

Biology/Biotechnology Honors Thesis Project Information Sheet (Sept. 2009)

General description of project:

Biology and biotechnology have emerged as the pre-eminent sciences of our times, impacting society on issues as diverse as environmental deterioration, global warming, energy production, human reproduction, science education and the battles against cancer, pathogens and age-related and genetic diseases. Having a detailed understanding of how biological research is done is becoming increasingly important for making informed decisions about social and political policies as well as for entering into the many biology-related career paths now available. Biology and Biotechnology thesis projects are intended to give Honors-caliber students first hand experience in designing and carrying out biological research on a subject of interest to them. By working in close relation with one or more experienced faculty members, students are also exposed to the collaborative nature of research activity, which is vital to doing innovative and productive science.

General requirements of project:

All Honors program students are required to do an Honors thesis project. Non Honors students, including transfer students, who wish to do a Honors thesis project must first meet the requirements for entry into the Honors program, which are a cumulative GPA of 3.25 and sufficient evidence of initiative, originality and intellectual maturity to warrant registration in a Honors thesis project. Biology and Biotechnology Majors generally do a project with a faculty member in the department of their respective Majors. Biology and Biotechnology Honors projects are currently done through the same set of BIO 499 courses (though separate courses for each Major might be established in the future). Biology and Biotechnology Majors are free to work with faculty outside Biology and Biotechnology and earn credits toward the 40 credit hour Biology Majors requirement as long as they register in BIO 499, select subject matter that is related to Biology or Biotechnology and have a co-advisor within their respective Major (Biology or Biotechnology) who assumes the responsibility of ensuring that the student fulfills the requirements for completing an Honors project in Biology/Biotechnology. Such students must get signatures on all Honors documents from their advisor and Biology/Biotechnology co-advisor plus the head of Biology/Biotechnology and the dean of CSM. Alternatively, Biology and Biotechnology Majors working with faculty outside Biology and Biotechnology can choose to earn honors credits in other departments (e.g. CHEM 499) that do not count toward the 40 hr Biology Majors requirement. Biology and Biotechnology Majors must also have completed all four Biology core courses (BIO 114, 124, 214, 224) prior to starting an Honors project. Students who are not Biology or Biotechnology Majors and who wish to do an Honors project with Biology or Biotechnology faculty can do so for BIO 499 credit, and are subject to the requirements and credit system of Biology/Biotechnology honors projects.

Schedule for a project:

An Honors thesis project in Biology or Biotechnology is usually done in three consecutive terms and requires registration in three two-credit BIO 499 courses (BIO 499A, 499B, and 499C).

These courses are usually taken in spring term of junior year, and fall and spring terms of senior year. However, students, with the permission of their faculty advisor (see below), can start the program earlier, in the fall term of junior year, or later, in the summer session between junior and senior years. Students who start an Honors thesis project in their junior year can but are not required to do research during the summer between their junior and senior years. How they register to do summer research (i.e., in a BIO 499, BIO 497 or another course), what credit hours they receive, and if and how they are paid must be determined by arrangement with the faculty advisor. One BIO 499 course (499A or 499B) can be taken in summer school, but the other two BIO 499 courses must be taken during fall and spring terms. Students are discouraged from taking BIO 499 courses as eight-week block courses since it requires double the weekly time commitment (see below).

Steps for doing a project:

1. Students must contact the Honors Office (107 Hillcrest House, 8-5535, honors@jmu.edu) at the beginning of their junior year or earlier to obtain an application form (these can also be downloaded from <http://www.jmu.edu/honorsprog/forms.shtml>), a copy of the Senior Honors Project Handbook (which is also available at http://www.jmu.edu/honorsprog/wm_library/Senior_Project_Handbook_2008.pdf) and information on scheduled Honors orientation meetings. They should also attend the project workshops offered by the Honors Program staff in September and February of their junior year.

2. Students must identify a faculty adviser before or at the beginning of their junior year. The best way to do this is to review the webpage listings of Biology and Biotechnology professors and their research projects, find several doing interesting research, and contact them by email to see if they have space in their labs and are willing to support a thesis student. Many students who do research in Biology/Biotechnology find an advisor and start doing research before their junior year. They complete a research techniques (BIO 495), advanced research (BIO 497) and/or library research (BIO 496) course before considering an Honors thesis project. This way the professor and student are familiar with each other, the professor can be more confident that the student has the ability and drive required to do a Honors project, and the student is aware in advance of the professor's expectations for an Honors project. Students who wait until the middle of their junior year to find a faculty advisor might have difficulty finding one whose research interests them and who is willing to take on an unfamiliar student at that time. Thus, it is important that the student act sooner, rather than later, to contact a professor and initiate research, as the longer one waits, the more difficult it can become. Students wishing to start the Honors project earlier or later than spring term of their junior year must arrange this in advance with their faculty advisor.

It is the responsibility of the faculty advisor to ensure that any non Honors program student who requests to do a Honors thesis project has a cumulative GPA of 3.25 or higher in the term before registering for BIO 499A, has or will have completed the Biology core courses (Biology and Biotechnology Majors only), and exhibits sufficient initiative, originality, and intellectual maturity as well as available time to warrant registration in a Honors thesis project. Faculty advisors are advised to request copies of student degree progress reports for verifying the GPA and core course requirements and to ask about student extracurricular activity and work

schedules **before** taking on a student. Faculty advisors must also decide if and when a student must complete other cognate and biology course requirements to do their particular honors projects.

3. General requirements for BIO 499A, B and C:

Students are required to commit a minimum of 8 hours per week to each BIO 499 course (or the equivalent if taken as an 8 week block or summer course). This includes time spent in lab and group meetings. Although faculty advisors recognize the need for flexibility in research schedules, BIO 499 time that is deferred one week must be made up in subsequent weeks.

The faculty advisor, readers and student are required to hold two meetings in each BIO 499 course, at approximately the end of the first and third quarters of each term. One purpose of these meetings is to oversee the project, i.e., develop the project, define a schedule of activities and a set of expectations for research activity and literature review, set deadlines, and discuss problems and trouble shooting. A second important purpose of each meeting after the first is for the advisor and readers to decide whether the student is making sufficient progress to allow their continuation in an Honors project. If the decision is no, they must also decide whether the student is to be transferred to a BIO 497 or BIO 495 or prevented from continuing in research altogether. The criteria for their decision are the level of student performance, the reason for any underperformance and the student's demonstrated levels of motivation and ability.

4. Specific requirements for BIO 499A:

The faculty advisor and student first decide upon the general nature of the project and select two readers. Before and during the first committee meeting, the faculty advisor, readers and student develop a research project that can be done within the scope of three two-credit courses and work out a mutually acceptable schedule for carrying out the research training, library research, proposal writing, and research activity required to complete the project. Given the time-sensitive nature of much biology research, the scheduling of research training and activity over the course of BIO 499A, 499B and 499C is flexible. Students who start research with their faculty advisor earlier than the start of BIO 499A might be required by their advisor to complete the library research and proposal requirements for an Honors project in a BIO 496 Research Literature course in the term prior to BIO 499A. This would allow the student to participate more fully in research activity in BIO 499A. However, a proposal produced in a BIO 496 course still requires the approval of the readers who, if selected after the completion of the BIO 496, might ask the proposal to be revised to meet their requirements.

It is the responsibility of the student to complete a thesis proposal with the following sections: Introduction, Methods, Timeline, and References. The introduction must place the proposed research in a broader theoretical or conceptual context and explain why the research is important in terms of theory, application and/or generation of new knowledge. It must also describe what is currently well established in the broader area, identify unanswered questions that relate to the proposed research, and indicate how the proposed research will answer those questions or fill in a gap in our knowledge. The introduction should finish by explicitly stating the hypothesis or question being addressed (or the objectives of the research), and if appropriate,

providing predictions of objectives or tests. The methods section should describe the methods in sufficient detail for readers to evaluate their adequacy, feasibility and appropriateness for the tasks in question. This section should also provide details on data analysis, including statistical tests. The timeline should outline when major aspects of the research will be accomplished and when writing will commence. Biology and Biotechnology thesis proposals are generally at least 1250 words long, and have a minimum of 7 references to scientific journal articles, review articles, and scientific texts, which must be properly cited and referenced. The writing style must be polished and free of typos. A fully revised version of this proposal must be received and approved by the faculty advisor and readers and submitted to the Honors office by the Monday of the last week of classes of the Bio 499A term (or the end of summer session for students who do BIO 499A in summer session).

It is also the responsibility of the student to complete and submit a Senior Honors Project application to the Honors program office (107 Hillcrest House, 85535, honors@jmu.edu) by the Monday of the last week of classes of the Bio 499A term (or the end of summer session for students who start in summer session). Please use forms downloaded from <http://www.jmu.edu/honorsprog/forms.shtml> as out-of-date forms will not be accepted. The Senior Honors Project application must be approved and signed by the student's advisor and readers, the department head, and the college dean (contact Brenda Barker, barkerbj@jmu.edu, 83508, ISAT/CS 352) before submission. Acceptance into the Honors program is determined solely by the Honors Program director. Acceptance letters are sent to the student, adviser, department head/school director and college dean. Once accepted, students are accorded all privileges of being an Honors student.

It is the responsibility of the faculty advisor and readers to ensure that the proposal complies with their expectations for scholarship before they approve it. If the proposal is not approved and submitted on time, it is the responsibility of the faculty advisor and readers to disallow the student to register in BIO 499B. The faculty adviser will assign a grade for BIO 499A based on his/her own rubric for assessing progress made in library research, proposal writing, and if applicable research activity, as well as the ability to meet deadlines and respond to requested revisions.

It is the responsibility of the Honors liaison to verify that all students registered in BIO 499A have current GPAs above 3.25. BIO 499A students with GPAs that are found to be below 3.20 will be required to retroactively change their enrollment to BIO 497. If a student's GPA is between 3.20 and 3.25, their continuation in BIO 499A will be at the discretion of the faculty advisor and readers and will be based on their judgment of the student's ability to increase their GPA to 3.25 by the end of that term.

5. Specific requirements for BIO 499B and BIO 499C:

BIO 499B usually involves research activity, and BIO 499C usually involves completing the planned research activity, writing the thesis, responding to revisions requested by the faculty advisor and readers, and preparing the final document for submission to the Honors Program. In addition to the two required committee meetings per term, committees can choose to schedule additional meetings to review progress in research activity and early drafts of the thesis.

It is the responsibility of the student to produce a final thesis with the following: an introduction with literature review and statement of the problem, methods, results and discussion sections, and a bibliography with references that are properly cited and referenced. The length of the thesis and the number of references cited must be sufficient to meet the committee's expectations for Honors scholarship activity. All parties are reminded that according to the Honors program, Honors theses are expected to resemble Masters theses in terms of scholarship. They are not expected to resemble journal articles since learning to writing a thesis has different educational goals than learning to writing journal articles. Thesis writing puts more emphasis on literature review since the student is using the reading and writing experience to develop scholarship skills and a deep understanding of the significance and context of the science, not to be able to summarize subject matter for the sake of experts in the field. Thesis writing also puts more emphasis on explaining how the science is done and why, and why it might not have worked, again for the reason that being able to think through and articulate these ideas is a goal of the Honors educational experience. Although the organization of the material is flexible, the thesis must conform to all format requirements specified in the Senior Honors Project Handbook (http://www.jmu.edu/honorsprog/wm_library/Senior_Project_Handbook_2008.pdf). The writing style must be polished and free of typos. A fully revised version must be received and approved by the faculty advisor and readers by the deadline set by the Honors Program. To be considered for nomination for Outstanding Thesis Awards in Biology and Biotechnology, an almost complete, revised version of the thesis must be received by the Biology and Biotechnology Awards Committee three days before the deadline set by the Honors Program Outstanding Thesis Award Committee.

It is the responsibility of the student to comply with the committee's instructions according to the schedule, respond to all requests for revisions, and otherwise fulfill the committee's expectations for research and scholarship activity. The student must also submit the completed and approved thesis to the Honors office by the deadline set by the Honors office.

It is the responsibility of the faculty advisor and readers to ensure that students are given unambiguous instructions and a clearly defined schedule for completing various drafts of the thesis, and that they return their comments on each draft on a timely basis to the student. The faculty adviser will assign a grade at the end of each course based on his/her own rubric for assessing the progress made, the quality of the final product, and the ability of the student to meet deadlines and respond to requested revisions. Under no circumstances can a faculty advisor assign a grade for BIO 499C until the thesis has been completed, approved by the committee, and accepted by the Honors office.

If a student's GPA drops to 3.20-3.25 after completing BIO 499B, their continuation in the Honors project is at the discretion of the faculty advisor and readers, and will be based on their judgment of the student's ability to increase their GPA to 3.25 by the end of BIO 499C. If the drop is greater, the faculty advisor and readers must decide whether the student is to be transferred to a BIO 497 or BIO 495 or prevented from continuing in research on the basis of the reason for the drop in GPA and the student's level of motivation and ability.

6. Problem and conflict resolution:

Students, faculty advisors and readers who have any complaint or dispute regarding the performance or completion of any obligations regarding an Honors thesis project should consult the Biology Department Honors Liaison person for advice on resolving the problem.

Students wishing to change advisors for whatever reason are recommended to consult the Biology Department Honors Liaison person. Students wishing to discontinue their Honors project should address the issue with their faculty advisor.

Faculty advisors are free to terminate an Honors project upon unsuccessful completion of BIO 499A or BIO 499B (as indicated by a C grade or lower) on the basis of the student making insufficient progress, failing to meet weekly time commitments, deadlines or proposal/thesis requirements, or showing irresponsible, unethical or negligent behavior.