Graduating with Honors in NSCS

1. You must meet the Honors College requirements which include:
   - completion of the required number of Honors units:
   - completion of a 6-unit Honors thesis during your final two semesters; and
   - a GPA of at least 3.5 at the time of graduation.

   You are responsible for knowing and abiding by all Honors College and NSCS Program requirements.

2. You must complete an Honors Thesis, the final version of which must be approved by your faculty advisor, and the Honors College. The Honors Thesis is a research project of at least one-year duration for which there must be a prospectus, a thesis, and a formal presentation in the annual NSCS Honors Thesis Poster Forum. The thesis project is expected to help you integrate your knowledge of neuroscience and cognitive science, to give you an opportunity to delve deeply into and think critically about a particular area of neuroscience and cognitive science by engaging in a sustained research project, and to develop both an appreciation for and skill in research in this field. It should be a well-designed research project, guided by a faculty member, carried out by you, and typically written in the form of a manuscript such as would be submitted to a peer-reviewed journal appropriate for the area of the student’s research. Excellent writing is expected.

   If you wish to graduate with honors in two majors, you must write a thesis for each major; the theses may, however, be related. For example, an extensive literature review on a topic could be approved for one major and a manuscript on your laboratory research project done on the same topic could be approved for the second major. The expectation vis-à-vis level and amount of work for each is that each thesis could stand on its own and that there is little overlap in content.

3. You are expected to present your work in a short presentation to the School of Mind, Brain and Behavior at the NSCS Honors Thesis Poster Forum, which will be held during the last week of regular classes in the Spring semester. This presentation will not receive a formal grade, but is required for graduation with Honors in NSCS.

Graduate-level Courses

Students graduating with honors in NSCS are highly encouraged to enroll in a graduate level course (500 level) in Neuroscience/Cognitive Science in order to obtain experience taking graduate level courses. These courses usually offer a more critical and advanced approach to the topic area and, if you are considering graduate school or a professional school, having done well in one or more courses of this level strongly indicates to the admissions committees that you are capable of handling graduate coursework. The course or courses selected can be courses listed as 400/500-level, in which you would enroll in the 500-level version, or any courses listed between 500-599. You will need to obtain the instructor's permission.

IMPORTANT: According to the rules of the Honors College, you will receive Honors credit for the course ONLY IF you select the Honors credit option on the 500-level course petition. If you choose the graduate-credit option, you will not earn Honors credit. In addition, you must take the course(s) for a letter grade and must successfully complete the course in order to receive Honors credit.
The following timeline was created by the Honors College and NSCS-specific requirements have been incorporated. Students are responsible for checking the Honors College website for any updates to this timeline. http://www.honors.arizona.edu/students/honors-thesis

Completion of an Honors thesis requires preparation and planning. You will build up to your thesis throughout your years at UA by completing coursework, participating in research, engaging with faculty, and narrowing down your areas of academic and professional interest. By the end of your junior year, you should have a well-developed thesis plan that you can implement in your senior year.

Follow these basic steps when preparing for the Honors thesis:

**Explore Your Thesis Topic**
Early in the junior year, you will begin narrowing down your focus for an Honors thesis. This may be done in several ways, including engaging in discussions with faculty. As a helpful resource, you can search the Thesis and Dissertation database to read former student’s theses.

**Identify a Faculty Advisor**
A Faculty Advisor is the person who will supervise your thesis and award your final grade for your thesis. Since NSCS does not have its own “department,” NSCS students are free to work with any tenure-track faculty member on campus as long as their thesis topic is in an area of neuroscience and/or cognitive science. The Program Coordinator and the Director of the NSCS program can help students identify an advisor if they have been unsuccessful in their attempts to identify one on their own.

Ideally, you will find an advisor no later than the first semester of your junior year and conduct research in that advisor’s laboratory in the second semester of junior year. The goal is to meet regularly with your advisor and develop a proposal over the course of the second semester of junior year. Students who do not follow this recommended timeline for identifying a faculty advisor are likely to miss the thesis submission deadline.

**Submit the Honors Thesis Prospectus**
You are required to submit an Honors Thesis Prospectus by the end of semester prior to beginning the thesis. This process allows you to provide a description of your proposed thesis project, and also provides confirmation that a faculty member has agreed to advise your thesis. Guidelines for the prospectus can be found on page 4.

You must submit your prospectus to NSCS for approval at least 3 weeks before the last day of classes in the semester prior to starting your thesis (for most students this is the spring of their junior year). You may submit your prospectus earlier than that if you wish.

Your prospectus, which has been approved by your advisor, is then reviewed by the NSCS Undergraduate Studies Committee to ensure that it is a reasonable plan that is at a level consistent across students completing an honors thesis in NSCS. Proposals are expected to be 3-5 pages long and very detailed, in accord with the guidelines that follow. Once approved by the NSCS Undergraduate Studies Committee, the NSCS program will send you and your advisor a notice of approval and will submit your prospectus packet to the Honors College electronically.

PLEASE NOTE: Although the Honors College requirements state otherwise, NSCS students are not to submit their prospectus directly to the Honors College; the NSCS program will submit it for you. Once approved by NSCS, the prospectus is essentially automatically approved by the Honors College.
Register for Thesis credit
The thesis is a two-semester commitment that demands a minimum of six units of work — three units of Departmental Honors 498H per semester usually taken in the senior year. Under no circumstances will you be permitted to complete all six thesis units in a single semester. You will enroll in NSCS 498H through the NSCS Program Coordinator. Under no circumstances should you enroll through your faculty mentor’s department. The last day to register for courses without a late charge in the Fall/Spring semesters is the 21st day after the first day of classes.

PLEASE NOTE: Each unit of lab credit officially requires 3 hours of work per week so enrolling for the required honors thesis credits means a minimum of 9 hours in the lab per week. This represents a minimum expectation, and often you will be expected to or need to spend more hours in the lab. You and your faculty member should discuss this up front to come to a clear, mutual understanding of the expectation for weekly lab work.

Engage in Your Thesis Project
Working under the guidance of your faculty advisor, you will engage in a personalized research experience. Although the details of the project will vary from student to student, most will begin by writing a draft of the statement of purpose, the methodology/capstone design, and the literature review. This is generally followed by collecting data, completing data analysis, synthesizing and drawing conclusions; and revising the written version of thesis. Your faculty advisor will award a grade for your first semester of thesis work, based on the progress you have made up to that point. Remember to register for your next three units of thesis credit for your second semester.

Submit Your Thesis
Prior to the end of the semester, you will submit your final work to your faculty advisor in order to receive feedback and a final grade. The thesis must be submitted to the Honors College by the last day of classes before graduation, so you are encouraged to plan ahead and allow yourself enough time to make any needed revisions. Once your thesis has been approved by your advisor, you will submit:

- your original signed thesis title page (see the following link for the format of the title page) http://www.honors.arizona.edu/sites/default/files/u7/Sample%20thesis%20title%20page.pdf;
- your original signed UA Library Distribution Rights form (see the following link for this form) http://www.honors.arizona.edu/sites/default/files/u7/The%20University%20of%20Arizona%20Electronic%20Theses%20and%20Dissertations_0.pdf. The Distribution Rights form allows the UA library to include your thesis in the UA Thesis and Dissertation Database. If you do not want your thesis included in the database, you should write your name on the form and write “do not release” across the page;
- an electronic copy of your thesis document to the Honors College AND to the NSCS program. All parts of the thesis, including the signed title page, the distribution rights form, the abstract and the actual thesis, should be integrated into a single pdf file. Your thesis will be kept as part of the NSCS program archives and also used for program assessment.

Note that you can submit your thesis only after your degree check has been completed by the Honors College.
NSCS-specific Guidelines for Honors Thesis Prospectus

The NSCS requirements for the Honors Thesis Prospectus differ slightly from the Honors College requirements. Although the Honors College requires only a 1-2 page prospectus, NSCS students must write a 3-5 page prospectus. The NSCS Honors Prospectus resembles in intent the Honors College Prospectus BUT requires you to provide more detail.

What is a prospectus?
A prospectus is a short description of your proposed thesis. Your prospectus should clearly describe your thesis topic, the form your thesis will take, and how you will reach your thesis goals. For a laboratory-research-based thesis, focus on your governing questions or hypotheses, your research methods, and your theoretical or methodological framework. For a literature-based review thesis, your prospectus should focus on the big picture question and what specific question you seek to answer or frame. For a creative or project-based thesis, your prospectus should focus on what you plan to do and why this project is important to you and relevant for your discipline.

Important: If your research involves experimentation, observation, or interviews with individuals or groups you may be required to get permission from the Institutional Review Board (IRB) to undertake this research in order to ensure the protection of your informants. Your faculty member should be prepared to guide you through the process of obtaining Human Subjects and (IRB) approval and you will have training to go through also. Sometimes it can take several months to get this permission, so plan accordingly.

Formatting
Please use 1-inch margins all around, Times New Roman, 12 pt font, 1.15 line spacing (NOT 1.5). Submit your prospectus as a pdf file.

What to include in your prospectus
1. What is your thesis topic, and why is this topic of interest to you and to other scholars or researchers in the field? Why is the topic relevant and important? What specific question will your research or project seek to answer? You can provide detailed and specific information, as space permits, but you should always provide enough background information so that a scientist working outside your specific area of interest, or even a well-read lay reader, can understand the big picture.

You should reference some of the literature to show that you have begun to think seriously about why that question is important to answer and what key findings drive your work. If you will be working in a lab or on a literature review that is driven by work in the lab, you should describe current efforts in the lab you have chosen that specifically undergird your project. End this section with a list of the specific aims for your work. We expect this section to take 2-3 pages.

2. If you will be writing a laboratory-research-based paper or doing empirical or observational research, which research methods and resources will you use? Provide enough detail so that a reader unfamiliar with the kind of work you will be doing can understand. If you will be doing a project or creative work, please describe in detail what your project work will involve, what the outcome or result will be, and how you will incorporate research-based analysis into your final product or artist statement. The goal of this section is to provide enough detail that you, and we, know how you plan to do your study. We expect this section to take up to a page.

Here’s an example: “I will be using intracellular electrophysiology of glial cells in the ventral nerve cord of 3rd instar Drosophila to show how these cells respond to stimulation of interneurons. Interneurons will be engineered to express a channelrhodopsin so that they can be stimulated by light. I will record from the glial cells, pulse the preparation with light, and examine in the glial cells the resulting response to neuronal activity. After recording, I will pulse the glial cells with hyperpolarizing current to fill them
with a fluorescent dye, and after processing, will view them on the confocal microscope. I will then use Image J to measure branch length and number.” If there are concepts that might not be familiar to your reader but that are important to understand in order to understand your project, you should address them briefly. For example, in the methods outlined above, you might describe what a channelrhodopsin is. Figures are welcome, and may be drawn from published work as long as the legend and bibliography include the appropriate acknowledgement and reference.

If you are writing a literature review, you should include a list of references that you have consulted or plan to consult to begin your review. You and your faculty advisor can construct this list together.

3. Create a timeline for your work, agreed upon by you and your advisor. Also list any expected work products, such as presentations to your lab group, a poster, an abstract, and the like. Finally, note the expected frequency of meetings with your advisor.

4. Specify that you will present your research in the NSCS Honors Thesis Poster Forum (students graduating in the fall semester will need to present in the spring forum associated with the prior academic year).

5. Last, specify what you hope to learn or gain from the work you do to create an honors thesis.

The prospectus review process
The prospectus will be reviewed by the members of the NSCS Undergraduate Studies committee. In no way is this review meant to interfere with a faculty member’s academic freedom; rather the review is meant to ensure a high standard of quality for and consistency of expectations across Honors theses carried out in the NSCS program. The committee thus will look for evidence that the proposed work is sufficiently challenging and that your plan includes the likelihood that you will achieve solid understanding of the theoretical, methodological and data analysis aspects of the work. Revisions may be requested. Once approved, the prospectus will be forwarded to the Honors College for their formal approval, which is essentially automatic after NSCS approval. The thesis work will be guided by your faculty mentor with no further review by the NSCS Program.

Guidelines for the Honors Thesis in NSCS

Honors Theses are intended to be major student projects involving various types of original work. While the type of research can vary, a substantive and substantial written product is required for completion of your Honors Thesis. It is expected that you will obtain a level of depth within the thesis topic equivalent to a point between a large undergraduate research paper and a Master’s thesis. Not only should the thesis synthesize and build upon existing scholarship, but it should also further the discipline’s understanding of the subject in some way.

The thesis may take any form appropriate to your discipline and approved by the thesis advisor (e.g. research paper, performance, video, artwork, etc.). The Honors College requires a written summary or abstract to accompany thesis work. There are no set requirements as to length, but most theses range between 40 and 60 pages, including illustrations and references. If you’re working with scientific materials or statistics, the paper produced might be shorter than this, while if you are utilizing interviews and participant/observation techniques, it might be longer. You should discuss the thesis length and other expectations with your thesis advisor prior to the start of your thesis. In addition, the University requires a minimum of 45 hours of work for each unit of credit awarded. (An Honors Thesis requires a minimum of six units divided over two or more semesters.) The content of an Honors thesis must not significantly duplicate
material produced by the student in fulfillment of the course requirements of any regular scheduled courses of University of Arizona.

You will work closely with a faculty advisor of your choosing when completing your Honors thesis. The faculty advisor will help you to develop a research plan, outline goals, and delineate which thesis components should be written during each of the two semesters (with the understanding that the effort put forth and the quality of work completed during each semester can receive a separate grade.) It is also the responsibility of the advisor to set a deadline for a draft of the thesis so that you will have enough time to make any necessary changes to the final document. The faculty advisor may also guide you in the presentation of the final thesis during a departmental function or showcase.

For a laboratory-research-based thesis, the typical structure of the thesis should closely resemble the structure of a paper that would be submitted to a journal in the field of Neuroscience or Cognitive Science. You could also look at the Journal for Undergraduate Research and Scholarly Excellence (http://jur.colostate.edu/), where you might even consider publishing your work.

A laboratory-based thesis typically will include:

- **An Abstract**, which is a short summary of your thesis and includes a statement of the key question, the approach and significant results, and a conclusion.
- **An Introduction** that lays out the overall and specific question(s) addressed, describes why these questions are important, and provides the existing context for the question(s) in the form of a presentation of the key relevant literature, including results from your laboratory if appropriate. If figures are included in this section from other’s work, note the source of the figure in the legend and be sure to include the reference in your bibliography.
- **A Methods** section that is in sufficient detail that others could replicate the work, including statistical analysis.
- **A Results** section that details the logic for and results of your studies. Figures are expected.
- **A Discussion** section in which you will interpret your data in the light of your results and in the context of previous published results in the literature. It will end with a statement of your conclusions and could include one or more summary figures.
- **Acknowledgments** that specify the names, affiliations, and contributions of others who were critical to your effort.
- **A Bibliography** listing your references. Every reference you refer to in the text needs to be listed in the Bibliography, and you do not list any references that you do not cite in the main body of the thesis.

For a literature-review-based thesis, the typical structure of the thesis should closely resemble the structure of a review paper that would be submitted to a journal in the field of Neuroscience or Cognitive Science. You could also look at the Journal for Undergraduate Research and Scholarly Excellence (http://jur.colostate.edu/), where you might even consider publishing your work. The level of the literature review is greater than that expected for an upper-division course, but is not expected to be as comprehensive as a Masters thesis. Note the discussion of page length earlier.
The first step will be to identify a topic area with your advisor, then do some reading with the intent of exploring the topic broadly so that you can fine-tune the topic area on which you want to focus. Your advisor may help you identify relevant research articles or even review articles to give you that overview or you may search on your own. Once you and your advisor agree on the specific topic and a broad outline of the thesis, then you will research it in depth. There is no set number of primary research articles or primary sources specified because this is a scholarly exploration, which you pursue until you and your advisor believe that you have satisfactorily addressed the question you set out to examine. Your thesis may benefit from figures. You might end up making some schematic diagrams to illustrate a point or a relationship or to make a summary of your findings. You also may include, with acknowledgment of course, figures from papers you study that you think make particularly important points.

Your thesis will have several parts:

- **An Abstract**, which is a short summary of your thesis and includes a statement of the key question, the major findings of your review and your conclusion.
- **An Introduction** that lays out the overall and specific question(s) addressed, describes why these questions are important, and provides the existing context for the question(s) in the form of a presentation of the key relevant literature. This is an overview of that literature only.
- The **Body** of your thesis, in which you critically review, and compare and contrast the studies you have chosen.
- A **Discussion** section, in which you bring together your analysis and interpretation to address the question you raised at the outset.
- **Acknowledgments** that specify the names, affiliations, and contributions of others who were critical to your effort.
- A **Bibliography** listing your references. Every reference you refer to in the text needs to be listed in the Bibliography, and you do not list any references that you do not cite in the main body of the thesis.

For either type of thesis, the format and style of the thesis should follow guidelines typical of journals in the field of Neuroscience or Cognitive Science. Your advisor can help you in this area.

**Thesis approval process**

You and your advisor should agree on a process and timeline for finishing your thesis that will allow several iterations of review by your advisor. Something like 3 weeks before the due date to the Honors College is typical. The rubric for evaluation of an NSCS thesis is below. Once your faculty advisor approves and signs your thesis, you may submit it in accord with the guidelines above (See “Thesis Timeline.”)

**NSCS Honors Thesis Poster Forum**

Because scientists are expected to be able to present and explain their work, both to colleagues and to the general public, we require NSCS Honors students to present their thesis work at the end of the spring semester. If you are graduating in December, you will present whatever work you have completed by this time.
Your poster should be created in accord with the standards of poster presentations at the Society for Neuroscience Meeting or the American Psychological Association Meeting. If you are writing a literature review as your thesis, you can either create a poster or give a 15-minute presentation at the NSCS Honors Thesis Poster Forum.

At the Forum, we will have an array of poster boards available. You will pin your poster up onto your assigned board and be prepared to guide visitors through it. You should work with your advisor to create a presentation that is targeted to a scientifically literate audience, but not necessarily to people who intimately know the area in which you have been working. Plan to be able to guide your visitors through your poster in about 5 minutes, which means you need to focus on why the question you’re asking is important, what specific question(s) you asked, very briefly how you did the study, then what the results and conclusions are. If people want more detail, they will ask. You can expect people attending the Forum to circulate around the posters, and if you have time, you can do the same.

### Rubric for Evaluation of NSCS Honors Theses Projects

**Outstanding**
- Original idea. Could also be described as clear, clever, creative, exciting, interesting, thoughtful, engaging, surprising, persuasive
- Very well written and very well organized
- Shows mature and independent thinking
- Clearly states the problem and why it is important
- Displays strong understanding of the literature and does an excellent job reviewing it critically
- Argument is focused and logical
- Has an excellent research design
- Uses or develops new tools, methods, or approaches
- Data were acquired by the student from multiple sources or technical approaches
- Analysis is complete and convincing
- Conclusion ties the projects elements together and explores interesting issues and connections
- Merits authorship on a manuscript in a peer-reviewed journal in the discipline

**Very good** (this is the level expected of most Honors thesis projects)
- Has some original ideas and insights, but is less clear, clever, creative, exciting, interesting, thoughtful, engaging, surprising, or persuasive than is an outstanding project. Could be described as solid
- Well written and well organized
- Carries out a significant step in a larger project
- Shows good understanding of critical elements of the literature
- Argument is strong
- Research is well executed
- Demonstrates technical competence
- Uses only one or a few approaches or gets data from a single source
- Analysis is solid
- Contributes solidly to the body of work in the lab

**Acceptable**
- Workman-like presentation
- Demonstrates technical competence
- Shows the ability to participate in research
• Displays little creativity or thoughtfulness or insight
• Writing is pedestrian and structure and organization are weak
• Displays a minimal understanding of critical elements of the literature
• Underlying problem is understood only at a simple level
• Scope of the project is minimal
• Analysis is adequate but doesn’t explore possibilities and connections
• Makes a small contribution to the work of the lab

Unacceptable
• Is poorly written with spelling and grammatical errors
• Presentation is sloppy
• Plagiarizes or misuses literature sources
• Shows no clear understanding of the important literature
• Lacks careful thought
• Argument is unconvincing or invalid
• Data are flawed or misinterpreted
• Scope of project is too small or project is trivial
• Analysis is unsupported or exaggerated