

Interdepartmental Genetics and Genomics Graduate Program

Graduate Student Handbook



Effective
Fall 2021-Spring 2022

2014 Molecular Biology Building
Iowa State University
Ames, IA 50011-1079
www.genetics.iastate.edu

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INTRODUCTION AND WELCOME

If you are new to [Iowa State University](#), welcome! As you will discover, Iowa State University is a major land grant university located in [Ames, Iowa](#). Ames is a pleasant, small, yet cosmopolitan, city with a population of 60,000 (35,000 students). Ames has a vibrant cultural scene, and a secondary school system that ranks one of the best in the United States.

This document is for graduate students enrolled in Genetics and Genomics Interdepartmental Graduate Program and supplements the Iowa State University [Graduate College Handbook](#). It specifies the programs academic requirements. It also covers policies and procedures relevant to graduate student life, and provides other contact information. While this information may be of interest to students applying for admission, this document does not cover the admission process. See the [Genetics and Genomics](#) web site for information about admissions.

The Genetics and Genomics program is a research based discipline and it is our goal to help you achieve excellence in research and scholarship. The Genetics and Genomics has strong, world-renowned research programs with a faculty rich in diversity, breadth and depth of research opportunities. 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 molecular studies of gene regulation, gene mapping, transposable element studies, developmental genetics, quantitative and mathematical genetics, evolutionary genetics, and population genetics.

Genetics and Genomics offers PhD and Master of Science with Thesis. This program does NOT offer non-thesis Master of Science or online degrees. The first PhD degree in Genetics at Iowa State University was awarded in 1941.

As you progress through the program, you will eventually have questions. Where most of the information is available on the ISU websites, feel free to contact the people below with any additional questions.

PROGRAM CONTACTS

Director of Graduate Education (DOGE)

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Dr. Maura McGrail, Genetics, Development and Cell Biology, mmcgrail@iastate.edu
Dr. Jack Dekkers, Animal Science, jdekkers@iastate.edu

LEARNING OUTCOMES

Learning goals that each Genetics and Genomics students is expected to meet are:

1. Clearly and accurately communicate research findings orally and in writing.
 1. Measurable outcomes
 - a. Talks
 - b. Abstracts
 - c. Posters
 - d. Papers
 - e. Grant proposals
 2. Demonstrate comprehensive understanding of scholarly literature in the area of study.
 1. Measurable outcomes
 - a. Passing the qualifying exam
 - b. Passing the defense with an appropriately written discussion of the research findings
 - c. Proposed research in the area of study
 - d. Scholarly productivity (papers, posters, grants, etc.)
 3. Conduct qualitative and/or quantitative research via appropriate acquisition, analysis, and reporting of data.
 1. Measurable outcomes
 - a. Passing the prelim
 - b. Passing the dissertation defense
 - c. Publication of research results
 - d. Presentation of conference abstracts (poster)
 - e. Oral presentation of scientific data

FIRST YEAR - Rotations

- Your Graduate Student Information can be obtained through [AccessPlus](#).
- During the first year, students take nine credits (three credits of rotation) for Fall and Spring semesters. You will complete no less than three rotations of 6-8 weeks.
- Rotation information:
 - Generally two in the fall and one in early spring. Decide by April 15.
If funded for fall only, two rotations or three short rotations. Decide by Dec 1.
 - Student use these rotations to identify suitable mentor for their doctoral studies and as the same time, potential major professor evaluates students' research performance during rotation.
 - You should meet with your potential major professor to discuss expectations several times throughout your rotation.
 - To evaluate the research environment students should do all they can to learn about the lab's research interests and interact with all lab staff.
 - At the end of your third rotation (fourth if necessary), you will be expected to choose your major professor and in agreement join their laboratory.
 - By the end of the first year, students commit to a specific laboratory for doctoral students. The date of this commitment is around April 15th. Once your chosen faculty member agrees to have you join his/her lab you need to fill out the "[Home Department for Students Admitted to Interdepartmental Majors](#)"
- International students complete [OECT](#) by end of the 1st semester.
 - Take courses, if appropriate, to be certified as a level "1" teaching assistant.
- Familiarize yourself with the [Graduate College](#) and [Graduate Handbook](#).
- The faculty member teaching BBMB 404 determines if you have met this requirement prior to arrival at Iowa State University based on the submitted undergraduate syllabus.
- The IGG Curriculum Committee determines if you have met the STAT 587 requirement prior to arrival at Iowa State University based on the submitted undergraduate syllabus.
- All IGG core courses in which a student receives a B- or lower are not satisfactorily completed and must be repeated for graduation.
- [Professional Ethics: Responsible Conduct in Research](#) can be downloaded for free at the National Academies Press website
- **Add/Drop Slips** - To add a course after the first week of classes you will need a ½ sheet yellow add/drop slip signed by all required individuals. This has to be walked around campus. Forms available in most departmental offices and outside of 2014 Molecular Biology on the bulletin board.
- [As a graduate student, there is more to life than just academics](#)

SECOND YEAR - POSC

- POSC committee should be selected with consultation with your advisor.
- **Ph.D. students** should set up their Committee and POSC by the end of your 1st year after choosing your major professor/home department
 - [Graduate College POSC Committee Makeup](#)
 - Five Faculty members. Three faculty must be genetics faculty: One faculty member must be listed as “outside”; this is up to you and your major prof.
 - The “outside” faculty member can be a faculty member in Genetics and Genomics and/or your home department. The outside graduate faculty member(s) of the POSC provide relevant specialized knowledge or a different perspective helpful to the planning, execution, and reporting of research, or some aspect of intellectual diversity deemed important by the committee and/or major.
 - Meet with committee members prior to submitting POSC in [ACCESSPLUS](#)
 - [Required courses and seminars](#)
 - Other courses as required by your committee
 - Ph.D. 72 total credits
- **MS students** should set up their Committee and POSC by the beginning of their 2nd semester after selection of major professor/home department
 - [Graduate College POSC Committee Makeup](#)
 - Three faculty members. Two faculty must be genetics faculty: One faculty member must be listed as “outside”; this is up to you and your major prof.
 - The outside graduate faculty member(s) of the POS committee provide relevant specialized knowledge or a different perspective helpful to the planning, execution, and reporting of research, or some aspect of intellectual diversity deemed important by the committee and/or major.
 - MS students generally have two years to complete their degree
 - Meet with committee members prior to submitting POSC in [ACCESSPLUS](#)
 - [Required courses and seminars](#)
 - Other courses as required by your committee
 - M.S. 32 total credits
- Setting up your first POSC meeting:
 - By the end of the first year in the major professor’s laboratory, a Ph.D. student majoring in IGG must formally set up a Program of Study (POSC). To accomplish this, the student contacts committee members to select a date for a committee meeting (at least three committee members must attend for Ph.D. and two committee members for M.S. degree). One week prior to that meeting, the student must present a written basic research plan to all members of the POSC. In the written proposal, the student should provide information about educational and research backgrounds, outline basic questions to be pursued in the Ph.D. research, and indicate some of the basic research strategies to be employed and possible future directions (impact of the research). During the oral presentation, the student should carefully consider feedback from the committee members, as they often have good insights and advice for research and career enhancement. The student should coordinate with committee members unable to attend this first POSC meeting, individually providing the same oral presentation that was given to the group.
- Good Strategies for setting up POSC meetings. Students need to realize that many professors have very full schedules.
 - Talk with major professor about possible dates, amount of time required for the meeting

- Identify DAYS that everyone on your POSC will be present in Ames.
 - A two-week interval several weeks in the future for initial and annual (usually 1 to 2 hours)
 - At least a month in the future for prelim and final defense seminars (usually 2 to 3 hours)
 - Identify windows (several hours) on those days when your POSC faculty are available
 - You should identify how much time (hours) will be needed in during this part of the contact
 - Students might opt to use an on-line free scheduling program like Doodle or finding out which hours everyone is available.
 - After the faculty respond, the student can select one or a few times when everyone appears to be free, and when a room is available for the meeting, and again solicit the opinions of the POSC members.
 - This whole process needs to be completed in one or two days so that slots that were free during the initial inquiry remain free. E-mail is the preferred method of communication.
- Other POSC information
 - [Undergraduate Courses on Program of Study](#)
 - POS form will list all the courses required as partial completion of your degree, those taken and those to be taken during your training
 - Pre-requisites, core, seminars, scientific ethics, bioethics, and workshop, research and courses required by the members of your POSC.
 - To Graduate you will need an overall GPA of 3.0
 - Pre-requisites: BBMB 404 and STAT 487 - If you have not completed these courses or equivalent you should take by end of 2nd fall semester
 - Are these courses offered now? <http://classes.iastate.edu/>
 - Catalog Descriptions will include whether the course is offered Fall, Spring, Summer. <http://catalog.iastate.edu/azcourses/>
 - **Transferability of Credits from Other Institutions.** The transferability of credits from other institutions will be determined on a case-by-case basis by the student's POSC and the IGG Chair. To waive a course requirement, students should make their case to their POSC after meeting with the instructor of the course they wish to waive. If the committee approves, the major professor (on behalf of the POSC) and the instructor of the course the student wishes to waive should agree the previously taken course covers the requirements for the course they want to waive. The memo must state that the student has already received satisfactory instruction in the subject matter covered by the required course. Credits for seminars, workshops and colloquia are not transferable.
 - How do I show on my POSC I have met the BBMB 404 and STAT 587 requirements since I didn't take them here? Show how you met this requirement in the comments section of the POSC. "example": Took STAT 503 at U of Missouri; was approved by IGG as meeting STAT 587 requirement
 - [MS students who plan to pursue a PhD within same program](#)
 - [Preparing for Future Faculty](#) - for those interested in a teaching career
 - [Seminars and Workshop](#) on research, grant writing, special topics, etc.
 - Checklists showing progress are turned in every year Fall semester.

SUBSEQUENT YEARS (3 – 6 year) – Preliminary Oral Exam

- Preliminary Oral Exam is due by the end of the third year in the program and no less than six months before final oral exam. The Prelim tests a Graduate Student's knowledge of major, minor, and supporting subject areas as well as the student's ability to analyze, organize, and present subject matter relevant to the field.
 - Breadth of knowledge in the area of genetics
 - Depth of knowledge in a student's particular research area
 - Critical thinking skills especially as they pertain to the scientific method and hypothesis-based research.
 - [Preliminary Oral Exam Request](#) (Make sure you list any co-majors, minors, or specializations on form, you cannot go back and add other majors or minors of specializations after Prelim.)
 - [Preliminary Oral Exam with Committee Member at a Distance](#)
 - [Preliminary Oral Exam with Committee Member Substitution](#)
- Additional Prelim Information
 - Prelim Oral Exam should be submitted at least two weeks in advance to the Graduate College
 - Prelim form will be sent to the Graduate Program Coordinator.
 - The entire POS committee must be convened for the preliminary oral examination.
 - Each member votes their recommendation.
 - IGG requires a written component as well as the oral examination. Check with your POS committee members as to what the written component will consist of (i.e. proposal and/or questions).
 - What should I expect regarding the preliminary examination? Talk with your committee members and major professor as to what to expect.
 - Prelim Outcomes
 - Pass: committee recommends admitted to Ph.D. candidacy
 - Conditionally pass: must meet other conditions specified before recommendation
 - Fail with opportunity to repeat examination after six months
 - Fail and is not permitted to work towards a Ph.D.
 - We asked students who have successfully completed their Preliminary Examinations: "More than anything else I think it is helpful to cultivate a relationship with each member on your committee. This way you can understand where they're coming from and they can do likewise of you. In the end, prelims are not solely about facts, questions or science but are instead about interactions between people. My adviser did an excellent job of helping me understand that. The most important thing I could tell new students is to get to know their committee members and ask them their expectations." "Review basic genetics and cell biology textbook. This helps remind you of the "bigger picture" rather than your own detailed experiment. Practice the oral presentation in front of your lab members. Senior students in the lab will be able to ask preliminary questions based on their own experiences."
- Meet annually with your POS committee after passing your prelim.
 - Record on your annual IGG checklist
 - Discuss progress or lack of progress, goals, plans for completion of thesis research
 - Discuss professional development, job opportunities
 - Three members of POSC should be present; others met independently
- Checklists showing progress are turned in every year Fall semester.

GRADUATION YEAR - Thesis and Final Oral Exam

- [Graduation Requirements](#)
- Final Oral Checklist - [MS](#) / [PhD](#)
- Check your POSC in ACCESS PLUS in the Student Tab for “Grad Stdnt Status” to insure everything is “green”. If not, make corrections to your POSC now. Do not wait until your final defense.
- Apply for Graduation through [AccessPlus](#)
- Time Limits on courses listed on your POSC. See Graduate College Handbook [6.3.4](#) for information on who can approve overage courses. All courses taken more than 7 years prior to graduation are subject to this requirement.
- [Thesis checklist](#)
 - IGG requires that thesis be written in Journal Paper format
 - If your POS committee feels that the Journal Paper format is inappropriate for your thesis, this requirement can be waived by petition from your POS committee to the IG Chair if done well before you begin writing our thesis.
- **Request for Final Oral Examination - must be done three weeks in advance of final**
 - [Final Oral Exam Request](#)
 - [Final Oral Exam with Committee Member at a Distance](#)
 - [Final Oral Exam with Committee Member Substitution](#)
 - [Final Oral Exam with Student at a Distance](#)
 - [Final Oral Exam Conditions Met](#)
- Fill out information at this [link](#) for announcement of your final oral defense.
- [Graduation Certification Letter](#) - Employer requests that you verify that all degree requirements have been met
- [Graduation and Commencement](#)

ASSISTANTSHIPS AND TUITION

- You must be registered to be paid on an assistantship.
- Registration is via ACCESS PLUS.
- Go to the Student Tab. Go to Student Registration
- You can register on-line till the first day of classes
- You can make changes to your schedule on-line through the first week of classes
- After the first week or if you have not registered prior to classes beginning you will need to use an ADD/DROP slip. This form is available in most departmental offices or on the bulletin board outside of the 2014 Molecular Biology (yellow ½ sheet).
- Students who are not registered will have a HOLD placed on their payroll at the beginning of the semester
- The minimum number of credits for summer is “1” credit. **“1” credit is all you should register unless you clear it with your major professor.** Tuition in the summer is charged by credit hour
- To receive a tuition scholarship your GPA must be 3.0 or above
- Students on assistantships receive 100% tuition scholarships (Ph.D.) and 50% tuition scholarships charged at in-state rates (M.S.) provided your overall GPA is 3.0 or above.
- **How do I know when my assistantship starts and stops and how much I am being paid?**
 - You should have received a letter of intent (LOI) that describes the amount per month and the dates your assistantship begins and ends. If you do not have an LOI or the present LOI is ending soon talk to your major professor.
- All students on assistantships receive paid single health insurance.

GENETICS MINOR

- Three of the four categories of the Core Curriculum with a “B” or better
- One semester of a seminar in GENET is recommended
- One member of the student’s POSC must be a Genetics and Genomics Faculty member.

SPECIALIZATION

- The Computational Molecular Biology Specialization within the Genetics and Genomics graduate major requires that the research project be in the field of computational molecular biology. One semester of Student Seminar of BCB 690 may be substituted for GENET 690
- The [Predictive Phenomics of Plants \(P3\) Specialization](#) within the Genetics and Genomics graduate major requires coursework in addition to IGG course/program requirements:

Genetics and Genomics PhD

Name: _____ Date: _____

POSC completed: YES / NO Major Prof: _____ Prelim date: _____

Entry Term and Year: _____ Expected Graduation Date: _____ Current GPA: _____

Prerequisites – must be taken by end of their 4 th semester (summer included)	BBMB 404	STAT 401/STAT 587	GR ST 565 (1 credit) End of first year to meet NIH and NSF requirements must have a “B” or better (F,S)
IG Core Courses grade of “B” or better Required (12 credits)	Genetics, Bioinformatics, and Statistical Genetics Circle the class taken: ANS 556 COM S 551 STAT 516, 581 BCB 544, 546, 567, 568, 569, 570	Evolution, Population and Quantitative Genetics Circle the class taken: ANS/Agron 561 EEOB 507, 540, 561, 563, 566, 567 GDCB/STAT 536	GDCB 511 Advanced Molecular Genetics GDCB 510 Transmission Genetics
Seminars (6 credits) MS students – 1 time each GENET 591 GENET 690	Workshop in Genetics (F) GENET 591 GENET 591	Conceptual Foundations of Genetics (F) GENET 692	Graduate Student Seminar (S) GENET 690 GENET 690 Faculty Seminar in Genetics (F) GENET 691
Elective courses	Course: Credit:	Course: Credit:	Course: Credit:
Research GENET 699			
Use research credits to fill to meet for PhD 72 and MS 32 course credit requirement Contact Program Coordinator for reference number for your major professor’s GENET 699 Research credits do not count towards grade GPA Minimum research credits for MS is 3; for Ph.D. is 10. There is no maximum.			

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IGG CORE COURSES

- **AN S 556: Current Topics in Genome Analysis**
(3-0) Cr. 3. Alt. S., offered even-numbered years.
Prereq: BBMB 405 or GDCB 510
Introduction to principles and methodology of molecular genetics useful in analyzing and modifying large genomes.
- **AN S 561: Population and Quantitative Genetics for Breeding**
(Cross-listed with AGRON). (4-0) Cr. 4. F.
Prereq: STAT 401
Population and quantitative genetics for plant and animal genetics. Study of the genetic basis and analysis of variation in quantitative traits in domestic or experimental populations using phenotypic and molecular marker data, including estimation of heritability and other genetic parameters, linkage analysis and mapping of quantitative trait loci, and the impact of inbreeding, heterosis, and genotype-by-environment interaction.
- **BCB 544: Fundamentals of Bioinformatics**
(Cross-listed with COM S, CPR E, GDCB). (4-0) Cr. 4. F.
Prereq: MATH 165 or STAT 401 or equivalent
A practical, hands-on overview of how to apply bioinformatics to biological research. Recommended for biologists desiring to gain computational molecular biology skills. Topics include: sequence analysis, genomics, proteomics, phylogenetic analyses, ontology enrichment, systems biology, data visualization and emergent technologies.
- **BCB 546/EEOB 546. Computational Skills for Biological Data.**
(Cross-listed with EEOB 546X). (1-2) Cr. 3. S.
Prereqs: Graduate student status or permission of the instructor.
Computational skills necessary for biologists working with big data sets. UNIX commands, scripting in R and Python, version control using Git and GitHub, and use of high performance computing clusters. Combination of lectures and computational exercises.
- **BCB 567: Bioinformatics Algorithms**
(Cross-listed with COM S, CPR E). (3-0) Cr. 3.
Prereq: COM S 228; COM S 330; credit or enrollment in BIOL 315, STAT 430
Biology as an information science. A review of the algorithmic principles that are driving the advances in bioinformatics and computational biology.
- **BCB 568: Statistical Bioinformatics**
(Cross-listed with COM S, GDCB, STAT). (3-0) Cr. 3. S.
Prereq: BCB 567 or (BIOL 315 and STAT 430), credit or enrollment in GEN 409
Statistical models for sequence data, including applications in genome annotation, motif discovery, variant discovery, molecular phylogeny, gene expression analysis, and metagenomics. Statistical topics include model building, inference, hypothesis testing, and simple experimental design, including for big data/complex models.
- **BCB 569: Structural Bioinformatics**
(Cross-listed with BBMB, COM S, CPR E, GDCB). (3-0) Cr. 3. F. Prereq: BCB 567, BBMB 316, GEN 409, STAT 430
Molecular structures including genes and gene products: protein, DNA and RNA structure. Structure determination methods, structural refinement, structure representation, comparison of structures, visualization, and modeling. Molecular and cellular structure from imaging. Analysis and prediction of protein secondary, tertiary, and higher order structure, disorder, protein-protein and protein-nucleic acid interactions, protein localization and function, bridging between molecular and cellular structures. Molecular evolution.
- **BCB 570: Systems Biology**
(Cross-listed with COM S, CPR E, GDCB, STAT). (3-0) Cr. 3. S.
Prereq: BCB 567 or COM S 311, COM S 228, GEN 409, STAT 430
Algorithmic and statistical approaches in computational functional genomics and systems biology. Analysis of high throughput biological data obtained using system-wide measurements. Topological analysis, module discovery, and comparative analysis of gene and protein networks. Modeling, analysis, and inference of transcriptional regulatory networks, protein-protein interaction networks, and metabolic networks. Dynamic systems and whole-cell models. Ontology-driven, network based, and probabilistic approaches to information integration.

- **COM S 551: Computational Techniques for Genome Assembly and Analysis**
(3-0) Cr. 3.
Prereq: COM S 311 and some knowledge of programming
Introduction to a big data research area in bioinformatics. Focus on applying computational techniques to huge genomic sequence data. These techniques include finding optimal sequence alignments, generating genome assemblies, finding genes in genomic sequences, mapping short sequences onto a genome assembly, finding single-nucleotide and structural variations, building phylogenetic trees from genome sequences, and performing genome-wide association studies.

- **EEOB 507: Advanced Animal Behavior**
(3-0) Cr. 3. S.
Prereq: Graduate standing, BIOL 354, or permission of instructor
Analysis of current research in animal behavior. Topics covered may include behavioral ecology, mechanisms of behavior, evolution of behavior, applications of animal behavior to conservation biology, and applications of animal behavior to wild animals in captivity.

- **EEOB 561: Evolutionary and Ecological Genomics**
(3-0) Cr. 3. Alt. S., offered even-numbered years.
Prereq: Permission of instructor; BCBIO 444 recommended.
Use of genomic and other "omic" data in evolution and ecology. Review of data-generation platforms, computational methods, and examples of how phylogenomics, metagenomics, epigenomics, and population genomics are transforming the disciplines of evolution and ecology.

- **EEOB 562: Evolutionary Genetics**
(3-0) Cr. 3. Alt. S., offered even-numbered years.
Prereq: Permission of instructor
Seminar/discussion course covering the genetic basis of evolutionary processes in multicellular organisms.

- **EEOB 563: Molecular Phylogenetics**
(2-3) Cr. 3. S.
Prereq: BIOL 313 and BIOL 315
An overview of the theory underlying phylogenetic analysis and the application of phylogenetic methods to molecular datasets. The course emphasizes a hands-on approach to molecular phylogenetics and combines lecture presentations with computer exercises and discussion of original scientific literature.

- **EEOB 566: Molecular Evolution**
(3-0) Cr. 3. Alt. F., offered even-numbered years.
Prereq: Permission of instructor
Seminar/discussion course covering the fundamentals of molecular evolution. Emphasis is placed on original scientific literature and current topics, including rates and patterns of genetic divergence; nucleotide and allelic diversity; molecular clocks; gene duplications; genome structure; organellar genomes; polyploidy; transposable elements; and modes and mechanisms of gene and genome evolution.

- **EEOB 567: Empirical Population Genetics**
(3-0) Cr. 3. Alt. F., offered irregularly.
Prereq: Permission of instructor
An overview of fundamental population genetic theory and the ecological and evolutionary factors underlying the distribution of genetic variation within and among natural populations. Emphasis on the analysis of inbreeding, breeding systems, parentage, relatedness, spatial autocorrelation, effective population size, hierarchical population models, and phylogeography.

- **GDCB 510: Transmission Genetics**
(3-0) Cr. 3. F.
Prereq: GEN 410 or graduate standing
In-depth investigations of modern research practices of transmission genetics. Designed for students interested in genetic research. Topics include: Mendelian genetic analysis, analysis of genetic pathways, mutational analysis of gene function, chromosomal mechanics, genetic mapping, epigenetic inheritance, human genetic analysis.

- **GDCB 511: Advanced Molecular Genetics**
(Cross-listed with MCDB). (3-0) Cr. 3. S.
Prereq: BIOL 313 and BBMB 405
Mechanisms of molecular genetic processes in eukaryotes and prokaryotes, including DNA replication and repair, transcription, translation and regulation of gene expression. Critical evaluation and discussion of current primary literature, methodologies and experimental data.

- **GDCB 536: Statistical Genetics**
(Cross-listed with STAT). (3-0) Cr. 3.
Prereq: STAT 401, STAT 447; GEN 320 or BIOL 313
Statistical models and methods for genetics covering models of population processes: selection, mutation, migration, population structure, and linkage disequilibrium, and inference techniques: genetic mapping, linkage analysis, and quantitative trait analysis. Applications include genetic map construction, gene mapping, genome-wide association studies (GWAS), inference about population structure, phylogenetic tree construction, and forensic and paternity identification.

- **STAT 516: Statistical Design and Analysis of Gene Expression Experiments**
(3-0) Cr. 3.
Prereq: STAT 500; STAT 447 or STAT 542
Introduction to high-throughput technologies for gene expression studies (especially RNA-sequencing technology): the role of blocking, randomization, and biological and technical replication in the design of gene expression experiments; normalization methods; methods for identifying differentially expressed genes including mixed linear model analysis, generalized linear model analysis, generalized linear mixed model analysis, quasi-likelihood methods, and empirical Bayes analysis; procedures for controlling false discovery rate for multiple testing; clustering problems for gene expression data; testing gene categories; emphasis on current research topics for statistical analysis of high dimensional gene expression data.

- **STAT 581: Analysis of Gene Expression Data for the Biological Sciences**
(3-0) Cr. 3. S.
Prereq: STAT 401 or STAT 587
Introduction to high-throughput technologies for gene expression studies (especially RNA-sequencing technology): the role of blocking, randomization, and biological and technical replication in the design of gene expression experiments; normalization methods; methods for identifying differentially expressed genes including mixed linear model analysis, generalized linear model analysis, generalized linear mixed model analysis, quasi-likelihood methods, empirical Bayes analysis, and resampling based approaches; procedures for controlling false discovery rate for multiple testing; clustering and classification problems for gene expression data; testing gene categories; emphasis on practical use of methods. May not be used for graduate credit in the Statistics MS and PhD degree programs. Credit in STAT 416 or STAT 581, but not both, may be applied toward graduation.

STUDENT CODE OF CONDUCT

Academic misconduct by graduate students is taken very seriously. The more serious cases involve cheating or plagiarism on preliminary written and oral examination, thesis or dissertation. Plagiarism involves taking or passing off as one's own the ideas or writings of others. Other individual's ideas or writings should always be openly acknowledged and thoroughly referenced. Such matters of misconduct are very serious violations of academic ethics and usually result in dismissal from the University without a degree. Cheating on a course examination or plagiarism on a paper related to a course is also academic misconduct. If a graduate student is believed to have plagiarized a term paper or to have cheated on an exam, most often that situation is handled informally between the professor and the student or by a representative of the Department. The student or the faculty member may ask for more formal review by the Dean of Students' office using policies developed for ensuring that due process is followed. A formal investigation of the situation may be conducted by the Dean of Students office, a hearing held by a committee of the all-university judiciary, and a recommendation made to the Vice President for Student Affairs. The student may appeal to the Vice President for Student Affairs if he/she is not satisfied with the decision of the hearing committee.

Violations of the Student Code of Conduct can be found here: [KNOW THE CODE](#)

DISMISSAL CRITERIA

Continuing registration as a graduate student at Iowa State University is contingent on maintaining good standing in a graduate major. Interdepartmental Genetics and Genomics (IGG) expects that its students will complete their degrees in a satisfactory and timely manner. However, there are several situations that may require severing the relationship between IGG and a student.

A student may be dismissed, that is, removed from their degree program and not permitted to register as an IGG student, for the following reasons:

a). Failure to progress satisfactorily in his/her degree program

This may be evidenced by a lack of research progress, failure to complete required components of the genetics degree program by deadlines specified in this handbook, a lack of aptitude for genetics, or a failure to maintain a satisfactory academic standing, as defined by the Iowa State University Graduate College Handbook.

b). Lack of a major professor

Because graduate degrees in genetics at Iowa State are centered about a mentored research project, it is impossible to complete a degree without a research mentor [major professor]. To maintain good standing and earn a degree in IGG, a student must have an IGG faculty member serving as his or her major professor.

A student admitted to IGG on rotation has up to 12 months from the date of entry into the program to find a faculty member willing to serve as his or her major professor (unless otherwise designated at the time of admission). If the student desires, the IGG Chair will help the student search for a major professor; however, final responsibility for finding a major professor rests with the student.

Occasionally, faculty who have previously agreed to serve as a major professor become unable or unwilling to serve. Faculty desiring to terminate their service as major professor may do so by notifying the student and the IGG Chair in writing. A student who has lost his or her major professor has up to three months after the date the IGG Chair is notified to identify another IGG faculty member willing to serve. The IGG Chair will help the student search for a new major professor, if the student desires.

c). Academic dishonesty

The proper conduct of science requires the highest standards of personal integrity. Because of this, dishonesty in the classroom or in the conduct of research is considered a serious offense by IGG and by the University. Students accused of academic dishonesty will be dealt with according to the procedures outlined in the University Catalog and the Faculty Handbook. Possible punishments can include dismissal from the program and expulsion from the University, depending on the severity of the offense.

Dismissal Procedures

- A student's POS committee, or if the student has no POS committee, the student's major professor, temporary advisor, or a member of the IGG Supervisory Committee can recommend the dismissal of a student for any of the reasons listed above. Decisions for dismissal are made by the IGG supervisory Committee and acted upon by the IGG Chair.
- Procedures for dismissal are as described in the Iowa State University Graduate College Handbook. Before a dismissal is decided, the IGG Chair must give the student a written justification for why dismissal is being considered. The IGG Chair must also discuss the situation with the student, as well as his or her POS committee, major professor, temporary advisor, and/or Supervisory Committee, in an attempt to find a satisfactory resolution. This discussion constitutes the "informal conference" as described in the Graduate College Handbook. If a satisfactory resolution cannot be reached and the Supervisory Committee votes to dismiss the student, either party may bring the issue to the attention of the Associate Dean of the Graduate College for a decision. The student may appeal the decision of the Associate Dean, as described in the Graduate College Handbook.
- Responsibilities of IGG and the major professor: It is the responsibility of IGG to counsel students who are having academic difficulties, to help students search for an acceptable major professor, or if students are unable to overcome these difficulties, to help the students identify and apply to other appropriate degree programs. It is the responsibility of the major professor and his/her department to help the student seek funds for a student's assistantship and for the conduct of research.
- Relationship between status in IGG and Termination of Financial Support: Although students in IGG are normally supported on graduate assistantships, this is not a requirement for continued participation in IGG. Students not on assistantship will continue to have regular status in the major so long as they remain in good standing and are registered.
- However, because assistantship support at Iowa State requires that a student be a member of a graduate program, dismissal from IGG requires that assistantship support be terminated, unless the student is able to transfer to another graduate program at ISU.
- Students with any doubt about their assistantship status should discuss their situation with their major professor, the IGG Chair, and/or the department or program providing their assistantship support. For further information on termination of assistantship appointments, see the Graduate College Handbook.

Appeal Process

The University has established appeal processes for student grievances. These vary depending on the nature of the grievance, and are described in the Graduate Handbook. Generally, these procedures begin with the program chair or the appropriate department DEO. It is usually best for all parties if a satisfactory resolution can be reached without initiating a formal appeal process. The Associate Dean of the Graduate College is available to informally consult with students and faculty.

DESCRIPTION OF PROGRAM RESPONSIBILITIES

Successful completion of a Genetics and Genomics degree requires an understanding of the roles and responsibilities of the student and various program officials. These are briefly described here, but students are encouraged to discuss these with their major professor, since expectations and standard practices may vary between research groups.

- The **Director of Graduate Education (DOGE)** is responsible for overseeing the execution of all graduate degree programs, ensuring that graduate examinations are properly conducted and that academic requirements are met upon conferring graduate degrees. The DOGE will monitor academic progress through the POSC forms and departmental progress reports, and will engage in intervention activities, as deemed appropriate.
- The **Graduate Program Coordinator (GPC)** will facilitate program administration and will coordinate with other university officers on matters related to academic programs, assistantships, fellowships, international status, etc. The GPC will also serve as the primary administrative contact for students. All forms requiring DOGE signature/approval are to be submitted to the GPC.
- The **Major Professor (MP)** will serve as the principal student advisor for all matters related to research, academics, assistantships, and overall programmatic progress. The major professor will also serve as the primary evaluator of student performance and will be assisted by the Program of Study Committee and the IGG Graduate Program Committee. Under normal circumstances, the major professor is expected to meet with each graduate student individually for at least one hour per week to discuss research progress, professional development, and other issues as might arise with the student's program. The MP is responsible for providing safe laboratory facilities and ensuring that the student has received proper training to perform work safely.
- The **Program of Study Committee (POSC)** is responsible for working with the MP to review proposal (Ph.D.) and thesis (M.S. and Ph.D.) documents and to conduct preliminary/final oral examinations. In addition, the POSC serves as a technical advisory board, available to provide advice, guidance, or recommendations regarding research activities, as appropriate. The POSC must be established using the online POSC form by the second semester of choosing a major professor. Refer to the ISU Graduate Handbook for policies regarding the make-up of the POSC.
- The **Research Assistant (RA)** is expected to engage professionally in the research activities assigned by the major professor. For a 1/2-time assistantship, a minimum of 20 hours per week of non-credit research is expected. More time may reasonably be expected under certain circumstances for fulfillment of commitments, as outlined by the MP. The RA is expected to observe professional standards with regard to attendance and notification of absences, as directed by the MP.
- The **Teaching Assistant (TA)** is expected to engage professional in the teaching activities assigned by the instructor of the course. For a 1/2-time assistantship, a minimum of 20 hours per week of non-credit teaching activities are expected. More time may reasonably be expected under certain circumstances for fulfillment of commitments, as outlined by the instructor. The TA is expected to observe professional standards with regard to attendance and notification of absences, as directed by the instructor.
- The **Graduate Student** (whether on assistantship or not) is expected to engage professionally in academic coursework and curricular research assignments (GENET 699). Students are also expected to read, understand, and follow the administrative procedures outlined in this document and the Graduate College Handbook. Graduate students are responsible for completing all required safety training and providing/maintaining appropriate records of such training, as assigned by the cognizant MP or course instructor. Students are expected to maintain the highest standards of integrity during academic, research, and reporting activities. Plagiarism, falsification, or misrepresentation of research results will not be tolerated.

HELPFUL WEBSITES

- [Genetic and Genomics](#)
 - [POSC Progress Form](#)
 - [Program Deadlines](#)
 - [Final Oral Checklist - MS / PhD](#)
- [Graduate College](#)
 - [Career Services](#)
 - [Center for Communication Excellence](#)
 - [Oral English Certification Test for International TAs \(OECT\)](#)
 - [Events & Deadlines](#)
 - [Graduate College Handbook](#)
 - [Graduate Student Rights & Responsibilities](#)
 - [Graduation](#)
 - [Application for Graduation](#)
 - [Dissertations/Thesis Checklist](#)
 - [Graduation and Commencement](#)
 - [Graduation Certification Letter](#)
 - [Home Department for Students Admitted to Interdepartmental Majors](#)
 - [POSC Committee Responsibilities: A Summary](#)
 - [Preliminary and Final Exam Requirements](#)
 - [Professional Development](#)
 - [Pursuit of Master's and PhD in Same Department](#)
 - [Request to Transfer from One Major/Degree/Certificate to Another](#)
- [Iowa State University](#)
 - [Catalog, University \(Courses and Programs\)](#)
 - [Center for Excellence in Learning and Teaching \(CELT\)](#)
 - [Preparing for Future Faculty](#)
 - [Dean of Students Office \(DSO\)](#)
 - [Graduate and Professional Student Senate \(GPSS\)](#)
 - [Office of Equal Opportunity](#)
 - [Discrimination and Harassment](#)
 - [Schedule of Classes](#)
 - [Student Counseling Services](#)