**CELLULAR, MOLECULAR AND BIOMEDICAL SCIENCES PH.D.**

All students must meet the Requirements for the Doctor of Philosophy Degree

**OVERVIEW**

The CMB program trains students to:

- Become scholars in their field
- Conduct hypothesis-based research in an ethically responsible manner
- Think independently, creatively, and critically
- Effectively communicate as teachers, researchers, and scholars

The curriculum of the Cellular, Molecular and Biomedical Sciences program is designed to give students fundamental and applied skills to prepare them for future positions in scientific research and related fields. The core curriculum includes course work in biochemistry, cell biology, genetics, ethics, and data analysis and presentation. Students also enhance their writing skills through a grant-writing course and improve their presentation skills through participation in the CMB seminar series. Students are provided with at least two opportunities to serve as teaching assistants, typically in undergraduate laboratory-based courses.

During the first year, CMB students complete three research rotations with potential advisors, while taking the required core course work in Cell Biology and Biochemistry. Students generally fulfill their core course and comprehensive exam requirements in year two. In addition to core courses, students are expected to enhance their training through advanced courses in one of the following advanced areas of concentration:

- Biochemistry, Structural Biology and Biophysics
- Genetics, Cellular and Molecular Biology
- Microbiology and Immunology
- Molecular Physiology and Pharmacology

**SPECIFIC REQUIREMENTS**

**Requirements for Admission to Graduate Studies for the Degree of Doctor of Philosophy**

Competitive applicants typically have evidence of strong course preparation, an undergraduate GPA of 3.00 or better, and 60th percentile or greater on the general Graduate Record Examination (GRE). Foreign applicants to the CMB Program are required to have a satisfactory score on either the TOEFL (100 or higher) or the IELTS (7.0 or better). Prior research experience is expected of all competitive applicants.

**Minimum Degree Requirements**

Completion of course and research credits totaling 75 credits is required for the Ph.D. Maintaining a GPA of 3.00 or better in core courses and advanced electives is required.

**Required core courses for all CMB students:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 301</td>
<td>General Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOC 302</td>
<td>General Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CLBI 301</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>CLBI 401</td>
<td>Critical Reading &amp; Analysis</td>
<td>2</td>
</tr>
<tr>
<td>CLBI 394</td>
<td>Science Communication</td>
<td>3</td>
</tr>
<tr>
<td>MPBP 395</td>
<td>Special Topics (Grant Writing)</td>
<td>2</td>
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</tbody>
</table>

**Genetics Requirement:**

- MMG 211 Prokaryotic Molecular Genetics 3
- or MMG 312 Eukaryotic Molecular Genetics
- or PATH 395 Special Topics

**Ethics Requirement:**

- NSCI 327 Resp Conduct in Biomed Rsch 1

In addition to the required core courses, a new 2 credit course (CLBI 402; Practical Statistics and Data Presentation in Cellular, Molecular, and Biomedical Sciences) has been created for Academic Year 2017-18 and will be required to graduate. The course will be listed as a required core course in Academic Year 2018-19.

Students must also complete the required courses in their area of concentration before completion of their degree. Students must complete a minimum of twenty research credits (CLBI 491) and thirty course credits, and an additional twenty-five course or research credits. Once students have earned 75 credits, they register for continuous registration GRAD 901, GRAD 902 or GRAD 903, as appropriate.

Additional program requirements include service as a graduate teaching assistant (GTA) twice during the first two years, weekly attendance at the CMB seminar series, annual presentation of research progress within the CMB seminar program starting in the second year, and annual meetings with the student’s dissertation studies committee beginning in the second year.

**ADVANCED CONCENTRATION COURSES**

**Biochemistry, Structural Biology & Biophysics**

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOC 370</td>
<td>Physical Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>or MPBP 323</td>
<td>Biophysical Techniques</td>
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<tr>
<td>BIOC 351</td>
<td>Proteins I: Structure&amp;Function</td>
<td>3</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
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<tr>
<td>or BIOC 352</td>
<td>Protein: Nucleic Acid Interact</td>
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</tr>
<tr>
<td>or MMG 352</td>
<td>Protein: Nucleic Acid Interact</td>
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<tr>
<td>or BIOC 353</td>
<td>Proteins II: Enzymology</td>
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<tr>
<td>Genetics, Cell &amp; Molecular Biology (choose two)</td>
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<td></td>
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<tr>
<td>MMG 232</td>
<td>Methods in Bioinformatics</td>
<td></td>
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<tr>
<td>MMG 312</td>
<td>Eukaryotic Molecular Genetics</td>
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<tr>
<td>MPBP 310</td>
<td>Molecular Control of the Cell</td>
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<tr>
<td>Microbiology &amp; Immunology</td>
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<tr>
<td>MMG 320</td>
<td>Cellular Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>MLRS 242</td>
<td>Immunology</td>
<td>3</td>
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<tr>
<td>or MMG 223</td>
<td>Immunology</td>
<td></td>
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<tr>
<td>Physiology &amp; Pharmacology</td>
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<td></td>
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<tr>
<td>MPBP 301</td>
<td>Human Physiology &amp; Pharm I</td>
<td>4</td>
</tr>
<tr>
<td>MPBP 302</td>
<td>Human Physiology &amp; Pharm II</td>
<td>4</td>
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**Comprehensive Examination**

The comprehensive examination is a tool to evaluate the progress of each student and ensure that they are prepared to proceed toward the doctorate degree. All parts of the qualifying examination will be evaluated in a manner to avoid bias and maintain uniformity of assessment. The examination will determine whether the candidate:

1. Has acquired an adequate academic background through required course work and electives
2. Can analyze and interpret data and scientific ideas
3. Can apply logical thought to synthesize diverse facts and concepts
4. Understands and meets the intellectual demands of the degree program

The comprehensive examination is structured to provide assessment in oral and written formats. The two phases of the exam occur at distinct times during training and both must be satisfactorily completed to advance to doctoral candidacy.

Phase I is an oral examination that tests students on their ability to synthesize and integrate scientific knowledge learned from first-year laboratory rotations, CMB seminar and core courses. The oral exam must be completed by June 31st of the first year. Phase II is a written grant proposal based on the student’s thesis research project that must be completed by August 31st of the second year. The Phase II exam will provide the student with a detailed plan for conducting their dissertation research. The comprehensive exam is organized and conducted by the CMB Education Committee.

**Requirements for Advancement to Candidacy for the Degree of Doctor of Philosophy**

Maintain a 3.00 GPA and successful completion of the comprehensive exam, as outlined in the CMB Program Handbook.