Genetics

Alan M. Myers, Chair, Genetics Major Committee

Genetics is the scientific study of heredity. Understanding the basis of heredity is fundamental to all aspects of the life sciences, from the most basic molecular study to applied studies of agricultural species. At Iowa State University the study of the life sciences is interdepartmental, involving faculty in the basic, agricultural, and veterinary sciences. Faculty in 20 different departments are involved in genetics research. This large group of faculty presents a broad range of possibilities for students to learn from faculty who are at the forefront of research in many areas of genetics.

Undergraduate Study

Undergraduate study in genetics is jointly administered by three departments: the Roy J. Carver Department of Biochemistry, Biophysics, and Molecular Biology; the Department of Genetics, Development, and Cell Biology; and the Department of Ecology, Evolution, and Organismal Biology. Undergraduate degrees are offered through both the College of Agriculture and Life Sciences and the College of Liberal Arts and Science. Programs of study for genetics majors leading to a B.S. degree are available.

Training in genetics may lead to employment in teaching, research, or a variety of health-related professions. Although some students find employment directly after their baccalaureate training, many students continue their education in graduate or professional programs. Students with the B.S. degree may find employment in the biotechnology, health, or food industries. Recent graduates have also developed careers in conservation biology, technical writing, science journalism, technical sales, and business.

The required course work and associated electives provide students with the foundation in basic life sciences, mathematics, chemistry, and physics that is essential for professions involving modern biological/biomedical sciences. As part of these courses students develop skills in problem solving, critical thinking, writing, and research-related activities in the biological sciences.

Specific entrance requirements for medical and health-related professions are established by the professional schools. Students interested in fulfilling pre-professional requirements for such professions as dentistry, human medicine, genetic counseling, optometry, pharmacy, physical therapy, physicians assistant, and veterinary medicine can major in genetics while fulfilling the pre-professional requirements. (See Preprofessional Study .)

Curriculum in Genetics - Requirements

Total Degree Requirement: 120 cr.

A maximum of 65 cr. from a two-year institution can be applied that may include up to 16 technical cr.; up to 9 Pass-Not Pass cr. of free electives can be applied; a cumulative GPA of at least 2.0 is required for graduation.

1. Genetics and Life Sciences

A grade of C– or better is required in all Genetics and Life Science courses.

A. Courses required of all Genetics majors

GEN 110	Genetics Orientation	1
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
GEN 313	Principles of Genetics	3
GEN 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
BIOL 315	Biological Evolution	3
GEN 409	Molecular Genetics	3
GEN 410	Analytical Genetics	3
GEN 462	Evolutionary Genetics	3
or EEOB 563	Molecular Phylogenetics	
GEN 491	Undergraduate Seminar	1
MICRO 302	Biology of Microorganisms	3
Total Credits		**32**

B. Course required of majors in the College of Agriculture and Life Sciences only

BIOL 312	Ecology	4
Total Credits		**4**

2. Advanced Sciences Electives: 6 cr. from department approved list

A grade of C- or better is required in each course.

3. Mathematical Sciences

Complete at least one calculus course from MATH, minimum of 4 credits.		4
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
MATH 181	Calculus and Mathematical Modeling for the Life Sciences I	
Complete at least one course from STAT, minimum of 3 credits.		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
Complete at least one additional course from MATH or STAT, minimum of 4 credits.		4
MATH 166	Calculus II	
MATH 182	Calculus and Mathematical Modeling for the Life Sciences II	
STAT 301	Intermediate Statistical Concepts and Methods	
STAT 401	Statistical Methods for Research Workers	
Total Credits		**11-12**

4. Supporting Sciences

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
CHEM 332	Organic Chemistry II	3
CHEM 332L	Laboratory in Organic Chemistry II	1
PHYS 111	General Physics	5
or PHYS 221	Introduction to Classical Physics I	
PHYS 112	General Physics	5
or PHYS 222	Introduction to Classical Physics II	
Choose one of the following options		6-7
Option 1		
BBMB 404	Biochemistry I	
And one of the following:		
BBMB 405	Biochemistry II	
BBMB 411	Techniques in Biochemical Research	
CHEM 211 & 211L	Quantitative and Environmental Analysis and Quantitative and Environmental Analysis Laboratory	
CHEM 325	Chemical Thermodynamics	
Option 2		
BBMB 420	Physiological Chemistry	
And one of the following:		
BBMB 411	Techniques in Biochemical Research	
CHEM 211 & 211L	Quantitative and Environmental Analysis and Quantitative and Environmental Analysis Laboratory	
CHEM 325	Chemical Thermodynamics	
Total Credits		**33-34**

5. International Perspectives: 3 cr. from university approved list

This course can satisfy **both** the university requirement for International Perspectives and the college requirement for a General Education elective (item 8) if the selection appears on both lists of approved courses.

6. U.S. Diversity: 3 cr. from university approved list

This course can satisfy **both** the university requirement for U.S. Diversity and the college requirement for a General Education elective (item 8) if the selection appears on both lists of approved courses.

7. Communications/Library

A. Courses required of all Genetics majors

Grades of C or better are required in ENGL 150 and ENGL 250 and advanced writing.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
LIB 160	Information Literacy	1
One advanced English writing course from department approved list		3
Total Credits		**10**

B. Course required of majors in the College of Agriculture and Life Sciences only.

A grade of C or better is required by the college.

SP CM 212	Fundamentals of Public Speaking	3
or AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
Total Credits		**3**

8. General Education electives

Courses from college approved lists that also appear on university approved lists of U.S. Diversity or International Perspectives courses can be used to satisfy both requirements.

A. College of Agriculture and Life Sciences

Humanities course from college approved list	3
Social Science course from college approved list	3
Ethics course from college approved list	3
Total Credits	**9**

B. College of Liberal Arts and Sciences

Humanities courses from college approved list; one of these should be a Science/Humanities bridge course from department approved list	12
Social Science courses from college approved list	9
Students must have completed 3 years of a single world language in high school or take 4-8 credits of World Languages at the university level.	
Total Credits	**21**

Undergraduate Minor

The minor in Genetics may be earned by completing the following courses. At least 9 cr. must be used **only** to fulfill the requirements of the minor and not be applied to any other major, college, or university requirement.

GEN 313	Principles of Genetics	3
GEN 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
GEN 410	Analytical Genetics	3
GEN 409	Molecular Genetics	3
Two or more additional credits in Genetics at the 300 level or above.		2
Total Credits		**15**

Graduate Study

Graduate study in genetics leading to the Master of Science and Doctor of Philosophy degrees is offered at ISU. Graduate study is organized as a separate interdepartmental graduate major from the undergraduate program. For more information on graduate study in genetics see: Genetics - Interdisciplinary.