



Molecular Medicine Graduate Program

Degree Requirements Booklet

Fall 2009

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Molecular Medicine (MM)

Course Requirements

The recommended curriculum for first year students located at the College of Medicine in Hershey includes the Huck Institutes' Colloquium and core courses in Regulation of Cellular and Systemic Energy Metabolism, Cell and Systems, Cell and Systems Biology, and Flow of Cellular Information. Students must also select from a series of advanced courses in the second year in addition to a Problem-Based Learning Course in Molecular Medicine and Ethics in Life Sciences. In addition, students are required to participate in the Cell and Molecular Biology Research Seminar Series and the Graduate Student Seminar Series in the Biomedical Sciences. The recommended curriculum for first year students located at the University Park campus includes the Huck Institutes' Colloquium and courses in Biochemistry, Molecular Biology, Immunology and Molecular Medicine. Students must also select from a series of advanced courses in the second year in addition to Ethics in Life Sciences. First year students at both campuses participate in the Faculty Research Presentation Seminars and in three laboratory rotations. Students at the University Park Campus are also required to participate in the Bortree Lecture Seminar Series and the Joint CDB/Genetics/IID/MM Friday Research Series. The Co-Chair on the campus of residence will assist the student in course selection until a mentor is chosen.

Responsible Conduct of Research Training Requirement: NEW for Fall 2009

Starting in Fall 2009, all new students in the Molecular Medicine graduate program will be required to complete the online CITI (Collaborative Institutional Training Initiative) Biomedical Science Responsible Conduct of Research (RCR) training course during their first year. This online course will supplement in-class, discussion-based RCR training provided in IBIOS 591, Ethics in the Life Sciences, a 1-credit required course taken during the second year.

First year students should register at the CITI website

(<http://www.citiprogram.org/>) (select Pennsylvania State University as the participating institution) and begin the online Biomedical Science RCR course as soon as possible in the Fall semester. Students must work on their own to complete the modules and pass the on-line quizzes. All modules must be completed before the end of the first Spring semester; and a copy of the student's Completion Report must be submitted to the Program administrative office by June 15th.

Rotations/Selection of Mentors

All MM students are required to complete three to four laboratory research rotations in the first year. At the UP campus, three rotations will be chosen by the student based on their interactions with the faculty and an investigation of their research programs. All research rotations (5 weeks each) at the UP campus will be completed in the fall semester. Students at the Hershey campus will carry out two research rotations in the fall semester (for approximately 5 weeks) and two rotations in the spring semester (for approximately 5 weeks each). The fourth rotation can be a repeat of one of the first three. These research rotations will be selected based on the faculty presentations at the beginning of the fall semester. Optional research rotations on the alternate campus can be completed during the Spring or Summer semesters. Each student will select a primary mentor and establish a doctoral thesis committee. To encourage inter-campus interactions, both participating campuses should be represented on the committee. The selection of a mentor will usually require the student to complete advanced course work at that location.

Candidacy Exam

After completion of the first year curriculum, students must pass the candidacy examination, which includes both a written and oral component. A minimum GPA of 3.0 in the first year curriculum is required to take the examination. Students are also required to demonstrate high-level competence in the use of the English language, including reading, writing, and speaking as part of the Penn State English competency requirements. Students at the Hershey and UP campus will be asked to critique a recent paper that has been chosen by the candidacy committee. The student will present the critique in an oral exam before a committee of four faculty members. The presentation will include a critique of the methods and conclusions of the paper and a proposal for future experiments based on the results presented in the paper. Requirements remaining to be satisfied after admission to candidacy include advanced course work, the comprehensive examination, completion of a thesis research project, and the dissertation defense. Students must also regularly attend a journal club, student seminars and faculty research seminars as outlined in the option curriculum.

Comprehensive Exam

The doctoral committee is responsible for administration of the comprehensive examination and conducts the dissertation defense. The comprehensive examination will be completed by the beginning of the third year. The exam at the Hershey campus involves formulation of two research topics with associated specific aims. The student, in conjunction with the doctoral committee, will select one topic for expansion into a research grant application. After review of the written proposal by the committee, the student will present and defend the proposal in an oral examination. At the UP campus, students will present their thesis project to the doctoral committee and defend the proposal in an oral examination.

Teaching (optional)

With permission of the advisor teaching experience is available on both campuses. An English competency requirement must be satisfied by non-native English speakers before any teaching duties are assigned. 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.

Internship (optional)

After the second year, students may spend a summer exploring academic, government, medical, law, or business corporate approaches to research. Non-traditional settings are available. This is an external work assignment relevant to individual research or career goals. 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). 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.

Thesis

The dissertation is guided by the rules of the Graduate School and will involve the preparation of a final thesis document and its defense in a public presentation and oral exam with the doctoral committee.

Molecular Medicine (MM) Curriculum

Year 1

College of Medicine (Hershey)

- BMS 501. Regulation of Cellular and Systemic Energy Metabolism (3)
- BMS 502. Cell and Systems Biology (3)
- BMS 503. Flow of Cellular Information (3)
- IBIOS 590. Huck Institutes' Colloquium (2 credits per semester)
- IBIOS 596. Independent Studies: Laboratory Rotations (3)
- Elective courses (2nd Semester) (5)
- Attendance at weekly student seminar
- Attendance at weekly seminars (invited outside speakers)
- Completion of the Ph.D. Candidacy Examination
- Register for CITI on-line RCR course (see p. 3)

University Park Campus

- BMB 464. Molecular Medicine (3) or VBSC 520. Pathobiology (3).
- BMMB 501. Biochemistry & Molecular Biology (5)
- IBIOS/VBSC/BMB 511. Molecular Immunology (2)
- IBIOS 590. Huck Institutes' Colloquium (2 credits per semester)
- IBIOS 596. Independent Studies: 3 Laboratory Rotations (1)
- IBIOS 597K. Contemporary Concepts in Molecular Medicine (1)
- IBIOS 600. Thesis Research (2)
- Advanced Course Electives (3)
- Completion of the Ph.D. Candidacy Examination
- Submit CITI RCR Course Completion Report to Program Office

Summer Session (*Both Campuses*)

- IBIOS 595 Internship (1) (optional) or Laboratory Rotations at other campus

Year 2 (Both Campuses) Fall/Spring Semesters

- IBIOS 591. Ethics in the Life Sciences (1)
- IBIOS 590. Colloquium (0/semester)
- CMBIO 506: Biological Basis of Human Health & Disease (Hershey) (2)
- IBIOS 600 Thesis Research (2-7/semester)
- Advanced Course Electives (0-5)
- Participation in Teaching and Seminar Series as available at each campus.

Summer Session

- IBIOS 600. Thesis Research (1)
- Comprehensive Examination

Years 3-5 (Both Campuses)

- IBIOS 601. Independent Studies/Thesis Preparation (variable credits)
- Participation in Teaching and Seminar Series as available at each campus.

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 pass 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 D 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

Vacation and Sick Leave Policy

Full-time graduate students in the Molecular Medicine Intercollege Graduate Degree Program (IGDP) who receive stipends must get permission for all absences from the laboratory. Vacation leave should be arranged with the appropriate Molecular Medicine Graduate Program co-Chair (1st year students) or thesis advisor (2nd year and above students). Please consult with your thesis advisor for policies in place that restrict and or regulate both vacation and/or sick leave within the individual research laboratories. Students should formalize their vacation dates in writing at least two (2) months in advance and, to alleviate any possible confusion, vacation requests should be made in writing. The appropriate Molecular Medicine Graduate Program co-Chair or the student's thesis advisor will agree or disallow the vacation request in writing within 72 hours of its submission. All other reasons for leave (i.e. sickness, maternity/paternity leave, illness of a family member etc.) also require approval from either the Graduate Program Chair (1st year) or thesis advisor (2nd year and above students). It is the student's responsibility to contact their thesis advisor or IGDP Chair when he/she is absent from the classroom or laboratory due to illness.

RESTRICTIONS: No vacations or other foreseeable leaves (maternity/paternity leave) can be taken unless approved in advance. Approval should be granted unless the leave is believed to seriously compromise the academic progress of the student; in such cases the disapproval must be confirmed by the appropriate Molecular Medicine Graduate Program co-Chair. Students will not be routinely granted vacation leave while enrolled in formal class work.

Pre-Doctoral Research Fellowship Incentive Award

Purpose:

This incentive program is designed to catalyze the development and successful submission of competitive applications to external doctoral research fellowship programs. The Graduate School will offer an incentive award to select graduate students who successfully complete and submit a competitive external fellowship application. The award will be 2.4 percent (rounded to the nearest \$50) of the annual fellowship amount. The minimum total fellowship amount must be \geq \$10,500 per year to qualify, while the maximum incentive award is \$1,000. One incentive award may be distributed per student.

Eligibility:

To be eligible for an incentive award, a student must:

1. be a full-time Ph.D. student applying for a pre-doctoral fellowship that is comparable in prestige and competitive nature to the NSF Graduate Research Fellowship and similar programs (e.g., EPA Star), and that awards a minimum fellowship stipend of \$10,500 per year (To confirm eligibility of a program, contact the Director, Office of Graduate Fellowships and Awards Administration.);
2. exhibit exemplary academic achievement and accomplishments commensurate with those qualities that would position a student to be competitive (i.e., quality indicators similar to the University Graduate Fellowship awardees, in addition to strength of the pre-doctoral fellowship application);
3. have a defined area of research interest and the support of a graduate faculty mentor who will work with him/her to develop the fellowship application, including the research project plan;
4. be willing to adhere to the necessary production schedule and meet submission deadlines for the respective sponsor.

Application Procedures:

1. **Prior** to submitting a proposal for a fellowship to the respective external sponsor, the Graduate School must be notified of the student's intent. This notice must be submitted by the sponsoring faculty member with the following:

- a completed "Intent to Submit" form that includes the signature of the sponsoring graduate faculty member;
- a statement that clearly identifies the timeline for submission.
- a summary of the pre-doctoral fellowship provisions from official program materials (i.e., advertisement for the award or description from Web site).

2. Once a completed proposal has been submitted to the funding source, the sponsoring graduate faculty member must submit the following:

- "Submission Completed" form with signatures of the faculty sponsor, the program graduate officer, and the associate dean for graduate studies of the college;
- copy of the confirmation of proposal submission from agency/foundation. Student must notify the Office of Graduate Fellowships and Awards Administration of the outcome of their proposal submission.

Deadline for Applications:

Rolling submission on a first-come, first-served basis as long as incentive funds are available during a given fiscal year. Completed nominations should be forwarded to the Office of Graduate Fellowships and Awards Administration, 313 Kern Graduate Building, University Park, PA 16802.

**This information can be found at www.gradsch.psu.edu/fellowships
Click on Funding Programs, Pre-Doctoral/NSF fellowship Incentive, nomination form**

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
 - Lisa Harman (Physiology)** H166 HMC; 717-531-8566; lsb10@psu.edu
 - University Park:**
 - Huaru Yan (Genetics)** 202 Life Sciences Bldg.; 814-865-3076; huy2@psu.edu
 - Jean Pierce (Ecology)** 101 Life Sciences Bldg.; 814-867-0371; jep32@psu.edu
 - Janice Kennedy (CDB, IBIOS, IM, MM, MT, NEURS)** 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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