

# PhD in BIOPHYSICS, ACADEMIC REQUIREMENTS, 2012-2013

## Special Committee

Graduate students in Biophysics follow the guidelines of the Cornell Graduate School (see Graduate Bulletin) with respect to residency, composition of Special Committee, examinations, and thesis requirements: A student entering the program will select a **Special Committee consisting of a chairperson in the Field of Biophysics, a second faculty member representing the Field, and a faculty member representing an appropriate minor subject area.** It will be the responsibility of the Special Committee to (i) develop a coursework program appropriate for the student's needs, (ii) monitor the general progress of the student, and (iii) ensure that the program is successfully completed. It will be the responsibility of the chairperson of the Special Committee to counsel the student on a day-to-day basis.

In addition to the regular members of the Special Committee, an additional Field appointed member is assigned by the Director of Graduate Studies. This member will attend the A-Exam and will ensure that Field requirements are being satisfied, but will not serve on subsequent committees.

The Chair of the Special Committee is expected to have detailed knowledge of the research project to be carried out by the student. We recommend that an orientation meeting be held as soon as the Special Committee is established to ensure a working relationship between student and committee, to establish expectations for the performance of the student, and to define any specific requirements for completion of the degree. The Committee will meet at least once per year thereafter, and send a report concerning the meeting to the Director of Graduate Studies of the Field.

In general, the Special Committee is chosen during the summer after the first academic year, when rotations have been completed. Prior to that time, the DGS for Biophysics serves as the temporary Special Committee Chair, mainly to advise the student about courses and rotations.

## Requirements

### 1. Courses

**The Field of Biophysics, in accordance with general Cornell Graduate School practice, does not have specific course requirements.** However, students will be expected to achieve a broad interdisciplinary knowledge of fundamental principles in both biological and physical sciences. **Specific course selections will be tailored to the needs of the individual student by his/her Special Committee** so that students attain multidisciplinary competence encompassing five subject areas (see Table A). For convenience, levels of knowledge to be achieved are specified in terms of standard Cornell courses, but the pathway by which

individual students achieve the specified levels is not limited to these courses; some components will have been learned in previous undergraduate study. **In addition, all students will be expected to (1) attend the weekly 4PM Wednesday Biophysics seminars; and (2) attend the all-day seminar September 15, 2012 “Frontiers in Biophysics”.**

**Biophysics covers a very wide range of areas; it is not considered realistic or desirable to attempt to train students in all of these facets. Thesis research should be the most important element of the student’s program.** Thus, coursework will be selected in consultation with the Special Committee to meet the student’s needs, interests, and future plans. For example, a student involved in laser studies of proteins in biological membranes would require a strong background in quantum physics, instrumentation, chemistry, and biomembranes, while a student working in computational modeling of protein motions would need a strong background in statistical physics, computational science and chemistry.

Minors for doctoral students may be selected from a variety of Programs including Applied Physics, Biochemistry, Biomedical Engineering, Chemical Engineering, Computational Biology, Genomics, Mathematics, Physical Chemistry, and Physics and other possibilities. A minor is required.

## **2. A-Examination**

**The student will prepare a Thesis Proposal describing the background and motivation for the proposed thesis research, work accomplished so far, and an outline of the proposed research plan.** The scope of the proposal should be arranged with the thesis adviser 10-15 double-spaced pages is suggested, and much longer proposal is generally not in the best interests of the student. The proposal should be given to each member of the Committee (**and also the Field appointed member**) at least one week prior to the exam. The exam will consist of an oral presentation elaborating the thesis proposal, followed (or interrupted!) by oral examination covering, but not limited to, the student’s understanding of material related to the research topic, the student’s general background in the Areas of Required Competence (Table A), and the student’s research proposal. The Committee will review the student’s academic record and examine any potential weak areas to determine if additional course-work is required. The minor advisor may specify additional exam components as required for the minor. Students should feel free to chat with the DGS in advance about any aspect of the A-exam.

The A-exam should be taken at the end of the second year if possible, or before the start of the seventh semester at the latest. The chairperson of the Special Committee should prepare and send to the DGS a short report describing the exam results including:

- Courses or other criteria used to satisfy academic course requirements
- Evaluation of research progress and potential
- Evaluation of student competency based on the oral exam

Satisfaction of requirements for the minor will be assessed by the minor field member at the A-exam. Note that the field does not normally award a Special Masters for completion of the A-exam. (This degree can be offered if a student is not progressing to the Ph.D.; see below).

### 3. B-Examination

This exam is the thesis defense. The completed dissertation should be submitted to the committee at least 1 week before the examination. The exam will begin with a public seminar describing the thesis research. This will be followed by a closed oral examination covering the dissertation.

### 4. Assessment

New rules from the Graduate School require rather frequent assessment of each graduate student. This assessment has no consequences whatsoever for the student, as far as anyone knows (!). The process will be discussed at the first meeting of the year with the DGS, which will take place on August 21, 2012.

### 5. Additional seminar presentations

**In addition to the required comprehensive and thesis exams, each student will be expected to present at least three half-hour summer seminars.** The first will be presented in the Summer following the second year. These seminars are immensely valuable practice in “public” presentation of research, so students are encouraged to participate even in their later years.

## Areas of Required Competence

**Advanced Mathematics:** One semester of mathematics beyond 4 semesters at the elementary undergraduate level is required, two semesters recommended. For a 1-semester course, CHEM 7870 is recommended. Appropriate 2-semester sequences are: (AEP 4210 and AEP 4220), (TAM 3100 or TAM 6100 and TAM 6110).

**Physical Chemistry:** One course in statistical mechanics and thermodynamics (PHYS 6562 or PHYS 7653 or CHEM 7950 or CHEM 7960) **and** one course in quantum mechanics (CHEM 3890 or CHEM 7930 or PHYS 4443 or PHYS 6572).

**Biochemistry, Molecular and Cell Biology:** If you have not had basic biochemistry, take BIOMG 3300, or BIOMG 3310 plus BIOMG 3320). To meet the Field requirement: cell biology BIOMG 4320 or 6360 or 4370, or biochem lab BIOMG 4400, or BIOMG 6310 or 6390, with at least a total of five credits at the 400 level or higher.

**Computer Literacy or Laboratory Electronics and Instrumentation:** In lieu of undergraduate experience, computer experience may be gained through either appropriate courses or research experience. Expertise in instrumentation electronics, if not previously acquired, is available through PHYS 3360 or AEP 3630.

**Advanced Studies in Molecular Biophysics and Associated Areas of Biological and Physical Science:** At least three credits are required. This is typically a graduate course in the area of your thesis work.

**Ethics:** A course in scientific ethics is required of all students. See the DGS for details.

Students should freely consult with the DGS and/or with members of their Special Committee regarding appropriate courses.

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Note: Courses that are taken to satisfy requirements should be taken for a letter grade. A minimum of B is expected. One required course, and only one, may be taken Pass/Fail.