

# UNIVERSITY FACULTY SENATE FORMS

## Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. For more information, call the Faculty Senate Office at 831-2921.

**Submitted by:**  Melinda K. Duncan  phone number  0533

**Action:**  Request for New Concentration in Molecular Biology and Genetics for the Ph.D. in Biological Sciences

(Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

**Effective term**  08J   
(use format 04F, 05W)

**Current degree**  Ph.D.   
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

**Proposed change leads to the degrees of:**  Ph.D.   
   
(Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

**Proposed names:**  Ph.D. in Biological Sciences with a concentration in Molecular Biology and Genetics;   
   
Proposed new name for revised or new major / minor / concentration / academic unit (if applicable)

### Revising or Deleting:

**Undergraduate major / Concentration:**    
(Example: Applied Music – Instrumental degree BMAS)

**Undergraduate minor:**    
(Example: African Studies, Business Administration, English, Leadership, etc.)

**Graduate Program Policy statement change:**  See attached   
(Attach your Graduate Program Policy Statement)

**Graduate Program of Study:**    
(Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)

**Graduate minor / concentration:**

### List program changes for curriculum revisions:

None, this proposal seeks to codify our ongoing departmental policies at the level of the University.

### List new courses required for the new or revised curriculum:

(Be aware that approval of the curriculum is dependent upon these courses successfully passing through the Course Challenge list. If there are no new courses enter "None")

None

**Other affected units:**

(List other departments affected by this new or revised curriculum. Attach permission from the affected units. If no other unit is affected, enter "None")

None

**Rationale:**

(Explain your reasons for creating, revising, or deleting the curriculum or program.)

Our department has required all of our graduate students to complete the curricular requirements of a "track" for many years although the track curricular requirements were never approved at the university level. At the request of the Office of Graduate Studies, we submitted our graduate program policy to through the appropriate channels for approval. In February of 2008, it was suggested by the University Graduate Studies Committee that we further revise our curriculum to change the term "Track" to "Concentration" so that the student's curriculum is noted on their transcript. This new proposal is in response to this request by the University graduate studies committee. .

**Program Requirements:**

(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the present curriculum.)

**See Attached.**

**ROUTING AND AUTHORIZATION:** (Please do not remove supporting documentation.)

Department Chairperson \_\_\_\_\_ Date \_\_\_\_\_

Dean of College \_\_\_\_\_ Date \_\_\_\_\_

Chairperson, College Curriculum Committee \_\_\_\_\_ Date \_\_\_\_\_

Chairperson, Senate Com. on UG or GR Studies \_\_\_\_\_ Date \_\_\_\_\_

Chairperson, Senate Coordinating Com. \_\_\_\_\_ Date \_\_\_\_\_

Secretary, Faculty Senate \_\_\_\_\_ Date \_\_\_\_\_

Date of Senate Resolution \_\_\_\_\_ Date to be Effective \_\_\_\_\_

Registrar \_\_\_\_\_ Program Code \_\_\_\_\_ Date \_\_\_\_\_

Vice Provost for Academic Programs & Planning \_\_\_\_\_ Date \_\_\_\_\_

Provost \_\_\_\_\_ Date \_\_\_\_\_

Board of Trustee Notification \_\_\_\_\_ Date \_\_\_\_\_

Revised 11/03/04 /khs

# Concentration in Molecular Biology and Genetics Policy and Curriculum

The prospective student must meet all general requirements for the Ph.D. degree in the Department of Biological Sciences. The curriculum described below was developed to ensure that students achieve the breadth of knowledge, written and oral communication skills, and proficiency in the practice of research expected of individuals holding an advanced degree with a specialization in Molecular Biology and Genetics. All students are expected to have basic competency in biochemistry, molecular biology and genetics upon admittance to the program since these fields underpin the training provided in this concentration. The biochemistry competency must be demonstrated by superior performance in a biochemistry course from another institution or by completing CHEM 641 (Biochemistry(core) with a B or better in the first semester of graduate enrollment. Acceptance of courses from other institutions is subject to approval by the Concentration Coordinator. Competency in Molecular Biology and Genetics is primarily assessed by the student's performance on the oral preliminary exam. However, all students are required to take a written diagnostic exam or equivalent after one semester of enrollment to help them assess their level of preparation for the preliminary exam. The results of this exam will be discussed with the student by the concentration coordinator to help the student plan a strategy to prepare for the preliminary exam.

## Fall, Year One

Course Name(s) and Number(s)	Credits
BISC 602 - Molecular Biology of Animal Cells (core)	3
BISC 864 <sup>3</sup> - Laboratory tutorial (2 credits)	2
BISC 827 <sup>1</sup> - Graduate Research Seminar (core)	1
Teaching assistantship, development of oral presentation and teaching skills <sup>2</sup>	0

Total: 6 credits

## Winter, Year One

Molecular Biology and Genetics diagnostic exam

Second laboratory tutorial<sup>4</sup>

## Spring, Year One

Course Name(s) and Number(s)	Credits
BISC 654 - Biochemical Genetics (core)	3
BISC 868 - Research in the laboratory of chosen thesis/dissertation advisor	2
BISC 864 - Laboratory tutorial <sup>4</sup> (registration for winter session tutorial)	2
BISC 827 - Graduate Research Seminar, (core)	1
Teaching assistantship, development of oral presentation and teaching skills	0

Total: 8 credits

## Summer, Year One

June

Preliminary examination

July and August

3 credits: BISC 868<sup>6</sup> - Research in the dissertation laboratory

Identification of Advisory Committee and first committee meeting

## **Fall, Year Two**

<b>Course Name(s) and Number(s)</b>	<b>Credits</b>
BISC 665 - Advanced Molecular Biology and Genetics (core)	3
BISC 827 - Graduate Research Seminar (core)	1
Research, in thesis/dissertation laboratory	4-6
BISC 964 - Ph.D. students who have unconditionally passed Preliminary exam	
BISC 868 - Students who have not unconditionally passed preliminary exam	

Total: 8-10 credits

## **Spring, Year Two (Ph.D. students)**

<b>Course Name(s) and Number(s)</b>	<b>Credits</b>
BISC 827 - Graduate Research Seminar, (core)	1
BISC 964 - Research, in thesis/dissertation laboratory	6
From elective list (core)	3

Total: 10 credits

## **Doctoral Year Three - until successful completion of qualifying exam**

<b>Course Name(s) and Number(s)</b>	<b>Credits</b>
BISC 964 - Pre-candidacy Study	6
BISC 827 - Graduate Research Seminar	1

Total: 7 credits

## **After completion of qualifying exam by Doctoral students**

<b>Course Name(s) and Number(s)</b>	<b>Credits</b>
BISC 969 - Doctoral Dissertation	9
BISC 827 - Graduate Research Seminar	1

Total: 10 credits

## **Electives**

All students also are required to complete one elective from the approved list. Choice of elective should be made with approval of the student's research advisor.

BISC 605 - Advanced Mammalian Physiology

BISC 612 - Advanced Cell Biology

BISC 615 - Vertebrate Developmental Biology

BISC 625 - Cancer Biology

BISC 639 - Developmental Neurobiology

BISC 645 - Bacterial Evolution

BISC 646 - Plant Cell Biology

BISC 656 - Evolutionary Genetics

BISC 671 - Cellular and Molecular Immunology (4 credits)

BISC 679 - Virology

BISC 693 - Human Genetics

BISC 806 – Advances in Cell and Organ Systems

ANSC 644 - Bioinformatics

CHEM 645 - Proteins, Structure and Function

CHEM 646 - DNA-Protein Interactions

ELEG 673 - Signal Processing in Neural Systems

PLSC 635 - Plant Developmental Biology

## **Notes**

1. BISC 827 - Graduate Seminar is required every fall and spring semester while enrolled as a student. Students will present oral summaries of their laboratory tutorials or ongoing research.

2. For Ph.D. students, Teaching Assistantship will be awarded to (usually) new graduate students as part of their requirement to gain teaching experience. All Ph.D. student must serve as teaching assistants at least two semesters but under usual circumstances, no more than 4 semesters (two years) will be supported on TA stipends. Generally, the TA carries with it an expectation of 20 hours/week, including in-class/laboratory time, preparation, grading, etc.

3. For the Ph.D. program, BISC 864 credit will include, during the first year, two, two-credit Laboratory Tutorials or rotations in 2 different research labs (one of which will ultimately be chosen as the primary research lab).

4. During winter term of the first year, Ph.D. students are expected to devote full time effort to a laboratory tutorial. Registration for this is during the spring semester.

5. BISC 868 credits during the following spring semester will be considered research credit, assigned by the student's primary research advisor.

6. Students are expected to devote summer and winter session after the first year to full time research work towards the dissertation after completion of the preliminary examination

Doctoral students must pass a qualifying examination in order to advance to candidacy for the Ph.D. degree.

If any graduate courses equivalent to those listed above have been taken in previous graduate degree programs and have been accepted as graduate level transfer credit by the University, the transferred courses may be used to satisfy the Concentration requirements with the approval of the Concentration coordinator.

Other courses in addition to those listed above may be taken upon the advice of the student's advisor and thesis/dissertation committee, but these will not substitute for approved electives

### ***The Preliminary Examination***

Graduate students in the Molecular Biology and Genetics Concentration are expected to possess a fundamental body of knowledge in biochemistry equivalent to CHEM 641, molecular/cellular biology equivalent to BISC 401, and genetics equivalent to BISC 403 as well as the ability to critically analyze scientific literature. See the core competency list for more details. To ensure that this is the case, an oral preliminary examination will be administered to all graduate students in the Concentration at the end of their first year of study.

In order to be eligible to take the preliminary exam, students must have completed first year core courses (CHEM641 if needed, BISC602, and BISC654) with a grade of B or better. In all cases, the student is expected to correct all deficiencies in their performance in the first year curriculum by the end of the semester after the deficiency occurred but no later than the end of their third semester in the program. If the applicable course is not offered, a suitable substitute will be determined by the Concentration coordinator. Failure to obtain a B or better in a required course in the second attempt will make the student subject to dismissal from the graduate program. Students are expected to take the preliminary exam within six weeks after the first year curriculum has been successfully completed. If the student fails to complete the preliminary exam by this time, the student will be subject to dismissal.

### **Procedure**

Students will be provided with at least four sets of papers from the primary literature selected by faculty from which they must choose one set as the basis for their oral examination. These papers will be available at least six weeks before the exam, usually no later than May 1 [for students admitted in the summer or fall], so that the exam can be administered the second or third week of June. Students admitted in the Spring will usually have paper sets available by December 10 so that the exam can be administered in late January. Four weeks prior to the exam, the student should inform the Concentration coordinator of the chosen paper set and arrange the time of the exam. Prior to the exam, the student should prepare transparencies of all of the figures and tables presented in the papers so that they will be available for discussion during the exam.

During the exam, the student will be tested by a committee of four to six faculty on his/her comprehension of all aspects of the paper including background and related information. Students present a 10 minute synopsis of the primary paper, then the examination committee will ask questions pertaining to the paper's background material, methodology, experimental results and their significance, the article's overall significance to the field as well as the topics found in

the list of core competencies. It therefore is imperative that the student searches and reads the literature for background and related information. While a good starting point is the bibliography at the end of the chosen paper set, it is likely that other primary literature sources will need to be consulted. Prior to the exam, students are encouraged to contact faculty to discuss the topics they are responsible for and to clarify difficult concepts.

## **Grading**

After the oral examination, the examination committee will determine an appropriate grade. Four grades are possible at the initial exam: unconditional pass, conditional pass, re-examination or failure. If the student receives an unconditional pass, the exam was completed satisfactorily and no conditions are applied. In a conditional pass, the student performed marginally in one or more areas and may be asked to complete (with a grade of B or better) one or more courses as a condition for changing the grade to pass. The examination committee may prescribe conditions in addition to, or in lieu of, course enrollment. Once the condition is fulfilled, the student is responsible for informing both the Biology Graduate Program Director and the Concentration Coordinator so that the grade can be changed officially. If the student receives a re-examination, the student's performance was unsatisfactory and the exam should be repeated within three months, but no later than six months after the initial examination. Only one retake will be permitted. This would normally be prior to the start of the fall semester for June examinations, and during Spring break for January examinations. If the student receives a failure, the student's performance strongly indicated an inability to complete an independent research project and the student will be terminated from the Molecular Biology and Genetics concentration without the possibility of a retest. If the student does not perform satisfactorily in a re-examination, the student will be terminated from the Concentration in Molecular Biology and Genetics and recommended to the Graduate Affairs Committee for dismissal from the graduate program.

Once the student passes the preliminary examination, he/she becomes eligible to take the qualifying examination for advancement to Ph.D. candidacy.

### ***The Ph.D. Candidacy Examination***

The purpose of the oral candidacy examination is to give the student the opportunity to demonstrate:

- the ability to write and defend a research proposal;
- an understanding of the research area in which he or she is interested;
- the ability to formulate a research problem and to comprehend its significance; and,
- the ability to design appropriate experimental approaches to solve the problem.

A student's performance will be regarded as satisfactory only if the student:

- demonstrates an adequate knowledge of the field in general as well as the research specialty in which he or she is interested;
- formulates a research problem, the solution of which will make a substantial contribution to our existing knowledge;
- demonstrates that the experimental design and methods proposed are appropriate to solving the problem.

### ***Ph.D. Research Proposal***

At the end of the student's third year, the student is expected to have spent at least two years working on a research project in the laboratory of the dissertation advisor. At this time, the student, in consultation with the dissertation advisor, will prepare a proposal in a format similar to an NIH grant proposal that outlines the background of the project, the hypothesis to be tested, the research accomplishments to date and the research to be completed to fulfill the requirements of a Ph.D. in Biological Sciences. It is the student's responsibility to submit the Research Proposal to each member of the dissertation committee at least two weeks prior to the oral exam date (see below).

The Research Proposal must be double-spaced and should include:

**Specific Aims:** State concisely and realistically what the research is intended to accomplish and what hypothesis is to be tested. Do not exceed two pages.

**Background and Significance:** Briefly sketch the background to the present proposal, critically evaluate existing knowledge, and identify gaps that the proposed research is intended to fill. State concisely the importance of the research by relating the specific aims to longer term objectives. Four to eight pages.

**Research Design and Methods:** Briefly summarize the experimental design and the procedures to be used to accomplish the specific aims of this research. Include a description of the types of data to be obtained and how they will be analyzed to accomplish the specific aims. Students must be prepared to discuss potential pitfalls in the experimental design and contingency plans in the event that the data run counter to expectations. Fifteen to twenty pages.

**Literature Cited:** All citations must include all author names as well as article titles. A suggested format (the standard for Journal of Cell Science for EndNote users) is:

Mazaki, Y., Uchida, H., Hino, O., Hashimoto, S. and Sabe, H. (1998). Paxillin isoforms in mouse. *J. Biol. Chem.* 273, 22435-22441.

The Proposal should also contain a concise Preliminary Results section. However, the candidacy examination is not meant to be a defense of the student's previous laboratory work, but rather it should be an evaluation of the student's ability to construct a hypothesis and to design the means by which to test it.

### **Exam for admission into candidacy for the Ph.D. (Qualifying exam)**

The exam will be administered by the student's dissertation committee excluding the student's primary research advisor. Since the primary advisor for the dissertation will not be present during the examination, the student must choose an examination committee chair from among the four remaining members. The chair will be responsible for the conduct of the exam and the completion of a detailed report outlining the student's strengths and weaknesses, as well as any suggestions for alterations to the research proposal after the defense.

Prior to the exam, the student should meet with each committee member to clarify which topics that member feels are relevant for the background knowledge portion of the exam. At the oral defense, the student will present the background and significance of the work, the hypothesis to be tested and the preliminary data collected. The majority of the presentation should be devoted to explaining the research to be performed in the two years remaining in the student's degree program. Students should plan on a 30-45 minute presentation during which the committee will not ask questions except to clarify very specific issues (graph axes, incubation times, etc.). At the conclusion of the formal presentation the committee will evaluate the student's scientific background as well as the scientific validity of the proposed research project. It also is essential that the student demonstrates the ability to make a significant intellectual contribution to their project.

If the student receives a grade of unconditional pass, the student will be admitted into candidacy and should arrange for the appropriate paperwork to be filed with the graduate school. If the student receives a grade of conditional pass, deficiencies were found in the student's preparation

that need to be rectified by completion of the "condition(s)" before the student is admitted into candidacy. The student is responsible for informing the Graduate Program Director when any such conditions are fulfilled so that the student can be admitted into candidacy. If the student receives a re-examination, deficiencies in the written proposal and/or the student's scientific background will need to be corrected and the defense repeated. Only one reexamination will be permitted. If the student fails the qualifying exam on the first or second attempt, the student may be either recommended for a terminal Master's degree or for termination from the Ph.D. program by the examining committee.

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