



The Huck Institutes
OF THE LIFE SCIENCES

Integrative Biosciences Graduate Programs

Degree Requirements Booklet

Fall 2007

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Bioinformatics and Genomics Option (BG)

Course Requirements:

The following required courses are taken during the first year of study: Genomics, Bioinformatics I and II, Current Research in Statistical Genomics, the Huck Institutes' Colloquium, the Huck Institutes' Ethics in the Life Sciences course, and Lab Rotations (Independent Studies). These courses provide incoming students with a foundation for further study in bioinformatics and genomics, and for selection of a mentor. However additional courses will be recommended by the **first year advisor** (one of the co-chairs for the BG option) and/or the research advisor that will help the student to prepare for the Candidacy and Comprehensive exams, by complementing the student's background, and that will also support the student's research interests.

Rotations/Mentor Selection:

Students will participate in three lab rotations, preferably beginning in their first semester. Additional rotations will be permitted, as required. The choice of rotation laboratories will be made in consultation with the co-chairs of the BG Option. After this exposure to various laboratories and levels of investigation, the student will pick a primary mentor/advisor and two co-advisors who together will compose the student's doctoral thesis research committee. The selection of primary advisor will be based on the preferences of both the student and mentor and will take into consideration shared research interests and the student's course work and previous research background. In addition to the primary advisor, the student will select two co-advisors such that all three focal areas of the BG Option – Computational Biology, Functional Genomics, and Evolutionary Genomics - are represented on the student's doctoral thesis research committee.

Candidacy Exam:

The candidacy examination will be administered after completion of the core courses, usually in the first semester of the second year; definitely by the end of the second year; however the timing can be adjusted for the student's prior levels of expertise. The goal of the candidacy examination is to evaluate the student's ability to solve problems in the three major areas of the BG option (computational, evolutionary and functional genomics) including the ability to think in an integrated manner to determine if the student has the potential to successfully complete the Ph.D. program. Based on this evaluation, the candidacy exam committee may recommend the student to take remedial actions to address any areas of deficiency.

The candidacy exam will have both written and oral components. The student will choose a topic for the written component along with one or more papers on that topic in consultation with his/her three advisors (committee). The student is encouraged to address a question that is interdisciplinary, requiring both biological and computational approaches (i.e. both bioinformatics and genomics). The topic may be one that was encountered in a core course or in the literature. The topic should not be based upon the student's thesis research; it should not be a thesis proposal. The student will write a synopsis that will identify a problem within the topic area, will show how the problem will be resolved, and will propose future research within that problem area. The written part of the exam should be written in a research paper format in 11-point font, with single spacing, of about five to ten pages length, including references. The paper may also include original graphics and tables. All aspects of the document should be directly and clearly relevant to the question being addressed. This document will serve as the basis for the oral portion of the candidacy examination, which will include questions from each of the three major areas of the BG option (computational, evolutionary and functional genomics).

The student's candidacy exam committee will include the three advisors plus another member of the BG option faculty. The chair of the student's examination committee will be a member of the BG Option's Standing Committee on Candidacy Exams. To facilitate appointment of the exam chair, the student will provide a brief statement that outlines his/her research interests to the Chair of the BG Option's standing committee. The timetable for completion of the written and oral portions of the examination will be agreed upon by the student and the three co-advisers. The ideal timeframe will be two weeks to finish the written examination, with the oral

examination to follow one week after the written portion is submitted to the examining committee. The oral examination will consist of a 15-20 minute oral presentation given by the student that is a summary of the written paper. Interruptions by the committee should be expected. The presentation will have a maximum of four slides that outline the written exam, with no more than 3 or 4 bullet points per slide. The examination committee will ask questions of the student for the remainder of the exam, which will normally take approximately 2 hours.

Comprehensive Exam:

The comprehensive exam will test the ability of the student to articulate a testable hypothesis and present a rational approach to supporting this hypothesis. The comprehensive examination will be administered by a committee composed of the three advisors plus two additional persons to be appointed by the BG Option co-Chairs – a chair who is a faculty member of the BG Option and an outside faculty member (not in the primary advisor's home department). The comprehensive exam will be an oral defense of a written proposal for the planned thesis research. Experience in writing research proposals is an invaluable part of graduate training in the BG option. Thus, students in the BG option will develop the proposal for their comprehensive exam to fit the format and guidelines for an NSF or NIH doctoral dissertation improvement proposal. It is expected that the proposal will be submitted to the agency at the time of or soon after the comprehensive examination. The comprehensive exam will begin with a 15 – 20 minute overview of the proposal and of any preliminary data that the student has obtained to support the proposal. The comprehensive exam should be taken after the second academic year upon the student's successful completion of the core courses, and the candidacy exam, and any additional courses required by the advisory committee.

Thesis Committee:

After the comprehensive exam, the thesis committee will be composed of the three advisors plus at least one additional faculty member who is not from the same home department as the primary advisor. All members of the thesis committee must have official Graduate Faculty status with PSU Graduate School. It is preferred that the fourth committee member be the same 'outside' faculty member who served on the student's comprehensive exam, although this is not mandatory. The thesis committee will also serve as the Doctoral defense committee. The final exam is an oral defense of the written thesis which is required prior to conferral of the Ph.D.

Post-Comprehensive Progress Reports:

Subsequent to the Comprehensive Examination, all BG students will be required to provide his/her Doctoral Committee with a yearly progress report to be delivered prior to the anniversary date of the comprehensive exam. The report is to consist of a 5 to 12 page summary of progress made during the last year and a prospectus of upcoming work. This report is to be discussed with the committee members, preferably by an annual meeting of the entire committee. Students must submit copies of their reports as well as a signature page documenting the fact that they have discussed the report with all members of their committee to the IBIOS graduate program office and BG option director(s) within three weeks of the anniversary date of their comprehensive exam.

Teaching Requirement:

A minimum of one semester of teaching is required of all BG students. It is preferred that students serve as a teaching assistant and enroll for credit in the required Supervised Experience in College Teaching course in the Fall and/or Spring semesters of their second year, if possible. An English competency requirement must be satisfied by non-native English speakers before any teaching duties are assigned. The Supervised Experience in College Teaching booklet lists the courses available and the teaching duties. Students are asked to prioritize their top three course selections from the booklet during the semester prior to each official assignment.

Internship (optional):

Students may spend up to one semester in an internship at a medical center, government laboratory or in an industrial environment. Non-traditional settings are also available. The IBIOS Graduate Program Office will provide assistance in securing a suitable internship. Typically students who wish to participate in an internship do so during the summer of their first year. Internships can be conducted later, with the agreement of their advisors,

but they must arrange for their own financial support. Students will register for one credit of IBIOS 595 while conducting the internship.

Thesis Requirement:

Submission of a written thesis and its defense before the thesis committee are the program's final requirements. The thesis must be approved in writing by the thesis committee and the option co-Director on that campus. Students must follow the thesis guidelines outlined by the Graduate School. The final approved thesis must be deposited with the Graduate School and the Huck Institutes of the Life Sciences in advance of graduation.

Bioinformatics and Genomics (BG) Curriculum

Year 1 - Fall Semester

- IBIOS 590. Huck Institutes' Colloquium (2)
- IBIOS 591. Ethics (1)
- IBIOS 551. Genomics (3)
- CSE 598F / STAT 598F. Bioinformatics I (3)
- STAT 597D / IBIOS 598E. Current Research in Statistical Genomics (1)
- IBIOS 596. Independent Studies, Lab Rotations (1)

Spring Semester

- IBIOS 590. Huck Institutes' Colloquium (2)
- IBIOS 596. Independent Studies, Lab Rotations (1)
- IBIOS 598E. Current Research in Statistical Genomics (1)
- BIOL 597A/CSE 598F/STAT 597A. Bioinformatics II (3)
- Elective (3)

Summer

- IBIOS 595. Internship (1) (optional)

Year 2 - Fall Semester

- IBIOS 600. Thesis Research (variable credits)
- IBIOS 602. Supervised Experience in College Teaching (1)
- BG Electives (0-6 credits)
- Candidacy Examination

Spring Semester

- IBIOS 600. Thesis Research (variable credits)
- BG Electives (optional; 0-6 credits)

Year 3

- IBIOS 600. Thesis Research (9)
- Comprehensive Examination

Years 4-5

- IBIOS 601. Thesis Preparation (0)

BG Elective Courses:

- BIOL 405. Molecular Evolution (3)
- BIOL 428. Population Genetics (3)
- BIOL 497D. Practical Bioinformatics (3)
- BIOL 497G/597G. Computer Programming in C: Biological Applications (3)
- BIOL 505. Statistical Methods in Evolutionary Genetics (3)
- BMMB 501. Core Concepts in Biomolecular Science (3)
- BMMB 597C. Computers for Biochemists and Molecular Biologists (3)
- CSE 598E/STAT597E. Data Mining I (Fall) and II (Spring) (3 each)
- IBIOS 593. Molecular Biology Lab (3)
- IBIOS 597C. Advanced Lab Techniques (1)
- IBIOS 597G/HORT 597A/AGRO 597G. Plant Genomics (3)

Chemical Biology Option (CB)

Course Requirements

Students in the Chemical Biology Option must take a minimum of four 3-credit graduate level or approved undergraduate courses in addition to the Ethics in the Life Sciences (1 credit) and Huck Institutes' Colloquium (4 credits). These courses may range from bio-inorganic, bio-organic, and biophysical chemistry to microbiology, molecular biology, and cell biology. The selection of courses is left to the student, mentor(s), and Doctoral Committee. The courses should build on background, fill in essential gaps in knowledge and prepare the student for thesis research. An option co-chair will provide guidance in course selection until a mentor(s) is chosen.

First Year Advisor

An option co-chair or a temporary advisor from the list of the Chemical Biology faculty will be appointed for each student upon entrance into the program. This advisor will serve as the primary program contact for the student if problems or questions arise.

Rotations and Reports

Students will choose three laboratories for rotations, in consultation with an option co-chair. The purpose of these rotations is to acquaint the student with several laboratories, their approach to scientific practices, and work habits. The rotations should help students determine in which laboratories they would prefer to work and mentors (or dual mentors) of interest, and will also introduce students to a variety of technologies and experimental approaches to science.

The duration of the rotations will depend on whether or not these rotations take place at the same time as formal course requirements are being met. For example, while courses are being taken, rotations will be approximately 5 weeks; during the summer, rotations can be for either 4 or 8 weeks. At the conclusion of each rotation, students will write a 5-10 page report (typed, double-spaced) on the purpose of the work performed, methods used, results obtained, conclusions drawn, and suggestions for further work in the area. Students may do additional rotations if they so desire. However, a mentor must be selected before the third semester in residence

Selection of Dual Mentors

On the basis of student and faculty preferences, students will be assigned either to two mentors whose complementary areas of expertise will offer novel, interdisciplinary opportunities for thesis research or to a primary mentor. In the latter case, it is very strongly recommended that a secondary mentor be appointed as soon as possible. The secondary mentor may change or a third mentor may be added as the thesis project evolves.

Teaching Requirement

A one-semester teaching requirement will be satisfied during the second year in residence. An English competency requirement must be satisfied by non-native English speakers before any teaching duties are assigned. The IBIOS Supervised Experience in College Teaching booklet lists the courses available and the teaching duties. Students are asked to prioritize their top three course selections prior to official assignment.

Candidacy Exam

The Candidacy Exam is uniquely designed for each student. The exam should be taken by the end of the student's third semester in the Integrative Biosciences Graduate Program. The student will be assigned a scientific paper from the Biochemical literature to read and analyze; the paper will be selected based upon the student's background and coursework. The analysis should involve exploring the relevant literature as well as the fundamental issues in chemistry, physics, biochemistry and biology. An oral exam will be scheduled 10 consecutive calendar days after the paper is assigned. The student should be able to integrate knowledge about chemical and biological aspects of the paper and understand and evaluate the experimental design, rationale, results, and the authors' interpretation of their work. The exam will be scheduled for approximately one hour; the student will present a 10-minute summary of the paper that will then be followed by a 50-minute discussion and question period with the committee. An Evaluation Committee consisting of three members of the Chemical Biology Option faculty will administer the exam; the faculty mentor(s) may attend but will not participate in the

examination. The Research and Training Committee (as appointed by the Option Chair) of the Chemical Biology Option will appoint the Evaluation Committee members. The charge of the latter Committee will be to evaluate the student's performance. In the event that the student does not pass this exam, the Evaluation Committee will make a recommendation as to whether to offer another opportunity or to terminate the student's tenure in the program.

Doctoral Committee

Upon successful completion of the Candidacy Examination, the student in consultation with the mentors will, as soon as possible, select a Doctoral Committee. The committee will consist of the mentor (or both mentors if two have been chosen), two additional members of the Chemical Biology Option and one IBIOS faculty member who is not a member of the Chemical Biology option. This committee is responsible for supervising the academic program and monitoring the progress of the student towards his/her degree.

First-Year Meeting with Doctoral Committee

The student is required to meet with his/her Doctoral Committee by the end of the first year in residence if the Candidacy Examination has been passed and a Doctoral Committee has been chosen. If a Doctoral Committee has not yet been chosen, the Research and Training Committee of the Chemical Biology option will meet with the student. The student should be prepared to discuss his/her accomplishments as well as plans for the next year. Topics to be discussed include courses, seminars, the comprehensive examination and the thesis research.

Seminar Requirements

Students enrolled in the Chemical Biology option of IBIOS are required to present two seminars.

The first seminar must be given prior to taking the oral comprehensive exam and during the first two years in residence. This seminar is to be given in an appropriate seminar series on a topic not closely tied to research being done within the Chemical Biology option. A written report on the subject of the seminar must also be prepared as a part of the overall requirement. The text of this report will be limited to no less than nine and no more than twelve double spaced pages in length. The student will be formally evaluated on both the seminar and written report by three members of the student's Doctoral Committee faculty. If one or more of the Doctoral Committee is unable to attend the seminar another member of the Option can serve as a substitute. Written reports are due to the graders one week prior to the seminar date. The committee members will read and make comments on the report, assign a preliminary grade, and return it to the student at the seminar. Students will then have one week from the date of the seminar to revise the written report and resubmit it to the committee for final grading. This seminar will be scheduled in the Biological Chemistry seminar program on the University Park campus and the departmental seminar program on the Hershey campus.

The second seminar will be presented as a public defense of their thesis.

IBIOS Fellows are also expected to attend seminars in their areas of specialization in addition to continuing their participation with the Colloquium throughout their graduate career.

Internship (optional)

Typically after the second year in residence, students can spend a summer in an internship at a medical center, government laboratory or in an industrial environment. The time frame for the internship is negotiable with the Research and Training Committee. Non-traditional settings are available.

Comprehensive Examination

The purpose of the Comprehensive Examination is to assess the student's ability to design and interpret experiments, and the breadth and depth of knowledge related to Chemical Biology. This exam should normally be taken by the end of the second summer, but must be taken prior to completion of the fifth semester. For the examination, the student will prepare an NIH-type postdoctoral research proposal on a topic related to the thesis

research. This proposal will be the basis of an oral exam administered by the student's Doctoral Committee. The student should be prepared to discuss the background, significance, experimental design, feasibility, and potential impact of the proposed work.

Post-Comprehensive Progress Reports

Subsequent to the Comprehensive Examination, all Chemical Biology students in the IBIOS program are required to provide his/her Doctoral Committee with a yearly progress report to be delivered prior to the anniversary date of the comprehensive exam. The report is to consist of a (maximum 12 page) summary of progress made during the last year and a prospectus of upcoming work. This report is to be discussed with the committee members either on an individual basis or, if the student so desires, by a meeting of the entire committee. Students must submit copies of their reports as well as a signature page documenting the fact that they have discussed the report with all members of their committee to the IBIOS graduate program office within three weeks of the anniversary date of their comprehensive exam.

Thesis Requirement

Submission of a written thesis, a public presentation of the thesis, and its defense before the Doctoral Committee are the final program requirements. Students must follow the thesis guidelines outlined by the Graduate School.

Chemical Biology (CB) Curriculum

Year 1 - Fall Semester

- IBIOS 590. Huck Institutes' Colloquium (2)
- IBIOS 596. Independent Studies: Laboratory Rotations (2)
- Graduate level course in biochemistry or molecular biology (3)
- Chemical Biology elective (3)
- Fulfill prerequisites by taking appropriate courses.

Spring Semester

- IBIOS 590. Huck Institutes' Colloquium (2)
- IBIOS 596. Independent Studies. Laboratory Rotations (1) or IBIOS 600. Thesis research (1)
- Graduate level course in biochemistry or molecular biology (3)
- Chemical Biology elective (3)
- Candidacy Examination (or by early fall semester)

Year 2 - Fall Semester

- IBIOS 591. Ethics in the Life Sciences (1)
- IBIOS 600. Thesis research (variable credits)
- IBIOS 602. Supervised Experience in College Teaching (optional) (1)
- Elective or other supporting course (3) (optional)

Spring Semester

- IBIOS 600. Thesis research (variable credits)
- Student Seminar
- Elective or other supporting courses (3) (optional)

Summer Session

- IBIOS 595. Internship (optional) (1) or IBIOS 600. Thesis Research (1)
- Comprehensive Examination

Years 3-5

IBIOS 601. Thesis Preparation (0)

General Information

Courses available for all Huck Institutes' Graduate Programs

IBIOS 590. HUCK INSTITUTES' COLLOQUIUM (2) Students typically take this course in the Fall and Spring semesters of their first year. In Colloquium, students are introduced to a wide variety of topics of contemporary and future importance in the life sciences. A particular focus is placed on topics where science is likely to impact on society (and society on science). Topics are drawn from the area introduced by the speaker and can span the entire spectrum from basic research to the social, legal, moral and ethical implications of the science. A significant challenge in Colloquium is to organize and coordinate a presentation using contemporary presentation software, such as PowerPoint, in an environment in which part of the audience is present at a remote site. Students are required to attend the lectures and the dinners following the lectures. Students also participate in the group presentations during discussion sessions and submit written reports. Reports may be submitted to the co-chairs of the graduate program/option who may add them to the student's permanent record. Students receive A-F quality grades.

IBIOS 591. ETHICS IN THE LIFE SCIENCES (1) Students examine integrity and misconduct in life sciences research, including issues of data collection, publication, authorship, and peer review. Students receive A-F quality grades.

IBIOS 595. INTERNSHIP (1, optional) For students interested in exploring academic, government, medical, law, or business corporate approaches to research. This is an external work assignment relevant to individual research or career goals. Students receive a R (satisfactory/passing) or U (unsatisfactory/failing). Only R credits are counted for credit totals. Students typically participate in an internship the summer of their first year. Contacts, positions, applications, course registration, course requirements, and grading are processed through the Eberly College of Science Cooperative Education Program (814-865-5000). Additional credits of IBIOS 595 are at the expense of the student. Interested Huck Institutes' graduate students are to discuss the opportunity with their graduate program/option chair and/or their faculty advisor to help determine the best timing for this experience.

IBIOS 596. INDEPENDENT STUDIES: LABORATORY ROTATIONS (1-3 per semester pending graduate program) For students exploring potential Ph.D. projects and faculty advisors. Students receive a R (satisfactory/passing) or F (unsatisfactory/failing). Only R credits are counted for credit totals.

IBIOS 600. THESIS RESEARCH (1-9 per semester pending graduate program) For students who have been matched with a faculty advisor AND have not taken/passed their comprehensive exams. Students may receive A-F grades or R/F grades at any time. By the time students passes their comprehensive exams, up to 12 credits worth of IBIOS 600 may have the A-F quality grade.

IBIOS 601. THESIS PREPARATION (0 per semester) For those students who passed their comprehensive exams. This course appears on the transcript but does not have any grade or credit associated with it.

IBIOS 602. SUPERVISED EXPERIENCE IN COLLEGE TEACHING (1) Students receive either a lecture, lab, or recitation class to help teach. Students also participate in the Huck Institutes teaching assistant training sessions and receive A-F grades on their transcripts from their faculty course supervisors. Please note that these grades are not computed in with the overall GPA. International graduate students must pass an English proficiency exam before any teaching duties are assigned.

English Requirement for International Students

The English Requirement for International students is that prescribed by the Graduate School. Depending on the graduate program, all entering international students, whether or not they hold a Teaching Assistantship, will be required to take a Test of Spoken English (TSE) which is administered by the University's Center for English as a Second Language (ESL).

Given at the beginning of fall and spring semesters, international students are required to pre-register for the TSE. The test scores from the TSE are posted on the University's Administrative Information System (AIS) computer. Below is the course of action for the various TSE score ranges.

- > 250 approved for teaching and the ESL requirement will be satisfied.

- 230-249 required to schedule and pass ESL 118G.

- 200-229 required to pass ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

- <200 required to schedule and pass with the grade of A ESL 115G, before ESL 117G*. These students will not be permitted to teach in a classroom situation, and may instead be assigned to grading and/or proctoring duties.

* At the end of this course, students are re-tested. Based upon these test results, students are either approved for teaching, placed in a subsequent ESL course, or asked to retake the course.

Students, who are required to enroll in ESL courses, must complete the ESL requirement by the end of the second semester of residency. Students who fail to satisfy this requirement may be terminated from the respective graduate program, at the discretion of the graduate program chair.

Safety Training Sessions / Examinations

Within the first semester of residence, all students are required to take/pass the radioisotope safety and chemical waste disposal training sessions offered at the respective campus.

Grade Point Average

Credit hours are earned only for the grades A, B, and C. However, all A and F grades are included in the computation of the grade point average. Grade points are assigned as follows:

- A = 4 (above average graduate work)
- B = 3 (average graduate work)
- C = 2 (below average graduate work)
- D = 1 (failing graduate work)
- F = 0 (failing graduate work)

Grades D and F are not acceptable for graduate credit. If a course is repeated, then both grades are used in computing the cumulative grade point average.

Unsatisfactory Scholarship

Students are required to have a minimum grade-point average of 3.0 for the doctoral candidacy examination, admission to the comprehensive examination, thesis defense, and graduation. One or more failing grades, a cumulative grade-point average below 3.0, or failing any of the examinations may be considered evidence of

unsatisfactory scholarship and be grounds for dismissal from the University (see the Appendix III of the Graduate Programs Bulletin [www.psu.edu/bulletins/whitebook/\\$appendices.htm](http://www.psu.edu/bulletins/whitebook/$appendices.htm)).

Assistantships and Student Status

Students with teaching or research graduate assistantships must be registered as full time students to maintain stipend eligibility. Full time status is considered either a minimum of nine credits each fall and spring semester (pre-comprehensive exam) or XXX 601 (0 credits, post-comprehensive exam). The assistantship appointments typically originate with the department of the faculty advisor. If no faculty advisor has been identified, as likely the situation with first year doctoral students, students should consult with their respective graduate program Chair.

Thesis Submission and Exit Interview

Upon completion of the degree, students are to provide the Graduate Program with a paper copy of their thesis. Students also participate in both the University and Huck Institutes' Exit Interview Process. For the latter, students may meet with the Graduate Program Chair or appropriate representative.

Activate Intent to Graduate

Students must present their thesis in accordance with the Penn State University guidelines as described in the THESIS GUIDE Requirements for the Preparation of Master's and Doctoral Theses". Current copies can be obtained from the Thesis Office:

115 Kern Building
University Park, PA 16802
Phone: 814/865-5448

Web site: http://www.gradsch.psu.edu/gs_overview/thesisguide

At the beginning of the semester that students wish to graduate, they are to either:

- (1) access eLion via www.eLion.psu.edu, if in the PSU computer system
- or
- (2) call Graduate Enrollment at 1-814-865-1795, if not in the PSU computer system

Internships (optional)

As members of the Huck Institutes of the Life Sciences, all graduate students may participate in a three month internship in academia, industry, or government and receive credit on their transcript by enrolling in IBIOS 595 (1). Non-traditional settings are also available. Students interested in this opportunity should initiate discussion early on with their advisor and graduate program chair to help determine the best timing for this experience (typically the first or second summer).

Teaching

Depending on the graduate program, teaching experience may be required or optional.

For a teaching experience beyond a departmental funding means or as a requirement, the Huck Institutes of the Life Sciences Supervised Experience in College Teaching Booklet lists courses available and corresponding teaching responsibilities at the respective campuses. Besides an opportunity to develop teaching skills in a classroom setting, students also participate in the Huck Institutes teaching assistant training sessions and receive credit on their transcript by signing up for IBIOS 602 (1). Students interested in this opportunity should initiate discussion early on with their advisor and graduate program chair to help determine the best timing for this experience.

Doctoral Thesis Committee Composition

According to the Graduate Degree Programs Bulletin published by the Graduate School regarding Doctoral Committees: ([http://www.psu.edu/bulletins/whitebook/\\$gradreqs.htm](http://www.psu.edu/bulletins/whitebook/$gradreqs.htm))

- 4 person minimum of approved PSU Graduate Faculty.
- 2 members must be inside the major and 1 member must be outside the major. Note - the outside member must be member of the approved PSU Graduate Faculty. The outside member for intercollege graduate programs may be inside the major but committee membership must have representation from more than one department. The outside member may not be a co-funded faculty from the same department, have budgetary ties, or conflict of interest (aka co-author paper) with any of the other committee members.
- A person not affiliated with PSU may be added as a special member (beyond the 4 members of the approved PSU Graduate Faculty) upon recommendation of the head of the program and approval of the graduate dean. A memo plus the individual's C.V. must be drafted with approval signature spaces for the Graduate Program Chair plus Ms. Cynthia Nicosia (Director, Graduate Enrollment).
- Have committee chair or one of the co-chairs be a member of the approved PSU Graduate Faculty. Typically this is the faculty advisor or someone in the graduate program.
- The doctoral candidate and three committee members must be physically present for the comprehensive exam and defense. No more than one person may be present via telephone. Telephone or video conference arrangements must be approved by the Dean of the Graduate School. A form letter is available for this special request.
- Need approval of 2/3 of the committee members for passing comprehensive exam and defense dissertation.
- **Need to submit paperwork 3-4 weeks prior to your scheduled comprehensive exam and defense. Please contact the appropriate staff member:**
 - Hershey:**
 - Lori Coover (Neuroscience)** H179 Hershey Medical Center; 717-531-1045; ljc11@psu.edu
 - Kathy Shuey (Genetics, IBIOS, IM, MM, MT)** H133 HMC; 717-531-8982; kes6@psu.edu
 - Beth Ditzler (Physiology)** H166 HMC; 717-531-0221; bat4@psu.edu
 - University Park:**
 - Huaru Yan (Genetics)** 202 Life Sciences Bldg.; 814-865-3076; huy2@psu.edu
 - Mary Hudson (Ecology)** 101 Life Sciences Bldg.; 814-867-0371; meh25@psu.edu
 - Janice Kennedy (CDB, IBIOS, IM, MM, MT)** 101 Life Sciences Bldg.; 814-865-3155; jkk5@psu.edu
 - Deb Murray (Plant Biology, Physiology)** 101 Life Sciences Bldg.; 814-865-8165; dkm9@psu.edu
- Please note- Graduate Programs may have additional committee composition criteria.

Masters (M.S.) Degree

Masters students must have a minimum of 30 credits and a 3.0 overall GPA (see Graduate Degree Programs Bulletin ([http://www.psu.edu/bulletins/whitebook/\\$gradreqs.htm](http://www.psu.edu/bulletins/whitebook/$gradreqs.htm)))

If pursuing a masters thesis option, up to 6 XXX 600 credits may be A-F graded and 12 credits need to be in the major at the 400-600 level (excluding XXX 600). The students select a thesis committee (upon consultation with faculty advisor), write a thesis, and defend their work.

If a Graduate Program offers a non-thesis option, graduate students should consult with their chair for details. 18 credits need to be in the major at the 500-600 level.

If pursuing a masters non-thesis option, the student must have a first authored manuscript (based on his/her research) that has been either accepted and/or published in a peer reviewed journal. 18 credits need to be in the major at the 500-600 level. The manuscript is given to at least the faculty advisor and the Option Chair for evaluation.

IBIOS 595 (Internship) and IBIOS 596 (Rotations) credits all count toward the 30 credits. However, any IBIOS 602 (Teaching) credits do not count toward the 30 credits. If all course credits and requirements are met, students do not have to be registered for classes while writing and/or defending their work.

Activate Intent to Graduate

At the beginning of the semester that a student wishes to graduate

- . if in PSU's computer system: access e-Lion at www.elion.psu.edu
- if not: call 1-814-865-1795 to reach Graduate Enrollment

This publication is available in alternative media on request.

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