

# Genetics (BS)

The Genetics program offers undergraduate majors classroom training in fundamentals of genetics and other sciences, as well as opportunities for meaningful research experience. The degree in genetics is the only genetics major offered in the UNC system.

The genetics major complements other degree programs in the biological and life sciences at N.C. State, as it prepares students for further graduate study, professional schools (such as medical, dental, veterinary, genetic counseling) or careers in industries whose products are based on biological and agricultural research, including biopharmaceutical and biotechnology companies. Building on the strength of NC State as a leader in science and technology, students in the program can easily earn a concurrent minor in any of the other life sciences curricula, as well as other programs such as statistics or biotechnology.

Responsible conduct as a scientist and citizen are emphasized in the genetics coursework, and students will also have opportunities for public service and engagement through participation in the genetics outreach program. Students will be challenged to master their coursework while practicing hands-on problem-solving in both the classroom and active research settings. Genetics students also will be required to read the primary literature and present papers and their research findings, thus gaining valuable experience in scientific communication.

## Contact Person

**Dr. Whitney Jones**

2526B Thomas Hall

wmjones4@ncsu.edu (bgardner@ncsu.edu)

## Plan Requirements

| Code   | Title  | Hours |
|--|--|-------|
| <b>Orientation</b>   |  |       |
| LSC 103  | Exploring Opportunities in the Life Sciences             | 1     |
| <b>Advanced Writing/Communication</b>                            |  |       |
| ENG 333  | Communication for Science and Research <sup>1</sup>      | 3     |
| Select one of the following Communications courses: <sup>1</sup> |  | 3     |
| COM 110  | Public Speaking  |       |
| COM 112  | Interpersonal Communication                              |       |
| COM 211  | Argumentation and Advocacy                               |       |
| <b>Mathematical Sciences &amp; Physics</b>                       |  |       |
| MA 131   | Calculus for Life and Management Sciences A <sup>1</sup> | 3     |
| or MA 141  | Calculus I   |       |
| MA 231   | Calculus for Life and Management Sciences B <sup>1</sup> | 3     |
| or MA 241  | Calculus II  |       |
| ST 311   | Introduction to Statistics <sup>1</sup>                  | 3     |
| or ST 371  | Introduction to Probability and Distribution Theory      |       |
| PY 211   | College Physics I <sup>1,3</sup>                         | 4     |
| PY 212   | College Physics II <sup>1,3</sup>                        | 4     |
| <b>Chemistry</b>   |  |       |
| CH 101   | Chemistry - A Molecular Science <sup>1</sup>             | 3     |
| CH 102   | General Chemistry Laboratory <sup>1</sup>                | 1     |
| CH 201   | Chemistry - A Quantitative Science <sup>1</sup>          | 3     |
| CH 202   | Quantitative Chemistry Laboratory <sup>1</sup>           | 1     |

|        |                                       |   |
|--------|---------------------------------------|---|
| CH 221 | Organic Chemistry I                   | 3 |
| CH 222 | Organic Chemistry I Lab <sup>1</sup>  | 1 |
| CH 223 | Organic Chemistry II <sup>1</sup>     | 3 |
| CH 224 | Organic Chemistry II Lab <sup>1</sup> | 1 |

### Required Life Sciences

|   |   |   |
|---|---|---|
| LSC 101   | Critical and Creative Thinking in the Life Sciences <sup>1</sup>        | 2 |
| BIO 181   | Introductory Biology: Ecology, Evolution, and Biodiversity <sup>1</sup> | 4 |
| BIO 183   | Introductory Biology: Cellular and Molecular Biology <sup>1</sup>       | 4 |
| GN 311  | Principles of Genetics <sup>1</sup>                                     | 4 |
| GN 312  | Elementary Genetics Laboratory <sup>1</sup>                             | 1 |
| GN 421  | Molecular Genetics <sup>1</sup>   | 3 |
| GN 423  | Population, Quantitative and Evolutionary Genetics <sup>1</sup>         | 3 |
| GN 425  | Advanced Genetics Laboratory <sup>1</sup>                               | 2 |
| BCH 451   | Principles of Biochemistry <sup>1</sup>                                 | 4 |
| Select one of the following Cell Biology/Physiology courses: <sup>1</sup> |   | 3 |

BIO 240 Principles of Human Anatomy & Physiology (A): Nervous, Skeletal, Muscular, & Digestive Systems

BIO 245 Principles of Human Anatomy & Physiology (B): Endocrine, Cardiovascular, Respiratory & Renal Systems

BIO 414 Cell Biology

PB 421 Plant Physiology

### Research/Teaching Requirement

|           |  |   |
|-----------|--|---|
| GN 496    | Genetics Research Experience (S allowed) | 3 |
| or GN 497 | Genetics Teaching Experience             |   |

### Genetics Electives

|   |                                       |   |
|---|---------------------------------------|---|
| Select two of the following: <sup>1</sup> |                                       | 6 |
| GN 427                                    | Introductory Bioinformatics           |   |
| GN 434                                    | Genes and Development                 |   |
| GN 441                                    | Human and Biomedical Genetics         |   |
| GN 451                                    | Genome Science                        |   |
| GN 456                                    | Epigenetics, Development, and Disease |   |
| GN 541                                    | Human and Biomedical Genetics         |   |

### GEP Courses

|  |  |   |
|--|--|---|
| ENG 101  | Academic Writing and Research <sup>1</sup> | 4 |
| GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )   |  | 6 |
| GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )  |  | 6 |
| GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )                  |  | 2 |
| GEP US Diversity, Equity, and Inclusion ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/</a> )  |  | 3 |
| GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> ) |  | 3 |
| GEP Global Knowledge ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/</a> ) (verify requirement)                      |  |   |

World Language Proficiency (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/>) (verify requirement)

### Restricted Electives

Restricted Electives (p. 2) <sup>1</sup> 8

### Free Electives

Free Electives (12 Hr S/U Lmt) <sup>2</sup> 9

**Total Hours** 120

<sup>1</sup> A grade of C- or higher is required.

<sup>2</sup> Students should consult their academic advisors to determine which courses fill this requirement.

<sup>3</sup> PY 205 and PY 208 may be substituted for PY 211 and PY 212. PY 205 and PY 208 are calculus-based and may require the MA 141 and MA 241 series of Mathematics. PY 201 and PY 202 also may be substituted for PY 211 and PY 212. PY 201 and PY 202 are calculus-based, require the MA 141 and MA 241 series.

## Restricted Electives

| Code    | Title   | Hours |
|---------|---|-------|
| ANT 370 | Introduction to Forensic Anthropology         | 3     |
| BIO 270 | Introduction to Evolution                     | 3     |
| BIO 432 | Evolutionary Medicine                         | 3     |
| BIO 434 | Hormones and Behavior                         | 3     |
| BIO 440 | The Human Animal: An Evolutionary Perspective | 3     |
| BIO 444 | The Biology of Love and Sex                   | 3     |
| BIO 488 | Neurobiology                                  | 3     |
| BIO 588 | Neurobiology                                  | 3     |
| BIT 410 | Manipulation of Recombinant DNA               | 4     |
| ENT 425 | General Entomology                            | 3     |
| GN 450  | Conservation Genetics                         | 3     |
| MA 331  | Differential Equations for the Life Sciences  | 3     |
| MA 341  | Applied Differential Equations I              | 3     |
| MB 351  | General Microbiology                          | 3     |
| MB 352  | General Microbiology Laboratory               | 1     |
| MB 441  | Immunology                                    | 3     |
| MEA 220 | Marine Biology                                | 3     |
| PB 400  | Plant Diversity and Evolution                 | 4     |
| PSY 430 | Biological Psychology                         | 3     |
| TOX 401 | Principles of Toxicology                      | 4     |
| TOX 501 | Principles of Toxicology                      | 4     |
| ZO 350  | Animal Phylogeny and Diversity                | 4     |
| ZO 402  | Invertebrate Biology                          | 4     |
| ZO 410  | Introduction to Animal Behavior               | 3     |

## Semester Sequence

This is a sample.

### First Year

| Fall Semester   | Hours |
|---|-------|
| LSC 101 Critical and Creative Thinking in the Life Sciences <sup>1</sup>        | 2     |
| BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity <sup>1</sup> | 4     |

|   |   |
|---|---|
| CH 101 Chemistry - A Molecular Science <sup>1</sup>   | 3 |
| CH 102 General Chemistry Laboratory <sup>1</sup>  | 1 |
| MA 131 Calculus for Life and Management Sciences A <sup>1</sup>   | 3 |
| LSC 103 Exploring Opportunities in the Life Sciences <sup>1</sup>   | 1 |
| GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> ) | 1 |

**Hours** 15

### Spring Semester

|   |   |
|---|---|
| BIO 183 Introductory Biology: Cellular and Molecular Biology <sup>1</sup> | 4 |
| CH 221 Organic Chemistry I <sup>1</sup>                                   | 3 |
| CH 222 Organic Chemistry I Lab <sup>1</sup>                               | 1 |
| MA 231 Calculus for Life and Management Sciences B <sup>1</sup>           | 3 |
| ENG 101 Academic Writing and Research <sup>1</sup>                        | 4 |

**Hours** 15

### Second Year

#### Fall Semester

|   |   |
|---|---|
| CH 223 Organic Chemistry II <sup>1</sup>  | 3 |
| CH 224 Organic Chemistry II Lab <sup>1</sup>  | 1 |
| ST 311 Introduction to Statistics <sup>1</sup>  | 3 |
| Restricted Elective (p. 2) <sup>1</sup>   | 4 |
| GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )                             | 3 |
| GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> ) | 1 |

**Hours** 15

#### Spring Semester

|  |   |
|--|---|
| GN 311 Principles of Genetics <sup>1</sup>             | 4 |
| GN 312 Elementary Genetics Laboratory <sup>1</sup>     | 1 |
| CH 201 Chemistry - A Quantitative Science <sup>1</sup> | 3 |
| CH 202 Quantitative Chemistry Laboratory <sup>1</sup>  | 1 |
| Restricted Elective (p. 2) <sup>1</sup>                | 4 |
| Communications Requirement (p. 1) <sup>1</sup>         | 3 |

**Hours** 16

### Third Year

#### Fall Semester

|  |   |
|--|---|
| GN 421 Molecular Genetics <sup>1</sup>   | 3 |
| BCH 451 Principles of Biochemistry <sup>1</sup>  | 4 |
| PY 211 College Physics I <sup>1</sup>  | 4 |
| ENG 333 Communication for Science and Research <sup>1</sup>  | 3 |
| GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> ) | 3 |

**Hours** 17

#### Spring Semester

|  |   |
|--|---|
| GN 425 Advanced Genetics Laboratory <sup>1</sup>                       | 2 |
| GN 423 Population, Quantitative and Evolutionary Genetics <sup>1</sup> | 3 |
| PY 212 College Physics II <sup>1</sup>                                 | 4 |

|  |            |
|--|------------|
| GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> )  | 3          |
| GEP US Diversity, Equity, and Inclusion ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/</a> )  | 3          |
| <b>Hours</b>   | <b>15</b>  |
| <b>Fourth Year</b>   |            |
| <b>Fall Semester</b>   |            |
| Genetics Research/Teaching Requirement (p. 1)  | 3          |
| Select one of the following: <sup>1</sup>  | 3-4        |
| BIO 414 Cell Biology   |            |
| PB 421 Plant Physiology  |            |
| GEP Interdisciplinary Perspectives ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/</a> ) | 3          |
| Free Elective  | 4-5        |
| <b>Hours</b>   | <b>14</b>  |
| <b>Spring Semester</b>   |            |
| Genetics Electives (p. 1) <sup>1</sup>   | 6          |
| GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> )   | 3          |
| Free Elective  | 4          |
| <b>Hours</b>   | <b>13</b>  |
| <b>Total Hours</b>   | <b>120</b> |

<sup>1</sup> A grade of C- or higher is required.

## Career Opportunities

Many students majoring in the Department of Biological Sciences take advantage of scholarship and honors programs available at NC State, including the University Honors Program and the University Scholars Program. In addition, we offer a discipline-based Undergraduate Honors Program in Biological Sciences (DBS Honors Program). The DBS Honors Program requires students to design a challenging program of advanced study, including eight credits of honors coursework in biology and at least two semesters of research or teaching scholarship.

Participants write an honors thesis and are required to present their scholarly work at a local, regional, or national meeting. Invitations to join the DBS Honors Program are sent in the first three weeks of the Fall and Spring semesters. Students in any major in the Department of Biological Sciences who have earned an overall GPA of 3.60 after completing 30-65 credit hours at NC State will receive an invitation to join the DBS Honors Program; transfer students in any of our majors who have earned an overall GPA of 3.60 in 15 credit hours at NC State also will receive an invitation.

Students who graduate from the Department of Biological Sciences are well prepared for employment in various government agencies and private industries. Graduates may continue their education with studies leading to advanced degrees in many areas of the biological sciences, including cell biology, ecology, microbiology, genetics, zoology, neurobiology, and biomedical disciplines. Many choose to seek advanced degrees in medicine, dentistry, optometry, veterinary medicine, public health, and other health-related fields. Students who plan to seek certification for pre-college teaching may want to pursue a second major in the Department of Science, Technology, Engineering & Mathematics Education.

## Career Titles

- Agricultural Sciences Professor
- Biochemist
- Biologist
- Biology Professor
- Botanist
- Cardiologist (MD)
- Environmental Research Analyst
- Family Practitioner (MD)
- Food & Drug Inspector
- Forensic Science Technicians
- General Internists (MD)
- Genetic Counselors
- Geneticist
- Greenhouse and Nursery Manager
- Marine and Aquatic Biologist
- Medical and Health Services Managers
- Microbiologist
- Molecular and Cellular Biologists
- Pathologist (MD)
- Pharmacologist
- Public Health Service Officer
- Sales Representative (Chemicals & Drugs)
- Zoologist

## Learn More About Careers

NCcareers.org (<https://nccareers.org/>)

Explore North Carolina's central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (<https://www.bls.gov/ooh/>)

Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (<https://www.careeronestop.org/>)

View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (<https://careers.dasa.ncsu.edu/explore-careers/career-assessments/>) (NC State student email address required)

This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (<https://careers.dasa.ncsu.edu/about/hours-appointments/>) to discuss the results.

Focus 2 Apply Assessment (<https://www.focus2career.com/Portal/Register.cfm?SID=1929>) (Available to prospective students)

A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

Genetics Society of America (<https://genetics-gsa.org/>)