA SCIENCE:**

\_\_\_ CS152 [2]      or    \_\_\_ DSCI 235 [2]

\_\_\_ CS162 [2]      \_\_\_ DSCI 335 [3]

\_\_\_ CS 220 [4]

##### **RESEARCH:**

\_\_\_ BC 406 [2]      \_\_\_ BC 487 [3]

\_\_\_ BC 475 [3]      \_\_\_ BC 495 [var]

##### **BIOINFORMATICS:**

\_\_\_ BZ 360 [3]

##### **STATISTICS:**

\_\_\_ STAT 158 [1]

\_\_\_ STAT 341 [3]

##### **BIOCHEMISTRY:**

\_\_\_ BC 463 [3]      \_\_\_ BC 499A/E [3]

\_\_\_ BC 465 [3]

\*NOTE: Data Science students only take PH 121 or PH 141. PH 122 or PH 142 are not required

\*\*NOTE 2: See page 4 for list of DS electives

#### **ALL UNIVERSITY CORE CURRICULUM (AUCC):**

An updated and complete list of courses for categories 1 - 3E can be found here:

<https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc>

**DEPARTMENT COURSE LIST**

Course	Cr	Title	Semester	Prerequisites
BC 192	2	BC Freshman Seminar	F	None
BC 295	1 to 3	Intro Independent Study	F,SP,S	LIFE 102 or CHEM 112, may be taken concurrently
BC 360	1	Responsible Conduct in...	F,SP	LIFE 212
BC 401	3	Comp Biochemistry I	F, SP	CHEM 245 or 343 or 346, may be taken concurrently and MATH 155 or 160
BC 403	3	Comp Biochemistry II	F, SP	CHEM 245 or CHEM 341 or CHEM 345
BC 404	2	Comp Biochem Lab	F,SP	BC 401 may be taken concurrently and CHEM 246 or 344 or 346 and LIFE 203 and 212
BC 411	4	Physical Biochemistry	F	BC 351 with a grade of B or BC 401 and CHEM 113 and MATH 161 or MATH 255
BC 463	3	Molecular Genetics	F	BC 401 may be taken concurrently or BC 351 and LIFE 201B or BZ 350, all with a min. gr of C
BC 465	3	Molec Reg of Cell Function	SP, S	LIFE 210 and BC 403, may be taken concurrently or BC 351
BC 467	3	Biochemistry of Disease	SP	BC 401
BC 475	3	Mentored Research	F,SP,S	BC 404
BC 484	1 to 18	Supervised College Teaching	F,SP,S	Written consent of the instructor and department chair
BC 487A	1 to 18	Internship	F,SP,S	BC 401 and BC 403 and BC 404; minimum GPA of 2.0; written consent of department
BC 487B	1 to 18	Internship—International	F,SP,S	BC 401 and BC 463 senior standing and BC 495 in lab of host liaison faculty member
BC 493	1	Senior Seminar	F,SP	None
BC 495	1 to 18	Independent Study	F,SP,S	Minimum GPA of 3.0; written consent of laboratory mentor
BC 496	1 to 18	Group Study	F,SP,S	None
BC 498	1 to 6	Research	F,SP,S	Written consent of research mentor and department chair
BC 499A	3	Thesis Lab Research-based	F,SP,S	None
BC 499B-D	3	Thesis Literature-based	F,SP,S	BC 493
BMS 300	4	Princ. Of Human Physiology	F,SP,S	BZ 101 or BZ 110 or LIFE 102 and CHEM 103 or CHEM 107 or CHEM 111
BMS 301	5	Human Gross Anatomy	F,SP,S	BZ 110 or LIFE 102
BMS 302	2	Lab in Princ. of Physiology	F,SP	BMS 300 or BMS 360 may be taken concurrently
BMS 305	4	Dom Animal Gross Anatomy	SP	BZ 110 or LIFE 102
BMS 360	4	Fundamentals of Physiology	SP	BZ 110 or LIFE 102 and CHEM 245 or CHEM 341 may be taken concurrently
CHEM 111	4	General Chemistry I	F,SP,S	Math 118 or 141 or 155 or 160 or 161 or 229 or 26 and CHEM 105 or CHEM preparation completion
CHEM 112	1	General Chemistry Lab I	F,SP,S	CHEM 111 or CHEM 117 may be taken concurrently; credit not allowed for both CHEM 108 and CHEM 112
CHEM 113	3	General Chemistry II	F,SP,S	CHEM 107 or 111 or 117 and MATH 124 or 141 or 155 or 160 or 161 or 229 or 261, may be taken concurrently
CHEM 114	1	General Chemistry Lab II	F,SP,S	CHEM 108 or CHEM 112 and CHEM 113, may be taken concurrently
CHEM 341	3	Modern Organic Chem I	F,SP,S	CHEM 113; credit allowed for only CHEM 245 or CHEM 341 and CHEM 345
CHEM 343	3	Modern Organic Chem II	F,SP,S	CHEM 241 or 245 or 341 or 345, with a minimum grade of C-; credit not allowed for both CHEM 343 and 346
CHEM 344	2	Modern Organic Chem Lab	F,SP,S	CHEM 114 and CHEM 343 may be taken concurrently; credit not allowed for both CHEM 344 and CHEM 246
CO 150	3	College Composition	F,SP,S	CO 130
CO 301B	3	Writing in Disciplines-Science	F,SP,S	CO 150 or HONR 193
ECON 202	3	Princ. of Microeconomics	F,SP,S	MATH 117 or MATH 118 or MATH 141 or MATH 155 or MATH 160
LIFE 102	4	Attributes of Living Systems	F,SP,S	None
LIFE 201B	3	Introductory Genetics	F, SP, S	LIFE 102
LIFE 203	2	Intro Genetics Lab/Rec.	SP	LIFE 201A or LIFE 201B, may be taken concurrently
LIFE 210	3	Intro Eukaryotic Cell Biology	F, SP, S	CHEM 111 and CHEM 112 and LIFE 102
LIFE 212	2	Intro Cell Biology Lab/Rec	F, SP	CHEM 112 and LIFE 210 may be taken concurrently
MATH 155	4	Calc for Biological Scientists	F,SP,S	MATH 124 and MATH 125; credit only for 1 of the following MATH 141, MATH 155 MATH 159 or MATH 160
MATH 160	4	Calc for Physical Scientists I	F,SP,S	MATH 124 min gr B and MATH 126 with min gr B; credit only for 1 of the following MATH 141, MATH 155 or MATH 160
MATH 161	4	Calc for Physical Scientists II	F,SP,S	MATH 124 and MATH 159 or MATH 160
MATH 255	4	Calc for Biological Sci. II	F,SP	MATH 126 may be taken concurrently and MATH 155; credit no allowed for both MATH 255 or MATH 261
MIP 300	3	Gen Microbiology	F,SP,S	BZ 110 or BZ 120 or LIFE 102 and CHEM 245 or CHEM 341 or CHEM 345 may be taken consurately
MIP 302	2	Gen Microbiology Lab	F,SP,S	MIP 300, may be taken concurrently

MIP 342	4	Immunology	F,SP,S	BZ 310 or BZ 350 or LIFE 201B or LIFE 210 or MIP 250 and CHEM 245 or 341 or 345 may be taken concurrently and MIP 300
PH 121	5	General Physics I	F,SP,S	MATH 125 or MATH 155 or MATH 157 or MATH 160 may be taken concurrently
PH 122	5	General Physics II	F,SP,S	PH 121 or PH 141; credit not allowed for both PH 122 and PH 142
PH 141	5	Phys Sci & Engineers I	F,SP,S	MATH 126 and MATH 155 or MATH 155 or MATH 159 or MATH 160 may be taken concurrently; credit not allowed for both PH 142 and PH 122
PH 142	5	Phys Sci & Engineers II	F,SP,S	PH 141 and MATH 161 or MATH 255 or MATH 271 may be taken concurrently; credit not allowed for both PH 142 or PH 122
SPCM 200	3	Public Speaking	F,SP,S	None
STAT 301	3	Intro to Statistical Methods	F,SP,S	MATH 117 or 118 or 124 or 125 or 126 or 141 or 155 or 159 or 160; STAT 301, STAT 302A, STAT 307, or STAT 311
STAT 307	3	Intro to Biostatistics	F,SP,S	MATH 117 or 118 or 124 or 125 or 126 or 141 or 155 or 160; credit only for only 1 of the following STAT 301, STAT 307, STAT 311
STAT 315	3	Intro to Theory and Practice	F,SP,S	MATH 155 or MATH 159 or MATH 160

### **BIOSCIENCE ELECTIVES**

Course	Cr	Title	Semester	Prerequisites
<b><i>One of the bioscience electives must be from the following list of physiology/organismal biology courses:</i></b>				
BMS 300	4	Principles of Human Physiol.	F,SP,S	(BZ 101 or BZ 110 or LIFE 102) and (CHEM 103 or CHEM 107 or CHEM 111)
BMS 301	5	Human Gross Anatomy	F,SP,S	BZ 110 or LIFE 102
BMS 305	4	Domestic Animal Gross Anat.	SP	BZ 110 or LIFE 102
BMS 330	4	Microscopic Anatomy	SP	BMS 300 or BMS 360
BMS 345	4	Functional Neuroanatomy	F,SP	BMS 300 or BMS 360
BMS 360	4	Fundamentals of Physiology	SP	(BZ 110 or LIFE 102) and (CHEM 245 or 341, may be taken concurrently)
BMS 420	3	Cardiopulmonary Physiology	F	BMS 300 or BMS 360
BMS 430	3	Endocrinology	F	BMS 300 or BMS 360
BMS 450	3	Pharmacology	SP	BMS 300 or BMS 360 and BC 351 or LIFE 210
BMS 500	4	Mammalian Physiology I	F	BMS 300 or BMS 360
ERHS 332	3	Principles of Epidemiology	SP	STAT 301 or STAT 307, may be taken concurrently
FSHN 350	3	Human Nutrition	F,SP,S	BMS 300, may be taken concurrently and CHEM 245 or CHEM 341
HES 319	4	Neuromuscular Aspects	F,SP	BMS 300 and FSHN 150 and HES 145 and HES 207
HES 403	4	Physiology of Exercise	F,SP,S	BMS 300 or BMS 360
VS 331	4	Histology	F,SP,S	BZ 100 or LIFE 102
<b><i>The second and third bioscience electives must be from the above list or from the following:</i></b>				
BC 406A*	2	Investigative Biochemistry	F, SP	BC 404
BC 467	3	Biochemistry of Disease	SP	BC 401
BC 475*	3	Mentored Research	F, SP, S	BC 404
BC 487*	1 to 18	Internship	F, SP, S	BC 401 and BC 403 and BC 404
BC 495*	1 to 18	Independent Study	F, SP, S	None
BC 496*	1 to 18	Group Study	F, SP, S	None
BMS 325	3	Cellular Neurobiology	F	BMS 300 or BMS 360
BMS 405	3	Nerve & Muscle Toxins...	SP	BMS 325 or BMS 345
BZ 220	3	Introduction to Evolution	F,SP,S	BZ 110 or BZ 120 or LIFE 103
BZ 311	4	Developmental Biology	SP,S	BZ 310
BZ 346	3	Pop. And Evolut. Genetics	F	BZ 220 and MATH 155 and STAT 301 or STAT 307 or ERHS 307
BZ 360	3	Bioinformatics & Genomics	SP	BZ 110 or BZ 120 or LIFE 102
BZ 401	3	Comparative Animal Phys.	SP	BZ 214
BZ 440	3	Plant Physiology	SP	BZ 120 or LIFE 103
BZ 455	3	Human Heredity & Birth Def	SP	BZ 110 and BZ 111 or LIFE 103
BZ 476	3	Genetics of Model Organisms	F even yr	BZ 350 or LIFE 201A or LIFE 201B or SOCR 330.
CHEM 334	1	Quantitative Analysis Lab	F,SP	CHEM 114 and CHEM 335, may be taken concurrently
CHEM 335	3	Intro to Analytical Chemistry	F,SP	CHEM 113 with a minimum grade of C and CHEM 334, may be taken concurrently
CHEM 433	3	Clinical Chemistry	SP odd yr	CHEM 334 and BC 351 or BC 401
ERHS 450	3	Intro to Radiation Biology	SP	LIFE 102
FSHN 470	3	Integrative Nutr. & Met	F,SP	BC 351 and FSHN 350
FTEC 350	2	Fermentation Microbiology	SP	BC 351, may be taken concurrently and MIP 300
FTEC 460	3	Brewing Science II	SP	FTEC 422
MIP 300	3	General Microbiology	F,SP,S	BZ 110 or BZ 120 or LIFE 102 and CHEM 245 or CHEM 341 or CHEM 345 maybe taken concurrently

MIP 302	2	General Microbiology Lab	F,SP, S	MIP 300, may be taken concurrently
MIP 342	4	Immunology	F,SP, S	BZ 310 or BZ 350 or LIFE 201B or LIFE 210 or MIP 250 and CHEM 245 or 341 or 345 may be taken concurrently and MIP 300)
MIP 343	2	Immunology Lab	SP	MIP 302 and MIP 342, may be taken concurrently
MIP 351	3	Medical Bacteriology	SP	MIP 342
MIP 352	3	Medical Bacteriology Lab	SP	MIP 302 and MIP 351, may be taken concurrently
MIP 420	4	Medical & Molecular Virology	F	MIP 342 and BC 351 may be taken concurrently or BC 401 may be taken concurrently
MIP 425	2	Virology and Cell Culture Lab	F	MIP 302 and MIP 420 may be taken concurrently
MIP 450	3	Microbial Genetics	F	MIP 300 and BC 351 may be taken concurrently or BC 401 may be taken concurrently
MIP 462	5	Parasitology & Vector Biol.	F	BZ 110 or LIFE 103 and MIP 302 or LIFE 206 or BZ 212
NB 501	2	Cell & Molec. Neurophys.	F	BZ 100 to 481 - at least 1 course or BIO 100 to 481 - at least 1 course or LIFE 100 to 481 - at least 1 course and BC 100 to 481 - at least 1 course and PH 100 to 481 and MATH 141 or MATH 155 or MATH 160 to 161 - at least 1 course or MATH 255 or MATH 261
* A maximum of three credits of BC 406A, BC 475, BC 487, BC 495, or BC 496 can be applied to the bioscience elective requirement.				

### DATA SCIENCE ELECTIVES

Course	Cr	Title	Semester	Prerequisites
DSCI 320	3	Optimization Methods in Data Science	F	CS 163 or CS 164 and MATH 151 and MATH 255 or MATH 261 and DSCI 369 or MATH 369
DSCI 369	4	Linear Algebra for Data Science	SP	MATH 124 and MATH 126 or MATH 160
DSCI 445	3	Statistical Machine Learning	F	DSCI 369 and STAT 341
DSCI 473	2	Introduction to Geometric Data	F	DSCI 369
DSCI 475	2	Topological Data Analysis	SP	DSCI 369 or MATH 369
CS 320	3	Algorithms - Theory and Practice	F, SP	CS 165 and CS 220 and MATH 155 or MATH 160 and DSCI 369 or MATH 229 or MATH 369 (all with a minimum grade of C)
CS 425	4	Introduction to Bioinformatics Algorithms	F	BZ 360 or CS 320 and CS 345 (all with a minimum grade of C)
CS 435	4	Introduction to Big Data	F	CS 320 or CS 370 (all with a minimum grade of C)
CS 445	4	Introduction to Machine Learning	SP	CS 165 and CS 345 and DSCI 369 or MATH 229 or MATH 369 (all with a minimum grade of C)
MATH 151	1	Mathematical Algorithms in MATLAB	SP	MATH 141 or MATH 155 or MATH 160.
STAT 342	3	Statistical Data Analysis II	SP	STAT 340 or STAT 341
STAT 460	3	Applied Multivariate Analysis	SP	STAT 341 and DSCI 369 or MATH 229 or MATH 340 or MATH 369

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