

The guiding principle underlying the minimum course requirements for the Cognition and Cognitive Neuroscience is that there needs to be a balance between the need to provide students with a broad, common background in the field and the need to provide students with opportunities for the development of expertise in their more narrowly defined interest areas. A central value of the program is the preservation of maximum time to conduct independent research and develop specific expertise in one or more research domains. Thus, the requirements delineated in this document are to be regarded as a common minimum core.

It is expected that students will take a variety of courses not specified in this document to create the special competencies they desire. Students may also be required to sign up for additional course hours to satisfy university requirements for full-time enrollment while being supported on fellowships and assistantships. Full time enrollment is defined as 9 hours for all graduate students, both fellowship holders and graduate assistants. **Underload permits may be obtained from the Graduate Training Office (209 PSY) if the student is not eligible for a tuition waiver.** Other requirements, which apply to the Psychology Department as a whole, are contained in the document titled "Guidelines for the Operation of the Graduate Program".

No distinction is made here between requirements for Master's and Ph.D. The only specific requirements for a Master's degree are those listed as departmental or college requirements. It should be noted that the requirement for the Master's involves thirty semester hours (18 of which must be those in which a letter grade is assigned).

At a glance, course requirements are as follows:

- 3 Core courses (Cognitive Neuroscience, CCN Survey I, CCN Survey II)
- 3 Methods courses (e.g. Research Design & Analysis I and II, MATLAB)
- 1 Practical/Professional Development course (Grant Writing, Professional Development, or Teaching Practicum)
- 1 Breadth course (e.g. Developmental Psychology, Neurobiology of Learning & Memory, or Vertebrate Neuroanatomy)
- 1 Elective course (any course not fulfilling the requirements above or an approved course outside of Psychology)
- 1 Issues in Cognitive Science (taken twice)

Additional credits will be taken in research described below.

Psychology Content Core

Core courses are designed to provide students with foundational knowledge in the domain of Cognition and Cognitive Neuroscience. EXP 5508 Cognitive Neuroscience will provide a basic background in cognitive psychology and cognitive neuroscience across all relevant domains. EXP 6609 CCN Survey I will delve deeper into contemporary research in topic areas relevant to faculty expertise. EXP 6609 CCN Survey II will provide advanced, specialized readings in the student's area of interest. Collectively, the coursework will provide a combination of breadth in cognitive and cognitive neuroscience, and depth in particular research domains thereby readying the student for candidacy. **Please note that course names are under revision and may appear listed differently than as described here. Please contact the area head for specific course information.**

- EXP 5508 Cognitive Neuroscience (may be listed as Intro to Cognitive Science)

- EXP 6609 CCN Survey I (may be listed as Seminar in Higher Mental Processes)
- EXP 6609 CCN Survey II (may be listed as Seminar in Higher Mental Processes)

Students in the cognitive program are required to take one departmental core course to provide further breadth of knowledge. Students will select one course from the following list:

- DEP 5165 Developmental Psychology
- EXP 5406 Neurobiology of Learning & Memory (formerly Conditioning & Learning)
- SOP 5069 Personality & Social Psychology (formerly PSY 6919)
- PSB 5056 Biological Psychology
- PSB 5341 Systems & Behavioral Neuroscience
- PCB 5845 Cell & Molecular Neuroscience
- PSB 5230 Vertebrate Neuroanatomy
- PSB 6059 Behavioral Endocrinology

During their first year, students will register for EXP 6920 Issues in Cognitive Science (total of two hours, one in the Fall and one in the Spring). The purpose of this course is to acquaint students with work of the faculty, to accomplish specific skills instruction that is outside of other course content, and to create unity in the first year class.

- EXP 6920 Issues in Cognitive Science (1 credit in Fall & 1 credit in Spring of first year)

Statistics/Methodology Core

Students must take one of the following courses:

- PSY 6919 Research Design & Analysis I
- EDF 5401 General Linear Model Application
- STA 5126 Statistical Procedures for the Behavioral Sciences
- STA 5206 ANOVA & the Design of Experiments
- STA 5207 Applied Regression Methods

In addition, students must take two additional courses either from the list above or from the following list:

- PSY 5916 MATLAB for Experimental Psychology
- PSY 5916 Meta Analysis
- PSY 5916 Introduction to SEM
- PSY 5916 Introduction to Latent Variables
- PSY 5916 Advanced Topics in Structural Equation Modeling
- PSY 5916 Developmental Methods (Hierarchical Linear Modeling)
- PSY 5916 Introduction to fMRI
- PSY 6919 Research Design and Analysis II
- PSY 6969 Multivariate Applications: Latent Variables
- EDF 5400 Basic Descriptive and Inferential Statistics Applications
- EDF 5401 General Linear Model Applications
- EDF 5402 Advanced Topics in Analysis of Variance Applications
- EDF 5406 Multivariate Analysis Applications

- EDF 5410 Nonparametric Analysis
- EDF 5411 Factor Analysis
- EDF 5434 Measurement Theory II
- STA 5207 Applied Regression Methods
- STA 5857 Applied Time Series Analysis

Additional courses may be counted with the approval of your major professor and the cognitive area head.

Practical/Professional Development

Students must take one course in practical/professional development. These courses offer relevant, career-oriented skills that are not obtained in other coursework. Options include:

- PSY 6919 Grant Writing
- PSY 5916 Professional Development
- PSY 6945 Teaching Practicum

Elective Course

In addition to the requirements listed above, students must take one additional elective course. This may take the form of a Cognition and Cognitive Neuroscience area seminar, or any of the courses listed above that are not used for the purpose of meeting the requirements listed above. Alternatively, students may pursue coursework outside of the courses listed above to gain specialized expertise at the approval of the student's committee. Examples of the latter could consist of courses in mathematics, computer science, scientific computing, data science, or advanced statistics.

Research/Experiential Core

- PSY 5973r Master's Thesis (minimum of 6 credits if completing a Master's Degree*)
- PSY 8976 Master's Thesis Defense (0 credits**)
- PSY 6656r Preliminary Exam Preparation (minimum of 3 credits, maximum of 44 credits)
- PSY 8964 Preliminary Doctoral Examination (0 credits)
- PSY 6980r Dissertation (minimum of 24 credits*)
- PSY 8985 Dissertation Defense (0 credits**)

In addition to these required courses, students may wish to gain additional hours of supervised research/experience by signing up for PSY 5908r (Directed Individual Study), which may be repeated for a maximum of 50 hours.

First Year Project

Students will be required to complete a first year project. This project is an independent research project that is initiated during the student's first year in the program, and subsequently presented to the faculty and students of the cognitive area early in the fall of their second year. The purpose of this project is to get students off to a fast start in developing a research program, and to provide a mechanism through which the faculty of the cognitive area can provide advice and feedback to the

student early in their career. The student will assemble a 2-person committee (major professor, and one other faculty member from the cognitive program) to serve in an advisory role on the first year project. This committee will review a written report of the project at the end of the first and determine its acceptability.

Initial Supervisory Committee membership

Students enter the Program under the sponsorship of an initial advisor whose area of research matches the student's interest. This matching process allows students to start hands-on research in their area of interest but does not obligate them to continue in the same lab for their dissertation research. The initial three-person supervisory committee guides students as they choose a research project. It is normally expanded to form the full five-member committee, but an entirely new committee could be formed if appropriate. The initial supervisory committee also has the correct membership to be a Masters Degree committee if the student and the committee agree that the experience of completing a MS degree would be an advantage.

1. Initial faculty sponsor acting as major professor: Cognition and Cognitive Neuroscience member.
2. A second Cognition and Cognitive Neuroscience member.
3. Non-Cognition and Cognitive Neuroscience member from Psychology.

The initial committee should be chosen in consultation with the major professor and established by the end of the Spring semester in the student's first year. When committee membership is agreed by all members, a memo is sent to the to the Cognition and Cognitive Neuroscience area head. The student is responsible for ensuring that this memo is sent, as well as completing the necessary paperwork if a master's degree is sought.

Guidelines for Completion of the Critical Review paper or Comprehensive Exam or Research Proposal

The purpose of these guidelines is to clarify the requirement of completing a Critical Review paper, passing a comprehensive exam, or a research proposal including both a written portion and oral defense. Completing a Critical Review paper, passing a comprehensive exam or submitting a research proposal is required for advancement to candidacy and initiation of a doctoral dissertation. The purpose of this requirement is to demonstrate that a student is ready to begin a dissertation. The decision about whether to meet this requirement by completing a Critical Review paper, passing a comprehensive exam, or research proposal should be made jointly by the student and his or her advisor, in consultation with the student's other committee members.

Guidelines for Completing a Critical Review paper

The intent of the Critical Review paper is for the student to demonstrate mastery of an area by writing a critical analysis of a theoretically significant topic. The Critical Review paper is different from a typical Master's Thesis in the extent and quality of analysis required. It is different from a typical dissertation in that reporting of original data is optional. Ideally, but not necessarily, the Critical Review paper serves as preparation for proposing a dissertation topic.

The ultimate goal of completing a Critical Review paper is for it to be published. As such, the Critical Review paper should be a well-written and edited document that is ready to be submitted for possible publication. Although there are no length requirements, the target length is the typical range for manuscripts to be submitted for publication (i.e., 30 to 50 pages). Although the primary objective of a Critical Review paper is critical analysis of a theoretically significant topic and reporting of original data is not required, original data can be reported if it helps achieve the primary objective. In some cases, including empirical data may increase the likelihood that the Critical Review paper will be published by expanding the range of possible publication outlets. The Critical Review paper may also take the form of a metanalysis.

Guidelines for Taking a Comprehensive Exam

The purpose of the comprehensive exam is for the students' committee to verify that the student has mastered his area of specialization by a written and/or oral examination. The first step for a student is to select committee members and submit a written proposal to them defining the area in which the student wishes to claim competency and listing a preliminary set of readings that represents the current knowledge about that area. The committee will meet with the student and make necessary adjustments to the definition of the area and the reading list. The committee can reconvene if the definition needs to be changed or the reading list requires adjustment. Upon the recommendation of the student the committee will determine how the examination will be organized.

Type of examination: oral; written (without reference books); written (with access to reference books); or some combination of written and oral. For a written examination, each committee member will submit one or two questions and the supervisor will select a suitable number of questions and monitor that the questions are appropriate given the definition of the agreed area of specialization and the reading list. The supervising professor will be responsible for the administration and proctoring of the exam. Recommended duration is two days with different questions with an 8-hour time limit for each day.

For an oral exam the supervisor will monitor that the committee members' questions are consistent with the definition of the specialization and reading list. Recommended duration is between two and three hours.

If the student shows general mastery but weakness in some limited areas, the committee can decide to reconvene with renewed questions restricted to those areas within an oral examination format.

Guidelines for a Research Proposal

The third option consists of both a written portion and oral defense. The written portion will involve the development of a set of experiments and/or analysis in the format of a NIH-style grant application. The written research proposal will be followed by an oral defense of the proposal, and an oral examination of the general knowledge of the candidate.

- **Research Proposal:** Research proposals will contain the following: a Title, Abstract, Specific Aims, Background and Significance, Innovation, Experimental Plan, and References in the format of an NIH-style grant application (i.e. F31). The Specific Aims will be 1 page long, and the body of the document including the Background and Significance, Innovation, and Experimental Plan will collectively constitute 6 pages. The thesis proposal will be defended orally during the exam.

- **Related Research Areas:** In consultation of the committee, the student will identify two research areas that are distinct from, but complementary to the topic of thesis proposal. These areas will be examined orally. It is expected that faculty will provide a partial list of papers within the areas to facilitate the student's preparation. The student will then be required to demonstrate substantial knowledge of concepts and methods in the agreed upon areas.