

# Genetics and Genomics

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## Undergraduate Preparation

Undergraduates wishing to prepare for graduate study in Genetics and Genomics should elect courses in basic biology, chemistry at least through organic chemistry, one year of college-level physics, mathematics at least through calculus, at least one thorough course in basic transmission and molecular genetics, one semester of upper level statistics and one semester of upper level biochemistry. Incoming students who have not completed an upper level statistics course and an upper level biochemistry course prior to beginning in the program will take STAT 401 Statistical Methods for Research Workers and BBMB 404 Biochemistry I during their first year of graduate training. A waiver may be requested for these courses by providing appropriate documentation (catalog description and syllabus) to the curriculum committee showing completion of an upper level statistics and upper level biochemistry course equivalent to STAT 401 Statistical Methods for Research Workers and BBMB 404 Biochemistry I.

See Genetics - Undergraduate for information on a bachelor of science degree in Genetics.

## Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in Genetics and Genomics in fourteen cooperating departments: Agronomy; Animal Science; Biochemistry, Biophysics and Molecular Biology; Biomedical Sciences; Ecology, Evolution and Organismal Biology; Entomology; Food Science and Human Nutrition; Genetics, Development and Cell Biology; Horticulture; Materials Science and Engineering; Plant Pathology and Microbiology; Natural Resource Ecology and Management; Veterinary Microbiology and Preventive Medicine; and Veterinary Pathology.

The diversity of faculty in the Genetics and Genomics major ensures a broad, well-balanced education from the best instructors, while offering flexibility in choice of research area. Genetics and Genomics faculty have strengths in many areas, from fundamental studies at the molecular, cellular, organismal, and population levels, to research with immediate practical application. Ongoing research projects span all the major areas of theoretical and experimental genetics, including genomics, molecular studies of gene regulation, gene mapping, genetics of disease, transposable element studies, developmental genetics, quantitative and statistical genetics, computational molecular biology, evolutionary genetics, and population genetics.

Students are admitted by the approval of the Chair after review by the Genetics and Genomics Admissions Committee. Students are admitted either to participate in research rotations with several faculty before deciding on a major professor and laboratory, or by direct admission into a specific lab and department. First year students participating in rotations with Genetics and Genomics faculty will take GENET 697 Graduate Research Rotation.

All Ph.D. candidates take a core curriculum comprising one course each from the following four categories and attend seminars and workshops as described:

### Transmission Genetics

GDCB 510	Transmission Genetics
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### Molecular Genetics

GDCB 511	Molecular Genetics
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### Quantitative, Population, and Evolutionary Genetics

AN S 561 & AGRON 561	Population and Quantitative Genetics for Breeding and Population and Quantitative Genetics for Breeding
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EEOB 562	Evolutionary Genetics
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EEOB 563	Molecular Phylogenetics
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EEOB 566	Molecular Evolution
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EEOB 567	Empirical Population Genetics
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GDCB 536	Statistical Genetics
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### Genomics, Bioinformatics and Statistical Genetics

AN S 556	Current Topics in Genome Analysis
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BCB 544	Introduction to Bioinformatics
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STAT 516	Statistical Design and Analysis of Gene Expression Experiments
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BCB 567	Bioinformatics I (Fundamentals of Genome Informatics)
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BCB 568	Bioinformatics II (Advanced Genome Informatics)
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BCB 569	Bioinformatics III (Structural Genome Informatics)
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BCB 570	Bioinformatics IV (Computational Functional Genomics and Systems Biology)
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### EEOB 540X Evolution of Developmental Processes (experimental course)

Students will give three research presentations (GENET 690 Graduate Student Seminar in Genetics), attend two genetics and genomics faculty seminar series (GENET 691 Faculty Seminar in Genetics), and participate in two Workshops in Genetics and Genomics (GENET 591 Workshop in Genetics) during their training period. First-year graduate students will also take GENET 692 Conceptual Foundations of Genetics.

Students may elect a computational molecular biology specialty within the genetics major. This requires that the research project be in the field of computational molecular biology. IG majors will be expected to complete all of the courses required for the genetics and genomics major, except that one semester of BCB 690 Student Seminar in Bioinformatics and Computational Biology can be substituted for GENET 690 Graduate Student Seminar in Genetics. Students will be expected to take additional courses in the area of specialization.

M.S. students will take the above core courses and seminars with the following changes: participate in one Workshop in Genetics (GENET 591 Workshop in Genetics) and present their research course (GENET 690 Graduate Student Seminar in Genetics). Additional coursework may be selected to satisfy individual interests or departmental requirements.

The course designator Genet applies to graduate courses taught by the interdepartmental major in Genetics and Genomics.

Students wishing to minor in genetics and genomics must submit a complete application to the graduate program. Requirements for the successful completion of a minor at the Ph.D. or M.S. levels are: completion of three of the four categories of the common-core required lecture courses listed above. One semester of Seminar in Genetics is recommended.

GENET 690	Graduate Student Seminar in Genetics	1
GENET 691	Faculty Seminar in Genetics	1
GENET 692	Conceptual Foundations of Genetics	1

One member of the POS committee must be a Genetics faculty member.

Student Outcomes: Most students awarded doctoral degrees continue their training as postdoctoral associates at major research institutions in the U.S. or abroad in preparation for research and/or teaching positions in academia, industry, or government. A few go directly to permanent research positions in industry. Many students awarded master's degrees continue their training as doctoral students; however, some choose research support positions in academia, industry, or government. A more thorough list of outcomes is available at our web site.