

Genetics - Interdepartmental

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Undergraduate Preparation

Undergraduates wishing to prepare for graduate study in Genetics 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 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; Plant Pathology and Microbiology; Natural Resource Ecology and Management; Statistics; Veterinary Microbiology and Preventive Medicine; and Veterinary Pathology.

The diversity of faculty in the Interdepartmental Genetics major ensures a broad, well-balanced education from the best instructors, while offering flexibility in choice of research area. Genetics 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 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 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

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| GDCB 510 | Transmission Genetics |
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Molecular Genetics

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

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| AN S 561 | Population and Quantitative Genetics for Breeding |
| & AGRON 561 | 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

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| 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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| BCB 596 | Genomic Data Processing |
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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 faculty seminar series (GENET 691 Faculty Seminar in Genetics), and participate in three Workshops in Genetics (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 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 two of the Workshops in Genetics (GENET 591 Workshop in Genetics) and present their research once (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.

Students wishing to minor in genetics 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.

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| 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.

Courses primarily for graduate students, open to qualified undergraduates:

GENET 539. Ethics and Biological Sciences.

(2-0) Cr. 2. S.

Introduction to Bioethics through case study discussion and recent news events. Students will read and discuss contemporary issues in science ethics, including some of the following topics: ethics and responsible research practice, animal ethics and the use of animals in teaching and research, cloning, human reproductive and stem cell research, regulation of genetically modified crops and foods, plant biotechnology, gene patents. Students will be divided into groups to develop their own case study, to be presented in class at the end of the term. Offered on a satisfactory-fail basis only. Offered on a satisfactory-fail basis only.

GENET 565. Professional Practices in Sciences and Engineering.

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia. Offered in modular format.

GENET 565A. Responsible Conduct of Research. (Cr. 1.0). F.,

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia. Offered in modular format.

GENET 565B. Working with Industry. (Cr. 0.5)..

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia. Offered in modular format.

GENET 565C. Communications in Science. (Cr. 0.5). Alt S., offered 2011.

Reading and reviewing manuscripts; publishing papers; oral and poster presentations..

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia.
Offered in modular format.

GENET 565D. Time Management and Mentoring. (Cr. 0.5). Alt F., offered 2012. Balancing life and career; mentoring; lab management..

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia.
Offered in modular format.

GENET 565E. The Interview Process. (Cr. 0.5). Alt S., offered 2012. Applying and interviewing for academia, industry and government..

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia.
Offered in modular format.

GENET 565F. Grant Writing. (Cr. 1.0). Alt F., offered 2011. Writing a winning proposal..

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia.
Offered in modular format.

GENET 565G. Teaching. (Cr. 0.5)..

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia.
Offered in modular format.

GENET 565S. Establishing productive collaborations with industry..

(Cross-listed with AGRON, AN S, BBMB, BCB, CH E, CPR E, EEB, HORT, M E, MICRO). Cr. arr. *Prereq: Graduate Classification*
Professional, ethical and legal issues facing scientists and engineers in academia.
Offered in modular format.

GENET 590. Special Topics.

Cr. arr. Repeatable. F.S.SS.
Contact individual faculty for special projects or topics. Graded.

GENET 591. Workshop in Genetics.

(1-0) Cr. 1. Repeatable. F. *Prereq: Permission of instructor*
Current topics in genetics research. Lectures by off-campus experts. Students read background literature, attend preparatory seminars, attend all lectures, meet with lecturers.

Courses for graduate students:

GENET 690. Graduate Student Seminar in Genetics.

(1-0) Cr. 1. Repeatable. F.S. *Prereq: Permission of instructor*
Research presentations by students to improve their ability to: orally present scientific work in a clear and meaningful way, critically evaluate oral presentations, and give and receive constructive criticism. Students may enroll in one seminar per school year. ,.

GENET 691. Faculty Seminar in Genetics.

(1-0) Cr. 1. Repeatable. F. *Prereq: Permission of instructor*
Faculty research seminars that introduce students to the variety of genetics research projects on campus and provide an opportunity for students to become engaged in the scientific presentation to the point where they can think critically and ask meaningful questions.

GENET 692. Conceptual Foundations of Genetics.

(1-0) Cr. 1. F. *Prereq: Permission of instructor*
Landmark papers in the development of genetics concepts. Papers are presented and discussions led by students, guided and mentored by the instructors. Instructors provide a broad overview and history of the development of fundamental concepts in genetics.

GENET 697. Graduate Research Rotation.

Cr. arr. Repeatable. F.S.SS.
Graduate research projects performed under the supervision of selected faculty members in the graduate Genetics major.

GENET 699. Research.

Cr. arr. Repeatable. F.S.SS.