Genetics and Development Biology

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Degrees Offered

• Master of Science
• Doctor of Philosophy

Nature of the Program

The objective of this program is an increased level of understanding of modern concepts and methodologies employed in genetic and developmental biological work and to prepare a student to pursue a career in teaching and/or research. Responsibility for a student’s program is vested in a graduate committee charged with arranging the student’s coursework, conducting examinations, and supervising the research.

Concentrations

The degree is offered in genetics and developmental biology, an interdisciplinary program involving the faculty and facilities of a number of departments in the various colleges and schools of the university. A student may concentrate in genetics or developmental biology. The areas in which emphases are offered are as follows:

GENETICS

Biochemical and molecular genetics, developmental genetics, plant genetics, and population and quantitative genetics.

DEVELOPMENTAL BIOLOGY

Molecular aspects of development.

The student may also minor in one or more other scientific fields.

Admissions

For regular admission, a student must:

• Possess a baccalaureate degree from a college or university and have at least a grade point average of 2.75 on a 4.0 scale (or an average of 3.0 or higher for the last sixty credit hours).
• Provide three letters of reference from persons acquainted with the applicant’s professional work, experience, or academic background.
• Submit a written statement of 500 words or more indicating the applicant’s goals and objectives relative to receiving a graduate degree, and identify a potential faculty advisor.
• Have an adequate academic aptitude at the graduate level as measured by the Graduate Record Examination (GRE) or the New Medical College Admissions Test (New MCAT).

* International students have the additional requirement to submit a minimum score of 550 on the paper TOEFL examination or 213 on the electronic TOEFL examination if their native language is not English.

A candidate for the M.S. degree in Genetics and Developmental Biology must meet all University, College, Division, and Program requirements as outlined in the WVU Graduate Catalog.

Program Requirements

All M.S. degree candidates are required to follow a planned program of study. The student develops the plan of study during their first year in the program in conjunction with the graduate committee. The plan must be approved by the Director of the Division and the Associate Dean for Academic Affairs of the Davis College. For a more complete statement of requirements, the student is referred to the program’s Guidelines for Graduate Students in the Genetics and Developmental Biology Program.

A minimum cumulative GPA of 3.0 is required in all courses applied toward degree requirements.

Select one of the following:

| STAT 511 | Statistical Methods 1 |

3
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<th>Course Code</th>
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<tbody>
<tr>
<td>BIOS 601 &amp; BIOS 602</td>
<td>Applied Biostatistics 1 and Applied Biostatistics Lab</td>
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Select one of the following:
- STAT 512: Statistical Methods 2
- BIOS 603: Applied Biostatistics 2
- BIOS 604: Applied Biostatistics 3

Select three of the following:
- AGBI 514: Animal Biotechnology
- AGBI 612: General Biochemistry
- BIOL 611: Epigenetics
- BIOL 658: Systems Biology
- GEN 535: Population Genetics
- GEN 726: Advanced Biochemical Genetics
- WMAN 630: Conservation Genetics

Select one of the following: 3
- GEN 796: Graduate Seminar

Research: 6
- GEN 797: Research

Seminar: 3
- GEN 796: Graduate Seminar

Required Coursework: 3
- GEN 521: Basic Concepts of Modern Genetics
- AGBI 610: General Biochemistry

Total Hours: 31

* Substitution of a course containing some genetics and of special interest to the student may be allowed when approved by the student's committee.

A candidate for the Ph.D. degree in Genetics and Developmental Biology must meet all University, College, Division, and Program requirements as outlined in the WVU Graduate catalog.

Program Requirements

All Ph.D. degree candidates are required to follow a planned program of study. The student develops the plan of study during their first year in the program in conjunction with the graduate committee. The plan must be approved by the Director of the Division and the Associate Dean for Academic Affairs of the Davis College. Students are expected to maintain at least a 3.0 (B) grade point average in all work offered in fulfillment of the degree program. For a more complete statement of requirements, the student is referred to the program’s Guidelines for Graduate Students in the Genetics and Developmental Biology Program.

A minimum cumulative GPA of 3.0 is required in all courses applied toward degree requirements.

Course Requirements as determined by the Plan of Study

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<tr>
<td>GEN 796</td>
<td>Graduate Seminar</td>
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<tr>
<td>GEN 797</td>
<td>Research</td>
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Total Hours: 11

* A student must be enrolled in Seminar all semesters in residence.

Major Learning Outcomes

GENETICS AND DEVELOPMENT BIOLOGY

Students will acquire fundamental knowledge of genetics and associated fields such as biochemistry, chemistry, and biology.
Students will acquire detailed knowledge of their particular subdiscipline or research area, including the scientific literature fundamental to their discipline and the ability to stay current on scientific literature.

Students will acquire technical skills in the laboratory.

Students will develop the ability to communicate in writing and orally about scientific concepts and the results of their research.

Student will develop the ability to design, conduct, and interpret the results of experiments.

**COURSES**

**GEN 521. Basic Concepts of Modern Genetics. 3 Hours.**
PR: 8 hours of biological sciences and one year of chemistry courses. Independent inheritance. Chemical nature of genetic material. Control of phenotype by genetic material. Gene action and coding of genetic material.

**GEN 525. Human Genetics. 3 Hours.**
PR: GEN 371 or GEN 521 or Consent. Study of genetic system responsible for development of phenotype in man.

**GEN 535. Population Genetics. 3 Hours.**
PR: GEN 371 or GEN 521 or Consent. Relationship of gene and genotype frequencies in populations of diploid organisms, and the effects of mutation, selection, assortive mating, and inbreeding in relation to single gene pairs. Application of these concepts to multigenetic inheritance of quantitative traits.

**GEN 591. Advanced Topics. 1-6 Hours.**
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

**GEN 595. Independent Study. 1-6 Hours.**
Faculty supervised study of topics not available through regular course offerings.

**GEN 630. Conservation Genetics. 3 Hours.**
Study of population genetic concepts relevant to small populations, with a focus on management implications of genetic data and current applications of conservation genetics. Cross-listed with WMAN 630.

**GEN 692. Directed Study. 1-6 Hours.**
Directed study, reading and/or research.

**GEN 697. Research. 1-15 Hours.**
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U.)

**GEN 724. Cytogenetics. 4 Hours.**
PR: GEN 171 or GEN 321. Emphasis on macromolecules that carry information of the chromosomes, cell division, and the cytological and molecular basis of genetics. Special attention given to visible manifestation of genes, human cytogenetics of genomes and chromosome morphology, and their evolution.

**GEN 726. Advanced Biochemical Genetics. 3 Hours.**

**GEN 727. Genetic Mechanisms of Evolution. 3 Hours.**
PR: GEN 371 or equivalent. Molecular genetic mechanisms which result in evolutionary change. Origin of life, origin and organization of genetic variability, differentiation of populations, isolation and speciation, role of hybridization and polyploidy, and origin of man.

**GEN 790. Teaching Practicum. 1-3 Hours.**
PR: Consent. Supervised practice in college teaching of Genetics. Note: This course is intended to insure that graduate assistants are adequately prepared and supervised when they are given college teaching responsibility. It will also present a mechanism for students not on assistantships to gain teaching experience. (Grading will be S/U.)

**GEN 791. Advanced Topics. 1-6 Hours.**
PR: Consent. Investigation of advanced topics not covered in regularly scheduled courses.

**GEN 792. Directed Study. 1-6 Hours.**
Directed study, reading and/or research.

**GEN 793. Special Topics. 1-6 Hours.**
A study of contemporary topics selected from recent developments in the field.

**GEN 794. Seminar. 1-6 Hours.**
Special seminars arranged for advanced graduate students.

**GEN 795. Independent Study. 1-9 Hours.**
Faculty supervised study of topics not available through regular course offerings.
GEN 796. Graduate Seminar. 1 Hour.
PR: Consent. Each graduate student will present at least one seminar to the assembled faculty and graduate student body of his or her program.

GEN 797. Research. 1-15 Hours.
PR: Consent. Research activities leading to thesis, problem report, research paper or equivalent scholarly project, or a dissertation. (Grading may be S/U).

GEN 798. Thesis or Dissertation. 1-6 Hours.
PR: Consent. This is an optional course for programs that wish to provide formal supervision during the writing of student reports (698), or dissertations (798). Grading is normal.

GEN 799. Graduate Colloquium. 1-6 Hours.
PR: Consent. For graduate students not seeking coursework credit but who wish to meet residency requirements, use of the University's facilities, and participate in its academic and cultural programs. Note: Graduate students who are not actively involved in coursework or research are entitled, through enrollment in their department's 699/799 Graduate Colloquium to consult with graduate faculty, participate in both formal and informal academic activities sponsored by their program, and retain all of the rights and privileges of duly enrolled students. Grading is P/F; colloquium credit may not be counted against credit requirements for masters programs. Registration for one credit of 699/799 graduate colloquium satisfies the University requirement of registration in the semester in which graduation occurs.