Dissertation Syllabus for Ph.D. in Quantitative and Systems Biology (QSB)

Description of Purpose:

The final and central requirement for awarding the QSB Ph.D. degree is the completion of a substantial and original independent research project. The successful completion of this requirement is demonstrated through the production of a dissertation document, describing the research project and its results, and the defense of the project from challenges offered by the members of the student's faculty Dissertation Committee. The quality of the dissertation and the defense of its thesis are evaluated by the Dissertation Committee in order to determine if the student has successfully completed this final requirement for the Ph.D. degree in QSB.

Learning Outcomes:

Candidate for the Ph.D. in Quantitative and Systems Biology will:

1] Demonstrate mastery of quantitative and systems biology skills.
2] Demonstrate knowledge and understanding of ethical standards.
3] Demonstrate effective communication of scientific concepts.
4] Demonstrate ability to perform original scholarship in specialized areas of biology.
5] Demonstrate ability to perform original research that advances scientific knowledge.

I. The Dissertation Research Proposal.

Purpose of the Proposal: Each student must prepare a document proposing a specific plan for her or his dissertation research. This document is expected to make a convincing case that the proposed research is likely to make an original contribution to human knowledge, is of sufficient interest to be worthy of pursuit, and is feasible given the student's skills, time constraints, and available resources.

Elements of the Proposal:
In order to defend the novelty of the research, as well as explain its significance, this document should include:

- A substantial review of literature relevant to the proposed dissertation project.

In order to justify the feasibility of the proposal, the document should include:

- An overview of progress to date;
- A detailed description of the research yet to be completed;
- An estimated schedule for the component tasks.

Negotiating the Topic and Obtaining Approval: The topic of the dissertation research proposal is to be determined by the student in negotiation with his or her Primary Research Adviser. The document must be approved by the Primary Research Adviser before it is delivered to the other members of the Dissertation Committee. Informal feedback on this document may be provided by Dissertation Committee members prior to the oral component of the Qualifying Examination, but the primary forum for feedback is to be the oral defense of the proposal. Thus, the negotiated date of the oral component of the Qualifying Examination must allow at least two weeks for the Dissertation Committee to evaluate the dissertation research proposal document.

Format of the proposal: The document must conform to the following guidelines:

Page Format and Font: One inch margins all around, Arial font, 11 point, single spaced.

Specific Aims (1 page maximum):

State concisely the goals of the proposed research and summarize the expected outcome(s), including the impact that the results of the proposed research will exert on the research field(s) involved.

List succinctly the specific objectives of the research proposed, e.g., to test a stated hypothesis, create a novel design, solve a specific problem, challenge an existing paradigm or clinical practice, address a critical barrier to progress in the field, or develop new technology.

Research Strategy (6 pages maximum):

Organize the Research Strategy in the specified order and using the instructions provided below. Start each section with the appropriate section heading – Significance, Innovation, Approach. Cite published experimental details in the Research Strategy section and provide the full reference in the Bibliography and References Cited section

(a) Significance

• Explain the importance of the problem or critical barrier to progress in the field that the proposed project addresses.

• Explain how the proposed project will improve scientific knowledge, technical capability, and/or clinical practice in one or more broad fields.

• Describe how the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field will be changed if the proposed aims are achieved.

(b) Innovation

• Explain how the application challenges and seeks to shift current research or clinical practice paradigms.

• Describe any novel theoretical concepts, approaches or methodologies, instrumentation or interventions to be developed or used, and any advantage over existing methodologies, instrumentation, or interventions.

• Explain any refinements, improvements, or new applications of theoretical concepts, approaches or methodologies, instrumentation, or interventions.

(c) Approach

• Describe the overall strategy, methodology, and analyses to be used to accomplish the specific aims of the project. Include how the data will be collected, analyzed, and interpreted as appropriate.

• Discuss potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.

• If the project is in the early stages of development, describe any strategy to establish feasibility, and address the management of any high risk aspects of the proposed work.

• Point any procedures, situations, or materials that may be hazardous to personnel and precautions to be exercised. Students should note whether or not they have receive the appropriate laboratory safety and training for their experiments, and if all research compliance issues have been completed or in progress (e.g. IACUC approval, radiation safety training).

Timeline and Milestones (1 page maximum):

Outline, by year, what specific milestones are expected to be met for the proposed project, including expected completion of the project aims and the expected time for the thesis defense.

Preliminary Studies (6 pages maximum):

Preliminary data is an essential part of any research grant application and helps to establish the likelihood of success of the proposed project. Discuss the any preliminary studies (student's own data, PI's data, or experience) pertinent to this proposed thesis work.

Bibliography & References Cited (no page limit)

Provide a bibliography of any references cited in the proposal. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. Include only

bibliographic citations. Students should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the application.

II: The Dissertation: Expectations and Responsibilities of Student and Advisor

The expectation is that the dissertation will serve as the basis for at least one publication in a peer-reviewed journal. The reported work and the written composition must be the student's own, though the student is encouraged to discuss both the substance and the preparation of the dissertation with the members of her or his Dissertation Committee well in advance of its final defense.

While the dissertation document is expected to provide a complete and comprehensive characterization of the student's Ph.D. research project, there are no universal requirements concerning the format of this document. Each student's Primary Research Adviser is responsible for providing structuring and formatting guidelines for the dissertation document.

Once the dissertation document is complete in the opinion of the student and the student's Primary Research Adviser, the student must provide a copy of the dissertation to each member of her or his Dissertation Committee. Each committee member must be given at least two weeks to read the dissertation and provide informal comments on it before a date may be scheduled for the thesis defense. Also, if one or more committee members find that there are significant errors or shortcomings in the dissertation, or that the scope or nature of the work is not adequate, the student must address these shortcomings before scheduling the defense. Once all of the committee members agree that the dissertation is ready to be defended (though minor errors or matters of controversy may still exist), the defense date may be scheduled.

Students are encouraged to create a proposed schedule for research and writing that is agreed upon with the advisor, and periodic meetings with the advisor should be part of the schedule. Students also should be familiar with the QSB Dissertation Rubric and should review it with their advisor on a regular basis to ensure that achievement of the objectives and progress towards degree (or lack thereof) is understood.

III. Thesis Defense

The Ph.D. thesis defense consists of an open seminar on the dissertation work followed by a closed examination conducted by the Dissertation Committee. During the examination, the student is expected to explain the significance of the dissertation research, justify the methods employed, and defend the conclusions reached.

The thesis defense cannot be scheduled until all members of the Dissertation Committee have read the dissertation and agreed that it is ready to be defended. Once such an agreement has been reached, the student is expected to negotiate with the members of the Dissertation Committee in order to schedule a date and time for the defense. All members of the Dissertation Committee must attend the thesis defense, either through physical presence or through the use of a high-bandwidth telecommunications technology that is unanimously accepted by the student and all members of the Dissertation Committee. The thesis defense cannot extend beyond three hours, but a block of time of that size should be reserved for this event in every case. Once the date of the thesis defense is determined, this information must be reported to the Dean of Graduate Studies, and one copy of the dissertation must be filed with the Division of Graduate Studies no later than two weeks before the scheduled date of the

thesis defense.

Immediately following the closed examination of the student by the Dissertation Committee, the members of the Dissertation Committee shall meet in private in order to discuss the student's performance. At the conclusion of these deliberations, the committee shall vote on the question of whether both the written dissertation and the student's performance during the defense are of sufficient quality to warrant the awarding of a Ph.D. degree from the University of California. A simple majority is required to pass. Members of the committee may vote to make conferral of the degree contingent on corrections and/or revisions to the dissertation, however. In this case, the committee will select one member, normally the Primary Research Adviser, to be responsible for approving the final version of the dissertation that is submitted to Division of Graduate Studies. All members of the Dissertation Committee who voted to award the degree must sign the final dissertation.