

CMMB Requirements

An incoming CMMB student is advised by a Graduate Education Committee (GEC) member in the programmatic requirements and in the selection of courses for the first semester (and for the second if an Advisory Committee has not yet been formed and coursework approved). All CMMB PhD students have a common set of requirements: students must take a total of 60 semester credits, including 20 semester credits of courses (includes any course other than Dissertation and Research), which must include at least three 3-credit (or more) graduate courses at the 500 or 600 level. All CMMB MS students also have a common set of requirements: students must take a total of 30 semester credits, including 20 semester credits of courses (includes any course other than Thesis and Research); at least half of the credits toward the degree must be at the 500 or 600 level. In addition to these common requirements, each option has its own prerequisites and suggested curricula (see below). PhD students who already have MS degrees in a related field may apply some of the MS coursework toward the PhD degree (as determined by the Advisory Committee). Students should be aware that additional coursework might be required at the discretion of the Advisory Committee. Furthermore, students must take:

- MS/PhD: Four credits of Professional Seminar (BCH/BIOM 594) or a seminar series course in another program as approved by the student's Advisory Committee. (An additional four credits in a seminar course can be counted toward PhD degree requirements.)
- MS: Two credits of Exp Molec Cell & Chemical Bio (BIOB 547). PhD: Four credits of Exp Molec Cell & Chemical Bio (BIOB 547). (Students are required to attend one of these "Data Club" courses, or a suitable alternative, throughout their tenure on campus.)
- MS: One credit of Introduction to Research (BCH/BIOM 570) for one lab rotation. PhD: Two credits of Introduction to Research (BCH/BIOM 570) for two lab rotations.

In addition to coursework, all PhD students must teach at least one semester (typically as a Graduate Teaching Assistant) and must rotate in at least two research laboratories. The requirement for a second research rotation can be waived by request of the GEC or Advisory Committee and by majority vote of approval from the CMMB faculty if the student enters the doctoral program with a Master's degree or extensive prior research experience.

Excluding the required courses mentioned in the previous section, there are no further restrictions on the distribution of the remaining credits. However, while courses are repeatable, only a certain number of credits can count towards your degree from each course. The max credits for each course are as follows:

Course Number	Course Title	Max. Credits
BCH/BIOM 595	Special Topics	6
BIOM 596	Independent Study	6
BCH/BIOM 597	Research	18/30
BCH/BIOM 599	Thesis	10
BCH/BIOM 699	Dissertation	20

Please view individual course descriptions to view other repeatability restrictions (R-#).

MS Student's Timeline

<p>End of semester 1</p>	<p>Select Research Advisor and assemble Advisory Committee. In addition to the Research Advisor, the Advisory Committee must include at least one CMMB faculty member and one faculty member outside of CMMB. (Only tenure-track faculty, research-track faculty, current faculty affiliates, or faculty on adjunct appointment can serve as voting members; faculty affiliates are considered outside of CMMB unless they serve as the Research Advisor.) Only one member of a research laboratory can serve as a voting member of a thesis committee. If the Research Advisor is not primarily affiliated with CMMB, then the Advisory Committee must include a CMMB committee member to serve as the Academic Advisor and the Research Advisor is referred to as the Research Director.</p>
<p>End of semester 2</p>	<p>Advisory committee meets and approves curriculum. Any course waivers are documented and forwarded to the GEC. Complete any missing prerequisite coursework. Submit thesis research plan to Advisory Committee for approval. The research plan is a description of the work to be completed for the fulfillment of the research component of the MS degree (not more than five pages).</p>
<p>End of semester 4</p>	<p>Complete coursework.</p>
<p>1 semester prior to graduation</p>	<p>Apply for graduation.</p>
<p>2 weeks before defense</p>	<p>Send thesis to Advisory Committee.</p>
<p>1 week before defense</p>	<p>Public notice of defense. Advisory Committee-approved draft sent to Dean of the Graduate School.</p>
<p>After passing defense</p>	<p>Signed Graduation Application to Graduate School.</p>

Ph.D. Student's Timeline

<p>End of Semester 2</p>	<p>Select Research Advisor and assemble Advisory Committee. In addition to the Research Advisor, the Advisory Committee must include at least three CMMB faculty members and one faculty member outside of CMMB. (Only tenure-track faculty, research-track faculty, current faculty affiliates, or faculty on adjunct appointment can serve as voting members; faculty affiliates are considered outside of CMMB unless they serve as the Research Advisor.) Only one member of a research laboratory can serve as a voting member of a thesis committee. If the Research Advisor is not primarily affiliated with CMMB, then the Advisory Committee must include a CMMB committee member to serve as the Academic Advisor and the Research Advisor is referred to as the Research Director.</p> <p>Advisory Committee meets and approves curriculum.</p> <p>Any course waivers are documented and forwarded to the GEC.</p> <p>Complete any missing prerequisite coursework.</p>
<p>End of semester 4</p>	<p>Submit a preliminary dissertation research proposal to Advisory Committee. The preliminary research proposal should emphasize key questions and the experimental approach, and briefly state the specific aims (two pages).</p>
<p>End of semester 5</p>	<p>Pass the qualifying examination (which consists of two parts: the written portion and the oral portion).</p>
<p>End of semester 6</p>	<p>Complete coursework.</p> <p>Submit final dissertation research proposal and schedule an Advisory Committee meeting for proposal approval. The dissertation research proposal is a description of the work completed, in progress, and to be completed for fulfilling the research component of the PhD degree. This research proposal serves as an informal contract that defines what must be completed before the student can apply for graduation (10 to 25 pages).</p>
<p>1 semester prior to graduation</p>	<p>Apply for graduation.</p>

Qualifying Exam

The qualifying exam includes a written portion and an oral portion. The written exam is either an out-of-field research proposal or a set of written questions; the Advisory Committee will choose the format. The Examination Chair will be a CMMB faculty member not serving on the Advisory Committee and will be appointed by the GEC, with advice from the Advisory Committee. The Examination Committee will consist of the Examination Chair and the members of the Advisory Committee other than the Research Advisor or Academic Advisor. The student's Research Advisor or Academic Advisor can participate in the oral exam but cannot vote and must not be present during the Examination Committee deliberation. The student will pass the written and oral portions with no more than one negative vote from Examination Committee. The oral exam is scheduled after the written exam is passed. If the oral exam is not satisfactory, the student should meet individually with each Examination Committee member to discuss possible improvements. A second oral exam may be scheduled no sooner than one month and no later than three months after the first oral exam. An extension of the three-month limit may be made only by request of the Advisory Committee and by majority vote of approval from the CMMB faculty. Upon successful completion of the qualifying exam, and with the recommendation of the Examination Committee, the Examination Chair signs that the student has passed the qualifying examination on the Graduation Application on file in the DBS office. The student becomes a PhD candidate upon successful completion of the qualifying exam. Failure to pass either the written or oral portions of the qualifying examination after a second attempt will result in removal of the student from the doctoral degree program.

Qualifying exam: out-of-field research proposal

For this format, the student must write an outside, original research proposal, with the intent of focusing on a research problem and the approach required to address the problem. The topic will be outside of the student's dissertation research. The following criteria will be applied by the Examination Committee to determine if the proposal topic is acceptable:

1. The system must be different than what the student is employing in the dissertation research.
2. The approach must be different from that which the student uses to pursue the dissertation problem.
3. The student will have to read literature not normally read for the dissertation research.
4. The out-of-field proposal must not be significantly similar to any proposal that the student has written for another purpose, such as an assignment for a course. Any appearance of overlap with a preexisting proposal must be declared and will be subject to approval by the Examination Committee.

After consulting with the academic advisor, the student must present a brief (up to 500 words) description of at least two possible topics to the Examination Committee for approval prior to initiating the written exam. The student will have five weeks from the time the topic is approved by the Committee to submit the out-of-field research proposal. The student will follow the guidelines for preparing the research portion of either an NSF or NIH (R21) grant application and include a biosketch. The scope of the proposal should be limited to experiments that can be performed within two to three

years and should be no more than 6 single-spaced pages plus a specific aims page and references. Preliminary data can be utilized from published sources with proper citation. (Students following the NSF guidelines should neglect the Broader Impacts section.) The ideas and approach must belong to the student, but the student can consult with other people, but not Examination Committee members, about techniques. 6

The written examination will be submitted to the Examination Chair, who will solicit votes for pass/no pass and critiques from the Examination Committee for their approval. The Examination Committee will have ten days to decide if the student has passed the written exam and if the proposal is defensible. Each Examination Committee member will provide the Examination Chair with a concise written critique. The Examination Chair will collate the critiques and communicate them to the student. The student will pass with no more than one negative vote and will then schedule the oral examination within ten days. If the written exam is not satisfactory, the student should meet individually with each Examination Committee member to discuss possible improvements and resubmit the written exam a final time within one month.

The oral exam will consist of two parts, for a total of no more than three hours:

1. Presentation of a brief overview of the out-of-field proposal for the written qualifying exam and a brief response to the Examination Committee members' written critiques (no longer than 20 minutes).
2. Defense of the student's out-of-field proposal as well as examination of the depth and breadth of knowledge in the student's field of study and cognate areas, especially as it applies to the out-of-field proposal and the student's coursework. The student can be questioned on any topic that relates to the out-of-field proposal or completed coursework.

Qualifying exam: written questions

For this format, the student must answer five written questions over a two-week period. Each member of the Examination Committee will submit a question designed to probe both the depth and breadth of knowledge in the student's field of study and cognate areas; the Examination Chair will coordinate the written exam and all members of the Examination Committee will have the opportunity to review the questions to ensure the exam is relevant and fair to the student. The written exam will take place over two consecutive weeks. The student may use all available resources, including those in print and online, but must develop and write the answer on their own without assistance from other scientists or trainees. Each answer is limited to 1500 words plus supporting references. The Examination Committee will have ten days to decide if the student has passed the written exam. Each Examination Committee member will provide the student with a concise written critique. The student will pass with no more than one negative vote and will then schedule the oral examination within ten days. If the student fails, they can take the written exam one more time within three months; the Examination Committee will decide if the entire exam or only a portion thereof is repeated.

The oral exam, which will last no more than three hours, will be conducted by the Examination Committee to test the student's depth and breadth of knowledge in their field of study and cognate areas.

The oral exam will consist of two parts, for a total of no more than three hours:

1. Presentation of a brief overview of the answers for the written qualifying exam and a brief response to the Examination Committee members' written critiques (no longer than 20 minutes).
2. Examination of the depth and breadth of knowledge in the student's field of study and cognate areas, especially as it applies to the answers to the written questions and the student's coursework. The student can be questioned on any topic that relates to the written questions or completed coursework.

Other requirements

The student must meet with their Advisory Committee once every year.

The student must complete and submit each January an annual evaluation that monitors progress in the graduate program and quality of teaching performance. Evidence of unsatisfactory progress for two years in succession or failure to address concerns of the Advisory Committee is grounds for academic probation or termination of the graduate assistantship.

The student must select and be accepted by a suitable Research Advisor by the end of their first semester (for MS students) or second semester (for PhD students) in order to ensure summer funding and continuation in the graduate program.

PhD students are required to rotate through two research laboratories. Students and faculty members will meet at the beginning of the rotation to review a rotation plan worksheet prepared by the faculty member. This document will lay out a research plan, expectations of the student, and a research goal for the rotation. By the tenth week of the first rotation and the eighth week of the second rotation, the student and the faculty member must meet to review the rotation worksheet and discuss the possibility of the student pursuing their dissertation project in that laboratory. Both the faculty member and the student must inform the GEC the conclusion from this meeting: whether or not the student and faculty member both agree that the faculty member can serve as a Research Advisor to the student and work in their laboratory. The student will not be obligated to return to the laboratory, but the faculty member will be held to the agreement unless excused by a majority vote of the CMMB faculty. If the first rotation does not result in a potential home by the tenth week, students will be strongly encouraged to begin a second rotation by the twelfth week of the semester rather than waiting until the second semester.

PhD students must submit a preliminary dissertation research proposal (about two pages) to the Advisory Committee that briefly states the specific aims and focuses on the key questions and experimental approach before the end of the second year. This must be approved by the committee prior to scheduling the qualifying exam. The student must submit the final dissertation research

proposal (10 to 25 pages including references) to the Advisory Committee before the end of the third year; the Advisory Committee will vote if it is acceptable. MS students must submit a thesis research plan (not more than five pages) to the Advisory Committee that describes specific aims and work to be completed before the end of the first year.

The student must maintain a GPA of 3.0 or higher for the curriculum approved by the Advisory Committee, or the student will be placed on academic probation. The student has one semester to raise the GPA to 3.0 or higher; failure to raise the GPA to a satisfactory level will result in removal from the graduate program.

The PhD student must write and defend a doctoral dissertation, which describes original scientific research performed by the student and developed by the student with input from the Research Advisor or Research Director. The Research Advisor or Academic Advisor along with the Advisory Committee determine the length and content of the dissertation. The PhD requires demonstrating proficiency in the scientific method, mastery of the current state of knowledge in the field of study, and a substantive new contribution to the body of either knowledge or methodology in the field of study. The student must demonstrate a rigorous comprehension of the principles and current techniques in the field of study, a thorough understanding of scientific data and error analyses, an appreciation of academic and scientific ethics, and a competence in scientific writing and presentation.

PhD students are expected to have published or, at a minimum, submitted their research to a peer-reviewed journal prior to completion of their degree. Under extenuating circumstances, this may not be possible, but will require written justification to the Advisory Committee.

Non-thesis Master's degree option

An optional non-thesis Master's degree is available to doctoral candidates. This degree does not replace the thesis Master's degree and is not available as an option to students matriculated in one of the Master's degree options or already holding a Master's degree in a related discipline.

Doctoral students may receive a non-thesis Master's degree upon fulfillment of all the following:

1. Completion of coursework.
2. Passing of the doctoral qualifying examination.
3. Approval of doctoral dissertation research proposal by the Advisory Committee.
4. Approval of the CMMB faculty by a majority vote.

CMMB Cellular and Developmental Biology Suggested Curriculum

- BIOB 567 Molecular Mechanisms of Development, 2 cr.
- BCH 582 Proteins and Enzymes, 3 cr.
- BCH 584 Nucleic Acids, 3 cr.
- BIOM 502 Advanced Immunology, 3 cr.
- BIOM 509 Advanced Virology, 3 cr.
- BCH 600 Cell Organization and Mechanisms, 3 cr.

CMMB Microbial Evolution and Ecology Suggested Curriculum

- BCH 584 Nucleic Acids, 3 cr.
- BCH 582 Proteins and Enzymes, 3 cr.

The remainder of the curriculum will be customized in consultation with the Advisory Committee to best prepare students for success in their graduate studies and career goals.

CMMB Microbiology and Immunology Suggested Curriculum

- BIOM 502 Advanced Immunology, 3 cr.
- BIOM 509 Advanced Virology, 3 cr.
- BIOM 520 Medical Parasitology, 2 cr.
- BIOM 540 Molecular Pathogenesis, 3 cr.
- BCH 584 Nucleic Acids, 3 cr.
- BCH 582 Proteins and Enzymes, 3 cr.
- BCH 600 Cell Organization and Mechanisms, 3 cr.

CMMB Molecular Biology and Biochemistry Suggested Curriculum

- BCH 584 Nucleic Acids, 3 cr.
- BCH 582 Proteins and Enzymes, 3 cr.
- BCH 600 Cell Organization and Mechanisms, 3 cr.
- BCH 581 Physical Biochemistry, 3 cr.