



Bioinformatics
and
Computational Biology
Interdepartmental Graduate Program

**GRADUATE STUDENT
HANDBOOK**

FALL 2006

IOWA STATE UNIVERSITY

Welcome to the Bioinformatics and Computational Biology (BCB) program at Iowa State University!

This student handbook is provided to give you general guidance about important issues related to your graduate career. Because the Bioinformatics and Computational Biology interdepartmental graduate program continually seeks to improve, some changes may occur between the annual printings of this handbook. Changes will be posted on the BCB website at www.bcb.iastate.edu. You should stay in close communication with your major professor regarding important curriculum and policy issues. We also encourage you to bring questions and comments to the Chair and members of the BCB Supervisory Committee at any time.

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I. INTRODUCTION

Bioinformatics and Computational Biology Interdepartmental Graduate Program

The Bioinformatics and Computational Biology (BCB) Program at Iowa State University is an interdepartmental graduate major offering outstanding opportunities for graduate study. The BCB program involves more than 80 nationally and internationally known faculty – biologists, computer scientists, engineers, mathematicians, physicists and statisticians – who participate in a wide range of collaborative projects.

The BCB program emphasizes interdisciplinary research in seven related areas of focus:

- Bioinformatics
- Computational Biology
- Functional and Structural Genomics
- Genome Evolution
- Macromolecular Structure and Function
- Mathematical Biology and Biological Statistics
- Metabolic and Developmental Networks

BCB students are trained to develop an independent and creative approach to science through an interdisciplinary curriculum and thesis research projects that include both biological and computational/mathematical components. First-year students are appointed as research assistants and have the opportunity to do research exploration rotations in various laboratories to gain experience in both "wet" and "dry" lab environments before selecting the laboratory in which to do their graduate research. In the second year, students initiate a thesis research project under the guidance of two faculty mentors, one from the biological sciences and one from the quantitative/computational sciences. BCB students are encouraged to participate in internships with academic or industrial partners during their degree program. The M.S. and Ph.D. degrees are usually completed in two and five years, respectively.

General information about the BCB program is available on our website at www.bcb.iastate.edu. This site also provides links to a directory of BCB faculty and their research interests as well as links to homepages for individual faculty and research groups.

Administration and Contact Information

Bioinformatics and Computational Biology program activities are overseen by the Chair, Supervisory Committee, and Program Assistant. Please contact us if you have any questions about the program.

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II. UPON ARRIVAL AT IOWA STATE

To help in the orientation process, new students should:

- *Read this handbook.* It is especially important to read the section on *Administrative Matters* during your first few days. Email is the BCB program's most important means of communication, so students should register for email as soon as possible, and then check it daily.
- Refer to the following documents regularly and examine them carefully. They contain information about University regulations and requirements for graduation.

From the Graduate and Professional Student Senate:

ISU Graduate Student Orientation Handbook

<http://www.grad-college.iastate.edu/gpss/>

From the International Students and Scholars Office

Orientation Handbook for International Students

http://www.public.iastate.edu/%7Einternat_info/Current_Students/handbook.html

From the Graduate College

Handbook

<http://www.grad-college.iastate.edu/publications/gchandbook/homepage.html>

Department offices also have copies available for student reference.

Thesis Manual

<http://www.grad-college.iastate.edu/publications/thesismanual.html>

Miscellaneous forms

Iowa State Graduate College forms are available online at:

<http://www.grad-college.iastate.edu/forms/forms.html>

From Iowa State University

Miscellaneous forms

Additional Iowa State University forms are available online at:

<http://www.ats.iastate.edu/forms.html>

- Other useful references include:

ISU General Catalog

<http://www.iastate.edu/~catalog/>

Schedule of Classes

<http://www.ats.iastate.edu/cgi-bin/class/>



<https://accessplus.iastate.edu/frontdoor/login.jsp>

Iowa State University's AccessPlus is a personalized secure university information resource that provides on-demand accessibility to your confidential information. Much university business for students can be handled through their AccessPlus accounts. The menu options for students include:

- Account/U-Bill
- Address Change
- Admissions
- Campus Housing
- Campus Org Events
- Class Registration
- Class Schedule
- Current Student Information
- CyCash
- Dining Services
- Direct Deposit
- Enrollment Cert
- Financial Aid
- Grad Student Status
- Grades & Transcripts
- Health Insurance
- Student Job Board
- Tax Info (1098)
- Telephone Services
- Third Party Access
- Votes and Surveys
- Web Based Training

Iowa State University Phone/Email Directory

<http://ph.iastate.edu/cgi-bin/phonebook>

The University phone directory is updated each Fall; copies can be purchased at the University Bookstore, Memorial Union. The directory includes a two-year calendar of academic dates and deadlines. The online directory is updated regularly throughout the year.

The Iowa State University homepage is at www.iastate.edu/

III. GETTING STARTED – THE FIRST YEAR

Graduate Student Orientation

For new graduate students, the academic year begins with a Graduate Student Orientation Week designed to ease the transition to graduate study at Iowa State. This is a time to become acquainted with the Bioinformatics and Computational Biology (BCB) program and its members and to prepare for registration and the start of classes. In addition to participating in the BCB orientation events, students also will take part in orientation activities offered by the Graduate College and International Student and Scholars office. Students should refer to all schedules for information about Orientation activities.

New BCB students are admitted to the program in one of two categories:

- *First year students admitted to BCB for research exploration rotations*
New students admitted into BCB are supported during the first year on a BCB research assistantship or an NSF fellowship. They spend the first year taking classes, doing research exploration rotations, and choosing a major and co-major professor. A temporary advisor helps new students arrange rotations and choose courses to fulfill the BCB program requirements. New students do not have a "home department" until after they complete their rotations and choose a major professor, usually before the end of their second semester on campus. The student's home department is the same as that of his/her major professor.
- *Current ISU students admitted to BCB as "transfers," "co-majors" or "concurrent degree candidates"*
Students admitted to BCB as transfers from other ISU departments or programs, or as co-majors or concurrent degree candidates, are usually supported by their major professor and/or home department. They spend their first year as BCB majors initiating an interdisciplinary research project, taking classes, and choosing a co-major professor. The major professor helps the student choose courses to fulfill the BCB program requirements. The student's home department is the same as that of his/her major professor. In most cases, the sections of the *BCB Graduate Handbook* dealing with temporary advisors, research exploration rotations and choosing a major professor do not apply to these students.

Assignment of a Temporary Advisor

Each new BCB student is assigned a temporary advisor who is usually a member of the BCB Supervisory Committee. Temporary advisors guide students in selecting courses during the first year, discuss research opportunities in Bioinformatics and Computational Biology, and suggest research groups/laboratories for research exploration rotations.

When a student is admitted to BCB as a transfer, co-major, or concurrent degree candidate, the major professor serves as advisor.

Registration for Classes

During Graduate Student Orientation week, students meet with their temporary advisors or major professors for counseling and preparation of class schedules for the upcoming semester. After

consulting with advisors, students can register for classes through their AccessPlus accounts. If changes in course registration are necessary, course adds and drops, section changes and credit changes can be made on **ACCESSPLUS** until the end of the first week of classes.

After the first week of classes, changes in class schedules must be submitted on a *Request for Schedule Change or Restriction Waiver* form (better known as an *Add/Drop Slip*), which is available from the BCB program office or from advisors. Once signed, this form needs to be taken to Room 10 Alumni Hall to formalize the change(s).

Students can register for future semesters through **ACCESSPLUS** after meeting with their advisor to plan their schedules.

Research Exploration Rotations

An important aspect of the BCB training program is participation in Research Exploration Rotations. The rotations serve several purposes. They are designed to help students choose their future major professors and to help professors choose graduate students. In addition, exploration rotations provide students an opportunity to actively participate in research projects of BCB faculty laboratories and promote interaction and exchange of information among BCB research groups. Because rotations are necessarily brief, students are not usually able to "complete" a project, in either a biological or computational research group. Instead, during the research exploration rotation period, students should:

- get to know the professor and the students and postdocs working in the research group;
- learn as much as possible about the professor's research projects;
- obtain "hands on" experience in one of the group's research projects;
- attend research group meetings and journal club meetings; and
- read reprints, reviews, and grant proposals related to the group's research.

It is appropriate for a rotating student to ask the rotation advisor whether the advisor would consider accepting him/her as a graduate student, but the final decision should not be made until all rotations have been completed.

Participation in research exploration rotations is required for all first year BCB students: three rotations for Ph.D. students and two rotations for M.S students. At least one rotation must be a "wet" laboratory experience (usually in a biological science laboratory using molecular biological, biophysical or biochemical techniques). At least one rotation must involve a strong computational component (usually in a research group in computer science, mathematics, physics, statistics or engineering). Students are strongly encouraged to participate in rotations in at least two different departments.

Beginning in Orientation Week and during the BCB Fall Faculty Seminar Series (BCB 691), students should take advantage of and make opportunities to meet individual faculty members and discuss their research. Students should arrange appointments for conferences with the professors whose work interests them most.

Students should make use of the following resources in selecting research groups and professors with whom to rotate:

- the list of BCB faculty who have expressed an interest in serving as mentors for research exploration rotation students, available on the BCB website and from the BCB program office;

- homepages of individual BCB faculty (see BCB website);
- discussions with individual faculty members. (This is very important.) Faculty can provide curriculum vitae, recent publications and grant proposals;
- research talks given by faculty in the BCB Fall Faculty Seminar Series and in the various departmental seminars on campus;
- discussions with current BCB graduate students.

Students should compile a list of several BCB faculty with whom they would like to rotate; this can be done in consultation with the temporary advisor. Students should personally contact the faculty members to determine whether they are accepting rotation students and to schedule a rotation.

To assist both faculty and students in planning, students should attempt to schedule exploration rotations and submit a completed *BCB Research Exploration Rotation Planning Form* to the BCB office as early as possible. The deadline for submitting the *Rotation Planning* form in Fall semester is September 6. Typically, the length of each rotation is approximately eight weeks for Ph.D. students, and about six weeks for M.S. students. **Adherence to the following timetable is strongly recommended. It is critical that students choose a major professor and notify the BCB office of their choice on or before the deadlines indicated.**

LAB EXPLORATION ROTATION TIMETABLE		
	Ph.D.	M.S.
Deadline for submitting Rotation Planning form	September 6	September 6
Deadlines for beginning rotations:		
Rotation #1	Sept. 11-Nov. 3	September 11
Rotation #2	Nov. 6-Jan. 12	October 18
Rotation #3	Jan. 15-Mar. 16	n/a
Deadline for final lab decision	April 13	December 1
Deadline for filing Home Department form	April 27	December 15

If a student realizes within the first two weeks of a rotation exploration that the rotation experience is not in an area of research he or she wishes to pursue, the student should consult with the temporary advisor. The temporary advisor will assist the student in scheduling another exploration rotation if assistance is needed.

Students obtain graduate credit for research exploration rotations by registering for *BCB 697 - BCB Research Rotations* for two semesters (Ph.D. students) or one semester (M.S. students). Rotation students usually register for two to five credits of BCB 697 per semester. The number of *BCB 697 - Research Rotation* credits is determined by the number of course credits for which the student is registered. **All BCB graduate students should register for a total of 12 credit hours each Spring and Fall semester and a total of 6 credit hours each Summer semester.** Although research will be conducted during the exploration rotations, **completion of a project is not required.** However, many faculty will use research productivity as one measure by which they determine whether to offer a student the opportunity to join their laboratory. It is therefore important to allow sufficient time in your schedule to actively engage in the intellectual activities of your host lab.

Choosing a Major Professor

Much of the first year will be devoted to the important process of selecting a major professor. After completing research exploration rotations, students should contact their potential major professors to discuss the possibility of joining their laboratories. First-year BCB students must choose a major

professor and notify the BCB program office of their choice **by April 13 (Ph.D.) or by December 1 (M.S.)**.

NOTE:

- *Students should not feel pressured to make a final decision about their future major professor until after all exploration rotations have been completed.* BCB faculty are *strongly* encouraged to wait until new BCB students have had an opportunity to complete all scheduled rotations before making a commitment to any specific student. It is in the student's best interest to reserve a final decision until becoming fully informed about all available opportunities.
- *It is important for students to discuss their future graduate assistantship support with potential major professors.* During the exploration rotation period, BCB students are usually supported as Research Assistants (RAs) with funds provided by the BCB program or NSF fellowships. Typically, Ph.D. students receive 12 to 24 months and M.S. students receive up to 6 months of guaranteed assistantship support. After a student has chosen a major professor, responsibility for the student's assistantship funding lies with the major professor and home department. (For administrative purposes, the major professor's department becomes the student's home department.)

When a BCB faculty member agrees to serve as a student's major professor, the faculty member is expected to arrange assistantship support for the remainder of the student's degree program, as long as the student remains in good standing and is making good progress toward the degree. Very few professors are able to "guarantee" a specific source of graduate assistantship support for several years. It is important, therefore, for each student to take an active role in discussing future assistantship funding with the major professor. Most students receive support as either a Research Assistant (RA) or a Teaching Assistant (TA), with funding supplied by the major professor and/or the home department. In some cases, students receive support from other sources, such as scholarships, training grants, or competitive research assistantships.

Establishing a Home Department

For administrative purposes, the major professor's department becomes the student's Home Department. After choosing a major professor, students must initiate a *Request to Establish a Home Department for Students Admitted to Interdepartmental Majors* form and submit it to the BCB administrative office. All BCB students should have filed their *Home Department* forms **by April 27 (Ph.D.) or December 15 (M.S.)**.

On the *Home Department* form, in Section II, after "Comments," the major professor must note his or her agreement to accept the student and to arrange or provide funding. The major professor should then sign the "Major Professor" line.

Choosing a Co-Major Professor

The major professor will assist the student in choosing an appropriate co-major professor. BCB requires that the major and co-major professor (one from the biological sciences and one from the computational/quantitative sciences) actively serve as joint mentors for the student. The co-major professor must be chosen prior to filing the *Committee Appointment* form.

The co-major professor plays an integral role in the mentoring of BCB students. Ideally, major and co-major professors have active research collaborations, share the responsibility for funding the student (by arranging a research or teaching assistantship). BCB PhD projects typically emerge from research collaborations between the co-major professors and the student. If this is not the case, it is still expected that the co-major professor will meet regularly with the BCB student to help guide dissertation research. The selection of a co-major professor, therefore, is an important decision and should be given careful consideration.

Appointing a Program of Study (POS) Committee

After choosing the major and co-major professors and establishing a home department, students should begin planning a suitable program for completion of the BCB graduate coursework. Before the end of the first year, students should appoint a graduate Program of Study (POS) Committee by filing a *Recommendation for Committee Appointment* form. The composition and responsibilities of the POS committee are in accordance with the Graduate College guidelines (see below).

The POS committee should include faculty whose knowledge and research interests can aid and complement the student's research interests, as well as faculty whose expertise will ensure a breadth of knowledge on the committee. **For Ph.D. candidates**, the POS committee must consist of at least five members of the Graduate College Faculty. The committee must have at least three faculty members – including the major professor and co-major professor – from within the Bioinformatics and Computational Biology major (i.e., who are members of the BCB faculty). One member of the committee must be either outside the major (not a BCB faculty member) or outside the student's home department.

For M.S. candidates, the POS committee must consist of at least three members of the Graduate College Faculty. Both the major and co-major professors must be members of the BCB faculty. One member of the committee must be either outside the major (not a BCB faculty member) or outside the student's home department.

Concurrent degree candidates, both M.S. and Ph.D., must meet the standard committee requirements for their Ph.D. or M.S. degree, as stated above.

Special rules govern the composition of the POS committee for **students seeking a co-major degree in BCB**:

For students seeking a **BCB Ph.D. co-major**, both the major and co-major professors must be members of the BCB faculty, with one professor affiliated with the department of the student's second major. The third member must be a BCB faculty member, and the fourth must be a faculty member of the student's second major. The fifth member can be outside both majors or in one of the two major departments or programs.

For students seeking a **BCB M.S. co-major**, both the major and co-major professors must be members of the BCB faculty, with one professor affiliated with the department of the student's second co-major. The third member can be outside both majors or in one of the two major department or program.

BCB MAJORS
GRADUATE COLLEGE REQUIREMENTS FOR COMPOSITION OF
PROGRAM OF STUDY COMMITTEES

Below are listed the current minimum requirements for the composition of Program of Study Committees. The rules are established by the Graduate College, but are listed below for students majoring in BCB. See the Graduate College Handbook (<http://www.grad-college.iastate.edu/publications/gchandbook/homepage.html>) for more details.

		Ph.D.	M.S.
Major Professor	BCB faculty member	1	1
Co-Major Professor	BCB faculty member	1	1
"Outside Department"	Outside BCB or Outside home department	1	1
Additional Members	No restrictions*	2	0
Total Members		5	3

* However, all POS committee members must be members of the Graduate Faculty.

After the chosen members of the POS committee have agreed to serve, students should complete the *Recommendation for Committee Appointment* form, sign it, and obtain signatures of committee members. They should submit the form to the Bioinformatics and Computational Biology program office for approval. "Bioinformatics and Computational Biology" should be listed as "Major"; home department (major professor's department) should be listed as "Department."

BCB Program Requirements Checklist

Students are required to use the *BCB Program Requirements Checklist* (see the *Forms* section at the back of this handbook) to track progress toward meeting BCB program requirements. An updated version of this checklist should be brought to each semester's schedule planning session with your advisor and to the BCB Annual Review interviews with the BCB program chair. Continued membership in the Bioinformatics and Computational Biology program and financial support is contingent upon satisfactory progress towards the degree. The *BCB Program Requirements Checklist* is one of the most important tools used by the program staff and BCB Chair to track student progress.

IV. ACADEMIC MATTERS

Degrees Offered

The Bioinformatics and Computational Biology graduate program is designed to provide doctoral (Ph.D.) level training. In certain circumstances, students may be admitted as M.S. candidates. The M.S. degree is not a prerequisite for the Ph.D. program.

Students who are admitted to the Ph.D. program and who later wish to transfer to the M.S. program must make the transfer concomitant with selection of a major professor (before the start of the second year). Students will be financially responsible for their education after the transfer. Transfers after the first year require approval of the BCB Supervisory Committee.

Students who are admitted to the M.S. program and who wish to transfer to the Ph.D. degree program in BCB may request to do so. Applications for transfer are judged on the basis of the same criteria as new applications for admission to the Ph.D. program. Students who wish to enter the Ph.D. program in BCB after completion of the M.S. degree in BCB must reapply to the program. Such applications are judged on the basis of the same criteria as new applications to the BCB Ph.D. program.

Academic Calendar

The BCB graduate program is a year-round program that includes Fall, Spring and Summer semesters. ***Students are expected to be registered and to participate in research and courses twelve months per year.*** A rotating student may take vacation with the approval of his or her temporary advisor and by notifying the Bioinformatics and Computational Biology program assistant. ***Each student must obtain the required approval and notify the BCB office prior to travel,*** in order to avoid potential interruption of graduate assistantship support and/or visa problems. See *Leave* in the *Benefits* section of this Handbook for information regarding vacation.

Research Expectations

BCB students are trained to develop an independent and creative approach to science through an integrated curriculum and interdisciplinary research projects in the fields of bioinformatics, computational biology, and biological statistics.

Advanced degrees in BCB require that a student's research project be interdisciplinary, including both biological and quantitative/computational components. The POS committee is responsible for determining whether a student's research project meets this condition.

The Ph.D. dissertation must: "demonstrate conclusively the ability of the author to conceive, design, conduct, and interpret independent, original, and creative research. It must attempt to describe significant original contributions to the advancement of knowledge and must demonstrate the ability to organize, analyze, and interpret data. ... Dissertation research should be worthy of publication and should appear in appropriate professional journals or in book form. ... Since satisfactory completion of the thesis or dissertation can constitute one of the most gratifying experiences in graduate study, the document should reflect the highest standards of scholarship, serving as a measure of quality for

the student, major professor, and the program.” (from the *ISU Graduate College Handbook* (<http://www.grad-college.iastate.edu/publications/gchandbook/chapter07.html#Academic>))

In BCB, the Ph.D. thesis is generally expected to include approximately three published or publishable original manuscripts. For additional details, see *Writing the Thesis* in the *Progressing Through the Degree Program* section of this Handbook.

The Ph.D. and M.S. degrees are usually completed in five and two years, respectively.

Prerequisite Undergraduate Coursework and Required Background Coursework

The foundation disciplines for BCB are genetics, molecular biology, mathematics, computer science, statistics and physics. Students entering the BCB program are expected to have a strong undergraduate background in at least **one** of these disciplines and additional coursework in another.

The following tables summarize the three areas in which BCB majors must demonstrate basic competence. Students are strongly encouraged to take courses equivalent to the ISU courses listed under *Course Prerequisites for Admission to BCB* **prior** to enrollment in the BCB program, but will have the opportunity to make up deficiencies during the first year of BCB graduate training. Courses listed under *BCB Background Coursework Requirements* are prerequisites for BCB core courses. These background courses should be completed either prior to admission or during the first year of BCB graduate training. The temporary advisor or major professor helps each student determine whether additional courses are needed. The student's POS committee will evaluate competence in the three background areas during the student's second Annual POS Committee meeting.

Course Prerequisites for Admission to BCB		
<i>Courses that should be taken ideally prior to enrollment. Note that many of these courses have additional basic mathematics, introductory physics, chemistry, or biology prerequisites at the undergraduate level</i>		
Category I. Mathematics and Statistics		
Math 165 or equiv	Differential calculus, applications of the derivative, introduction to integral calculus.	4 cr. – F S SS*
Math 166 or equiv	Integral calculus, applications of the integral, infinite series.	4 cr. – F S SS
Math 265 or equiv	Analytic geometry and vectors, differential calculus of functions of several variables, multiple integrals, vector calculus	4 Cr. – F S SS
Stat 341 or equiv	Probability; distribution functions and their properties; classical discrete and continuous distribution functions; moment generating functions, multivariate probability distributions and their properties.	3 cr. – F S SS
Category II. Biological Sciences		
Biol 313 or equiv.	Introduction to the principles of transmission and molecular genetics of plants, animals, and bacteria. Recombination, structure and replication of DNA, gene expression, cloning, quantitative and population genetics.	3 cr. F S
BBMB 301 or equiv.	A survey of biochemistry: structure and function of amino acids, proteins, carbohydrates, lipids, and nucleic acids; enzymology; metabolism; biosynthesis; and selected topics.	3 cr. F S

Biol. 315	The mechanisms of evolution. Topics in microevolution: population genetics, natural selection, genetic variation, and adaptation. Macroevolution: speciation, extinction, phylogeny, and major evolutionary patterns.	3 cr. F S
Category III. Computer Science		
Com S 207 or equiv	An introduction to computer programming using an object-oriented programming language. Emphasis on the basics of good programming techniques and style. Extensive practice in designing, implementing, and debugging small programs. Use of abstract data types. Interactive and file I/O. Exceptions/error-handling.	3 cr. – F S SS
Com S 208 or equiv	Intermediate-level programming techniques. Emphasis on designing, writing, testing, debugging, and documenting medium-sized programs. Data structures and their uses. Dynamic memory usage. Inheritance and polymorphism. Algorithm design and efficiency: recursion, searching, and sorting. Event-driven and GUI programming. The software development process.	3 cr. – F S SS
Com S 330 or equiv	Concepts in discrete mathematics as applied to computer science. Logic, proof techniques, set theory, relations, graphs, combinatorics, discrete probability and number theory.	3 Cr. F S SS

BCB BACKGROUND COURSEWORK REQUIREMENTS		
Courses (or equiv.) that should be taken <i>prior to enrollment or during first year</i> unless similar coursework was completed prior to joining the BCB Program		
Category I. Mathematics and Statistics		
Stat 300 level new courses that combines: relevant material from Stat 432 and 401	Probability and Statistical Inference for the Biological Sciences. Prereqs: STAT 101 or 104 or 226 or equivalent; STAT 341 or equivalent. Introduction to stochastic processes and statistical inference with applications to the biological sciences. Review of probability and random variables. Data, sampling, and basic statistical Inference, Classical estimation and hypothesis testing, Elementary experiment design and ANOVA. Stochastic Processes - Poisson processes and Markov Chains	3 cr – F
Category II. Biological Sciences		
Gen 411 or equiv	Molecular biology and cellular biochemistry with focus on systems-level analyses and high-throughput technologies. Review of basic cell structure and function; Principles of molecular genetics; Regulation of gene expression; Principles of cellular and developmental regulation,	3 cr. – S

	molecular evolution; Methods for high-throughput genomic, transcriptomic, metabolomic, structural genomic, and proteomic analyses.	
Category III. Computer Science		
Com S 363 (new prereq to replace Com S 311)	Relational, object-oriented, and semistructured data models and query languages. SQL, ODMG, and XML standards. Database design using entity-relationship model, data dependencies and object definition language. Application development in SQL-like languages and general purpose host languages with application program interfaces. Information integration using data warehouses, mediators and wrappers. Programming Projects.	3 cr. – F S

* F = Fall semester; S = Spring semester; SS = Summer Session

Required Core Courses

- at least one core course in molecular genetics
- four core courses in computational biology

Core courses in molecular genetics:

Gen 411 or 511 - Molecular Genetics (3 cr.) (Spring) Prerequisite: Biol 314.

Molecular biology and cellular biochemistry with focus on systems-level analyses and high-throughput technologies. Review of basic cell structure and function; Principles of molecular genetics; Regulation of gene expression; Principles of cellular and developmental regulation, molecular evolution; Methods for high-throughput genomic, transcriptomic, metabolomic, structural genomic, and proteomic analyses. (An equivalent or more advanced course may be substituted with approval of student's POS Committee.)

Core courses in computational biology:

BCB 548 (will become 567). Bioinformatics I (Fundamentals of Genome Informatics). (Cross-listed with COM S, CPR E.) (3-0) Cr. 3. F. *Prereq: Com S 208; Com S 330; Stat 341; credit or enrollment in Biol 315, Stat 401, and Stat 432.* Potential Instructors: Srinivas Aluru; David Fernandez-Baca; Oliver Eulenstein.

Catalog description: Biology as an information science. Review of algorithms and information processing. Generative models for sequences. String algorithms. Pairwise sequence alignment. Multiple sequence alignment. Searching sequence databases. Genome sequence assembly.

Expanded description: Biology as an information science. Review of algorithms and information processing: design of algorithms; space and time complexity analysis of algorithms; basic search algorithms; branch and bound search; dynamic programming. Generative models for sequences: multinomial models; Markov models. String algorithms: exact string matching; suffix trees and suffix arrays; approximate string matching (k mismatches, k differences). Pairwise sequence alignment: amino acid substitution scoring matrices; local and global alignment. Multiple sequence

alignment: progressive alignment; word-based methods; local multiple alignment (sequence profiles and motifs). Sequence database search: dot matrix methods; heuristic methods; statistics of database searches; Introduction to genome sequence assembly.

BCB 594 (will become 568). Bioinformatics II (Advanced Genome Informatics). (Cross-listed with GDCB, STAT, COM S.) (3-0) Cr. 3. S. *Prereq:* BCB 567, BBMB 301, Biol 315, Stat 401, Stat 432, credit or enrollment in Gen 411. Potential Instructors: Volker Brendel; Karin Dorman; Xun Gu.

Catalog description: Advanced sequence models. Basic methods in molecular phylogeny. Hidden Markov models. Genome annotation. DNA and protein motifs. Introduction to gene expression analysis.

Expanded description: Applications of sequence models: codon usage; discrete and continuous models of nucleotide substitution; synonymous and nonsynonymous nucleotide substitutions. Basic methods in molecular phylogeny: phylogenetic trees; distance matrix methods; maximum parsimony methods; maximum likelihood methods. Advanced sequence models: Random walks; score-based sequence analysis; Interpolated Markov Models; Markov Random Fields; applications to genome annotation; genome rearrangements. Hidden Markov Models: theory; training; applications to gene structure annotation, sequence alignment, and protein classification. DNA and protein motifs: weight matrices; word-based methods; EM algorithm, Gibbs sampling, and simulated annealing; Bayesian methods. Introduction to gene expression analysis, mRNA and protein expression data analysis, multiple comparisons.

BCB 569. Bioinformatics III (Structural Genome Informatics). (Cross-listed with BBMB, COM S, MATH, CPR E.) (3-0) Cr. 3. F. *Prereq:* BCB 567, Gen 411, Stat 401, Stat 432. Potential Instructors: Bob Jernigan, Guang Song, Zhijun Wu

Catalog description: Algorithmic and statistical approaches in structural genomics including protein, DNA and RNA structure. Structure determination, refinement, representation, comparison, visualization, and modeling. Analysis and prediction of protein secondary and tertiary structure, disorder, protein cores and surfaces, protein-protein and protein-nucleic acid interactions, protein localization and function.

Expanded description: Algorithmic and statistical approaches in structural genomics including: Protein, DNA and RNA structure; Protein and Nucleic acid databases; Computational problems in structure determination including structure representation, transformation between coordinate systems, structure comparison (using RMS and distance matrix based methods) and visualization, structure determination with NMR derived distances, Distance-based structure modeling, energy minimization methods for structure refinement, protein structure modeling using threading and homology based methods. Analysis and prediction of protein secondary structure and tertiary structure, ordered and disordered regions, structural domains, 3-dimensional structural motifs, protein cores and surfaces, structural classes, protein function from primary, secondary, or tertiary structure, protein-protein, protein-RNA and protein-DNA interfaces; analysis and prediction of RNA structure.

BCB 570. Bioinformatics IV (Computational Functional Genomics and Systems Biology). (Cross-listed with COM S, GDCB, STAT, CPR E.) (3-0) Cr. 3. S. *Prereq:* BCB 567, Biol 315, Com S 363, Gen 411, Stat 401, Stat 432. Potential Instructors: Vasant Honavar, Karin Dorman, Steve Proulx

Catalog description: Algorithmic and statistical approaches in computational functional genomics and systems biology. Biological Information Integration – knowledge (ontology) driven and statistical approaches. Qualitative, probabilistic, and dynamic network models. Modeling, analysis, simulation and inference of transcriptional regulatory modules and networks, protein-protein interaction networks. Metabolic networks; cells and systems.

Recommended (not required) Courses

It is recommended that all BCB graduate students who have not had laboratory experience in biological sciences take at least two 1-credit modules of BCB 542 (Introduction to Molecular Biology Techniques). Similarly, BCB graduate students who come in with a biology undergraduate degree take at least two modules of Introduction to Bioinformatics Tools (including modules on Sequence Analysis, Microarray Data Analysis, Protein Structure Analysis, Phylogenetics etc. to be developed and offered by the Baker Center).

Advanced Group Requirements

In addition to the five core courses, students must complete at least twelve credits of advanced coursework (excluding seminars, journal clubs, rotation credits, workshop credits, 1-credit lab or tools courses, or other courses that are graded on a pass / fail or satisfactory / unsatisfactory basis). In general, these should include at least six credits from *Category I* (Molecular Biology) and at least six credits from either *Category II* (Computer Science) or *Category III* (Mathematics/Statistics), i.e., six credits in one of the two areas. The table below provides a list of some of the courses that can be used to fulfill this depth requirement. These courses should ideally provide some depth in computer science, statistics, mathematics, or biological sciences.

Credits for a course listed in more than one category may be used to fulfill requirements in only one of the categories. Not all the listed courses are suited to all programs of study. Students should consult with their POS committees to determine which courses are most appropriate. Please note: with POS committee approval, courses not listed may also fulfill the Advanced Group Requirements. Check BCB Courses (www.bcb.iastate.edu/courses/BCBcourses.html) on the BCB website for new course offerings and updated course lists.

COURSES THAT FULFILL ADVANCED GROUP REQUIREMENTS		
This is a partial list; with POS committee approval, courses not listed may be used to fulfill Advanced Group Requirements. Please check BCB website for current list.		
Category I. Molecular Biology (6 credits required)		
An Sci 556	Current Topics in Genome Analysis	3 cr. – Alt S (2008)
BCB 550	Evolutionary Problems for Computational Biologists	3 cr. – F
BCB 538	Computational Genetics and Evolution	3 cr. – Alt S (2007)
BCB 539	Statistical Methods for Computational Biology	2 cr. – Alt S (2008)
BBMB 404	Biochemistry I	3 cr. – F
BBMB 405	Biochemistry II	3 cr. – S
BBMB 451	Physical Biochemistry	2 cr. – F
BBMB 501	Comprehensive Biochemistry I	4 cr. – F
BBMB 502	Comprehensive Biochemistry II	4 cr. – S
BBMB 531	Structure and Reactivity of Biomolecules	1 cr. – F
BBMB 541	Computational Biochemistry	1 cr. – F
BCB 542 A, B, C, D, E	Introduction to Molecular Biology Techniques	1 cr. per module – F S SS

BBMB 551	Molecular Biophysics	3 cr. – F
BBMB 653	Protein Chemistry – Physical Methods	1 cr. – S
Gen 462/EEOB 562	Evolutionary Genetics	3 cr. – S
GDCB 520	Genetic Engineering	3 cr. – Alt F (2007)
EEOB 563	Molecular Phylogenetics	3 cr. – F
EEOB 566	Molecular Evolution	3 cr. – Alt F (2006)
Category II. Computer Science (6 credits required from Group II OR from Group III)		
BCB 548* (will become 567)	Fundamentals of Genome Informatics	3 cr. – F
BCB 549	Advanced Algorithms in Computational Biology	3 cr. – S
BCB 550	Evolutionary Problems for Computational Biologists	3 cr. – F
BCB 551	Computational Techniques for Genome Assembly and Analysis	3 cr. – F
BCB 594* (will become 568)	Advanced Genome Informatics	3 cr. – S
BCB 596	Genomic Data Processing	3 cr. – F
BCB 597	Introductory Computational Structural Biology	3 cr. – S
Com S 311	Design and Analysis of Algorithms	3 cr. – F S
Com S 363	Introduction to Database Management Systems	3 cr. – F S
Com S 461	Database Systems Concepts & Internals	3 cr. – F
Com S 472/572	Principles of Artificial Intelligence	3 cr. – F
Com S 474	Elements of Neural Computation	3 cr. – S
Com S 511	Design and Analysis of Algorithms	3 cr. – F
Com S/Cpr E 526	Introduction to Parallel Algorithms and Programming	4 cr. – F
Com S 561	Principles of Database Systems	3 cr. – S
Com S 573	Machine Learning	3 cr. – S
Com S 574	Intelligent Multiagent Systems	3 cr. – S
Com S 611	Advanced Topics in Analysis of Algorithms	3 cr. – Alt S (2007)
Com S 672	Adv Topics in Computational Models of Learning	3 cr. – Alt S (2008)
Com S 673	Advanced Topics in Computational Intelligence	3 cr. – Alt S (2007)
EE 547	Pattern Recognition	3 cr. – F
Category III. Mathematics & Statistics (6 credits required from Group III or Group II)		
BCB 594* (will become 568)	Advanced Genome Informatics	3 cr. – S
Math 304	Introductory Combinatorics	3 cr. – F
Math 307	Matrices and Linear Algebra	3 cr. – F S SS
Math 314	Graphs and Networks	3 cr. – S
Math 378	Optimization and Modeling with Evolutionary Computation	3 cr. – S
Stat 500	Statistical Methods	4 cr. – F
Stat 536	Statistics for Population	3 cr. – Alt F (2006)
Stat 537	Statistics for Molecular Genetics	3 cr. – Alt S (2007)
Stat 542	Theory of Probability and Statistics I	4 cr. – F
Stat 543	Theory of Probability and Statistics II	3 cr. – S

F = Fall semester; S = Spring semester; SS = Summer Session

* Course may not be used to meet BOTH core course and advanced group requirements

Required Seminars and Activities

Workshops and Symposia

- *BCB 593 - Workshop in Bioinformatics and Computational Biology.* (1 cr. each time taken) (Fall, Spring, Summer) Current topics in bioinformatics and computational biology research. Lectures by off-campus experts. Students read background literature, attend preparatory seminars, attend all lectures and meet with lecturers.

Seminars

- *BCB 690 - Student Seminar.* (1 cr.) (Spring) Students present an account of their annual research progress to peers and to two faculty mentors who promote group discussions of experimental procedures and analysis.

- *BCB 691 - Faculty Research Seminar.* (1 cr.) (Fall) BCB faculty members present summaries of current research in their groups.

In addition, BCB students are expected to participate in a seminar series in their home department and to make an oral presentation (either in a research seminar or journal club) at least once each year.

Scientific Ethics and Good Science and Bioethics Training

All BCB majors are required to attend the Scientific Ethics Workshop, which is part of new student orientation each Fall semester. In this workshop, students are introduced to the concepts of ethical behavior and good practice in science. Discussion includes proper research methods, ways to avoid self-deception in the practice of science, and scientific misconduct.

In addition to attending the Scientific Ethics Workshop, BCB students are required to take BCB-approved bioethics courses or course modules. Students seeking M.S. degrees are required to take at least one BCB-approved bioethics course/module (0.5 credit minimum). Ph.D. students are required to take at least two bioethics modules or another BCB-approved bioethics course (1 credit minimum). *The required sessions in general scientific ethics offered during Fall orientation (above) do not count toward this bioethics course requirement.* Students supported by special training grants may have additional bioethics training requirements.

BCB-approved bioethics courses include:

BCB 565 - Professional Practice in the Life Sciences (usually offered Spring)

- A. Professional Practices in Research
- B. Intellectual Property and Industrial Interactions
- C. Life Science Ethics

Please see BCB Courses (www.bcb.iastate.edu/courses/BCBcourses.html) on the BCB website for additional information.

Language Requirements

Language requirements are determined by the student's Program of Study Committee.

Graduate English Requirements for Nonnative Speakers of English

Graduate students whose native language is not English and who do not have a bachelor's degree from ISU must take the English Placement Test at the beginning of their first semester of enrollment. This test is administered by the Department of English. It must be taken in addition to TOEFL (Test of English as a Foreign Language), which is required as part of the admissions process. A student who does not pass this examination is assigned to one or more courses in the English 101 series. This coursework must be completed during the first year of study.

Graduate students whose native language is not English but who have undergraduate degrees from ISU must take the Graduate English Examination for International Students, also administered by the Department of English, at the beginning of their first semester of graduate work. Students who do not pass this test must complete English 101D during their first year of study.

Teaching Requirements

Teaching requirements are determined by the home department. All graduate students are encouraged to participate in teaching seminars and obtain teaching experience as part of their training.

Testing of Nonnative Speaking Students Who Teach

SPEAK/TEACH testing is required of graduate students who fit **both** of the following categories:

- those who are not native speakers of American English (i.e., learned another language first), and
- those who are to be appointed to or considered for teaching assistantships, or who will have some teaching responsibilities even if they are not teaching assistants (TAs).

The SPEAK/TEACH tests of oral proficiency are given before the beginning of Fall and Spring semesters. Department offices have a schedule of SPEAK/TEACH testing dates. Registration for the test is held the day before the test is administered. Complete information about the SPEAK/TEACH program can be found at www.grad-college.iastate.edu/speakteach/. Questions about SPEAK/TEACH testing should be directed to the SPEAK/TEACH office, 1116 Pearson, 515-294-1958, 515-294-7996 or itas@iastate.edu.

A prospective teaching assistant who does not pass these tests is required to successfully complete coursework and be retested. (This coursework can be completed during the semester the student is teaching.) Sections of University Studies 180 are designed to help new teaching assistants. These courses focus on pronunciation, listening, question handling, teaching and lecturing skills, and an introduction to the culture of U.S. university life. Because enrollment in University Studies 180 is restricted, TAs must register for the course by obtaining an add slip from the SPEAK/TEACH Office, 1116 Pearson.

Additional Research Training Opportunities

Participation in International Scientific Conferences and Symposia

Attendance and presentation of research results at professional meetings are an essential part of the BCB graduate training program. Students should attend at least one national or international meeting during their degree program. All BCB students are eligible for financial assistance from the BCB program (as well as from other ISU sources) for conference-related expenses. For additional information, see *Grants for Professional Travel* in *Section VII. Financial Matters*.

Internships

BCB students are encouraged to participate in industrial internships as part of their training for careers in industry, government or the public sector. One such internship typically available is through the Pioneer Hi-Bred International Graduate Research Fellowship. Pioneer Fellows intern at Pioneer Hi-Bred for eight weeks during the summer of their first year of support. Additional internships in subsequent years can be arranged between the student and Pioneer. Formal agreements with other internship partners (e.g., NewLink Genetics) are currently under development. For additional information, please refer to the BCB website.

International Experiences

BCB students are encouraged to enrich their educational experience and establish international contacts by participating in international research experiences. The BCB program has had working relationships with four institutions (three in Europe and one in China) with which international training experiences were arranged in the past. Speak with your major professor about arranging these opportunities.

Summary of BCB Requirements for Ph.D. and M.S. Degrees

SUMMARY OF BCB REQUIREMENTS BY DEGREE				
Requirement	Course Number (Semester Offered)	Course Name	Ph.D.	M.S.
Background coursework	Variable	Variable	√	√
BCB core courses	(a) BCB 548 (F) (b) BCB 594 (S) (c) BCB 569 (d) BCB 570 (e) Gen 411, Gen 511 (S) or equivalent	Fundamental Algorithms in Computational Biology Computational Molecular Biology Structural Genome Informatics Computational Functional Genomics and Systems Biology Molecular Genetics	3 cr. 3 cr. 3 cr. 3cr. 3 cr.	3 cr. 3 cr. 3 cr. 3cr. 3 cr.
Advanced group requirements	Variable	At least 6 cr. from Group I and 6 cr. from Group II or Group III	12 cr.	12 cr.
Workshops and symposia	BCB 593 ^a	BCB Workshop	2 times	1 time
Student research seminars	BCB 690 (S)	BCB Student Research Seminar	2 times ^b	1 time ^c
Faculty seminars	BCB 691 (F)	BCB Faculty Research Seminar	2 times	1 time
Research rotation (first year only)	BCB 697 (F S)	BCB Research Rotations	3 labs	2 labs
Research	BCB 699 (F S SS)	Research	Variable cr.	Variable cr.
Bioethics training	Fall Var. (usually S)	Fall Scientific Ethics Workshop and BCB-approved bioethics course/modules	1 session and 1 cr.	1 session and 0.5 cr.
Graduate English	Variable	(for nonnative speakers only) Determined by placement exam	√	√
Total Credit Hours			72	30

a BCB 593 Workshop is offered various semesters (F S SS), but at least once each year.

b Student must make at least two oral presentations.

c Student must make at least one oral presentation.

Graduate Minor

A graduate minor in BCB requires:

- completion of BCB 548 or BCB 594 (3 credits);
- demonstration of competence in the three categories of required background coursework (Mathematics and Statistics, Molecular Genetics, Computer Science);
- completion of a total of 2 credits in BCB Workshops, Faculty Seminars and Student Seminars; and
- completion of at least 9 credits in courses listed under BCB Advanced Group Requirements, including at least 6 credits from one subject area and 3 credits from another area. The Program of Study Committee must approve the selected courses.

In addition:

- the planned POS must be reviewed by the BCB Chair prior to POS committee approval;
- at least one member of the POS committee must be a BCB faculty member; and
- application for minor must be made prior to PhD preliminary examination.

Co-major or Concurrent Degree Requirements

Students who are admitted to the BCB program as co-major or concurrent degree candidates must fulfill the requirements of the BCB program in addition to those of the co- or concurrent degree program. See the *Graduate College Handbook* for additional information.

Summary of First Year Course Requirements for BCB Majors

All first-year Ph.D. and M.S. degree candidates must:

- take courses to complete *BCB Background Coursework Requirements*
- take the required BCB core courses:
 - Gen 411 or Gen 511 - Molecular Genetics* (or equivalent)
 - and**
 - BCB 594 - Computational Molecular Biology*
 - and**
 - BCB 548 - Fundamental Algorithms in Computational Biology*
- attend *BCB 691 - BCB Faculty Research Seminar* (Fall);
- participate in *BCB 690 - BCB Student Research Seminar* (Spring);
- participate in *BCB 593 – BCB Workshop* (Fall or Spring), and
- participate in *Fall Scientific Ethics Workshop* and take courses to fulfill the BCB Bioethics training requirement

After the First Year

- Students should register for *BCB 699 - Research* (rather than *BCB 697 – Research Rotation*) every semester. Number of credits for BCB 699 will vary depending on other courses taken; **students should register for a total of 12 credits every Fall and Spring semester, and a total of 6 credits every Summer semester.**
- Students should register for courses to complete Advanced Group Requirements, following the recommendations of their major and co-major professors and POS committee.
- Students should refer to the Summary of BCB Requirements (above) for specific credit hour requirements for seminars, workshops, etc.

Sample Programs for First- and Second-Year BCB PhD Students

Students with Background in Computer Science and Biology

Year I	Fall	Spring
	Bioinformatics I Stat course to combine 432/401 Rotations	Bioinformatics II Gen 411 Rotations
Year 2	Fall	Spring
	Bioinformatics III	Bioinformatics IV

Year I	Fall	Spring
	Bioinformatics I Stat course to combine 432/401 Rotations	Bioinformatics II Com S 363 Rotations

Year 2	Fall	Spring
	Bioinformatics III	Bioinformatics IV

Year I	Fall	Spring
	Bioinformatics I Stat course to combine 432/401 Rotations	Bioinformatics II Gen 411 Rotations
Year 2	Fall	Spring
	Com S 363 Bioinformatics III	Bioinformatics IV

Students Without Biology Prerequisites, but with strong Computer Science background

Year I	Fall	Spring
	Biol 313 BBMB 301 Stat course to combine 432/401 Rotations	Gen 411 Com S 363 Rotations
Year 2	Fall	Spring
	Bioinformatics I Biol 315 Bioinformatics III	Bioinformatics II Bioinformatics IV

Students Without Computer Science Prerequisites, but with strong Biology background

Year I	Fall	Spring
	Com S 207 Stat course to combine 432/401 Rotations	Com S 208 Com S 330 Gen 411 Rotations
Year 2	Fall	Spring
	Bioinformatics I Com S 363	Bioinformatics II Bioinformatics IV
Year 3	Bioinformatics III	

Year I	Fall	Spring
	Com S 208 Stat course to combine 432/401 Rotations	Com S 330 Gen 411 Rotations
Year 2	Fall	Spring
	Bioinformatics I Com S 363	Bioinformatics II Bioinformatics IV
Year 3	Bioinformatics III	

Students Without Statistics Prerequisites AND Computer Science but with strong Biology background

Year I	Fall	Spring
	Com S 207 Stat 341 Rotations	Com S 208 Gen 411 Rotations
Year 2	Fall	Spring
	Stat course to combine 432/401 Com S 330	Com S 363
Year 3	Bioinformatics I Bioinformatics III	Bioinformatics II Bioinformatics IV

Transferability of Credits from Other Institutions

The transferability of credits from other institutions is determined on a case-by-case basis by the student's POS committee and the BCB Chair. To waive a course requirement, the student must attach to the POS form a memo signed by his or her major professor (on behalf of the POS committee) and signed by the instructor of the course the student wishes 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.

V. PROGRESSING THROUGH THE DEGREE PROGRAM

Forms listed in this section can be found in the *Forms* section at the back of this handbook; many also are available on the web at <http://www.grad-college.iastate.edu/forms/forms.html>.

The *BCB Program Requirements Checklist*, also included in the *Forms* section, summarizes the coursework requirements of the BCB program and provides a timetable for completion of degree requirements. ISU Graduate College requirements for the Ph.D. and M.S. degrees are summarized in the *ISU Graduate College Handbook*, available on the web at <http://www.grad-college.iastate.edu/publications/gchandbook/homepage.html>.

BCB REQUIREMENTS TIMETABLE AND DEADLINES		
	PhD	MS
Attend Lab Safety Training	Orientation week	Orientation week
Attend Scientific Ethics Workshop	September	September
Take Graduate English Examination (for nonnative speakers only)	Orientation week	Orientation week
Start rotation 1	September 11	September 11
Start rotation 2	November 6	October 23
Start rotation 3	January 15-March 16	Not applicable
Make major professor decision	April 13	December 1
File Home Department form	April 27	December 15
File Committee Appointment form	Before end of 1 st year	Before end of 1 st year
Hold first POS Committee meeting and file POS form	By 1 st semester of 2 nd year	Before end of 1 st year
Hold annual POS meeting	Each subsequent October	Each subsequent October
Take Speak-Teach test	Int'l: At least 1 semester prior to expected TA	Int'l: At least 1 semester prior to expected TA
Take preliminary examination	By 1 st semester of 3 rd year	Not applicable
Submit thesis to POS committee	2 weeks prior to defense	Not applicable
Provide research seminar information, title and abstract to BCB office	2 weeks prior to seminar	Not applicable

First Year Activities

Activities completed during a student's first year in the BCB program are described in *Section III. Getting Started – The First Year*.

Approval of the Program of Study (POS)

After choosing major and co-major professors and establishing a POS committee, students must file a *Program of Study* form. The Graduate College *Program of Study* form serves as a contract between the student and the Graduate College, indicating the minimum coursework that must be completed for the Ph.D. or M.S. degree.

Students should prepare a tentative *Program of Study* in consultation with their major professor and arrange a meeting of their POS committee to discuss the proposed *Program of Study* and research plans. All committee members must be present. The student's first Annual Progress Report is also reviewed at this meeting (see below).

In preparing the Program of Study, the student and major professor should refer to the BCB course requirements to ensure that the planned coursework: 1) meets all BCB requirements, 2) meets all Graduate College requirements, and 3) is appropriate, based on the student's planned research project. The POS committee will approve the POS form if these conditions are met. If courses listed on the POS form do not meet all BCB course requirements, the POS form will NOT be approved by the BCB program chair (unless a memo of justification is provided by the POS committee). The transferability of credits from other institutions will be determined on a case-by-case basis by the student's POS committee and the BCB Chair. To waive a course requirement, the student must attach to the POS form a memo signed by his or her major professor (on behalf of the POS committee) and the instructor of the course the student wishes 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.

Tips for Scheduling POS Meetings

Scheduling POS committee meetings can be challenging, but there are ways to simplify the task. In consultation with the major professor, the student should select four or five potential meeting timeslots, and then email the other POS committee members asking which times they could be available to meet.

Following the advice of the major professor, the student should indicate the expected duration of the planned meeting (usually about one hour) in the email message to POS committee members. This email request should be sent *several weeks prior* to the proposed date of the first POS meeting. Arrangements for the Preliminary Exam and Final Defense (which require longer time slots) should be made *at least one month in advance*. After obtaining faculty responses, the student should select a time when everyone can meet, reserve a conference room, and notify the POS committee members of the date, time, and location of the meeting. *The whole scheduling process should be completed within two to three days so that timeslots available during the initial inquiry remain available.* Email is the most efficient means of scheduling these meetings.

It is important (and courteous) to send an email reminder of the meeting time and place to POS committee members *two to three days prior* to the scheduled meeting.

First POS Committee Meeting

In most cases, a student's POS form is approved during the first POS committee meeting. **Approval of the POS must be obtained before the end of the first semester of the student's second year (Ph.D.) or before the end of the first year (M.S.)**

At least one week prior to the scheduled POS committee meeting, students should prepare the following documents:

- Proposed POS form
- Description of Proposed Research

The Description of Proposed Research should be concise (usually 2-3 pages) and summarize the major objectives of the research project and planned approaches to achieve these objectives. Because the POS must be approved soon after the student has chosen a major professor, the research description is expected to be preliminary; it is understood that the student's plans may change as the

research progresses. The written proposal should be viewed as a tool to help the student plan the dissertation or thesis research and to aid the POS committee members in evaluating whether the proposed POS coursework is appropriate. *The research project of BCB students must be interdisciplinary, comprised of both biological and computational/mathematical components.* The Description of Proposed Research should be emailed to the committee members one week prior to the first meeting.

Students should be prepared to make a brief oral presentation at the first POS committee meeting. Typically, the student describes his or her academic background (undergraduate institution, previous degrees, research experience, research interests, career goals) during the first few minutes of the meeting. The student then briefly summarizes the proposed research and solicits input from committee members. The POS committee is responsible for ensuring that the proposed research project is interdisciplinary, including both biological and computational/mathematical components. In addition, the POS committee is responsible for ensuring that the POS coursework: 1) meets all BCB requirements, 2) meets all Graduate College requirements, and 3) is appropriate, based on the student's planned research project. If no changes in the proposed POS are required, the meeting concludes with members of the committee signing the POS form. If changes to the proposed POS are required, the student must modify the form and obtain signatures of POS committee members as soon as possible after the meeting. Immediately after the POS is signed by committee members, the student must submit the completed and signed POS form to the BCB office for approval by the BCB Program Chair and the Graduate College.

After the Program of Study has been approved by the Graduate College, changes to the POS may be made only with the approval of the POS committee and the Graduate College.

Annual POS Committee Meetings

All BCB students must meet with their POS committees annually. A written synopsis of research progress should be provided to the committee in advance of the annual POS committee meeting.

For Ph.D. students, the first POS meeting must be scheduled before the end of the first semester of the second year. In each subsequent year, BCB recommends that Ph.D. students schedule their annual meeting during October. For annual meetings after the Ph.D. Preliminary Examination, only three committee members are required to be present. All committee members must be present for the Final Defense. Ph.D. students are expected to complete their degree work in approximately five years.

For M.S. students, the first POS meeting must be scheduled before the end of the first year (usually late Spring or early Summer semester.) M.S. degree students are expected to complete their degree work in approximately two years. If the M.S. degree is not completed within two years, the POS committee should meet at the end of the second year to review student progress and set a target date for completion of the degree. All committee members must be present for the Final Defense.

Complete copies of Ph.D. dissertation should be submitted to the POS committee *at least two weeks* before the Final Exam date.

Annual Review of BCB Student Progress

Continued participation in the Bioinformatics and Computational Biology program and financial support are contingent upon satisfactory progress towards the degree. The progress of all students in the BCB program is evaluated each year by the BCB Chair or members of the BCB Supervisory Committee. This evaluation is based primarily on information within the *BCB Program Requirements Checklist*. The Annual Review also offers an opportunity for BCB students to provide feedback on the program.

Progress will be evaluated on the basis of the following criteria:

- Timely completion of BCB training requirements (see *BCB Program Requirements Checklist* in *Forms* section)
- Satisfactory performance in laboratory exploration rotations or satisfactory progress in thesis research
- Satisfactory performance in required/recommended courses

Satisfactory Completion of BCB Courses

The POS committee is responsible for: 1) ensuring that a student's coursework fulfills the BCB requirements, and 2) determining whether required/recommended BCB courses have been satisfactorily completed. In addition, all BCB students must meet the Graduate College Grade Requirements, as described below.

Graduate College Grade Requirements

A cumulative GPA of at least 3.0 is required by the Graduate College for one-half tuition support by the Graduate College. The grading scale at ISU is as follows: A (4.0), A- (3.67), B+ (3.33), B (3.0), B- (2.67), C+ (2.33), C (2.0), C- (1.67), D+ (1.33), D (1), and F (0). Research grades (699, 697) do not count toward the GPA.

Preliminary Examination (Ph.D. only)

The Graduate College requires that all Ph.D. students pass a Preliminary Examination before advancing to candidacy for the doctoral degree. **The Preliminary Examination meeting should be completed before the end of the first semester of the third year.** All POS committee members must be present.

To initiate this process, the student must file a *Request for Preliminary Examination* form (available from department and program administrative offices and the Graduate College). Both the major professor and BCB Chair need to sign off on this form.

The examination must contain both a **written** and an **oral** component. The written component **must** include a "formal" Research Proposal in the format of an NSF, NIH or USDA research proposal. Master's degree candidates are not required to take a Preliminary Examination. Research Proposals that serve as the written component of the Preliminary Examination should be submitted *at least two weeks* before the Preliminary Examination.

Writing the Dissertation or Thesis

BCB requires students' research projects to be interdisciplinary, including both biological and quantitative/computational components. In addition, dissertations and theses written for Ph.D. and M.S. degrees in BCB must be in the "alternate format"; that is, they must include one or more papers designed for submission to a professional journal. As a guideline, the Ph.D. thesis is expected to include approximately three published or publishable original manuscripts.

Details about the alternate format and other thesis requirements are available from the *ISU Thesis Manual* (<http://www.grad-college.iastate.edu/publications/thesismanual.html>). Writing in alternate format provides important practice in writing publishable papers and shortens the time required for the final aspects of a student's thesis research to be published. If a student's POS committee feels that the alternate format is inappropriate for some reason, this requirement can be waived by petition from the POS committee to the BCB Chair. If research data from other students or researchers is included in the thesis (e.g., the student is one of several co-authors on a manuscript included in the thesis), instructions in the *ISU Thesis Manual* describe how to clearly indicate co-authors' roles in the research and/or preparation of the manuscript.

Students should refer to the *Format Checklist* (<http://www.grad-college.iastate.edu/degree/thesisrequirements.html>).

Students must provide a hardbound copy of the final thesis to the BCB program office. The BCB copy does not require special paper, and can be printed on either one or both sides of the page. Thesis binding services are provided for a nominal charge by Printing and Publications or by the Memorial Union Copy Center.

Application for Graduation

Students must submit to the Graduate College an *Application for Graduation (Diploma Slip)* indicating the expected semester of graduation and exact thesis or dissertation title. This form must be completed by *midterm of the semester preceding* the graduation semester. If a student does not graduate at the expected time, a new diploma slip must be submitted for a subsequent semester. Diploma slips are available at <http://www.grad-college.iastate.edu/forms/forms.html>.

Thesis Seminar and Final Examination

The Final Examination for the Ph.D. or M.S. degrees is an oral defense of the Ph.D. dissertation or M.S. thesis. This includes a required formal seminar presentation of thesis research to the Bioinformatics and Computational Biology faculty, students, and other members of the Iowa State academic community.

Students should submit a *Request for Final Examination* form after the dissertation or thesis work has been completed and all the other requirements have been met. After receipt of this form, the Graduate College will send a *Report of Final Examination* form directly to the major professor. The major professor is responsible for bringing this form to the final oral examination.

Students are strongly encouraged to present the final oral seminar during a regular BCB Seminar series or as part of a seminar series of their home department. *At least two weeks prior* to the seminar, students should provide the BCB office with the text of the formal seminar announcement.

Seminar posters will be distributed and an email message will be sent to BCB faculty and graduate students announcing the seminar. Following the public seminar (usually, but not always immediately afterwards), an oral examination (closed to the public) will be given by the POS committee. All members of the POS committee must be present at this meeting. This examination will review the dissertation or thesis and the candidate's knowledge of relevant subjects.

BCB Exit Interview

After receiving the *Graduate Student Approval Slip for Graduation* from the Graduate College, students should schedule a 30-minute exit interview with the BCB Chair. The Chair's signature (as Director of Graduate Education [DOGE] for BCB) is required on the *Approval Slip*. If a bound copy of the thesis has not already been provided to the BCB office, it should be given to the BCB Chair at the exit interview.

After Graduation

Letters of Recommendation

When letters of recommendation are needed for future employment or grant proposals, students should directly contact faculty to ask whether they are willing to serve as referees. If so, students should provide the following:

- adequate advance notice (*at least three to four weeks*);
- a copy of the job posting or job description;
- a current Curriculum Vitae; and
- an email reminder one week before the recommendation deadline.

It is courteous (and wise) to send referees a complete numbered list of the letters needed, with deadlines clearly indicated AND pre-addressed labels. An electronic copy of this address list is usually appreciated.

Dismissal

Continuing registration as a graduate student at Iowa State University is contingent upon maintaining good standing in a graduate major. The Bioinformatics and Computational Biology program expects BCB students to complete their degrees in a satisfactory and timely manner. However, there are certain situations that may require severing the relationship between a student and the BCB program.

Dismissal Criteria

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

- Failure to progress satisfactorily in his/her degree program

This may be evidenced by a lack of research progress, a lack of aptitude or a failure to maintain satisfactory academic standing, as defined by the Iowa State University *Graduate College Handbook*.

- Lack of a major professor

Because graduate degrees in Bioinformatics and Computational Biology at ISU 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 BCB, a student must have a BCB faculty member serving as major professor.

A student admitted to BCB on rotation has up to 12 months (Ph.D.) or 6 months (M.S.) 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 assistance, the BCB Chair will help the student search for a major professor; however, final responsibility for finding a major professor rests with the student.

Occasionally, a faculty member who has agreed to serve as a major professor becomes unable or unwilling to serve. A faculty member who wishes to terminate service as major professor for a BCB student may do so by notifying the student and the BCB Chair in writing. A student who has lost his or her major professor has up to three months (after the date the BCB Chair was notified) to identify another BCB faculty member willing to serve. (In BCB, the co-major professor usually would be the logical choice to replace the major professor; if he or she agrees, a new co-major professor should be appointed.) The BCB Chair will help the student search for a new major professor, if the student desires.

- Academic dishonesty

The proper conduct of science requires the highest standards of personal integrity. Because of this, the University and BCB consider dishonesty in the classroom or in the conduct of research to be a serious offense. 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 BCB Supervisory Committee – can recommend dismissal of a student for any of the reasons listed above. Recommendations for dismissal are made to the BCB Chair and are acted on by the BCB Supervisory Committee.

Procedures for dismissal are as described in the *ISU Graduate College Handbook*. Before a dismissal is decided, the BCB Chair must give the student a written notice explaining why dismissal is being considered. The BCB Chair must also discuss the situation with the student – as well as with the 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 BCB and the Major Professor

It is the responsibility of BCB 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 seek funds for a student's assistantship and for the conduct of research.

Relationship between Status in BCB and Termination of Financial Support

Although students in BCB are normally supported on graduate assistantships, this is not a requirement for continued participation in BCB. Students not on assistantship will continue to have regular status in the major so long as they remain in good standing and are registered.

Because assistantship support at Iowa State requires that a student be a member of a graduate program, dismissal from BCB 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 department or program providing their assistantship support and/or the BCB Chair. 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 College Handbook*. Generally, these procedures begin with the program chair or the appropriate Department Executive Officer. 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 consult informally with students and faculty.

VI. CAMPUS RESOURCES

Links to a number of campus resources for bioinformatics, computational biology and biological statistics are available on the BCB website. Some of these include:

ISU/BCB Computer Resources

Iowa State University has outstanding computational and biological research facilities that support collaborative research groups in the life sciences, bioinformatics and computational biology, computer and information sciences, engineering, and complex adaptive systems.

Information Technology Services (ITS) at Iowa State University -- manages a campus-wide network, which augments the various departmental computing facilities. Major computational research facilities include the Center for Bioinformatics and Biological Statistics, the Virtual Reality Applications Center, the Scaleable Computing Laboratory, and the Artificial Intelligence, Database, and Distributed Computing Research Laboratories in the Department of Computer Science.

General information about the computing facilities at Iowa State University can be found at <http://it.iastate.edu/> or call the ITS Solution Center located in 195 Durham, at 294-4000.

Available Services

If you are an Iowa State student:

- High Performance Computing Facilities can be accessed at <http://andrew.ait.iastate.edu/HPC/hpc-class/>
- instructional labs at Atanasoff Hall (soon to be moved to Pearson Hall)
- laptop checkout is available at 195 Durham Hall. Checkout is free for three days and is done on a first-come, first-serve basis. For more information, please go to <http://www.it.iastate.edu/checkout/>.

If you are a BCB graduate student:

- A Macintosh computing lab is in <http://www.bb.iastate.edu/computing/1340Home> (website is only viewable on campus). It is open Monday -Thursday 8 a.m. to 7 p.m. and Friday 8 a.m. to 5 p.m. The lab is closed on weekends.
- Satellite locations in MBB (see site above for exact room numbers) in the first floor copy room and in the 4th Floor BBMB reading room are open 24/7 to students with an MBB outside door key.
- The Bessey Hall Bioinformatics Facility located in Room 469 is intended for use by students, faculty and staff in Bessey Hall and nearby buildings as a local resource for bioinformatics-related educational and research activities. It houses six computer workstations (three PCs running Windows, two Macintosh G4s, and a Linux box), a scanner, and a printer dedicated for bioinformatics applications. The computers connect over the campus network to the deepc2 server in Molecular Biology, which allows them to run applications such as GCG. Applications installed locally on the computers include Sequencher, GeneSpring, Office, EMBOSS, and others. The networked color laser printer in the Plant Pathology Office can be accessed through each of the machines for printouts of color graphical output.
- The BCB office (2014 MBB, 294-5122) has a laptop available for student check out.
- A computer projector is available to BCB students for use in the Molecular Biology Building and can be reserved in the MBB administrative office, room 1210.

If you are an ISU student in the Computer Science Department:

- all labs in the Department of Computer Science facilities are open

If you are in ISU student participating in collaborative projects with the Center for Computational Intelligence, Learning, and Discovery (CCILD) faculty:

- [CCILD facilities](#) are open

Laurence H. Baker Center for Bioinformatics and Biological Statistics

The mission of the Laurence H. Baker Center is to facilitate the bioinformatics work of students and faculty by providing computer support, fostering communications among the students and faculty at ISU and with external laboratories and granting agencies, and providing leadership in bioinformatics activities. Faculty in the Center are engaged in research that either: 1) produces large amounts of biological data or 2) develops computational, graphical, or algorithmic methods to interpret and glean information from large biological data sets. Such data sets stem from molecular, cellular, anatomical, physiological, population, and ecological studies. Additional information is available at: <http://www.bioinformatics.iastate.edu>

Other resources include:

Graduate and Professional Student Senate (GPSS)

The Graduate and Professional Student Senate is an elected body whose mission is to represent the interests of Iowa State graduate students and to promote social interaction among graduate students. The GPSS office is located in G44 Memorial Union, 294-8725. The GPSS website is <http://www.grad-college.iastate.edu/gpss/>

BCB's 2006-2007 representative to the Graduate Student Senate is Matt Wilkerson, 2194 Molecular Biology, 294-3136, mwilkers@iastate.edu.

Student-Sponsored Seminars

BCB students are encouraged to recommend invited speakers for Bioinformatics, Computational Biology and Biological Statistics seminars on campus. Funding is available for at least one student-sponsored seminar by a top-caliber visiting scientist each year (i.e., students invite and make arrangements for hosting the speaker).

VII. FINANCIAL MATTERS

Graduate Appointments and Assistantships

Most students in Bioinformatics and Computational Biology receive some form of financial support. However, both the source of the support and the responsibilities associated with it vary from situation to situation. New BCB students are admitted to the program in one of two categories discussed in Section III. Students entering Bioinformatics and Computational Biology for exploration rotations usually receive a Research Assistantship (RA) funded by Bioinformatics and Computational Biology during the first year or by an NSF two-year fellowship. Typically, Ph.D. students receive 12-24 months of guaranteed assistantship support, and M.S. students receive up to 6 months. Stipends for students admitted as transfers, co-majors, or concurrent degree candidates are provided by major professors or home departments and are governed by departmental policies. The responsibilities associated with a stipend depend on the type of assistantship (Research Assistantship or Teaching Assistantship). Information about these forms of support is available in the *Graduate College Handbook*.

It is important for students to discuss their future graduate assistantship support with potential major professors. After a major professor has been chosen, the primary responsibility for a student's assistantship funding lies with the major professor and home department. (For administrative purposes, the major professor's department becomes the student's home department.)

All graduate students on assistantships sign a *Graduate Assistantship Letter of Intent* that lists the terms and conditions of their appointment. Generally, graduate assistantship appointments are on a "one-half time" basis. "Half-time" is the maximum time appointment for graduate students; the remaining "half-time" is spent as a student in graduate studies and research. Appointments can be terminated by mutual consent or for reasons as described in the *Graduate College Handbook*. Any questions regarding graduate appointments should be directed to the BCB office (2014 Molecular Biology Building).

- Financial constraints and program changes may result in adjustment in specific responsibilities and/or sources of funds during the period of appointment.
- The *Graduate Assistantship Letter of Intent* is based on the University fiscal year and does not imply that support will terminate on the end date noted in the *Letter of Intent*.
- BCB students will receive continued Graduate Assistantship support (either as a Research Assistant or Teaching Assistant) for the duration of Ph.D. degree work, as long as students remain in good standing. The specific source(s) of funding may vary depending on resources available to the major professor.
- If a student transfers from the BCB Ph.D. program to the BCB M.S. program, the student will be financially responsible for his/her education after the transfer.

The University payday is the last workday of each month, with pay deposited directly into students' bank accounts. Direct deposit and any bank account changes can be done on a student's AccessPlus account. Deductions are made for Federal and State income taxes and Social Security, if applicable.

Competitive Fellowships for Enrolled Students

In addition to the fellowships available for new students entering the BCB program, fellowship opportunities also exist for currently enrolled BCB students. See www.bcb.iastate.edu/students/fellowships.html for additional information.

Pioneer Hi-Bred International/Baker Center Graduate Research Fellowships

The Pioneer Fellowships provide a stipend of \$20,000 per year for two years, plus tuition, benefits and fees. Pioneer Fellows work as interns at Pioneer Hi-Bred for eight weeks during the summer of their first year of support. Subsequent internships can be arranged by agreement of both parties.

Ph.D. students who have completed at least their first year of graduate training are eligible to apply. Eligibility is not limited to students in the Bioinformatics and Computational Biology graduate program, those receiving IGERT or MGET support, or those with major professors affiliated with the Baker Center. Students in any program or department with a research interest in computational molecular biology and bioinformatics are eligible.

The Pioneer Fellowships are awarded to deserving students with strong records of research accomplishment or evidence of great potential. The awards are made in the Fall and begin on January 1.

James Cornette Research Fellowships in Bioinformatics and Computational Biology

The Cornette Fellowships provide \$10,000 six-month research assistantships plus tuition, benefits, and fees.

Ph.D. students majoring in Bioinformatics and Computational Biology who have completed at least their first year of graduate training are eligible to apply. Each student is eligible for a maximum of two Cornette Research Fellowships during his or her graduate program. Students must have met their program timeline requirements for academic, course, and training requirements and other required activities. (These requirements will vary for students depending on their program and their year of graduate study.)

The Cornette Fellowships are awarded to deserving students with strong records of research accomplishment or evidence of great potential. The awards are made in the Fall and begin on January 1.

Grants for Professional Travel

Attendance and presentation of research results at professional meetings are an essential part of the BCB graduate training program. Students should attend at least one national or international meeting during their degree program.

Financial assistance is available through *Professional Advancement Grants* from the Graduate College and the Graduate and Professional Student Senate, from major professors and home departments, and from the BCB program. Students interested in attending a conference should:

- discuss conference opportunities with their major professor and ask about the availability of funding provided through the major professor and the home department;

- plan conference attendance well in advance to ensure the best pricing for registration and airfares, and to secure funding;
- complete the *Professional Advancement Grant* (PAG) application for funding from the Graduate College and the Graduate and Professional Student Senate. The form and instructions can be downloaded from the Graduate College Forms page, www.grad-college.iastate.edu/forms/forms.html under "Miscellaneous Forms"; and
- submit the original of the PAG form to the Home department administrative office; and a copy of the PAG form to the BCB office, 2014 MBB. The home department typically will submit the form to the Graduate College for you.

The copy of the PAG form will serve as the application for BCB conference funding. Funding is available from the BCB program according to the following schedule, up to a maximum of \$1,000 over a five-year period for a Ph.D. student or \$400 over a two-year period for an M.S. student:

- \$200 per year, when presenting research
- \$100 per year, when not presenting research

Professional Advancement Grants

The Graduate and Professional Student Senate provides funds not only to support attendance at professional meetings, but also to support graduate student research and childcare. Information and forms are available on the GPSS website at <http://www.grad-college.iastate.edu/gpss/>, under *Professional Advancement Grants*.

Benefits

Student Health Insurance

Single student coverage under the Iowa State University Student Health Insurance Plan is provided free of charge to all graduate assistants at ISU. Insurance sign-up for new students takes place during Orientation. New students should not discontinue any other insurance before ISU coverage begins. Students also can arrange for insurance coverage for their family; this option is available only through payroll deduction. The 2006-2007 ISU Students and Scholars Health Insurance Program is provided by AETNA, and the claims administrator is The Chickering Group. Further information about the Student Health Insurance Plan is available from The Chickering Group (800-466-2381), Chickering's website (www.chickering.com), or Wanda Kellogg, 294-4820, 3350 Beardshear or visit ISU's site at: <http://www.hrs.iastate.edu/sship/homepage.html> .

All international students, whether on assistantship or not, are required to carry the ISU Student Health Insurance or to be covered by another health insurance policy. For more information, contact the International Student and Scholars office in Suite 250/252 Memorial Union (294-1120).

Prescription Drug Benefit Program

Graduate students receive single coverage free of charge in a prescription drug benefit program that reduces the cost of generic and prescription drugs available at the Student Health Center. For information, contact the Student Health Center Pharmacy (294-7983).

Health Service

All students have access to services provided by the ISU Student Health Service. A mandatory health fee of \$85 per semester (\$42.50 for summer session) and a health facility fee of \$8 per semester (\$4 for summer) are assessed to all students registered for five or more credits. This health fee pays for some services offered at the Student Health Center. The health facility fee applies to the cost of the new Student Health Center. The health center fee is optional for students enrolled for fewer than five credits. The health fee can be increased without notice.

Additional information about the student group plan medical insurance and the benefits of the mandatory health fee can be obtained from the Thielen Student Health Center (294-5801). Information about the Student Health Service also is available in the ISU General Catalog and on the web at www.public.iastate.edu/~health/homepage.html.

Leave

During the exploration rotation period, BCB research assistants with half-time appointments earn vacation at a rate of eight hours per month (equivalent to two calendar days per month). A student may take vacation with the approval of the temporary advisor and by notifying the BCB office.

After students' *Home Department* forms are approved, leaves (including maternity/paternity) are handled by the major professors and home departments, which develop and implement their own policies. Vacation time accumulated prior to joining home departments is not carried forward.

The *Graduate College Handbook* states only:

Arrangements for a leave of absence are made between the graduate assistant and that assistant's supervisor. When a graduate student employee needs to be absent either for personal reasons or illness, the supervisor should be understanding and accommodating to that need. At the same time, the graduate assistant should attempt to plan personal leave so that it does not interfere with or cause neglect of the duties associated with his or her appointment. Supervisors of graduate assistants are responsible for ensuring that their assistants do not exceed reasonable limits for leave.

All ISU students with assistantship appointments are employees of ISU and, as such, are allowed the regular university holidays (New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day, plus one additional day each year determined by the university administration). Absences for other time off must be arranged with the temporary or major professor as outlined above.

Injuries and Injury Reports

If a student is injured while performing duties as a Graduate Assistant, he or she must submit a *First Report of Injury* as soon as possible. This form is available from ISU's Environmental Health and Safety department or from ISU's Forms page located at <http://www.adp.iastate.edu/forms/other.html>. Usually the University's Worker's Compensation insurance carrier will pay for medical care.

VIII. ADMINISTRATIVE MATTERS

Administrative Assistance

The main administrative office for Bioinformatics and Computational Biology graduate students is the BCB program office in 2014 MBB. The office is open 9 a.m. to 5 p.m. Monday through Friday. The BCB Graduate Assistant can be contacted at 294-5122 or bcb@iastate.edu.

Communications

It is vital that students maintain good contact with Bioinformatics and Computational Biology personnel throughout their graduate program. There are a number of ways to do this:

Student Contact Information

The BCB program maintains a record of each student's current email address, local home address and telephone number, as well as campus address and telephone number. It is important that students advise the BCB program office of any address changes.

Email

Students should check email at least daily, as this is the **primary means** of keeping students informed about BCB program activities.

Internet

The Bioinformatics and Computational Biology website contains most of the information pertaining to ongoing program events, and is updated regularly. Students should visit the website regularly at www.bcb.iastate.edu.

Campus Mail Service

All first-year Bioinformatics and Computational Biology graduate students have a temporary mailbox in the Molecular Biology Building during the exploration rotation period. After the student chooses a major professor, the student's home department will arrange a permanent campus address and mailbox.

Telephone

Local calls can be made on most campus phones. Long distance calls can be made on University phones only with the prior approval of the person to whom the phone is assigned.

Transportation

Bicycles

Bicycle racks are located throughout campus. Except for walks labeled as bike paths, bicycle riders are prohibited from using campus sidewalks. Bicycles used between sundown and sunrise must be equipped with a headlight, taillights or an adequate reflector and a warning device. To assist in recovering lost or stolen bicycles, students should register bicycles at Ames City Hall (515 Clark Avenue) or the ISU Department of Public Safety (Armory). There is no charge for bicycle registration.

Buses

CyRide is the Ames bus system. Students can ride all CyRide routes free of charge upon presentation of a current *ISU* card. During the school year the buses leave from most locations every 20 minutes. Schedules are widely available throughout campus. Further CyRide information can be found at <http://www.cyride.com/>.

Cars and Parking

A copy of the ISU Traffic and Parking Regulations can be obtained from Public Safety, Parking Division, 27 Armory. Consult the handbook section pertaining to students.

Help in Preparing Research Presentations

A laptop computer and computer projector are available for BCB student use. The laptop can be checked out from the BCB program office, 2014 Molecular Biology; the computer projector can be reserved for use in the Molecular Biology Building, at the administrative office, room 1210.

ISU's Instructional Development Center (1200 Communications Building, 294-8022) provides audio and visual media services. Slide projectors, videotape players, etc. can be borrowed at no charge. The center's Creative Services office also can provide media graphics assistance in preparing posters on a fee-per-project basis.

Computer Short Courses

ISU Information Technologies (IT) offers short courses on a wide range of subjects. Contact the Solution Center, 195 Durham Center at 294-4000 for additional information and a schedule of courses or visit the IT website at www.it.iastate.edu for information about courses and a list of all services they provide.

Professional Ethics

During Orientation activities, students are required to attend an introduction to the concepts of ethical behavior and good practice in science. Included is discussion of proper research methods, ways to avoid self-deception in the practice of science, and scientific misconduct.

Bioethics training is a critical component of the BCB graduate program requirements. Every BCB student receives copies of *Honor in Science* and *The Responsible Researcher: Paths and Pitfalls*, which should be read carefully.

It is imperative that every student understand the ethical standards of science and conduct his or her scholarly activities accordingly. Scientists who commit unethical acts, whether from carelessness, ignorance, or malice, quickly lose the respect of the scientific community and may be prevented from receiving funding support. Scientific misconduct includes such activities as:

- falsification of data, ranging from fabrication to deceptively selective reporting, including the purposeful omission of conflicting data with the intent to falsify results
- plagiarism...representation of another's work as one's own
- misappropriation of the ideas of others...unauthorized use of privileged information

- misappropriation of funds or resources for personal gain
- falsification of one's credentials

At ISU, these acts are taken very seriously and constitute “academic misconduct” (ISU Faculty Handbook, Fall 1999). Individuals found guilty of academic misconduct may suffer a variety of penalties, up to and including expulsion from the university.

If a student is aware of a potentially unethical situation, he or she should seek the advice of a trusted professor. Students may also contact the BCB Chair or a member of the BCB Supervisory Committee. All discussions with the Chair and the Supervisory Committee members will be confidential. Alternatively, students may go directly to Associate Vice Provost for Research, who is responsible for investigating charges of academic misconduct on campus. It is very important to protect the rights of the individual whose actions are questioned. Frivolous accusations of misconduct and vicious spreading of rumors are just as unethical as fabrication of data or plagiarism.

Nondiscrimination, Affirmative Action and Sexual Harassment

**NON-DISCRIMINATION AND AFFIRMATIVE ACTION POLICY
IOWA STATE UNIVERSITY
(July 1, 2005 Reaffirmation)**

Iowa State University is committed to developing and implementing a program of nondiscrimination and affirmative action, a responsibility the university accepts willingly because it is the right and just thing to do. Because an educational institution exposes the youth of Iowa and of the nation to a multitude of ideas that strongly influence their future development, it is an area of our society where removing barriers is critical. We insist on promoting the concept of inclusion and participation.

This commitment is part of a larger commitment to developing a safe and supportive climate for all members of the ISU community in classrooms and laboratories, in offices, in the residence hall system, and throughout the campus. Iowa State University recognizes that a non-discriminatory environment complements a commitment to academic inquiry and intellectual and personal growth.

The goal is to provide a non-discriminatory work environment, a non-discriminatory living and learning environment and a non-discriminatory environment for visitors to the campus. Iowa State University herein recommits itself to comply with all federal and state laws, regulations, and orders, including the policies of the Iowa Board of Regents, which pertain to nondiscrimination and affirmative action.

All administrators and personnel providing input into administrative decisions are directed to ensure that all decisions relative to employment, conditions of employment and access to programs and services will be made without regard to race, color, age, religion, national origin, sexual orientation, gender identity, sex, marital status, disability, or status as a U.S. veteran. Exceptions to this directive may be made in matters involving bona fide occupational qualifications, business necessity, actions designed to eliminate workforce underutilization, and/or where this policy conflicts with federal and state laws, rules, regulations, or orders. Iowa State does not discriminate on the basis of race, color, age, religion, national origin, sexual orientation, gender identity, sex, marital status, disability, or status **as** a U.S. veteran. Inquiries can be directed to the Director of Equal Opportunity and Diversity, 3680 Beardshear Hall, (5 15) 294-7612.

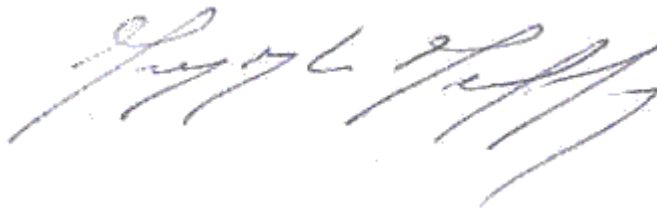
Iowa State University will base employment decisions so as to further the principle of equal employment opportunity and diversity. No otherwise qualified person will be denied access to, or participation in, any program, activity, service, or the use of facilities on the basis of factors previously enumerated. Reasonable accommodation will be made to facilitate the participation of persons with disabilities in all such activities

consistent with applicable federal and state laws, orders and policies. Further, all supervisory personnel will be responsible for maintaining an environment that is free of racial or sexual abuse and harassment. Acts by anyone that adversely affect another person's employment, conditions of employment, academic standing, receipt of services, and/or participation in, or enjoyment of, any other activity, will be regarded as a violation of university policy and thereby subject to appropriate disciplinary action. Retaliation against persons filing complaints, for bringing the violation of this policy forward for review, or for assisting in a review, pursuant to a filed complaint or grievance, is prohibited.

Iowa State University's commitment to nondiscrimination and affirmative action is of the highest priority and is to be adhered to as such. It applies to all university-sponsored programs and activities as well as those that are conducted in cooperation with the university.

Iowa State University has designated Carla R. Espinoza as the affirmative action officer and assigns overall program responsibility to her as the Director of Equal Opportunity and Diversity. Questions regarding complaints and/or compliance with affirmative action or equal opportunity should be directed to her at 3750 Beardshear Hall, Iowa State University, Ames, IA 50011-2033, (515) 294-7612.

President

A handwritten signature in black ink, appearing to read 'Gregory Geoffroy', written in a cursive style.

Gregory Geoffroy
President

The University has designated several offices that provide assistors for those individuals who feel they have been subjected to sexual harassment. An assistor is an individual who can provide support, explain alternatives and accompany a complainant to mediation or complaint sessions. An assistor can act in conjunction with, but not in lieu of, a complainant. Assistors are available in the Dean of Student's Office, in the Women's Center, and in each college. The name of the individual designated by a college as an assistor can be obtained at any of the sources named above or at the college office. All contacts with information sources and assistors are confidential. Talking to an assistor is not filing a complaint, nor will an individual be required to take any specific action following a visit with an assistor. Individuals may visit with an assistor and be assured that no action will be taken without the individual's consent. Similarly, discussing a situation with an assistor does not constitute notification to the university, and the university is not required to act.

APPENDIX

Graduate College Forms

(Multi-part Graduate College Forms Available in the BCB Office, 2014 MBB or from your home department office):

- Request for Schedule Change or Restriction Waiver (Add/Drop Slip)
- Request for Preliminary Examination
- Request for Final Examination

(Available for download from: <http://www.grad-college.iastate.edu/forms/forms.html>)

- Request to Establish a Home Department for Students Admitted to Interdepartmental Majors
- Recommendation for Committee Appointment
- Request to Change Committee Appointment
- Program of Study (POS)
- Program of Study (Supplement)
- Modifications to the Program of Study
- Request for Professional Advancement Grant (Travel or Research Minigrant)
- Application for Graduation (Diploma Slip)

BCB Forms

(Available for download from: http://www.bcb.iastate.edu/courses/current_rotations_06.htm)

- BCB Research Exploration Rotation Planning Form

(Available for download from: <http://www.bcb.iastate.edu/courses/index.html>)

- BCB Program Requirements Checklist