GENETICS AND BIOTECHNOLOGY - BACHELOR OF SCIENCE IN GENETICS

Codirectors of the Program:

Professor, Michelle Nishiguchi, Department Head, Biology

Professor, Rolston St. Hilaire, Department Head, Plant and Environmental Sciences

Professors Bosland, Cramer, Houde, Milligan, Nishiguchi, O’Connell, Ray, Sengupta-Gopalan, C. Shuster, St. Hilaire, Zhang; Associate Professors Bailey, Curtiss, M. Shuster

Have you ever wondered why your hair or eye color, facial features, or the build of your body resembles that of your parents, grandparents, or other close relatives? What factors are responsible for generating all the variety of colors and shapes of flowers, trees, and different types of animals? If these questions have crossed your mind, then you have been thinking about Genetics; the science of heredity. Genetics is studied at the DNA/gene/genome level (molecular genetics, biotechnology, genomics and bioinformatics), the level of organisms (classical or Mendelian genetics), and within/among populations of individuals (population and quantitative genetics).

One of the most significant scientific accomplishments in history has been the use of genomic technologies to recently identify most human genes, as well as, most genes for a number of other animals, plants, fungi, and bacteria. Geneticists now have tremendous opportunities to use molecular, biochemical, mathematical, and computer science-based (bioinformatics) approaches to investigate how these genes determine observable traits. This information can be used to significantly advance human health and well being, and to meet the food and fiber needs of the world.

A degree in Genetics can provide excellent preparation for careers in academic research and technical support, teaching, agriculture, the biotechnology industry, medicine and health sciences, forensic science, technical writing, and sales or marketing. It is also an excellent background for students wishing to enter a graduate program, medical school, and veterinary school.

Undergraduates in the Genetics program must earn a grade of C- or better to receive credit for required Basic Science Background and Genetics Core courses. Within the Genetics Core curriculum, Tier I courses must be taken by all majors, for a total of 28 credit hours. To accommodate differing interests among students, a series of Tier II courses comprising 11 to 13 credits are provided. Ethical considerations of genetic based technologies will be infused throughout the curriculum, with a focused course on Science and Ethics in the Tier III portion of the core curriculum.

Requirements

General Education Requirements

Area I: Communications

English Composition-Level 1. Select one from the following: 4

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>ENGL 111G</td>
<td>Rhetoric and Composition</td>
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<tr>
<td>ENGL 111GH</td>
<td>Rhetoric and Composition Honors</td>
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<tr>
<td>SPCD 111G</td>
<td>Advanced ESL Composition</td>
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Basic Science Background Requirements

A ST 311 or BIOL 455 Statistical Applications 3

BCHE 395 Biochemistry I 3

BCHE 396 Biochemistry II 3

BIOL 111G Natural History of Life 3

CHEM 111G General Chemistry I 4

CHEM 112G General Chemistry II 4

CHEM 313 Organic Chemistry I 3

CHEM 314 Organic Chemistry II 3

CHEM 315 Organic Chemistry Laboratory 2

MATH 191G Calculus and Analytic Geometry I 4

MATH 192G Calculus and Analytic Geometry II 4

PHYS 211G General Physics I 3

PHYS 211GL General Physics Laboratory 1

PHYS 212G General Physics II 3

PHYS 222G General Physics for Life Sciences I 1

Tier I Courses

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<tr>
<td>GENE 110</td>
<td>Experimental Systems in Genetics</td>
</tr>
<tr>
<td>BIOL 211G</td>
<td>Cellular and Organismal Biology</td>
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</tr>
<tr>
<td>BIOL 311</td>
<td>General Microbiology</td>
</tr>
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<td>BIOL 311 L</td>
<td>General Microbiology Laboratory</td>
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Viewing a Wider World

Select one Viewing a Wider World course 2

Area II: Laboratory Science

CHEM 111G General Chemistry I 4

CHEM 112G General Chemistry II 4

Area IV & V: Social/Behavioral Sciences and Humanities and Fine Arts

Select a total of 15 credits combined from Areas IV and V, with 6 credits in one area and 9 credits in the other area: 15

Area IV: Social/Behavioral Sciences: Select 6-9 credits 3

Area V: Humanities and Fine Arts: Select 6-9 credits 3

Core Requirements

Tier I Courses

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Additional Options

Area III: Laboratory Science

CHEM 111G General Chemistry I 4

CHEM 112G General Chemistry II 4

Areas IV and V: Social/Behavioral Sciences and Humanities and Fine Arts

Select a total of 15 credits combined from Areas IV and V, with 6 credits in one area and 9 credits in the other area: 15

Area IV: Social/Behavioral Sciences: Select 6-9 credits 3

Area V: Humanities and Fine Arts: Select 6-9 credits 3

Viewing a Wider World

Select one Viewing a Wider World course 2

Basic Science Background Requirements

A ST 311 or BIOL 455 Statistical Applications 3

BCHE 395 Biochemistry I 3

BCHE 396 Biochemistry II 3

BIOL 111G Natural History of Life 3

CHEM 111G General Chemistry I 4

CHEM 112G General Chemistry II 4

CHEM 313 Organic Chemistry I 3

CHEM 314 Organic Chemistry II 3

CHEM 315 Organic Chemistry Laboratory 2

MATH 191G Calculus and Analytic Geometry I 4

MATH 192G Calculus and Analytic Geometry II 4

PHYS 211G General Physics I 3

PHYS 211GL General Physics Laboratory 1

PHYS 212G General Physics II 3

PHYS 222G General Physics for Life Sciences I 1

Core Requirements

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<td>GENE 305 L</td>
<td>Genetic Techniques</td>
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<td>GENE 315</td>
<td>Molecular Genetics</td>
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<td>GENE 320</td>
<td>Hereditary and Population Genetics</td>
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<td>BIOL 377</td>
<td>Cell Biology</td>
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<tr>
<td>GENE 440</td>
<td>Genetics Seminar</td>
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<tr>
<td>GENE 452</td>
<td>Applied Bioinformatics</td>
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<tr>
<td>or BIOL 446</td>
<td>Bioinformatics and NCBI Database</td>
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<tr>
<td>BCHE 494</td>
<td>Biochemical Genetics Laboratory</td>
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<tr>
<td>or BIOL 302</td>
<td>Molecular Biology Techniques Laboratory</td>
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**Tier II Courses**

Select one course from each of the following four areas: **12-14**

**Selection response:**
- AGRO 462 Plant Breeding
- ANSC 423 Animal Breeding
- BIOL 467 Evolution

**Physiology:**
- ANSC 421 Physiology of Reproduction
- BIOL 354 Physiology of Humans
- BIOL 381 Animal Physiology
- BIOL 385 An Introduction to Cancer
- BIOL 451 Physiology of Microorganisms
- BIOL 474 Immunology
- EPWS 314 Plant Physiology
- HORT 471 Plant Mineral Nutrition

**Organism Structure:**
- ANSC 370 Anatomy and Physiology of Farm Animals
- BIOL 313 Structure and Function of Plants
- BIOL 322 Zoology
- BIOL 382 Plant Signalling and Development
- BIOL 470 Developmental Biology
- BIOL 465 Invertebrate Zoology
- EPWS 303 Economic Entomology

**Molecular Genetics:**
- BIOL 475 Virology
- BIOL 478 Molecular Biology of Microorganisms
- GENE 486 Genes and Genomes
- GENE 488 Gene Regulation

**Tier III Courses**

Select one from the following:
- AGRO 303V Genetics and Society
- HON 306V Science, Ethics and Society
- PHIL 321 Biomedical Ethics

**Additional Courses**

Select electives to bring total to 120 credits including 48 upper division credits.

**Recommended Electives (Honors College)**

- HON 400 Honors Thesis
- HON 205G Life, Energy, and Evolution
- HON 214 Successful Fellowship Writing

Select 6 credits from the following:

1 Total of 15 credits combined between Areas IV and V, with 6 credits in one area and 9 credits in the other area. See General Education Courses (http://catalogs.nmsu.edu/nmsu/essential-information-students/general-education-courses) for listing of available courses.

2 One VWW area will be satisfied using the nine-hour rule. Students with Biology as their home department will use GENE courses and students with Plant and Environmental Science as their home department use BIOL courses.