GENETICS AND BIOTECHNOLOGY - BACHELOR OF SCIENCE IN GENETICS

Codirectors of the Program:

Professor, Charles Shuster, Department Head, Biology
Professor, Anowar Islam, Department Head, Plant and Environmental Sciences

Professors Bailey, Cramer, Hanley, Houde, Milligan, Randall, Serrano, C. Shuster, M. Shuster, Smith, Unguez, Zhang; ***Associate Professors*** Curtiss, James, Xu ***Assistant Professors*** Lozada

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 Departmental and Non-Departmental required courses. Within the Departmental Required courses, Tier I courses must be taken by all majors, for a total of 31 credit hours*. To accommodate differing interests among students, a series of Tier II courses comprising 9-11 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.

**Note: This includes BIOL 2610G which also counts as a General Education elective.*

Requirements

Students must complete all University degree requirements, which include: General Education requirements, Viewing a Wider World requirements, other Non-Departmental requirements, and elective credits to total at least 120 credits with 48 credits in courses numbered 300 or above. Developmental coursework will not count towards the degree requirements and/or elective credits, but may be needed in order to take the necessary English and Mathematics coursework.

Prefix	Title	Credits
General Education Requirements		
Area I: Communications		*10*
English Composition - Level 1 [1]		
English Composition - Level 2 [1]		
Oral Communication [1]		
Area II: Mathematics		
MATH 1521G	Calculus and Analytic Geometry II [2]	4
Area III/IV: Laboratory Sciences and Social/Behavioral Sciences		*11*
CHEM 1215G	General Chemistry I Lecture and Laboratory for STEM Majors	
CHEM 1225G	General Chemistry II Lecture and Laboratory for STEM Majors	
Area IV: Social/Behavioral Sciences (3 credits) [1]		*3*
Area V: Humanities [1]		*3*
Area VI: Creative and Fine Arts [1]		*3*
General Education Elective		
BIOL 2610G	Principles of Biology: Biodiversity, Ecology, and Evolution (Tier I Requirement also)	3
Viewing a Wider World [3]		**6**
Departmental/College Requirements		
Tier I Requirements		
BIOL 2110G & BIOL 2110L	Principles of Biology: Cellular and Molecular Biology and Principles of Biology: Cellular and Molecular Biology Laboratory	4
BIOL 377	Cell Biology	3
BIOL 446	Bioinformatics and NCBI Database	3
or GENE 452	Applied Bioinformatics	
BIOL 455	Biometry	3
or A ST 311	Statistical Applications	
BIOL 467	Evolution	3
GENE 1110	Experimental Systems in Genetics	1
GENE 305 L	Genetic Techniques	1
GENE 315	Molecular Genetics	3
GENE 320	Hereditary and Population Genetics	3
GENE 440	Genetics Seminar	1
Choose 3 Credits from Following:		3
GENE 391	Genetics Internship	
GENE 449	Special Problems	
BIOL 302	Molecular Biology Techniques Laboratory	
BIOL 309	Guided Biological Research Lab	
BIOL 351	Biology Internship	
Tier II Requirements		*9-11*
Select one course from each of the three following categories.		
1. Molecular and Applied Genetics: AGRO 462, ANSC 423, BIOL 442, BIOL 475, BIOL 478, BIOL 488, GENE 486		
2. Physiology: ANSC 421, BIOL 354, BIOL 381, BIOL 385, BIOL 451, BIOL 474, EPWS 314, HORT 471		
3. Organism Structure: ANSC 370, BIOL 311, BIOL 313, BIOL 322, BIOL 382, BIOL 470, BIOL 490, EPWS 302, EPWS 373		
Tier III Courses		*3*
Select one from the following:		
AGRO 303V	Genetics and Society	
HNRS 306V	Science, Ethics and Society	
Non-Departmental Requirements (in addition to Gen.Ed/VWW)		

CHEM 313	Organic Chemistry I	3
CHEM 314	Organic Chemistry II	3
CHEM 315	Organic Chemistry Laboratory	2
BCHE 395	Biochemistry I	3
BCHE 396	Biochemistry II, Lecture and Laboratory	4
PHYS 2230G	General Physics for Life Science I	3
or PHYS 1230G	Algebra-Based Physics I	
PHYS 2240G	General Physics for Life Science II	3
or PHYS 1240G	Algebra-Based Physics II	
Electives, to bring the total credits to 120 [4]		**16**
Select electives to bring total to 120 credits including 48 upper division credits.		
Recommended Electives		
HNRS courses [5]		
Total Credits		**120-122**

1 See the General Education Section (https://catalogs.nmsu.edu/nmsu/general-education-viewing-wider-world/) of the catalog for a full list of courses.

2 MATH 1521G Calculus and Analytic Geometry II is required for the degree but students may need to take prerequisite courses before entering MATH 1521G Calculus and Analytic Geometry II.

3 See the Viewing a Wider World (https://catalogs.nmsu.edu/nmsu/general-education-viewing-wider-world/#viewingawiderworldtext) section of the catalog for a full list of courses.

4 Elective credit may vary based on prerequisites, dual credit, AP credit, double majors, and/or minor coursework. The elective credits in the requirements list is the amount needed to bring the total to 120 credits and may vary based on the degree. Students may need to complete more or less courses on a case-by-case basis and each student should discuss elective requirements with their advisor.

5 Students interested in graduating with University Honors should consult with an advisor to select 18 credits of relevant Honors (HNRS) courses.

Second Language Requirement

For the Bachelor of Science in Genetics with a major in Genetics and Biotechnology there is no second language requirement for the degree.

A Suggested Plan of Study for Students

This roadmap assumes student placement in MATH 1220G College Algebra and ENGL 1110G Composition I. The contents and order of this roadmap may vary depending on initial student placement in mathematics and english. It is only a suggested plan of study for students and is not intended as a contract. Course availability may vary from fall to spring semester and may be subject to modification or change.

First Year		
Fall		**Credits**
BIOL 2610G	Principles of Biology: Biodiversity, Ecology, and Evolution	3
GENE 1110	Experimental Systems in Genetics	1
CHEM 1215G	General Chemistry I Lecture and Laboratory for STEM Majors	4
ENGL 1110G	Composition I	4
Area IV: Social/Behavioral Science Course [1]		3
	Credits	**15**
Spring		
BIOL 2110G & BIOL 2110L	Principles of Biology: Cellular and Molecular Biology and Principles of Biology: Cellular and Molecular Biology Laboratory	4
CHEM 1225G	General Chemistry II Lecture and Laboratory for STEM Majors	4
MATH 1220G	College Algebra	3
Area V: Humanities Course [1]		3
Elective		1
	Credits	**15**
Second Year		
Fall		
CHEM 313	Organic Chemistry I	3
MATH 1250G	Trigonometry & Pre-Calculus	4
GENE 315	Molecular Genetics	3
Choose one from the following:		3
ENGL 2210G	Professional and Technical Communication Honors	
ENGL 2215G	Advanced Technical and Professional Communication	
Area I: Oral Communication [1]		3
	Credits	**16**
Spring		
CHEM 314	Organic Chemistry II	3
CHEM 315	Organic Chemistry Laboratory	2
MATH 1511G	Calculus and Analytic Geometry I	4
GENE 320	Hereditary and Population Genetics	3
Elective Course		3
	Credits	**15**
Third Year		
Fall		
BCHE 395	Biochemistry I	3
MATH 1521G	Calculus and Analytic Geometry II	4
PHYS 2230G	General Physics for Life Science I	3
Area IV: Creative and Fine Arts		3
Elective		2
	Credits	**15**
Spring		
BIOL 377	Cell Biology	3
BCHE 396	Biochemistry II, Lecture and Laboratory	4
GENE 305 L	Genetic Techniques	1
PHYS 2240G	General Physics for Life Science II	3
Choose from one of the following:		3
A ST 311	Statistical Applications	
BIOL 455	Biometry	
Elective		1
	Credits	**15**
Fourth Year		
Fall		
BIOL 467	Evolution	3
Choose 3 Credits from Following:		3
GENE 391	Genetics Internship	
GENE 449	Special Problems	
BIOL 302	Molecular Biology Techniques Laboratory	
BIOL 309	Guided Biological Research Lab	
BIOL 351	Biology Internship	

Tier II: Organism Structure Course		3-4
Choose from one of the following:		3
BIOL 446	Bioinformatics and NCBI Database	
GENE 452	Applied Bioinformatics	
VWW: Viewing a Wider World Course [2]		3
	Credits	**15-16**
Spring		
GENE 440	Genetics Seminar	1
AGRO 303V	Genetics and Society	3
Tier II: Molecular and Applied Genetics Course		3
Tier II: Physiology Course		3-4
VWW: Viewing a Wider World Course		3
Elective		1
	Credits	**14-15**
	Total Credits	**120-122**

[1] See the General Education (https://catalogs.nmsu.edu/nmsu/general-education-viewing-wider-world/) section of the catalog for a full list of courses.

[2] See the Viewing a Wider World (https://catalogs.nmsu.edu/nmsu/general-education-viewing-wider-world/#viewingawiderworldtext) section for a full list of courses.