

# GENETICS (GEN)

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**Any experimental courses offered by GEN can be found at:**

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**GEN 110: Genetics Orientation**

(1-0) Cr. 1. F.

This course is intended for first year students and others new to the genetics major. Discussion of university policies and resources, requirements of the major, career opportunities, and other topics related to the first year experience.

**GEN 112: Genetics Orientation for Transfer Students**

(0.5-0) Cr. 0.5. S.

Eight-week course for external transfer students and internal change of major students. Discussion of university policies and resources, requirements of the major, and career opportunities. Only one of GEN 110 or 112 may count toward graduation.

**GEN 298: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of department cooperative education coordinator; sophomore classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**GEN 313: Principles of Genetics**

(Cross-listed with BIOL). (3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 211, BIOL 211L, BIOL 212, and BIOL 212L*

Introduction to the principles of transmission and molecular genetics of plants, animals, and bacteria. Recombination, structure and replication of DNA, gene expression, cloning, quantitative genetics, and population genetics. Students may receive graduation credit for no more than one of the following: Gen 260, Gen 313 and 313L, Gen 320, Biol 313 and 313L, and Agron 320.

**GEN 313L: Genetics Laboratory**

(Cross-listed with BIOL). (0-3) Cr. 1. F.S.

*Prereq: Credit or enrollment in BIOL 313*

Laboratory to accompany 313. Students may receive graduation credit for no more than one of the following: Biol 313 and 313L, Gen 260, Gen 313, Gen 320, and Agron 320.

**GEN 320: Genetics, Agriculture and Biotechnology**

(Cross-listed with AGRON). (3-0) Cr. 3. F.S.

*Prereq: BIOL 212*

Transmission and molecular genetics with an emphasis on applications in agriculture, the structure and expression of the gene, how genes behave in populations and how recombinant DNA technology can be used to improve agriculture. Credit for graduation will not be allowed for more than one of the following: Gen 260, 313, 320 and Biol 313 and 313L.

**GEN 322: Introduction to Bioinformatics and Computational Biology**

(Cross-listed with BC BIO, BIOL). (3-0) Cr. 3. F.

*Prereq: BIOL 212*

Genome sequencing, assembly, structural and functional annotation, and comparative genomics. Investigating these topics will develop skills in programming and scripting (Perl and/or Python), the use of biological databases, sequence alignment, similarity search, identification of sequence patterns, construction of phylogenetic trees, and comparative genomics.

**GEN 340: Human Genetics**

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 313 or GEN 313*

Fundamental concepts and current issues of human genetics. Human chromosome analysis, pedigree analysis, gene mapping, the human genome project, sex determination, genetics of the immune system, genetics of cancer, gene therapy, the genetic basis of human diversity, eugenics.

**GEN 349: The Genome Perspective in Biology**

(Cross-listed with BIOL). (2-2) Cr. 3. S.

*Prereq: GEN 313 or GEN 320*

Analysis of genome, RNA, and protein data using computer technology to answer biological questions on topics ranging from microbial diversity to human health. An introduction for students in the life sciences to the fields of genomics, bioinformatics and systems.

**GEN 398: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of department cooperative education coordinator; junior classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**GEN 401: Fundamentals of Bioinformatics and Computational Biology**

(Cross-listed with BC BIO, BIOL, COM S). (4-0) Cr. 4. F.

*Prereq:* BC BIO 322, basic programming experience (e.g. COM S 127, COM S 227 or permission of instructor). MATH 160 or MATH 165; and STAT 101 or STAT 104; and MATH 166 or STAT 301.

Application of computer science and statistics to molecular biology with a significant problem-solving component, including hands-on programming using Python to solve a variety of biological problems. String algorithms, sequence alignments, homology search, pattern discovery, genotyping, genome assembly, genome annotation, comparative genomics, protein structure.

**GEN 402: Microbial Genetics and Genomics**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* MICRO 302, Biol 313

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**GEN 409: Molecular Genetics**

(3-0) Cr. 3. F.S.

*Prereq:* BIOL 313 or GEN 313

Principles of molecular genetics and analysis of gene expression, including elements of the Central Dogma (DNA replication, transcription, and translation) and gene regulation. Utilizing examples from the primary literature to illustrate experimental design, data analysis, and interpretation.

**GEN 410: Analytical Genetics**

(3-0) Cr. 3. F.S.

*Prereq:* BIOL 313 or GEN 313

The principles and practice of genetic analysis. Mendelian genetic analysis, mutational, transgenic, and genomic analysis of gene function, linkage and gene mapping, chromosomal aberrations, aneuploidy and polyploidy, extrachromosomal inheritance, analysis of genetic pathways.

**GEN 462: Evolutionary Genetics**

(Cross-listed with BIOL). (3-0) Cr. 3. F.

*Prereq:* BIOL 315

The genetic basis of evolutionary processes in eukaryotic organisms. The role of genetic variation in adaptation, natural selection, adaptive processes, and the influence of random processes on evolutionary change.

**GEN 490: Independent Study**

Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq:* GEN 313, junior or senior classification, permission of instructor

Independent study in any area of genetics. Students may use no more than 9 credits of university-wide 490 credits (including Gen 490) toward the total of 120 credits required for graduation.

**GEN 491: Undergraduate Seminar, Professional Practice in Genetics Disciplines**

(1-0) Cr. 1. F.S.

*Prereq:* BIOL/GEN 313; credit or enrollment in GEN 409 or GEN 410; Junior Classification

Intended to develop career objectives and obtain positions appropriate to the goals of students, in particular juniors, in preparation for position searches in the senior year. Discussion of various career paths in genetics disciplines; identification of experiences to enhance entry to specific careers; exposure to professional practices not covered elsewhere including literature database management, scientific figure preparation for publication, the peer-review journal system, the federal competitive grants system, laboratory budgets and management, authorship and collaborations, etc.; preparation of effective curricula vitae and application letters; and verbal scientific discourse appropriate to interview interactions and other professional settings.

**GEN 492: Undergraduate Teaching Experience**

Cr. 1-2. Repeatable, maximum of 9 credits. F.S.

*Prereq:* BIOL 212, junior or senior classification, permission of instructor

For students registering to be undergraduate laboratory or classroom assistants. Offered on a satisfactory-fail basis only. No more than 2 credits of GEN 492 may be applied toward the Genetics advanced course requirement.

**GEN 495: Special Topics in Genetics**

(1-0) Cr. 1-3. Repeatable, maximum of 3 credits. F.S.

*Prereq:* GEN 313; permission of instructor

Content varies from year to year. Genetics students may use no more than 9 credits of university-wide 490-499 credits toward the total of 120 credits required for graduation.

**GEN 496: Attendance and Critique of Genetics Seminars**

Cr. 1. Repeatable, maximum of 3 credits. F.S.

*Prereq:* GEN 313, junior or senior classification, permission of instructor

Attendance and critique of departmental seminars in BBMB, GDCB, or EEOB. Offered on a satisfactory-fail basis only. Genetics students may use no more than 9 credits of university-wide 490 - 499 credits toward the total of 120 credits required for graduation.

**GEN 498: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of department cooperative education coordinator; senior classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**GEN 499: Genetics Research**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: GEN 313, junior or senior classification, permission of instructor*

Independent research in any area of genetics. Genetics students may use no more than 9 credits of university-wide 490-499 credits toward the total of 120 credits required for graduation.

**GEN 499H: Genetics Research for Honors**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: GEN 313, junior or senior classification, permission of instructor*

Independent research in any area of genetics; for Honors students only. Genetics students may use no more than 9 credits of university-wide 490-499 credits toward the total of 120 credits required for graduation.