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Neuroscience (NEURS)

Campus Location
The curriculum of the Neuroscience Intercollege Graduate Degree Program is provided to students registered either at the University Park (UP) or the Hershey Medical Center (HMC) campus. Information on Neuroscience faculty members, their research projects and their campus location can be found at http://www.huck.psu.edu/education/neuroscience/faculty-and-research.

Advisors
Faculty Advisor
The Co-Director on each campus serves as the faculty advisor for students entering the program. Each Director is available for specific questions about the program and for more general discussions of a student's progress. The Director also signs course registration forms during the first year. After a student has selected a thesis advisor, that faculty member will assume these responsibilities.

Thesis Advisor
Students are expected to choose their thesis advisor and permanent laboratory home by the end of the first academic year. A student may choose any member of the Neuroscience Graduate faculty, provided that the faculty member is willing to accept the student and that there are space and resources available to the student. Usually, the student will have rotated with this faculty member and is familiar with the laboratory and research program.

Academic Requirements
Courses
The coursework in the Neuroscience Graduate Program consists of required courses and electives. The following table lists all the required courses that the students need to take during the first two years (numbers in parentheses indicate the credit hours). In addition to the required courses, students also need to take a minimum of three (3) credits of elective courses (referred to as Selectives on the HMC Campus) during the first two years. Elective courses at the UP campus include any 400 and 500 level courses pending approval by the Advisor and the Co-Director. Available elective courses vary from year to year (see Appendix 1 and Appendix 2 on Pages 12-13 for some examples). Students at UP are strongly encouraged, though not required to do lab rotations in the Fall semester of the first year (see details under Lab Rotations). Students are also encouraged to take statistics (e.g., STAT 600 or 601) relevant to their disciplinary research, the specific choice of which can be discussed between the students and their advisors. Ph.D. students may take no more than 12 graded credits (A-F) of IBIOS 600 Thesis Research, and Master-level students may take no more than 6 such graded credits. Statistics is a required course on the HMC.

<table>
<thead>
<tr>
<th>University Park Campus</th>
<th>Hershey Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1 Fall:</strong></td>
<td><strong>Year 1 Fall</strong></td>
</tr>
<tr>
<td>NEURO 512 Comparative Neuroanatomy (4)</td>
<td>NEURO 597. Neurochemistry (3)</td>
</tr>
<tr>
<td>NEURO 597A Seminars in Neuroscience (2)</td>
<td>PHSIO 503. Cellular Physiology (1)</td>
</tr>
<tr>
<td>Register for CITI on-line RCR course</td>
<td>NEURO 530. Professional Development (1)</td>
</tr>
<tr>
<td>Submit CITI RCR Course Completion Report to Program Office</td>
<td>BMS 501 Reg of Cell and Systemic Energy Metabolism</td>
</tr>
<tr>
<td>NEURO 596. Laboratory Rotations (1-3)</td>
<td>BMS 502 Cell and Systems Biol</td>
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</tr>
<tr>
<td>Electives (see Appendices 1 and 2)</td>
<td>NEURO 596. Laboratory Rotations (2) (1/ea)</td>
</tr>
<tr>
<td></td>
<td>Register for on-line RCR course</td>
</tr>
<tr>
<td></td>
<td>Submit CITI RCR Course Completion Report to Program Office</td>
</tr>
</tbody>
</table>

**Year 1 Spring:**

| BIOL 470. Functional and Integrative Neurosci. (3) | NEURO 521. Systems Neuroscience (3) |
| NEURO 501 Seminars in Neuroscience (2) | NEURO 511. Human Neurobiology (3) |
| BIOL 426 Developmental Neurobiology | IBIOS NEURO 596. Laboratory Rotation (1) |
| Electives (see Appendices 1 and 2) | IBIOS NEURO5XX Professional Development (1) |
| Candidacy Examination: End of Spring Semester |

**Year 2 Fall:**

| NEURO 501 Seminars in Neuroscience (2) |
| IBIOS 591. Ethics in the Life Sciences (1) | NEURO 522. Seminars in Neuroscience I (2) |
| IBIOS 600. Thesis Research (2) | IBIOSBMS 591. Ethics in the Life Sciences (1) |
| Electives (see Appendices 1 and 2) | HES 515. Introduction to Biostatistics (3) IBIOS 591. Ethics in the Life Sciences (1) |
|                                      | IBIOS 602. Superv. Exp. in College Teaching (1)HES |
### Year 2 Spring

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>NEURO 597A Seminars in Neuroscience</td>
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<tr>
<td>IBIOS 600. Thesis Research</td>
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<tr>
<td>Electives (see Appendices 1 and 2)</td>
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<tr>
<td>Comprehensive Exam: End of Spring Semester</td>
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### Years 3-5

<table>
<thead>
<tr>
<th>Course</th>
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</thead>
<tbody>
<tr>
<td>IBIOS 601. Thesis Preparation</td>
<td>0</td>
</tr>
<tr>
<td>IBIOS 595. Internship (optional)</td>
<td>1</td>
</tr>
<tr>
<td>Thesis Defense</td>
<td></td>
</tr>
</tbody>
</table>

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**Competence in Written and Spoken English**

An English competency requirement must be satisfied by non-native English speakers before any teaching duties are assigned, as prescribed by the Graduate School. All entering international students, whether or not they hold a Teaching Assistantship, will be required to take the American English Oral Communicative Proficiency Test (AEOCPT) which is administered by the University’s Department of Applied Linguistics. A score above 250 on the AEOCPT satisfies the Department’s requirement; students scoring under 250 will be required to take courses to improve their spoken language and to retake the test before being allowed to teach.

The Graduate School requires that all Ph.D. candidates demonstrate high-level competence in the English language, including reading, writing and speaking. At University Park, competence in written and spoken English is assessed as part of the candidacy exam. At Hershey, competence is assessed in the Professional Development
course [NEURO 530]. Passing these courses satisfies this requirement. In the event of failure, the Option Director will recommend a program for improvement and subsequent re-examination.

**Grade-Point Average/Unsatisfactory Scholarship**

Students are required to have a minimum grade-point average of 3.0 for doctoral candidacy, admission to the comprehensive examination, thesis defense, and graduation. One or more failing grades, a cumulative grade-point average below 3.0, or failing the Candidacy Exam or Comprehensive Exam may be considered evidence of unsatisfactory scholarship and be grounds for dismissal from the University [See http://bulletins.psu.edu/bulletins/whitebook/index.cfm].

**Responsible Conduct of Research Training Requirement**

Starting in Fall 2009, all new students in the Neuroscience graduate program must complete an online Responsible Conduct of Research (RCR) training course during their first year. The online course is offered through the CITI (Collaborative Institutional Training Initiative) Program and supplements the in-class, discussion-based RCR training provided in IBIOS 591, Ethics in the Life Sciences, a required 1-credit course typically taken during the second year. Together, these two courses satisfy RCR training requirements mandated by Penn State’s SARI (Scholarship and Research Integrity) Program, an RCR initiative organized through the Office for Research Protections (administrative unit within the Office of the Vice President for Research).

First year students should register for the online CITI RCR course as soon as possible in the Fall semester. To register, go to the SARI Program, Online Training Program page (http://www.research.psu.edu/training/sari/program) where you will find instructions and a link for the CITI Program (http://www.citiprogram.org/). Select Pennsylvania State University as the participating institution and register for either the CITI Biomedical Science course (for most students) or the CITI Human Subject Research course. The latter is suitable for students who strongly anticipate doing thesis research with human subject participants; it meets both general (SARI) RCR requirements and specific RCR training required by the Institutional Review Board (IRB) for Human Participants Research at Penn State. Whichever course is chosen, students must work on their own to complete the course modules and pass the on-line quizzes. All modules must be completed by the end of the first Fall semester; and a copy of the student’s Completion Report must be submitted to the Program administrative office before January 15th.

**Laboratory Rotations**

Students at UP are strongly encouraged, though not required to undertake 4-week laboratory rotations. They can take 1-3 credits of lab rotations in the Fall semester of the first year. Students at Hershey undertake three 6-week laboratory rotations, one in the Fall semester and two in the Spring. The purpose of these rotations is to provide students with the opportunity to become acquainted with different projects, laboratory environments and techniques to allow an informed choice of a thesis project and advisor. The rotation advisor will provide the student with a defined project and clear expectations as to the amount of work involved and the work schedule; the student should also meet regularly with the advisor to discuss the progress of the rotation.

Students may choose any member of the Neuroscience Graduate Faculty for a rotation. If research in a particular faculty member’s lab interests you, make an appointment to discuss the rotation plan with the faculty member. The Director will be available to provide guidance to narrow your choices.

**Candidacy Examination**

The purpose of the Candidacy Exam is to establish that the student has acquired sufficient proficiency in the discipline of Neuroscience for admission to Candidacy for the Doctoral Degree. The Candidacy Exam is taken at the end of the Spring semester of the first year. As prescribed by the Graduate School, students must have a minimum grade-point average of 3.0 to be eligible to take the Candidacy Examination.
Format
The Candidacy Examination consists of written and oral components and is administered by the Curriculum Committee, which solicits propositions from program faculty and assigns oral examiners. For the written component, students are asked to defend or refute a general proposition in an area of neuroscience: students are provided with a list of propositions and asked to select one proposition within 2 days. The written paper (15 pages) is due 14 days later and is graded by two to three faculty members who are experts in the subject area. The oral examination is based on topics in neuroscience covered in the first year courses. This examination is administered by faculty representatives of the first-year neuroscience courses.

Evaluation
Students are judged on their combined performance in the written and oral portions of the exam. In the event of failure, the Neuroscience Curriculum Committee will determine whether the student may take another examination. If the student fails a second examination, the status of the student with the graduate program shall be terminated.

Doctoral Committee
In the Fall of the second year in the program, as soon as possible after the student has passed the candidacy examination, the student will form a doctoral committee in consultation with the thesis advisor. The doctoral committee consists of four or more members of the Graduate Faculty and includes at least two members in the major field (i.e., neuroscience). The “outside” committee member may be a member of the Neuroscience Intercollege Graduate Degree Program but must be from a different department than the student’s thesis advisor (see Doctoral Thesis Committee Composition on Page 11-12 for further details). The committee is usually chaired by the student's thesis advisor, except in rare circumstances. [Detailed policy on doctoral committees can be found in the Graduate Degree Programs Bulletin: http://bulletins.psu.edu/bulletins/whitebook/index.cfm

The doctoral committee provides general guidance for the student and administers the Comprehensive Examination and Thesis Defense. Committee members should be knowledgeable and interested in the general area of the proposed research. Students should consult with their advisor when choosing the members of their thesis committee.

It is recommended that the student meet with the doctoral committee at least once each year. It is the student’s responsibility to call for and organize these meetings. Typically committee meetings occur following the student’s annual presentation in the Neuroscience Discussions (HMC) beginning on September 13, 2012. Students are expected to document in writing for the doctoral committee their progress on thesis research and their future plans.

Comprehensive Examination
The Comprehensive Exam is designed to test the student's maturation "from a consumer of knowledge to a generator of knowledge". This exam is usually taken at the end of the second year and consists of a written research proposal followed by an oral examination. The Comprehensive Examination is administered by the student's doctoral committee. It is a rule of the Graduate School that students must have a minimum grade-point average of 3.0 to be eligible to take the Comprehensive Examination. The student must also have satisfied the English competence requirement and should have completed all required coursework. The oral examination must be formally scheduled by the Graduate School, which requires three weeks' notice.

Written Proposal
The proposal may be on any topic, including the student's prospective thesis research, and follows the format of a NIH Predoctoral Fellowship application. The topic of the proposal and the Specific Aims must be agreed upon by the student and his/her thesis advisor. After agreeing to the topic and wording of the Specific Aims, the student's advisor should have as little to do with the proposal as possible. This means that the work has to be original.
Obviously, the student is free to utilize any published (or in press) papers that are available, but the logic, experimental design, and writing must belong entirely to the student. The written proposal must be completed and delivered to the members of the doctoral committee at least one week before the oral examination. It should be emphasized that this proposal need not correspond to the student’s intended dissertation research, although it usually does. The purpose of the exam is to test the student’s ability to develop a coherent research plan and support that plan with logical arguments, supported by literature.

**Oral Examination**
Students are expected to present the rationale and general approach of their proposal (approx. 20 minutes), followed by an oral examination by the committee on the proposed experiments, predicted results, interpretation of data, and knowledge of relevant background material.

**Evaluation**
Students are judged on their combined performance in the written and oral portions of the exam. A favorable vote of at least two-thirds of the committee is required for passing. In the event of failure, the examining committee will determine whether the student may take another examination.

**Dissertation & Final Oral Examination**
Completion of the requirements for a Ph.D. degree in the Neuroscience Intercollege Graduate Degree Program entails the preparation of a dissertation (written thesis), a final oral examination (thesis defense), and formal acceptance of the thesis by the student's doctoral committee.

**Thesis Preparation**
The Graduate School has strict guidelines for the preparation and format of the written thesis; see the Graduate Programs Bulletin (http://bulletins.psu.edu/bulletins/whitebook/index.cfm) or the thesis guideline (http://www.gradsch.psu.edu/current/thesis.html), for details. Extensive consultation with the thesis committee is strongly encouraged: it is expected that the student should distribute one or two drafts of the dissertation to committee members for review and critique prior to the defense. Students should plan to provide a first draft of the dissertation no less than 2 months before the anticipated date for the final oral examination. The goal is that the dissertation should be in final form for the oral examination.

**Oral Thesis Defense**
The final oral examination consists of a public presentation of the thesis research, followed by a closed meeting with the student's doctoral committee. The examination should be scheduled after the student has fulfilled all of the Graduate School requirements for the degree; three weeks' notice is required by the Graduate School for scheduling this examination. The final version of the dissertation should be delivered to the members of the doctoral committee two weeks before the defense. A favorable vote of at least two-thirds of the thesis committee is required for passing the final oral examination.

**Thesis Acceptance**
This is the final step of the process: the thesis must be accepted, as indicated by the signatures of two-thirds of the doctoral committee and the program director.

**Miscellaneous**

**Internship**
The internship experience is 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 Thesis Advisor and Co-Director (see further details under General Information).

**Student Presentations (Hershey Campus)**
Students beyond their first year in the program will be required to give a presentation of their research each year in the Neuroscience Discussions (HMC) series. This is an informal presentation intended to keep the faculty and fellow students apprised of progress in research and to provide practice in presentation. The students are advised to use this opportunity to inform the doctoral committee of their research progress.

**Student Presentations (University Park Campus)**
Students beyond their first year in the program will be required to give a presentation of their research each year in the Data Blitz session of the Neuroscience Day, a cross-campus event for the Penn State neuroscience community. This is a poster presentation intended to keep the faculty and fellow students in the neuroscience program apprised of progress in research and to provide practice in presentation.

**Attendance**
It is a program requirement that all Neuroscience Graduate Students attend all Neuroscience Seminars.

**Governance**
Neuroscience is governed by the Neuroscience Advisory Committee on each campus. The committees for this academic year consist of:

**University Park Campus**
- Ping Li, Ph.D., Co-Director, Prof. of Psychology, Linguistics, and Information Sciences and Technology
- Victoria Braithwaite, Ph.D., Prof. of Fisheries & Biology
- Rick Gilmore, Ph.D., Associate Prof. of Psychology
- Laura Klein, Ph.D., Associate Prof. of Biobehavioral Health
- Robert Sainburg, Ph.D., Prof. of Kinesiology and Neurology
- David Vandenbergh, Ph.D., Associate Director, Penn State Institute of the Neurosciences; Associate Prof. of Biobehavioral Health

**Hershey Campus**
- Colin J. Barnstable, D.Phil., Co-Director, Professor and Chair, Neural and Behavioral Sciences
- Robert Bonneau, Ph.D. Professor, Microbiology & Immunology
- Alistair Barber, Ph.D., Professor, Ophthalmology
- John Ellis, Prof. of Psychiatry & Pharmacology
- Andras Hajnal, MD/Ph.D., Professor, Neural and Behavioral Sciences
- Greg Holmes, Ph.D., Associate Professor, Neural and Behavioral Sciences
- Ian Simpson, Ph.D. Prof. of Neural & Behavioral Science
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 the American English Oral Communicative Proficiency Test (AEOCPT) which is administered by the University's Department of Applied Linguistics.

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

NR = No Restrictions. This person should be allowed to teach with no restrictions based on ability to communicate in English.
(Penn State AEOCPT Score of 250-300)

WR = Take ESL 118G. This person should not be allowed to teach before completing and receiving a grade of "A" in ESL 118G - "American Oral English for ITA’s III."
(Penn State AEOCPT Score of 230-249)

TC = Take ESL 117G. This person should not be allowed to teach before completing and receiving a grade of "A" in both ESL 117G -"American Oral English for ITA’s II" and ESL 118G - "American Oral English for ITA’s III."(Penn State AEOCPT Score of 200-229)

SL = Speaking/Listening. This person should enroll in ESL 115G - "American Oral English for ITA’s I" and receive a grade of "A" before taking ESL 117G and ESL 118G.
(Penn State AEOCPT Score below 200)

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 director.

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 http://bulletins.psu.edu/bulletins/whitebook/index.cfm).

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 zero credits (post-comprehensive exam). The assistantship appointments typically originate with the department of the faculty advisor. If no faculty advisor has been identified, students should consult with their respective Graduate Program Director.

Thesis Submission and Exit Interview
Upon completion of the degree, students are to provide the Graduate Program with a 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 Director or appropriate representative.

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 Director to help determine the best timing for this experience (typically the first or second summer).

Teaching
Depending on the graduate program, teaching experience is recommended. 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 one credit on their transcript by signing up for IBIOS 602. Students interested in this opportunity should initiate discussion early on with their advisor and Graduate Program Director 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://bulletins.psu.edu/bulletins/whitebook/index.cfm), the Doctoral Thesis Committee should have:

- 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 a 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 represents a field outside the candidate’s major field of study and is expected to provide a broader range of disciplinary perspective and expertise.
- 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 director 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 Director plus Ms. Cynthia Nicosia (Director, Graduate Enrollment).
- A dissertation advisor who usually serves as the committee chair.
In addition to the above requirements:

- 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.
- The student needs approval of 2/3 of the committee members for passing comprehensive exam and dissertation defense.
- The student needs to submit paperwork 3-4 weeks prior to scheduled comprehensive exam and defense. Please contact the appropriate staff member:

  **Hershey:**
  Kathy Shuey H170 Hershey Medical Center; 717-531-8982; kes6@psu.edu

  **University Park:**
  Janice Kennedy 101 Life Sciences Bldg.; 814-865-3155; jkk5@psu.edu

**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://bulletins.psu.edu/bulletins/whitebook/index.cfm](http://bulletins.psu.edu/bulletins/whitebook/index.cfm)).

If pursuing a masters thesis option, up to six 600-level credits from relevant departments may be A-F graded and 12 credits need to be in the major at the 400-600 level. 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 Director 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 Director 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**

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

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

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

1. access eLion via [www.eLion.psu.edu](http://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
Appendix 1: Courses Available for all Huck Institutes’ Graduate Programs

**IBIOS 590. HUCK INSTITUTES’ COLLOQUIUM** (2) In the 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) 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, no more than 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.
Appendix 2: Sample Elective Courses for the Neuroscience Graduate Program*

- BIO/PHYS 497A Networks in Life Science
- BBH 496 Neuroanatomy, Behavior and Health
- BBH 502 Health: Biobehavioral Perspectives
- BMS 503 Information Flow (Core Curriculum)
- BIOL 479 General Endocrinology
- BIOL 497 Molecular Basis of Neurological Disease
- BIOL 404 Cellular Mechanisms of Vertebrate Physiology
- BMB 401 Biochemistry
- BMB 598G Molecular Biology of Animal Development
- CHEM 597 Neurochemistry
- HDFS 597 Biological Systems in Development Contexts
- HDFS 597A Development Cognitive Neuroscience of Adolescence
- ESC 597F Introduction to Neural Engineering: Fundamentals of Interfacing with Brain
- ESC 597A (PHYS 597A) Neural Control Engineering
- KINES 565 Neurophysiological Basis of Movement
- KINES 497 The Neurobiology of Motor Rehabilitation in Stroke
- MICRO 554 Principles of Immunology
- MICRO 560 Concepts of Immunology
- PHARM 502 Pharmacology
- PHARM 520 Principles of Drug Action
- PHARM 561 Neuropharmacology
- PHARM 562 Endocrine Pharmacology
- PHYS 597A Computational Neuroscience
- PSY 511 Foundations of Social, Cognitive, and Affective Neuroscience
- STAT 600 Applied Statistics
(*) These courses are listed here as examples (based on courses that previous students have taken as electives), and are not meant to be exclusive. Elective courses at the UP campus include any 400 and 500 level courses pending approval by the Advisor and the Co-Director.

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