

2021-2022

THE MCDB GUIDE TO GRADUATE STUDY

THE DEPARTMENT OF
MOLECULAR, CELLULAR AND DEVELOPMENTAL BIOLOGY

University of California
Santa Barbara
Revised June, 2021

NOTE: Substantial changes to curriculum initiated in Fall, 2020. Continuing students who entered prior should refer to the earlier versions of the Graduate Guide (year of entry into the program) for specific course requirements.

See the website for hyperlinks and further information:

<https://www.mcdb.ucsb.edu/academics/graduate>

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GRADUATE PROGRAMS IN MCD BIOLOGY

The Department offers the Molecular, Cellular, and Developmental Biology (MCDB) PhD and terminal MA degrees. Students may be admitted to MA or PhD programs. The MA program provides two options: Plan 1 (thesis) or Plan 2 (project). Students are admitted initially under Plan 2 unless they have established a research opportunity with a specified faculty member. Students may petition later for transfer to Plan 1 (see PETITIONS & FORMS, pg 18).

MCDB Graduate Program Faculty & Staff

MCDB Staff Graduate Advisor: Mr. Anthony Galaviz serves as the Staff Graduate Advisor for the MCDB programs (3314 LSB; x8499; mcdb-gradadv@lifesci.ucsb.edu). The Staff Graduate Advisor provides administrative support for the graduate programs: (1) interprets policies and procedures for faculty and students; (2) advises students on admission, registration, fellowships, oral examination, petitions; (3) tracks academic and TA performance and makes recommendations to the Faculty Advisor on probation/dismissal; (4) first line of support to the Faculty Graduate Advisor and Graduate Committee; (5) assigns TA appointments and offsets fees; and (6) serves as liaison with the Graduate Division, Registrar and other campus departments. The Staff Advisor should be consulted regarding student status and academic progress.

MCDB Faculty Graduate Advisor: Dr. William Smith is the Faculty Graduate Advisor. The Faculty Graduate Advisor represents the Graduate Division and serves to implement graduate program policies. The Advisor approves enrollment plans and petitions. The Advisor is available to graduate students for consultation and may refer matters to the Graduate Committee (see below) or appropriate MCDB committees or faculty.

MCDB Graduate Program Diversity Advocate: The Graduate Program Diversity officer (to be named) and representative to the Graduate Division on matters pertaining to inclusivity and diversity. The Diversity Officer is available to students for consultation and works with the Graduate Advisor and students to ensure an inclusive and effective training environment.

Graduate Committee

The MCDB Graduate Committee consists of the Faculty Graduate Adviser, three to five other faculty members, and at least one graduate student who has advanced to candidacy, appointed and approved by the Department Chair. One of these faculty members serves as chair of graduate admissions. The Graduate Committee acts on behalf of the program faculty in reviewing and implementing graduate program policies. The Committee may refer matters for consideration or action by the MCDB faculty. The Committee makes decisions on admissions into, and transfers between, graduate programs; makes recommendations for University- or Department-administered fellowships and tuition grants, and awards certain traineeship funds available to the program. When acting to set policy regarding the allocation of traineeship funds, the Committee is expanded to include the Chair of the MCDB Department. The graduate student representative, selected by the graduate students, also serves on the committee as a consultant in matters not pertaining to admissions decisions or matters involving personal information of students.

Department Chair: Dr. Rick Dahlquist is Chair of the MCDB Department.

Students should access the [MCDB Graduate Program Resources website](#) for more information, especially with regard to campus resources and affiliate groups.

The MCDB Graduate DEIW (Diversity, Equity, Inclusion and Wellness) committee is open to all graduate students and works with the departmental committee on JEDI and wellness issues. See the [MCDB Diversity website](#) for more information.

PREPARATION

Undergraduate Preparation

Entering students are expected to have completed the following undergraduate courses or have demonstrated competency in preparation for graduate core coursework (suitable UCSB equivalents are identified in parentheses):

One year of organic chemistry, with laboratory (CHEM 109A-B-C and 6AL-BL-CL)

One year of biochemistry/molecular biology (MCDB 108A-B-C or CHEM 142A-B-C; MCDB 109L or CHEM 110L or CHEM 125L or MCDB 140L);

Genetics, especially gene regulation (MCDB 101A-B)

These courses are foundational preparation for the graduate core courses. Students may be admitted with identified deficiencies in their undergraduate preparation, but they are expected to rectify these through the satisfactory completion of specified undergraduate courses during the first year of graduate study. *Course deficiencies will be identified on entrance, in consultation with the Faculty Graduate Advisor.*

Students entering the PhD program who already have a Masters degree may be excused from certain core courses if they have successfully completed the equivalent course in their previous graduate program. These course waivers are subject to approval by the Graduate Advisor in consult with the student.

Language Requirement

All graduate students are expected to demonstrate proficiency with English in all written examinations. Students whose native language is not English are required, by University policy, to complete a placement examination and courses in the "English for Multilingual Students" (EMS) program until they earn an exemption from further EMS course attendance. All prospective international Teaching Assistants (TAs) are required to take the TA Language Evaluation in order to be certified for sole classroom teaching responsibility. This evaluation is conducted by faculty of the EMS Program and the examinee's department at the beginning of each quarter. It requires the prospective TA to give a brief oral presentation in English and respond to questions. Students may contact the EMS program assistant for further information. The Staff Graduate Advisor should be contacted for further details.

Quarterly Registration

It is the student's responsibility to complete class registration for each quarter, when due, via registration with the online GOLD system. (Late registration incurs a \$50 fee). Students who are associated with a research advisor are expected to consult with their research advisor prior to registration regarding electives. All students are expected to inform the Staff Graduate Advisor of their registration plans and consult regularly with the Staff Graduate Advisor regarding their progress toward meeting program requirements.

MASTERS PROGRAMS

All MA students will be full time students and register for at least 12 units each quarter. The degree sheets serve as the official requirements for degree and are available as downloadable PDFs:

<https://www.mcdb.ucsb.edu/academics/graduate/resources>

There are two Masters tracks, each briefly described here. The key distinction is either completion and presentation of a thesis presenting novel research (Plan 1) or completion of a final project with additional course requirements (Plan 2).

Masters Plan 1 (Thesis)

Requirements: Graduate core courses and electives for 30 units total (a maximum of 10 units of the units may be MCDB 596) and a thesis.

- Students must receive an *average* of a B- or better in the core courses (see Table on page 6 for core courses) and electives.
- See Appendix I for pre-approved elective course list; additional courses may be selected as electives upon written approval of the Faculty Graduate Advisor. Electives chosen in combination with research courses (see below) will total at least 14 units to reach the 30 unit minimum. At least 20 units of letter-graded coursework must be at the graduate level.

The capstone for the Masters degree, Plan 1 is the thesis. By the completion of their studies, students will produce a written dissertation or thesis that should represent substantial new contributions to the biological sciences. The research underlying the dissertation or thesis must be conducted under the mentorship of a faculty member, the research advisor. If the direct research advisor is not a tenure-track, ladder faculty member, then a co-chair must be named from among the faculty. Students will complete the degree once all core course and elective requirements are met and the written thesis is approved by the Thesis Committee.

Students should form and consult with a faculty committee at least two quarters prior to the expected date of degree completion. The principal function of the Thesis Committee is to critically read and ultimately approve the thesis. *The thesis should be carefully reviewed by the faculty advisor before going to the committee.* A clean draft that has already received the mentor's approval then is submitted to members of the committee whose critical review may aid the student in the completion of the final product. It is the student's responsibility to ascertain that committee members will be available for reading the thesis in a timely fashion. *The dissertation must be given to committee members at least two weeks* to allow sufficient time for the completion of this task. Students must advise the appropriate Staff Graduate Advisor and all members of their committees of their intent to file a thesis by the end of the second week of the quarter in which they intend to file.

The committee will review the written document and the student will present a short seminar, open to the public. The seminar may be presented in MCDB 262 (with faculty in attendance) or scheduled through the department.

Masters Plan 2 (Project)

Requirements: (1) graduate core courses and electives for a total of 36 units and completion of a project (see below).

- Students must receive an *average* of a B- or better in the core courses.
- See Appendix I for pre-approved elective course list; other courses may be selected upon prior written approval of the Faculty Graduate Advisor.
- Electives chosen in combination with literature and research courses will total at least 20 units to reach the 36 unit minimum. No fewer than 24 of the 36 letter-graded units must be at the graduate level. No more than 12 of the required 24 graduate units may be MCDB 596.

The capstone for the Masters degree, Plan 2 is a Final Project. Students will complete the degree once all core course and elective requirements are met, and the final project is approved by the Graduate Committee.

Students should [consult with the faculty graduate adviser at least one quarter in advance of the planned completion of the degree for approval of the final project by the Graduate Committee.](#)

The final project consists of either (i) a research presentation in the MCDB 262 meeting or (ii) a written review article on a topic pre-approved by the graduate committee and in the format of a *Nature Reviews* review article. Consult the Faculty Graduate Adviser for details.

Required Core	(Both Plans for Masters Degree)		
Course Code	Course Title	Units	Quarter
MCDB 229	Protein Biochemistry	2	F
MCDB 218A	Method & Logic in MCD Biology I	3	F
MCDB 218B	Method & Logic in MCD Biology II	5	F
MCDB 260	Research Strategies in MCDB (every quarter for 2 yrs)	1	F,W,S
Required Seminars			
MCDB 262	Student Research Seminar (every quarter)	1	F,W,S
MCDB 263	MCDB Departmental Seminar (every quarter)	1	F,W,S

Required Teaching Assistantship coursework. Students who wish to TA must complete the appropriate campus training as well as the TA orientation and techniques courses (MCDB 500 and 502; taken once, without degree credit). When serving as a TA, students also should enroll in the TA practice course (MCDB 501) for the appropriate number of units (maximally 4 units for a 50% TA ship assignment; without degree credit). **Note that Masters students are not guaranteed a TAship.**

Emphasis in Pharmacology and Biotechnology. Students pursuing an MA in MCDB may petition to add an Emphasis in Pharmacology and Biotechnology. The curriculum for the Emphasis in Pharmacology and Biotechnology requires that students take the MCDB core courses (16 units total) as described above. Additional units of coursework should be taken from a selection of graduate courses chosen from the MCDB, Chemistry and Biochemistry, and Psychology departments. Students are encouraged to enroll in the Pharmacology Colloquium (MCDB 187 and Biotechnology Seminar (BMSE/MCDB 294B); both courses bring in guest speakers from the Biotechnology and Pharma industry. The electives are grouped into three tracks, Molecular Biology and Cell Biology, Chemistry and Biochemistry, and Neurobiology and Behavior. The tracks have been established to reflect the three traditional areas of research in the field of pharmacology and biotechnology, and serve as a guideline for students to help shape their curriculum. Please consult with the Graduate Adviser for up to date information about the emphasis and electives in the specific tracks as these course selections across multiple departments are currently undergoing revision.

DOCTORAL PROGRAM

Brief Outline of MCDB Ph.D. Program (see Appendix II for Program Learning Outcomes)

The official degree check sheet is available as downloadable PDF here:

<https://www.mcdb.ucsb.edu/academics/graduate/resources>

• Year One

- ❑ Quarterly lab rotations (3 units each; MCDB 596)
- ❑ MCDB core courses and electives (FWS, including MCDB 260 every quarter; see below)
- ❑ Departmental seminar and Friday Noon Seminars (FWS; MCDB 262, 263; see below)
- ❑ TA Orientation/Techniques courses (MCDB 500 & 502)
- ❑ Decide on a dissertation advisor/laboratory by end of Spring Quarter
- ❑ Non-CA residents are expected to CHANGE THEIR RESIDENCY STATUS to CA before classes start in Fall quarter–this needs to be submitted ASAP upon arrival in California

• Year Two

- ❑ Finish any required coursework
- ❑ Enrollment in MCDB 260 (FWS)
- ❑ Enrollment in seminars, MCDB 262, 263 (FWS)
- ❑ Take Preliminary Off-topic Proposition Exam (Fall quarter)

• Year Three

- ❑ Continue enrollment in seminars (MCDB 262, 263; FWS)
- ❑ Advancement to Candidacy
 - Present dissertation proposal via a formal meeting with the Dissertation Committee to present the proposal.
 - Advancement to candidacy upon positive evaluation by Dissertation Committee and satisfactory completion of all required coursework.

• Subsequent Years

- ❑ Continue enrollment in seminar courses (MCDB 262, 263; FWS - **required**).
- ❑ Present research talk annually in MCDB 262 (FWS; **required**).
- ❑ If necessary, complete 2 quarter teaching requirement.
- ❑ Meet with dissertation committee at least once per year (**required**):
 - Submit short report to Graduate Program Assistant regarding the meeting.
 - The committee must convene and approve the final research plan (typically 3-12 months) before defense of the dissertation.

• Completion of Doctoral Degree

- ❑ Confirm all course work and teaching requirements for PhD degree are met.
- ❑ Prepare and file doctoral dissertation.
- ❑ Present final defense/seminar.

It is expected that all PhD students be enrolled as 'full time' students and earn a minimum of 12 course units each quarter, and that most of the course requirements (see below) will be completed during the first year of graduate study. All course requirements must be completed prior to advancement to candidacy.

Required Courses for the Doctoral Degree

Required Core	(16 units)		
Course Code	Course Title	Units	Quarter
MCDB 229	Protein Biochemistry	2	F
MCDB 218A	Method & Logic in MCD Biology I	3	F
MCDB 218B	Method & Logic in MCD Biology II	5	W
MCDB 221	Proposal Writing & Evaluation	3	S
MCDB 260	Research Strategies in MCDB (every qtr, years 1 & 2)	1	F,W,S
Required Sem	(every quarter while enrolled)		
MCDB 262	Student Research Seminar (every quarter)	1	F,W,S
MCDB 263	MCDB Departmental Seminar (every quarter)	1	F,W,S

At least 5 additional units of elective coursework is required (see Appendix I for pre-approved elective course list); other courses may be substituted upon prior written approval of the Faculty Graduate Advisor.

Units in the following courses may not be counted towards the unit degree requirement: MCDB 262, 263, 269, 500, 501, and 502.

Lab rotation consists of 3 units of MCDB 596 (directed research) per quarter in year 1. In subsequent quarters, students are expected to enroll in MCDB 596 for research units.

Teaching Requirements. Departmental TA orientation/practice/technique courses (MCDB 500, 501, 502); two quarters of TA service are a degree requirement.

Academic Standards

PhD students should generally register for lecture courses, literature courses, and research units for letter grades rather than S/U. In all programs, students are expected to maintain a minimum cumulative grade point average of 3.0. Failure to maintain this average will cause the student to be placed on academic probation (according to the policy of the Graduate Division) and may lead, in extreme cases, to dismissal from the program. Research and Teaching Assistants should meet the GPA standard of 3.0 as well. Students admitted with undergraduate deficiencies must complete all required undergraduate courses, with a letter grade of B or better, during the first year of study.

Failure to meet minimum grade standards will cause the student's record to be reviewed by the Graduate Committee. Fellowship support is awarded on the basis of excellence and may be jeopardized by poor academic performance. In cases of poor academic performance, the Graduate Committee may prescribe appropriate remedial action or, in extreme cases, recommend dismissal from the program to the program faculty. The program faculty must approve a dismissal recommendation before it is submitted to the Graduate Division. The Faculty Graduate Advisor will inform a student of any decision affecting the student's status (see also EVALUATION OF STUDENT PROGRESS AND STATUS, page 15).

Laboratory Rotations

All entering graduate students in the MCDB Doctoral program who are supported wholly or in part by institutional funds (including University fellowships, teaching assistantships, traineeships, etc.) are expected to complete three one-quarter long laboratory rotations during their first year of study. For first-year students supported entirely by faculty research grants and entering directly into a research group, the three rotations are not mandatory.

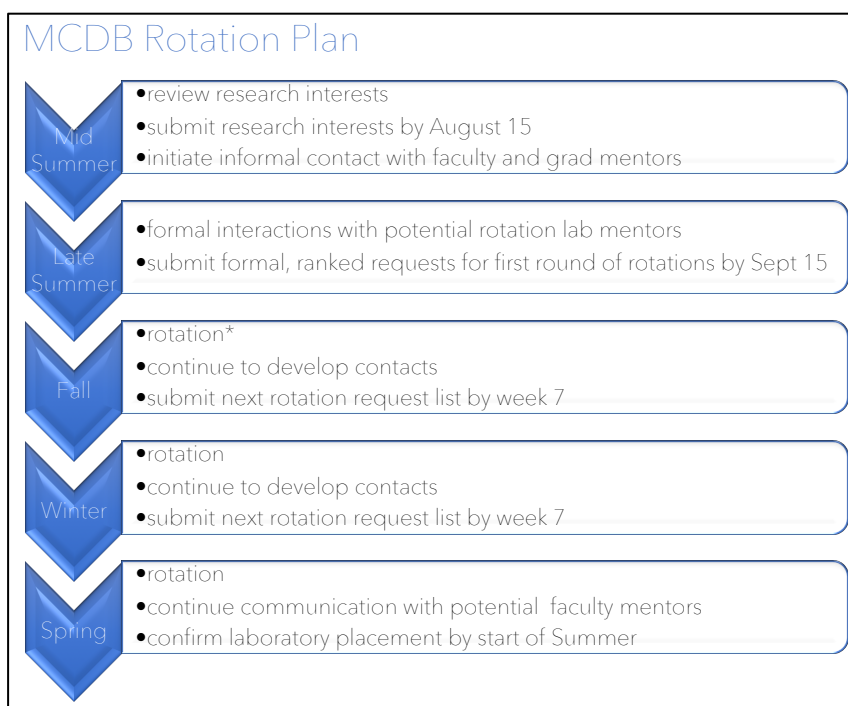
Laboratory rotations serve at least two important purposes: 1) students learn first-hand about research efforts in several different areas, thus broadening a student's research perspective; and 2) they allow students and mentors to "match up" so a research advisor may be selected. We increasingly find that rotation experiences lead to collaborative thesis projects. Each laboratory rotation consists of 3 units of MCDB 596 under the instruction of the appropriate faculty member. Although, in principle, this translates into a minimum commitment of 15 hours per week in the research laboratory, research is the core of a doctoral training and it is assumed that students will devote much more than this to their research efforts during rotations.

First year students are expected to rotate in MCDB faculty members' labs. Exceptions will be considered on an ad hoc basis by the Graduate Committee, and must be requested at least one month in advance. Financial support to rotate in a non-MCDB lab will be determined in consultation with the graduate committee and the sponsoring faculty member.

*The Faculty Graduate Advisors, in consultation with the Graduate Committee and individual faculty, will be responsible for assigning students to particular laboratories each quarter. Incoming students are expected to submit to the Staff Graduate Advisor their laboratory preferences in the form of a rank-

ordered list of three or four names. These lists should be submitted the week before classes start for fall rotations, and no later than the last week of fall and winter classes for winter and spring rotations. Students should contact and meet with faculty with whom they are interested in doing laboratory rotations prior to submitting their rotation requests.

During the spring quarter, PhD students should initiate discussions with prospective mentors about joining their research groups for their dissertation research. All students are normally expected to decide on their doctoral research mentor by the end of their first academic year.



PhD PRELIMINARY (COMPREHENSIVE) EXAMINATION

PhD students must complete a preliminary examination consisting of a written research proposition followed by an oral defense of the proposition.

Examination Objectives. The aim of the Preliminary Examination is to evaluate student progress following the first year of graduate study. It is important that students have achieved specific comprehensive goals that will enable them to be successful in their PhD studies.

These goals include:

1. Acquiring a strong foundation of knowledge in relevant disciplines.
2. Acquiring critical thinking and analysis skills vital to the basic principles of research, including the ability to develop scientific hypotheses, design experiments, and evaluate scientific outcomes.
3. Acquiring skills in scientific communication, writing and presentation.

Together these skills serve as a foundation for dissertation research in which the student develops increasing independence and responsibility for the design, implementation, and analysis of their research project.

Examination schedule. The preliminary exam period *typically* occurs during the first few weeks of fall quarter of the 2nd year of study, as outlined below (tentative):

First day (Mon) of F Qtr	Beginning of exam period - journal articles made available
Wed of 1 st week of F Qtr	Final date to choose article (the earlier the better)
Wed of 3 rd week of F Qtr	Written proposition due
5 th week of F Qtr	Oral exams

The student must have rectified any deficiencies in their undergraduate preparation and have completed the first year core courses. Elective course requirements need not be completed before taking the exam. *In the event that a student must re-take a first-year course, the preliminary exam will be deferred for up to one year until the required course work has been passed.* Such deferred preliminary exams will be administered the quarter following completion of the courses.

Examination Committee. The examination committee will consist of three MCDB faculty members who are assigned by the Graduate Advisor and will not include the research mentor.

Format of the Examination. The Preliminary Exam will be submitted as a written document that then will be orally presented and defended to the Exam Committee.

At the beginning of the quarter, candidates will be provided with a list of recent articles from which they will select one paper as the basis for their presentation. Candidates will forward their selection to the Graduate Advisor for approval, and will be notified shortly thereafter of the suitability of the chosen paper. If not suitable, the candidate must select another paper, which must be approved by the Graduate Advisor. Both the article and the proposition must be focused on a topic unrelated to the student's own dissertation project and different from that prepared for the MCDB Proposal Preparation class (MCDB 221). *As an expectation of ethical conduct, a student may not choose a paper that they have previously analyzed for a journal club, class or lab meeting, or one that has been analyzed in a class that they have attended.*

The exam is comprised of written and oral components. In the first half of each, the student will critically evaluate the chosen article. For the second half of the exam, students will propose a hypothesis based on the findings from the manuscript and other relevant studies in the field. They will then develop two aims for a proposal of their own to test their hypothesis. Students should emphasize development of the hypothesis, the experimental strategies devised to test the hypothesis, and interpretation of the potential outcomes. Students should use the same rubric used in the MCDB 221 course.

Submission of the Proposition. A PDF formatted electronic version of the proposition along with the PDF of the selected journal article must be submitted to the Staff Graduate Advisor by the proposition due date. Students who have detected a flaw in their already submitted proposition should not submit written amendments, but may discuss any revisions at the oral exam.

Written Proposition Format and Content. The written proposition is to consist of the sections described below. The proposition must be typewritten in 12 point font with 0.75 inch margins on all sides, top and bottom. Sections 1, 5 & 6 should be single-spaced; while Sections 2, 3 & 4 must be 1.5x spaced (~33 lines per page). The total length of sections 2, 3 & 4 must not exceed 8 written pages. Failure to adhere to these guidelines will result in the return of the proposal to the student.

Section 1 - Title Page and Abstract (1 page, single spaced). The title page should contain:

- a) a descriptive title of the proposition
- b) the general topic area of the proposition (e.g., molecular dynamics of the cytoskeleton, plant development, mechanism of enzyme action)
- c) the name of the student's research advisor
- d) *a one-paragraph description of the student's anticipated dissertation topic or research problem (even if only tentatively identifiable at the time).*
- e) Abstract - the proposal abstract may not exceed 250 words. It should include background information, significance of the problem to be investigated, the hypothesis to be investigated and the general approach to be used.

Section 2 - Journal Article Critique (~3½ pages, 1.5x spaced). The critique should include a concise description of the significance of the field including relevant background material and the current status of the field. Students are expected to research the topic of the paper and include a clear description of the most important previous work in the literature. The article critique should emphasize the authors' hypothesis, the principle findings of the authors, and evaluation of the authors' conclusions. The student should assess the data themselves, not merely re-state the authors' interpretation of the data, and critique it in the context of other published studies in the field. Throughout, the candidate should critically analyze the paper—were the conclusions justified by the data? Are there alternative interpretations of the data? Did the authors do the right experiments and the correct controls? How do the results compare to other studies?

Finally, the student should make a compelling argument for the direction they are proposing for further studies. A hypothesis for the proposition should be developed, and specific data that support the hypothesis of the proposition should be outlined. The rationale behind the proposed experimental approach should be described and the significance of the expected results should be discussed. All statements must be documented with references.

Section 3 - Specific Aims (~½ page, 1.5x spaced). The Aims should comprise a very short paragraph describing the overall goals of the proposed research, with minimal redundancy with the Critique/Background section, followed by 2 specific aims of the proposal, which should be listed and described. Each specific aim should include a 2-3 sentence description.

Section 4 - Research Design (~4 pages, 1.5x spaced). The research plan should be clearly laid out, including a description of the types of proposed experiments, their purpose, and the underlying techniques and methods to be used. The emphasis should be on experimental approach and design, with minimal description of methodological details.

Attention should be given to ensure that the aims and the possible experimental outcomes relate to the hypothesis that is proposed. In developing the proposed research plan, students should consider anticipated results and their interpretation to permit unambiguous conclusions regarding alternative

hypotheses or models that are being examined. Positive and negative control experiments, possible difficulties and alternative approaches should be discussed.

Excessive experimental detail should be avoided, but the student should be prepared to discuss technical details during the oral defense of the proposition. The proposal should not include buffer composition, minute details of plasmid constructs, routine lab methods, etc. The emphasis should be on experimental design as opposed to a description of methodology.

The principal experiments should be generally described in the sequence in which they might be carried out. A flow chart may be included in an Appendix; also, the use of appropriate figures (e.g. a protein's domain structure) is encouraged.

Section 5 - Literature Cited (no page limit; single spaced). A complete list of citations should be included. Each reference should be cited by number (as opposed to [author, year], for example) and must contain the full list of authors, year, the title of the paper, journal, volume and inclusive page numbers.

Section 6 - Appendix (optional; 1-2 pages; single spaced). An appendix of figures/tables is permissible (4-6 figures/tables maximum). Legends must be included with all figures/tables.

Consultation on the Preliminary Proposition Exam. *The purpose of the exam is to evaluate the student's ability to analyze, formulate and defend an experimental research plan and demonstrate their comprehensive knowledge.* While discussion with other students, post-docs, and faculty members is allowed and encouraged throughout the process, the final research plan must represent ideas originating from the student and *the written version of the research proposal must be the unaided product of the student.* The written proposal may not be circulated to anyone prior to its submission. However, after the document has been submitted, the student may enlist the help of a group of graduate students and postdocs to give a 'mock exam' to aid the student's preparation for the oral exam.

Oral Defense of Proposition. The student is expected to have a solid intellectual understanding of the research paper and of the proposition. The background should be understood fully: the student should know who the major contributors have been and should be able to critically evaluate their contributions. The student also should be able to discuss the significance of the proposal and will be expected to defend the rationale for the proposed experimental approach. The student will be expected to draw on other, relevant areas of knowledge. Precedents for the approach and the conceptual and theoretical basis for all proposed techniques should be understood.

The student also must be able to demonstrate a thorough understanding of basic knowledge relevant to the proposed research. The defense of the proposition is expected to be conducted with emphasis on the proposal itself; students should expect questions regarding basic biochemical and molecular biological principles in areas relevant to their proposal. Examination committees will assume that the student's preparedness in the broad field of molecular, cellular, and developmental biology will be commensurate with the successful completion of relevant course requirements.

The oral presentation should be a "chalk talk" at the white board, and students should be prepared to make effective use of the board. Electronic media, visuals, or handouts are not allowed. However, students may bring the manuscript being discussed, and all members of the examination committee will have access to the manuscript. The Candidate should expect that the members of the Committee have critically evaluated the manuscript prior to the exam. The student should be prepared for interruptions to their presentation and questions throughout the exam. The oral examinations are ~1.5 hours in length.

Evaluation of Oral Examination.

Immediately after the oral exam the Examination Committee will review the student's examination performance and decide whether the candidate has performed at or above the level expected of a student entering the second year of PhD studies. Evaluation is based on a combination of criteria including background knowledge in the discipline, critical thinking, development of hypotheses, design of experiments, interpretation of results, understanding research methods, and clarity of presentation. The student's research advisor will then join the meeting of the Examination Committee in order to participate as a consultant in the final decision regarding the outcome of the examination. The Examination Committee will make the final decision regarding the outcome (Pass or Not-Pass) of the exam. In either case, the committee may specify that additional courses be taken or recommend that a student take a particular course. All such imposed requirements must be completed to the satisfaction of the Examination Committee prior to the assessment by the Dissertation Committee for advancement of the student to candidacy. The Examination Committee will inform the student about the outcome of the examination as soon as possible. A completed examination rubric, a written summary and any advice from the committee will be provided to the student by the Examination Committee chair, with a copy sent to the MCDB Staff and Faculty Graduate Advisers.

Repetition of Proposition Examination

In some cases, a student may need to **rewrite part of the exam**. In these cases the exam committee should clearly state the expectations and provide a time line for submission of the re written portion.

On occasion, a student may **fail the exam**. This results in the student being placed on monitoring status. The student will be permitted to repeat the examination once. For the repeat, the student may select the same topic or a new topic, with approval of the committee. The committee member composition can also be changed, in consultation with the Graduate Advisor. The second attempt must be made **before fall quarter of the 3rd year** of graduate study. If the exam has not been completed by that time or if the student does not pass a second attempt, they will be dismissed from the PhD program and automatically placed in the Master's program (see page 15).

DISSERTATION COMMITTEE & ADVANCEMENT TO CANDIDACY

After passing the Preliminary Examination in the Fall Quarter, each student forms a Dissertation Committee and the Advancement to Candidacy assessment will take place at a committee meeting by the end of the 3rd year of graduate study. At the discretion of the faculty adviser and student, a committee meeting(s) may be held prior to the Advancement to Candidacy Exam. All students are required to hold annual committee meetings thereafter (see below).

The **Dissertation Committee** consists of four members with the student's advisor as Chair. See Graduate Division guidelines for the nomination of members of the Dissertation Committee:

<http://www.graddiv.ucsb.edu/academic/committees#doctoral-committee>

These committees are formally appointed by the Dean of the Graduate Division, upon nomination by the MCDB Department Chair. Typically, the committee's tentative membership will emerge from a discussion between the student and the research advisor. The consent of the proposed committee members must be secured before the committee slate is submitted for nomination. The student should inform the Staff Graduate Adviser of the committee composition.

The **goal of the Advancement to Candidacy assessment** is for the student to demonstrate that they have developed a viable dissertation project and achieved the independence and skills to successfully complete the project. Advancement to Candidacy will occur following a positive review by the student's Dissertation Committee. The appraisal will take place during the 3rd year of study at a formal meeting with the Dissertation Committee. The advisor, as chair of the committee, attends the meeting, but is expected to play a back-seat role

in the presentation of the project, and to resist the temptation to answer questions that are directed to the student.

The emphasis of the candidacy meeting is intended to be discussion and defense of the student's dissertation proposal. It is expected that the experimental design of this project will be developed by the student in close consultation with the mentor. The student also is encouraged to discuss their project with members of their Dissertation Committee, with fellow students and postdocs, through presentations of their project at group meetings, and writing of extramural fellowship applications.

[The student should follow these steps in preparation for the Advancement Meeting, which again, should take place by the end of Year 3:](#)

1 - Consult with the faculty mentor regularly regarding the appropriate timing for the meeting in regard to research progress.

2 - Consult well in advance with committee members regarding availability and the timing of the meeting and then work with the staff graduate adviser to secure an exact time and location. The staff adviser will prepare the required paperwork and carry out a progress check with the Staff Graduate Adviser to ensure that everything is in order for Advancement.

3 - Prepare a brief written proposal describing the dissertation project. *The exact format and content should be determined in consultation with the thesis adviser*, but typically provides brief background and significance, the specific aims of the project, an outline of experiments, both planned and completed, and key references.

4 -The thesis proposal should be submitted to the committee members roughly two weeks in advance of the meeting (students should consult with the members regarding exact timing and desired format). A PDF copy of the proposal should also be submitted to the Staff Graduate Adviser for inclusion in the student's file.

5 - The meeting typically will include a presentation by the student summarizing the scientific background for the project, the hypothesis, aims, the work accomplished, and the planned research directions. Students should plan to discuss the significance of their studies and defend the rationale for their approach. Students are expected to demonstrate proficiency in the background literature relevant to the field in which they are carrying out research and to present a defensible dissertation proposal together with the general experimental approaches to be used. In addition, the student should be able to think incisively and critically about experimental approaches, including recognizing potential difficulties with experimental approaches, identifying possible solutions for how to overcome them, and developing a reasonable timetable.

In the case of a passing evaluation, the Dissertation Committee will complete and sign the form recommending Advancement to Candidacy, which should be returned to the Staff Graduate Adviser. If the Committee imposes any special requirements, the recommendation for Advancement to Candidacy will not be completed until such requirements have been met. Filing for Advancement to Candidacy requires payment of a fee, but has a number of advantages including remission of some of a student's educational fees and eligibility for student travel awards from the Academic Senate.

DOCTORAL DISSERTATION

The capstone of graduate research is the dissertation. By the completion of their studies, students will produce a written dissertation that should represent substantial new contributions to the biological sciences. The research underlying the dissertation or thesis must be conducted under the mentorship of a faculty member, the research advisor.

The research advisor serves as the Chair of the student's Dissertation Committee, which is to be formed as described above. Committee members may be consulted at any time during the research phase of the student's graduate study at the discretion of the student or the committee chair. Also, committee members may inquire

on their own initiative into the student's progress. An annual meeting of the student with the Dissertation Committee is required in any case. In the last year of graduate study, the Dissertation Committee must convene and approve the final research plan (typically 3-12 months) before defense of the dissertation.

A principal function of the Dissertation or Thesis Committee is to critically read and ultimately approve the dissertation or thesis. *The dissertation should be carefully reviewed by the faculty advisor, and be in excellent shape before going to the committee.* A 'clean' dissertation or thesis draft that has already received the mentor's approval then is submitted to members of the committee whose critical review may aid the student in the completion of the final product. It is the student's responsibility to ascertain that committee members will be available for reading the dissertation or thesis in a timely fashion. *The dissertation must be given to committee members at least two weeks prior to the PhD defense seminar* to allow sufficient time for the completion of this task. Students must advise the appropriate Staff Graduate Advisor and all members of their committees of their intent to file a dissertation or a thesis by the end of the second week of the quarter in which they intend to file.

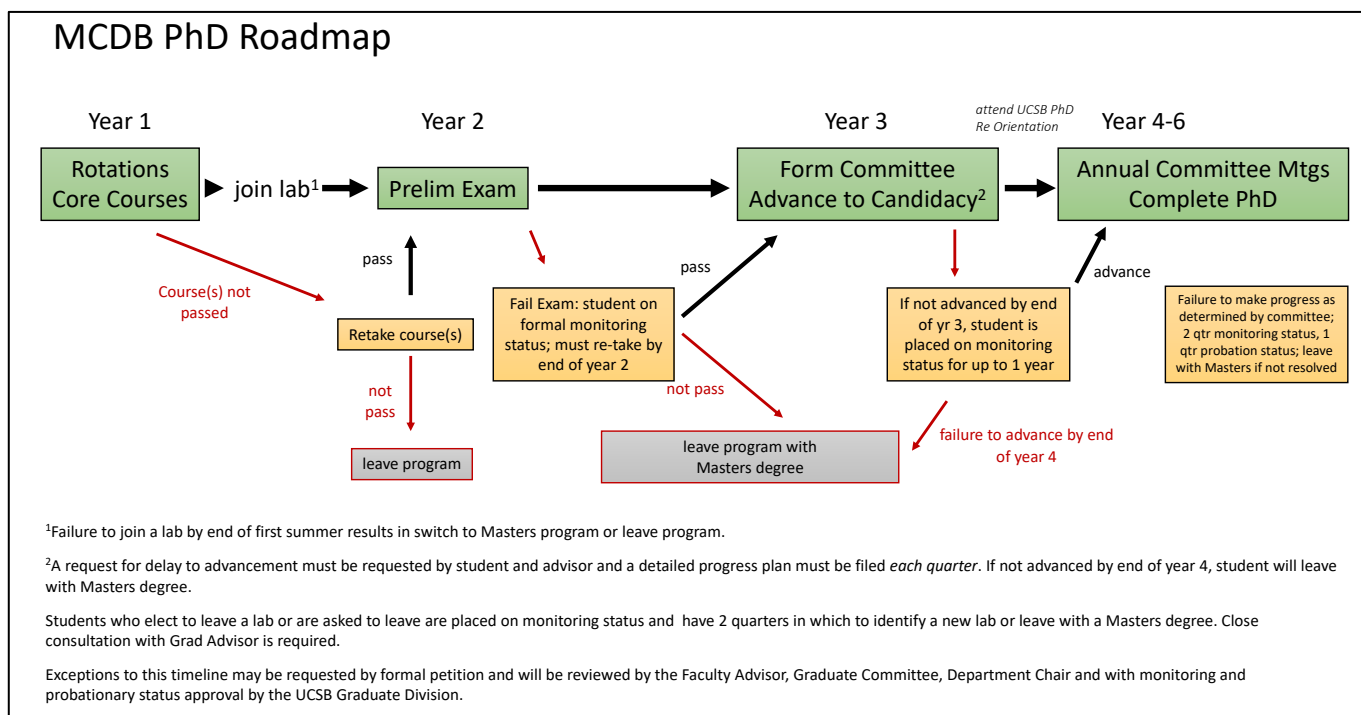
All PhD candidates must present a formally announced research seminar. After the dissertation seminar, the candidate and Dissertation Committee will convene privately for an oral defense of the dissertation. It is the student's responsibility to make the necessary arrangements for the seminar presentation, with the assistance of the Staff Graduate Advisor, well in advance of the planned finishing date.

Students should be aware of Graduate Division policy, filing deadlines and requirements, including the information provided on the Graduate Division website:

<http://www.graddiv.ucsb.edu/academic>

EVALUATION OF PhD STUDENT PROGRESS, STATUS, AND TIME TO DEGREE

The roadmap for progression through the PhD program is shown below, indicating potential barriers and outlining how these may be resolved. Students who encounter barriers should be in close contact with the Graduate Advisor to ensure a return to normal status as soon as possible. Students encountering academic difficulties should also consider meeting with the Graduate Division Academic Advisor, Ryan Sims.



Years 1 and 2

Students should plan to identify a lab by the summer of year 1. On occasion, it may be necessary to do an additional, summer rotation, with formal approval of the Graduate Advisor. Graduate Division requires that students maintain a GPA of 3.0 or above and all required core courses must be passed with a grade of B- or better.

Students typically take the preliminary exam in Fall of their second year. See the section on exams for details. Failure to pass the exam by the end of year 2 moves the student into the Masters program with a plan to graduate as soon as possible.

Advancement and Annual Committee Meetings

Students must form their thesis committee and pass the candidacy exam by the end of year 3. See page 13 for details about the Candidacy Exam. Delays require consultation of the student and faculty advisor with the Graduate Advisor and a written plan for timely progression in forming the committee and advancing. Except in very unusual circumstances and with approval from the Department Chair and Graduate Division, if the student has not advanced by the end of year 4, they will leave the program with a Masters degree.

Following Advancement to Candidacy, students are **required** to meet at least once a year with their Dissertation Committee. These meetings should be scheduled for the academic quarters - students wishing to meet during Summer should consult well in advance with the members of their committee in order to schedule.

The annual committee meetings are intended to evaluate the research accomplished and to refine goals and expectations. The purpose of these meetings is to help students plan their research, provide effective feedback and support, and to help students stay on track to make steady progress toward their PhD degree. The student is expected to communicate their research progress and chart a course for the next steps in the research plan. The Committee should provide informative feedback and mentoring for the student, highlight strengths and weaknesses of the studies, and help develop a roadmap for future work.

The precise format of the meeting will be up to the Dissertation Committee, the advisor and the student. Typically the committee will expect the student to provide a report of their research progress and plan:

- A discussion of any changes in goals, specific aims, or experimental design
- A concise description of studies conducted, the results obtained, and their significance to the field (negative results or technical problems also should be described).
- Specific objectives for the coming year

REQUIRED: Following each annual meeting, the student will send a brief synopsis of the meeting to each committee member summarizing agreed-upon steps for the upcoming year. The synopsis and research progress report also should be forwarded to the Faculty and Staff Graduate Advisors.

If the Dissertation Committee does not approve the annual research plan, the committee can dissolve, and if so, the student will be subject to dismissal from the doctoral program on the grounds that the student has not shown satisfactory progress toward the degree. In this case, the research mentor is responsible for communicating to the Staff and Faculty Graduate Advisors the outcome of the meeting.

In the last year of graduate study, the Dissertation Committee must convene and approve the final research plan (typically 3-12 months) before defense of the dissertation.

The performance of all graduate students will be reviewed and evaluated at least once each year by the Graduate Committee. The Graduate Committee in consultation with the Research Advisor will review any problematic cases. These reviews and evaluations will focus, as applicable, on the student's 1) progress and ability in the laboratory, 2) progress and performance in courses, 3) progress toward the remedy of course deficiencies, and 4) performance on PhD proposition examination and Advancement to Candidacy evaluation.

Students who have advanced to candidacy are also **required** to:

- Present a yearly seminar in MCDB 262 (Friday Noon Seminar) describing their research accomplishments and goals and attend the seminar each week, participating in discussion and feedback.
- Present a poster or short talk describing their work at the annual MCDB Research Symposium.

Students also are encouraged to present their work at national and international meetings and conferences.

Time-To-Degree Standards

The current Time-to-Degree Standard for MCDB PhD students currently is 5.75 years.

For more information, see:

<http://www.graddiv.ucsb.edu/academic/academic-performance#time-to-degree-standards>

Departments will deliver written notification to students if time standards for advancing to candidacy or completing a master's or doctoral degree have been exceeded. The departmental faculty Graduate Advisor and the student's faculty mentor/advisor will consult with the student to develop an *Academic Progress Plan – Time-to-Degree* (signed by the faculty mentor/advisor and the student). Once Graduate Division receives a copy of the written notification and *Academic Progress Plan – Time-to-Degree*, the student will be on departmental progress monitoring status for the remainder of the academic year or until the milestone is completed.

For a student who has not advanced to doctoral candidacy or completed the degree after the end of an academic year on probation, the Graduate Dean will ask the department to recommend and justify (a) continued academic probation (must involve extenuating circumstances) or (b) academic disqualification.

Departments have the discretion to ask the Graduate Dean for probation or academic dismissal under an earlier time frame.

A student is not eligible for central fellowships if they are beyond time-to-degree or normative time advancement to candidacy or degree completion.

Doctoral Levels (determined by the Graduate Division)

P1 status: Academic or professional doctorate degree objective, but not advanced to candidacy

P2 status: Academic or professional doctorate degree objective, *has* advanced to candidacy (P2 status lasts for 9 registered quarters)

P3 status: After 9 registered quarters in P2 status, student goes into P3 status. Students in P3 status are no longer eligible for central campus funding (such as Central Fellowships and Block Grant), although P3 students can still be employed as long as they meet all other employment eligibility criteria.

PETITIONS & FORMS

As a rule, students may petition for leaves of absence, inter-program transfers, or regarding certain degree requirements. In most cases, petitions must be made on special forms to be obtained from the Staff Graduate Advisor. If a student is formally associated with a research advisor, this advisor must signify approval of any petition by signature. Finally, the Faculty Graduate Advisor must sign petitions before they can be submitted to the Graduate Division for action. Please see the Academic Forms and Petitions Website for more details and the forms:

<http://www.graddiv.ucsb.edu/academic/forms-petitions>

Leave of Absence. All students are expected to be 'continuously registered' unless the Dean of the Graduate Division approves a leave 'under special circumstances'. Special limitations apply to students who are not U.S. citizens: they may not apply for a leave of absence unless all of their course and residency requirements have been met or, in case of students in PhD programs, unless they have been advanced to candidacy.

PhD Program Students wishing to also earn the MA degree. After formal admission to PhD candidacy, students in a PhD program may petition for a retroactive admission to an MA program and award the MA degree Plan 2 (project) with a minimum of 36 total units.

Transfers between Plan 1 and Plan 2 of the Masters program. Students wishing to change the MA plan should consult with the Staff and Faculty Graduate Advisers. A student seeking such a transfer should have made satisfactory progress in course work. In addition, the student's current or prospective research advisor must provide written support for the petition and affirm willingness to serve as the student's MA Thesis Committee chair if appropriate.

"Transfers" from MA to PhD programs. Students admitted to MA programs may apply to the PhD program. *This is not considered a transfer*; the student must apply directly to the PhD program under the normal cycle of admissions. Typically, a student will have identified a faculty research adviser and enter directly into the laboratory upon admission to the PhD program. In consultation with the research faculty adviser and the Faculty Graduate Adviser, the student should plan to apply during the normal cycle (late Fall quarter) in order to be considered for admission into the PhD program and for relevant fellowships. The Graduate Admissions Committee will act upon the application, and admission will be based on the same criteria applied to applications from all other entering PhD students. Successful entry into the PhD programs will also depend on satisfactory progress in all graduate courses and a written letter of support by the Principal Investigator. No late applications will be accepted.

Transfers from PhD to MA programs. A student in the PhD program may petition for the MA degree *instead of* the PhD degree. Such a petition should contain clear justification and be supported by at least one faculty member best acquainted with the student's progress in the PhD program. In some cases, when a student's progress in a PhD program is marginal or unsatisfactory, the student may be recommended for a terminal MA degree, in consultation with the graduate committee and faculty adviser (see pages 15, 16).

FINANCIAL SUPPORT

Every effort is made to provide financial support to students in good standing in the MCDB graduate program. Students in good standing in the PhD program are given priority in TAship and other funding allocation. It is the student's responsibility to observe application deadlines and requirements thoroughly. The Staff Graduate Advisor and the Graduate Division are the primary information sources. Masters student have no guarantee of financial support, including TAships, though every effort is made to provide TAships.

[Extramural Pre-Doctoral Fellowships](#) are available for students in their second and third year of study from relevant funding agencies. Such fellowships typically support 2-3 years of stipend and fees, and are a prestigious addition to a student's graduate accomplishments. Eligible first year students are encouraged to apply for extramural pre-doctoral fellowships from the National Science Foundation, the American Cancer Society, the National Institutes of Health, and other opportunities.

[University Scholarships or Fellowships](#) are usually awarded in conjunction with admission to the PhD program. The Graduate Admissions Committee makes recommendations for such awards. A limited number of university fellowships through the UCSB Graduate Division are available for continuing students who have advanced to candidacy, and students should consult the Grad Division web site and the Staff Graduate Advisor for application deadlines (typically February). Students who will be in P3 status (see above) at the time of the fellowship are not eligible.

[Departmental Fellowships](#) are also awarded on the basis of excellence in conjunction with admission to a PhD program; there are often fellowships available for continuing students as well. Also, in exceptional cases of funding emergencies, some awards may be made to continuing students in response to an application by a student, supported by the student's research advisor.

[Non-Resident Student Tuition \(NRST\)](#) during the first year of study is typically awarded by the department in conjunction with admission to a PhD program. The only exception is when a PhD student enters directly into a faculty member's laboratory (no rotations). *It is the responsibility of domestic out-of-state students to establish California residency before their second year of study.* International students will have the NRST covered by a fellowship starting in year 2 until advancement to candidacy. After advancement, the NRST is waived for up to 3 years, pending satisfactory progress in the program. Masters students are responsible for covering NRST. TAships do not cover NRST.

[Employment through GSR positions](#) is expected to provide the principal support of Ph.D. students, particularly after their first graduate year. Students should apply for such support directly to their research advisors. As a matter of University policy, students appointed to Graduate Student Researcher (GSR) positions receive payment of their fees, GHSIP, and California-resident tuition by the extramural grant that supports their GSR.

[Teaching Assistantships](#) are allocated, upon proper application, to newly entering students and continuing students by the Staff Graduate Advisor and MCDB Vice Chair. Students should consult with their mentors about their needs for TA support in the coming year. The application deadline for Teaching Assistantships in the Department of MCDB is typically July for the coming academic year. Students will receive regular emails regarding availability of TAships and procedural deadlines. TAships provide a stipend, health insurance and cover in-state fees/tuition except for the campus base fee. NRST is not covered by a TAship.

[Students with Teaching Assistant \(TA\) appointments must also complete the appropriate TA orientation and techniques courses \(MCDB 500 and 502; taken once, without degree credit, usually in the first year\).](#) Students who do not complete these required courses are not eligible to TA.

When serving as a TA, students also should enroll in the TA practice course (MCDB 501) for the appropriate number of units (maximally 4 units for a 50% TA ship assignment; without degree credit).

****In accordance with University policy, international students are not allowed to have combined employment appointments greater than 50% during the academic year. [Students must maintain a 3.0 or better GPA to qualify for a TA appointment. If the GPA falls below 3.0, the student may petition for an exception to be granted.](#)**

Appendix I

Pre-approved Graduate Elective Lecture Courses

See degree requirements sheets (posted on Resource website) for total unit requirements.

MCDB 203. Cell Biology (4)
 MCDB 208C. Computational/Systems Biology (4)
 MCDB 223. Signal Transduction (2)
 MCDB 225. Development (2)
 MCDB 226. Basic Pharmacology (4)
 MCDB 226B. Basic Pharmacology: Molecular Pharmacology (4)
 MCDB 231. General Microbiology (4)
 MCDB 232. Bacterial Pathogenesis (3)
 MCDB 233. Molecular and Cellular Immunobiology (3)
 MCDB 238. Angiogenesis in Health and Disease (2)
 MCDB 245. Post-translational Protein Processing (4)
 MCDB 246. Stem Cell Biology in Health and Disease (4)
 MCDB 247. Social Dimensions of Stem Cell Research (4)
 MCDB 248. Molecular Cellular Bio Statistics (4)
 MCDB 251. Neurobiology I. Cellular Organization and Biophysics of the Nervous System (4)
 MCDB 252. Neurobiology II. Molecular and Cellular Neurobiology (4)
 MCDB 253. Neurobiology III. Developmental Neurobiology (4)
 MCDB 254. Advanced Topics in Neurobiology (2)*
 MCDB 265. Literature in Virology (1)*
 MCDB 266. Literature in Neurobiology (1)*
 MCDB 268. Literature in Plant Molecular Biology (1)*
 MCDB 270. Intro to Programming in Mol Biosci (4)
 MCDB 272. Biological Dynamics (4)
 MCDB 269. Pharmacology Colloquium (1)*
 MCDB294B. Bioengineering: Career Development Opportunities at the Interface Between
 Biotechnology and Engineering (2)
 MCDB 290MR. Introduction to Microscopy (2)
 MCDB 293. Computational Methods in Biochemistry-Molecular Biology (1)
 BMSE 201A. Protein Structure and Function (2)
 BMSE 204. Protein Processing (4)
 BMSE 205A. Biochemical Techniques (1)
 BMSE 205B. Protein Characterization (1)
 BMSE 207. Enzyme Mechanisms (2)
 BMSE 215. Biophysical Thermodynamics (2)
 BMSE 244. Informational Macro- and Supra-Molecules (2)
 BMSE 247. Quantitative Methods in Biology (3)
 CH E 272. Omics-Enabled Biotechnology (3)
 EEMB 511. Writing Science (2)

*May be taken more than once, up to 3 times, all counting as elective units.

Advanced literature/seminar courses in the MCDB or BMSE 595 series will count as elective units up to a total of 3 units.

Other graduate courses that are more relevant to a student's needs/research interest may be approved by petition. All petitions must provide a statement regarding the relevance of the proposed elective to the needs/research interests. Please submit all petitions to the Staff Graduate Advisor, who will forward them to the MCDB Graduate Committee for review. Note that if a graduate course is listed concurrently with an undergraduate course, then a student may not take the graduate course (e.g. MCDB 203) for credit if they have previously completed the undergraduate course (e.g. MCDB 103).

Appendix II

MCDB Graduate Program Learning Outcomes (PLOs)

MCDB MA-Plan I (thesis) Program Learning Outcomes

Core Knowledge:

- Students will be able to demonstrate a broad knowledge of modern molecular and cellular biology, including areas outside of their specific research specialty.
- Students will be able to demonstrate mastery of at least one area of the molecular biosciences relevant to their thesis topic.

Research Methods and Analysis:

- Students will be able to design and conduct a well-controlled and hypothesis-driven experiment.
- Students will be able to collect, analyze, and present original research data.
- Students will be able to critically analyze published research reports in their area of expertise.
- Students will understand new research methods and analytical approaches.

Pedagogy:

- Students will develop the ability to communicate (in English) technical material to audiences ranging from general to specialized
- *Students will demonstrate skills for mentoring undergraduate students in the context of a discussion or laboratory section.**
- *Students will be able to critically assess the quality of undergraduate exams and writing assignments.*
- *Students will be able to make a technical presentation on both their own research and on published studies.*

Scholarly Communications:

- Students will be able to write effectively (in English) at the levels found in relevant peer-reviewed journals, conference proceedings, posters and other written formats.
- Students will be able to produce graphics of their own research for peer-reviewed publication.
- Students will be able to write critical summaries of published research articles.
- *Students will be able to prepare and present oral presentations of both their own research and published studies of other researchers.*

Professionalism:

- Students will understand and demonstrate the importance of effective communication in the molecular biosciences.
- Students will appreciate and demonstrate the cooperative and collaborative nature of research in the molecular biosciences.
- Students will demonstrate an understanding of the importance of research honesty and professional ethics and conduct themselves in an ethical manner in all aspects of their scientific careers.
- Students will have a thorough knowledge of different career options.
- *Students will contribute to professional societies in their areas of specialization.*

Independent research:

- Students will develop and conduct a creative, independent research project in the area of molecular, cellular or developmental biology that meets high standards of conceptual, experimental and methodological scientific rigor.
- Students will complete original research studies that are comparable in scope and format to an article that appears in leading peer-reviewed venues in the field of molecular, cellular and developmental biology.

MCDB MA-Plan II (exam) Program Learning Outcomes

Core Knowledge:

- Students will be able to demonstrate a broad knowledge of modern molecular, cellular and developmental biology

Research Methods and Analysis:

- *Students will be able to design and conduct a well-controlled and hypothesis-driven experiment.**
- *Students will be able to collect, analyze, and present original research data.*
- Students will be able to critically analyze published research reports in their area of expertise.

Pedagogy:

- Students will develop the ability to communicate (in English) technical material to audiences ranging from general to specialized
- *Students will demonstrate skills for mentoring undergraduate students in the context of a discussion or laboratory section.*
- *Students will be able to critically assess the quality of undergraduate exams and writing assignments.*
- *Students will be able to make a technical presentation on both their own research and on published studies.*

Scholarly Communications:

- Students will be able to write effectively (in English) at the levels found in relevant peer-reviewed journals, conference proceedings, posters and other written formats.
- Students will be able to write critical summaries of published research articles.
- *Students will be able to produce graphics of their own research for peer-reviewed publication.*
- *Students will be able to prepare and present oral presentations of both their own research and published studies of other researchers.*

Professionalism:

- Students will understand and demonstrate the importance of effective communication in the molecular biosciences.
- Students will appreciate the cooperative and collaborative nature of research in the molecular biosciences.
- Students will demonstrate an understanding of the importance of research honesty and professional ethics and conduct themselves in an ethical manner in all aspects of their scientific careers.
- Students will have a thorough knowledge of different career options.
- *Students will contribute to professional societies in the molecular biosciences.*

Independent research:

- *Students will develop and conduct a creative, independent research project in the area of molecular, cellular or developmental biology that meets high standards of conceptual, experimental and methodological scientific rigor.*

**Items listed in italics are considered desirable outcomes but are not required for degree completion.*

MCDB PhD Program Learning Outcomes

Core Knowledge:

- Students will be able to demonstrate a broad knowledge of modern molecular and cellular biology, including areas outside of their specific research specialty.
- Students will be able to demonstrate mastery of at least one select area of the molecular biosciences relevant to their dissertation topic.

Research Methods and Analysis:

- Students will be able to design and conduct a well-controlled and hypothesis-driven experiment.
- Students will be able to collect, analyze, and present original research data.
- Students will be able to critically analyze published research reports in their area of expertise.
- Students will understand new research methods and analytical approaches.

Pedagogy:

- Students will develop the ability to communicate (in English) technical material to audiences ranging from general to specialized
- Students will demonstrate skills for mentoring undergraduate students in the context of a discussion or laboratory section.
- Students will be able to critically assess the quality of undergraduate exams and writing assignments.
- Students will be able to make a technical presentation on both their own research and on published studies.

Scholarly Communications:

- Students will be able to write effectively (in English) at the levels found in relevant peer-reviewed journals, conference proceedings, posters and other written formats, especially research proposals.
- Students will be able to produce graphics of their own research for peer-reviewed publication.
- Students will be able to write critical summaries of published research articles.
- Students will be able to prepare and present oral presentations of both their own research and published studies of other researchers.

Professionalism:

- Students will understand and demonstrate the importance of effective communication in the molecular biosciences.
- Students will appreciate and demonstrate the cooperative and collaborative nature of research in the molecular biosciences.
- Students will demonstrate an understanding of the importance of research honesty and professional ethics and conduct themselves in an ethical manner in all aspects of their scientific careers.
- Students will have a thorough knowledge of different career options.
- Students will contribute to professional societies in their areas of specialization.

Independent research:

- Students will develop and conduct a creative, independent research project in the area of molecular, cellular or developmental biology that meets high standards of conceptual, experimental and methodological scientific rigor.
- Students will complete original research studies that are comparable in scope and format to articles that appear in leading peer-reviewed venues in the field of molecular, cellular and developmental biology.

Conflict of Interest Policy

See: <https://www.graddiv.ucsb.edu/academic/conflict-of-interest>

Opportunities for graduate students to work in the private sector as part of their education are rapidly increasing. The experience and feedback these experiences provide complement their academic curricula and enhance its relevance.

The Conflict of Interest (coi) Policy developed by the UCSB Graduate Divisions affirms joint student and faculty responsibilities, as members of the University of California, in relationship to potential conflicts of interest and provides mechanisms to ensure that outside activities are consistent with University policy. Specifically, this policy seeks to identify cases where a faculty member's financial interest may have negative effects on the student's academic interests, including publishing in a timely manner.

The MCDB Graduate Program requires that any coi situation, especially if the student's research or stipend is covered by a third party, be explained in writing by the faculty adviser and approved by the Department Chair and Graduate Program Faculty Adviser, with copy to the student. The student's thesis committee members must also be informed and in the mandatory annual committee meetings, the agreement must be reviewed, discussed and approved.