

# Biotechnology

## Department Information

- **Department Web Site:**  
[www.ndsu.edu/agriculture/academics/academic-units/microbiological-sciences](http://www.ndsu.edu/agriculture/academics/academic-units/microbiological-sciences) (<http://www.ndsu.edu/agriculture/academics/academic-units/microbiological-sciences/>)
- **Credential Offered:**  
 B.S.; Minor
- **Sample Program Guide:**  
[catalog.ndsu.edu/programs-study/undergraduate/biotechnology/#planofstudytext](http://catalog.ndsu.edu/programs-study/undergraduate/biotechnology/#planofstudytext) (<http://catalog.ndsu.edu/programs-study/undergraduate/biotechnology/#planofstudytext>)

## Major Requirements

### Major: Biotechnology

**Degree Type:** B.S.

**Minimum Degree Credits to Graduate:** 120

### University Degree Requirements

1. Satisfactory completion of all requirements of the curriculum in which one is enrolled.
2. Earn a minimum total of 120 credits in approved coursework. Some academic programs exceed this minimum.
3. Satisfactory completion of the general education requirements as specified by the university.
4. A minimum institutional GPA of 2.00 based on work taken at NDSU.
5. At least 30 credits must be NDSU resident credits. Resident credits include credits registered and paid for at NDSU.
6. At least 36 credits presented for graduation must be in courses numbered 300 or higher.
7. Students presenting transfer credit must meet the NDSU residence credits and the minimum upper level credit. Of the 30 credits earned in residence, a minimum of 15 semester credits must be in courses numbered 300 or above, and 15 semester credits must be in the student's curricula for their declared major.

For complete information, please refer to the Degree and Graduation Requirements (<http://catalog.ndsu.edu/past-bulletin-archive/2024-25/academic-policies/undergraduate-policies/degree-and-graduation/>) section of this Bulletin.

### University General Education Requirements

A list of university approved general education courses and administrative policies are available here (<http://catalog.ndsu.edu/past-bulletin-archive/2024-25/academic-policies/undergraduate-policies/general-education/#genedcoursestext>).

| Code                                                           | Title                           | Credits   |
|----------------------------------------------------------------|---------------------------------|-----------|
| <b>Category C: Communication</b>                               |                                 | <b>12</b> |
| ENGL 110                                                       | College Composition I           |           |
| ENGL 120                                                       | College Composition II          |           |
| COMM 110                                                       | Fundamentals of Public Speaking |           |
| Upper Division Writing <sup>†</sup>                            |                                 |           |
| <b>Category R: Quantitative Reasoning <sup>†</sup></b>         |                                 | <b>3</b>  |
| <b>Category S: Science and Technology <sup>†</sup></b>         |                                 | <b>10</b> |
| <b>Category A: Humanities and Fine Arts <sup>†</sup></b>       |                                 | <b>6</b>  |
| <b>Category B: Social and Behavioral Sciences <sup>†</sup></b> |                                 | <b>6</b>  |
| <b>Category W: Wellness <sup>†</sup></b>                       |                                 | <b>2</b>  |
| <b>Category D: Cultural Diversity <sup>**†</sup></b>           |                                 |           |
| <b>Category G: Global Perspectives <sup>**†</sup></b>          |                                 |           |
| <b>Total Credits</b>                                           |                                 | <b>39</b> |

\*

Courses for category D & G are satisfied by completing D & G designated courses in another general education category.

†

General education courses may be used to satisfy requirements for both general education and the major, minor, and program emphases, where applicable. Students should carefully review major requirements to determine if specific courses can also satisfy these general education categories.

## Major requirements

| Code                                                                            | Title                                                                     | Credits |
|---------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------|
| <b>Biotechnology Requirements</b>                                               |                                                                           |         |
| MICR 189                                                                        | Skills for Academic Success <sup>1</sup>                                  | 1       |
| CSCI 114                                                                        | Computer Applications                                                     | 3       |
| or CSCI 122                                                                     | Visual BASIC                                                              |         |
| MATH 165                                                                        | Calculus I                                                                | 4       |
| PHYS 211<br>& 211L                                                              | College Physics I<br>and College Physics I Laboratory                     | 4       |
| PHYS 212<br>& 212L                                                              | College Physics II<br>and College Physics II Laboratory                   | 4       |
| STAT 330                                                                        | Introductory Statistics                                                   | 3       |
| BIOL 150<br>& 150L                                                              | General Biology I<br>and General Biology I Laboratory                     | 4       |
| BIOL 151<br>& 151L                                                              | General Biology II<br>and General Biology II Laboratory                   | 4       |
| PLSC 315<br>& 315L                                                              | Genetics<br>and Genetics Laboratory <sup>Cross-listed as BIOL 315/L</sup> | 4       |
| CHEM 121<br>& 121L                                                              | General Chemistry I<br>and General Chemistry I Laboratory                 | 4       |
| CHEM 122<br>& 122L                                                              | General Chemistry II<br>and General Chemistry II Laboratory               | 4       |
| CHEM 341<br>& 341L                                                              | Organic Chemistry I<br>and Organic Chemistry I Laboratory                 | 4       |
| CHEM 342                                                                        | Organic Chemistry II                                                      | 3       |
| BIOC 460                                                                        | Foundations of Biochemistry and Molecular Biology I                       | 3       |
| BIOC 461                                                                        | Foundations of Biochemistry and Molecular Biology II                      | 3       |
| BIOC 474                                                                        | Methods of Recombinant DNA Technology <sup>2</sup>                        | 4       |
| MICR 350<br>& 350L                                                              | General Microbiology<br>and General Microbiology Lab                      | 5       |
| MICR 470                                                                        | Basic Immunology <sup>2</sup>                                             | 3       |
| MICR 471                                                                        | Immunology and Serology Laboratory <sup>2</sup>                           | 2       |
| MICR 485                                                                        | Capstone Experience I: Reflecting and Planning                            | 1       |
| MICR 486                                                                        | Capstone Experience II: Reflection and Dissemination                      | 1       |
| Ethics - Select one philosophy/ethics course from the following:                |                                                                           | 3       |
| PHIL 111                                                                        | Professional Responsibility and Ethics                                    |         |
| PHIL 210                                                                        | Ethics                                                                    |         |
| PHIL 215                                                                        | Contemporary Moral Issues                                                 |         |
| PHIL 216                                                                        | Business Ethics                                                           |         |
| PHIL 225                                                                        | Environmental Ethics                                                      |         |
| PHIL 327                                                                        | Ethics, Engineering, and Technology                                       |         |
| Capstone - Select one of the following capstone experiences from the following: |                                                                           | 2       |
| MICR 493                                                                        | Undergraduate Research (Research Experience) <sup>3</sup>                 |         |
| MICR 494                                                                        | Individual Study                                                          |         |
| MICR 497                                                                        | FE/Coop Ed/Internship (Internship Experience)                             |         |
| Biotechnology Elective - Select one course from the following:                  |                                                                           | 2-3     |
| BME 220                                                                         | Introduction to Biomedical Engineering                                    |         |
| MICR 455                                                                        | Microbial Biotechnology <sup>2</sup>                                      |         |
| Genetics Elective - Select one course from the following:                       |                                                                           | 3       |
| ANSC 357                                                                        | Animal Genetics <sup>2</sup>                                              |         |

|                                                             |                                                                     |              |
|-------------------------------------------------------------|---------------------------------------------------------------------|--------------|
| MICR 482                                                    | Microbial Genetics <sup>2</sup>                                     |              |
| PLSC 431                                                    | Intermediate Genetics <sup>2</sup>                                  |              |
| Physiology Elective - Select one course from the following: |                                                                     | 3            |
| MICR 480                                                    | Microbial Physiology <sup>2</sup>                                   |              |
| PLSC 380                                                    | Principles of Plant Physiology <sup>2</sup>                         |              |
| BIOL 460                                                    | Animal Physiology <sup>2</sup>                                      |              |
| Major Electives - Select 9 credits from the following:      |                                                                     | 9            |
| ABEN 263                                                    | Biological Materials Processing                                     |              |
| ABEN 456                                                    | Biobased Energy <sup>2</sup>                                        |              |
| ABEN 458                                                    | Process Engineering for Food, Biofuels and Bioproducts <sup>2</sup> |              |
| ASM 234                                                     | 3D Printing and Manufacturing                                       |              |
| BIOC 473                                                    | Methods of Biochemical Research <sup>2</sup>                        |              |
| BIOC 487                                                    | Molecular Biology of Gene Expression <sup>2</sup>                   |              |
| CFS 462                                                     | Food Ingredient Technology <sup>2</sup>                             |              |
| CHEM 431                                                    | Analytical Chemistry I <sup>2</sup>                                 |              |
| CPM 436                                                     | Biopolymers and Biocomposites <sup>2</sup>                          |              |
| ENVE 240                                                    | Microbiological Principles for Environmental Engineers              |              |
| IME 456                                                     | Program and Project Management                                      |              |
| MICR 352                                                    | Critical Skills in Microbiology                                     |              |
| MICR 352L                                                   | Critical Skills in Microbiology Laboratory Research                 |              |
| MICR 445                                                    | Animal Cell Culture Techniques <sup>2</sup>                         |              |
| MICR 481                                                    | Microbial Genomics with Computational Laboratory <sup>2</sup>       |              |
| PLSC 411                                                    | Genomics <sup>2</sup>                                               |              |
| PLSC 484                                                    | Plant Tissue Culture and Biotechnology <sup>2</sup>                 |              |
| <b>Total Credits</b>                                        |                                                                     | <b>90-91</b> |

1

MICR 189 is only required for first-time, first-year students--A first-time, first-year student is defined as a student who has not yet completed a college course as a college student. Students that are not first-time, first-year students that either transfer into the university or change their major are not required to take AGRI 189.

2

Courses that offer a 600 level dual course can be taken for the B.S./M.S. accelerated program. The 600 level courses have additional outcomes/requirements that students will have to complete. Students approved for accelerated programs must complete and submit the *Accelerated Declaration form*, which will require the student and advisor to identify which graduate courses (no more than 15 credits) will be counted toward the B.S. degree.

3

The research may also be completed as BIOC or PLSC.

Degree Notes:

- An accelerated undergraduate to master's degree program is available for the B.S. in Biotechnology major to the M.S. in Microbiology. Students must have a 3.00 GPA. Instructions to apply can be found in the online catalog and a sample 5-year plan can be found on the departments website. Students may complete a thesis-based or comprehensive study-based master's program.

## Minor Requirements

### Minor: Biotechnology

Required Credits: 20

| Code                                                                    | Title                                                | Credits |
|-------------------------------------------------------------------------|------------------------------------------------------|---------|
| BIOC 460                                                                | Foundations of Biochemistry and Molecular Biology I  | 3       |
| BIOC 461                                                                | Foundations of Biochemistry and Molecular Biology II | 3       |
| PLSC 315<br>& 315L                                                      | Genetics<br>and Genetics Laboratory                  | 4       |
| Biotechnology Technique Electives: Select 4 credits from the following: |                                                      | 4       |
| BIOC 473                                                                | Methods of Biochemical Research                      |         |
| BIOC 474                                                                | Methods of Recombinant DNA Technology                |         |

|                                                             |                                        |           |
|-------------------------------------------------------------|----------------------------------------|-----------|
| MICR 445                                                    | Animal Cell Culture Techniques         |           |
| MICR 471                                                    | Immunology and Serology Laboratory     |           |
| PLSC 484                                                    | Plant Tissue Culture and Biotechnology |           |
| Specialized Electives: Select 6 credits from the following: |                                        | 6         |
| ANSC 314                                                    |                                        |           |
| ANSC 357                                                    | Animal Genetics                        |           |
| MICR 455                                                    | Microbial Biotechnology                |           |
| MICR 470                                                    | Basic Immunology                       |           |
| MICR 480                                                    | Microbial Physiology                   |           |
| MICR 482                                                    | Microbial Genetics                     |           |
| PLSC 380                                                    | Principles of Plant Physiology         |           |
| PLSC 431                                                    | Intermediate Genetics                  |           |
| BIOL 370                                                    | Cell Biology                           |           |
| BIOL 460                                                    | Animal Physiology                      |           |
| <b>Total Credits</b>                                        |                                        | <b>20</b> |

### Minor Requirements and Notes

- A minimum of 8 credits must be taken at NDSU.