GENETICS AND BIOTECHNOLOGY - BACHELOR OF SCIENCE IN GENETICS

Codirectors of the Program:

Professor, Michelle Nishiguchi, Department Head, Biology

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

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

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 Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ENGL 111G</td>
<td>Rhetoric and Composition</td>
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<tr>
<td>SPCD 111G</td>
<td>Advanced ESL Composition</td>
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Area II: Laboratory Science

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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>BIOL 111G</td>
<td>General Chemistry I</td>
</tr>
<tr>
<td>BIOL 112G</td>
<td>General Chemistry II</td>
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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:

<table>
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<tbody>
<tr>
<td>BIOL 311</td>
<td>Experimental Systems in Genetics</td>
</tr>
<tr>
<td>BIOL 211G</td>
<td>Cellular and Organismal Biology</td>
</tr>
<tr>
<td>BIOL 211GL</td>
<td>Cellular and Organismal Biology</td>
</tr>
<tr>
<td>BIOL 311L</td>
<td>General Microbiology</td>
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<tr>
<td>BIOL 311</td>
<td>General Microbiology Laboratory</td>
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Core Requirements

Tier I Courses

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<tbody>
<tr>
<td>GENE 110</td>
<td>Experimental Systems in Genetics</td>
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<tr>
<td>BIOL 211G</td>
<td>Cellular and Organismal Biology</td>
</tr>
<tr>
<td>BIOL 211GL</td>
<td>Cellular and Organismal Biology</td>
</tr>
<tr>
<td>BIOL 311</td>
<td>General Microbiology</td>
</tr>
<tr>
<td>BIOL 311L</td>
<td>General Microbiology Laboratory</td>
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</tbody>
</table>
GENE 305 L Genetic Techniques 1
GENE 315 Molecular Genetics 3
GENE 320 Hereditary and Population Genetics 3
BIOL 377 Cell Biology 3
GENE 440 Genetics Seminar 1
GENE 452 Applied Bioinformatics 3
or BIOL 446 Bioinformatics and NCBI Database
BCHE 494 Biochemical Genetics Laboratory 3
or BIOL 302 Molecular Biology Techniques Laboratory

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 330 Comparative Anatomy and Embryology
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 3

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
Select 9 credits from the following:
HON 205G Life, Energy, and Evolution
HON 214 Successful Fellowship Writing

HON 225G History of Ethics
Select 6 credits from the following:
HON 306V Science, Ethics and Society
HON 314 Successful Fellowship Writing
HON 410 Honors Internship

Total Credits 127-129

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.