

# MAJOR IN CHEMICAL AND BIOLOGICAL ENGINEERING

## Requirements Effective Fall 2026

Students may enroll in either the standalone major or (at most) one of the concentrations under the Major in Chemical and Biological Engineering.

### Freshman

|                                                                                                                                                                                                      |                                                     | AUCC | Credits   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|-----------|
| CHEM 120 <sup>1</sup>                                                                                                                                                                                | Foundations of Modern Chemistry (GT-SC2)            | 3A   | 4         |
| CHEM 121 <sup>1</sup>                                                                                                                                                                                | Foundations of Modern Chemistry Laboratory (GT-SC1) | 3A   | 1         |
| CO 150                                                                                                                                                                                               | College Composition (GT-CO2)                        | 1A   | 3         |
| ENGR 111                                                                                                                                                                                             | Fundamentals of Engineering                         |      | 3         |
| ENGR 114                                                                                                                                                                                             | Engineering for Grand Challenges                    |      | 3         |
| LIFE 102                                                                                                                                                                                             | Attributes of Living Systems (GT-SC1)               | 3A   | 4         |
| MATH 160                                                                                                                                                                                             | Calculus for Physical Scientists I (GT-MA1)         | 1B   | 4         |
| MATH 161                                                                                                                                                                                             | Calculus for Physical Scientists II (GT-MA1)        | 1B   | 4         |
| 1C ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc</a> ) |                                                     | 1C   | 3         |
| <b>Total Credits</b>                                                                                                                                                                                 |                                                     |      | <b>29</b> |

### Sophomore

|                                                                                                                                                                                                                                             |                                                 |    |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|----|-----------|
| CBE 201                                                                                                                                                                                                                                     | Material and Energy Balances                    |    | 3         |
| CBE 205/BIOM 205                                                                                                                                                                                                                            | Biological and Cellular Engineering             |    | 3         |
| CBE 210                                                                                                                                                                                                                                     | Thermodynamic Process Analysis                  |    | 3         |
| CBE 223                                                                                                                                                                                                                                     | CBE Design and Experimentation I                |    | 2         |
| CBE 393                                                                                                                                                                                                                                     | Professional Development Seminar                |    | 1         |
| CHEM 241                                                                                                                                                                                                                                    | Foundations of Organic Chemistry                |    | 4         |
| CHEM 242                                                                                                                                                                                                                                    | Foundations of Organic Chemistry Laboratory     |    | 1         |
| MATH 261                                                                                                                                                                                                                                    | Calculus for Physical Scientists III            |    | 4         |
| MATH 340                                                                                                                                                                                                                                    | Intro to Ordinary Differential Equations        |    | 4         |
| PH 141                                                                                                                                                                                                                                      | Physics for Scientists and Engineers I (GT-SC1) | 3A | 5         |
| Arts and Humanities ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities</a> ) |                                                 | 3B | 3         |
| <b>Total Credits</b>                                                                                                                                                                                                                        |                                                 |    | <b>33</b> |

### Junior

|                                       |                                              |  |   |
|---------------------------------------|----------------------------------------------|--|---|
| CBE 320                               | Chemical and Biological Reactor Design       |  | 3 |
| CBE 330                               | Process Simulation                           |  | 3 |
| CBE 331                               | Momentum Transfer and Mechanical Separations |  | 3 |
| CBE 332                               | Heat and Mass Transfer Fundamentals          |  | 3 |
| CBE 334                               | CBE Design and Experimentation II            |  | 1 |
| CBE 335                               | CBE Design and Experimentation III           |  | 1 |
| CBE 340                               | Statistics for CBE Applications              |  | 3 |
| Select one course from the following: |                                              |  | 4 |
| BC 351                                | Principles of Biochemistry                   |  |   |
| CHEM 321                              | Foundations of Chemical Biology              |  |   |
| Bioscience Elective (see list below)  |                                              |  | 3 |
| Chemistry Electives (see list below)  |                                              |  | 6 |

Historical Perspectives (<https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives>) 3D 3

| Total Credits                                                                                                                                                                                                                                                                |                                               | 33         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------|
| <b>Senior</b>                                                                                                                                                                                                                                                                |                                               |            |
| CBE 430                                                                                                                                                                                                                                                                      | Process Control and Instrumentation           | 3          |
| CBE 442                                                                                                                                                                                                                                                                      | Separation Processes                          | 4          |
| CBE 443                                                                                                                                                                                                                                                                      | Chemical and Biological Engineering Lab II    | 2          |
| CBE 451                                                                                                                                                                                                                                                                      | Chemical and Biological Engineering Design I  | 4A,4B,4C 3 |
| CBE 452                                                                                                                                                                                                                                                                      | Chemical and Biological Engineering Design II | 4A,4B,4C 3 |
| Advanced Writing ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#advanced-writing</a> )                                   | 2                                             | 3          |
| Arts and Humanities ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities</a> )                                  | 3B                                            | 3          |
| Social and Behavioral Sciences ( <a href="https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences">https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences</a> ) | 3C                                            | 3          |
| Electives <sup>2</sup>                                                                                                                                                                                                                                                       |                                               | 9          |
| <b>Total Credits</b>                                                                                                                                                                                                                                                         |                                               | <b>33</b>  |
| <b>Program Total Credits:</b>                                                                                                                                                                                                                                                |                                               | <b>128</b> |

<sup>1</sup> Students who complete General Chemistry (CHEM 111, CHEM 112, and CHEM 113, CHEM 114) do not have to take CHEM 120 and CHEM 121.

<sup>2</sup> Select enough elective credits to bring the program total to a minimum of 128 credits, of which at least 42 credits must be upper-division (300-level or higher).

## Electives

The CBE program requires 18 credit hours of electives. These include 3 credits of Bioscience, 6 credits of Chemistry, and 9 credits of free electives. New courses are added all the time, if you find a course you believe is valuable to your education ask your advisor if it is an appropriate elective course.

## Bioscience Electives

Select a minimum of 3 credits from the following.

| Code            | Title                                             | AUCC | Credits |
|-----------------|---------------------------------------------------|------|---------|
| BC 401          | Comprehensive Biochemistry I                      |      | 3       |
| BC 403          | Comprehensive Biochemistry II                     |      | 3       |
| BC 404          | Comprehensive Biochemistry Laboratory             |      | 2       |
| BC 406A         | Investigative Biochemistry: Protein Biochemistry  |      | 2       |
| BC 406B         | Investigative Biochemistry: Molecular Genetics    |      | 2       |
| BC 406C         | Investigative Biochemistry: Cellular Biochemistry |      | 2       |
| BC 411          | Physical Biochemistry                             |      | 4       |
| BC 441          | 3D Molecular Models for Biochemistry              |      | 1       |
| BC 463          | Molecular Genetics                                |      | 3       |
| BC 464          | Molecular Genetics Recitation                     |      | 1       |
| BC 465          | Molecular Regulation of Cell Function             |      | 3       |
| BC 517          | Metabolism                                        |      | 2       |
| BC 521/CHEM 521 | Principles of Chemical Biology                    |      | 3       |
| BMS 300         | Principles of Human Physiology                    |      | 4       |
| BMS 301         | Human Gross Anatomy                               |      | 5       |
| BMS 302         | Laboratory in Principles of Physiology            |      | 2       |

|                 |                                                                        |      |
|-----------------|------------------------------------------------------------------------|------|
| BMS 305         | Domestic Animal Gross Anatomy                                          | 4    |
| BMS 325         | Cellular Neurobiology                                                  | 3    |
| BMS 330         | Microscopic Anatomy                                                    | 4    |
| BMS 345         | Functional Neuroanatomy                                                | 4    |
| BMS 360         | Fundamentals of Physiology                                             | 4    |
| BMS 409         | Human and Animal Reproductive Biology                                  | 3    |
| BMS 420         | Cardiopulmonary Physiology                                             | 3    |
| BMS 430         | Endocrinology                                                          | 3    |
| BMS 450         | Pharmacology                                                           | 3    |
| BMS 460         | Essentials of Pathophysiology                                          | 3    |
| BMS 500         | Mammalian Physiology I                                                 | 4    |
| BMS 501         | Mammalian Physiology II                                                | 4    |
| BMS 503/NB 503  | Developmental Neurobiology                                             | 3    |
| BMS 505/NB 505  | Neuronal Circuits, Systems and Behavior                                | 3    |
| BMS 545         | Neuroanatomy                                                           | 5    |
| BMS 575         | Human Anatomy Dissection                                               | 4    |
| BSPM 302        | Applied and General Entomology                                         | 2    |
| BSPM 361        | Elements of Plant Pathology                                            | 3    |
| BZ 240          | Synthetic Biology-Principles and Applications                          | 3    |
| BZ 310          | Cell Biology                                                           | 4    |
| BZ 311          | Developmental Biology                                                  | 4    |
| BZ 348/MATH 348 | Theory of Population and Evolutionary Ecology                          | 4    |
| BZ 350          | Molecular and General Genetics                                         | 4    |
| BZ 360          | Bioinformatics and Genomics                                            | 4    |
| LIFE 201B       | Introductory Genetics: Molecular/ Immunological/Developmental (GT-SC2) | 3A 3 |
| LIFE 202B       | Introductory Genetics Recitation: Molecular                            | 1    |
| LIFE 203        | Introductory Genetics Laboratory                                       | 2    |
| LIFE 210        | Introductory Eukaryotic Cell Biology                                   | 3    |
| LIFE 211        | Introductory Cell Biology Honors Recitation                            | 1    |
| LIFE 212        | Introductory Cell Biology Laboratory                                   | 2    |
| LIFE 320        | Ecology                                                                | 3    |
| MIP 300         | General Microbiology                                                   | 3    |
| MIP 302         | General Microbiology Laboratory                                        | 2    |
| MIP 315         | Pathology of Human and Animal Disease                                  | 3    |
| MIP 334         | Food Microbiology                                                      | 3    |
| MIP 335         | Food Microbiology Laboratory                                           | 2    |
| MIP 342         | Immunology                                                             | 4    |
| MIP 343         | Immunology Laboratory                                                  | 2    |
| MIP 351         | Medical Bacteriology                                                   | 3    |
| MIP 352         | Medical Bacteriology Laboratory                                        | 3    |
| MIP 410         | Foundations of Modern Biotechnology                                    | 2    |
| MIP 420         | Medical and Molecular Virology                                         | 4    |
| MIP 432/ESS 432 | Microbial Ecology                                                      | 3    |
| MIP 433/ESS 433 | Microbial Ecology Laboratory                                           | 1    |

|         |                                      |   |
|---------|--------------------------------------|---|
| MIP 443 | Microbial Physiology                 | 3 |
| MIP 450 | Microbial Genetics                   | 3 |
| MIP 555 | Principles and Mechanisms of Disease | 3 |

## Chemistry Electives

Select a minimum of 6 credits from the following; 3 credits must be at the 300 level or higher.

| Code                                                                                          | Title                                         | Credits |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------|---------|
| CBE 310                                                                                       | Molecular Concepts and Applications           | 3       |
| CHEM 231                                                                                      | Foundations of Analytical Chemistry           | 3       |
| CHEM 232                                                                                      | Foundations of Analytical Chemistry Lab       | 2       |
| CHEM 263                                                                                      | Foundations of Inorganic Chemistry            | 4       |
| CHEM 264                                                                                      | Foundations of Inorganic Chemistry Laboratory | 1       |
| Upper division courses from subject code BC (400-479) and (500-579)                           |                                               |         |
| Upper division courses from subject code CHEM (310-340 and 350-379), (400-479), and (500-579) |                                               |         |