

## Biochemistry and Biophysics Program

<http://www.med.unc.edu/biochem>

Department Chair: Leslie Parise, [parise@med.unc.edu](mailto:parise@med.unc.edu), 966-2238

Director of Graduate Studies: Brian Strahl, Ph.D. [brian\\_strahl@med.unc.edu](mailto:brian_strahl@med.unc.edu), 843-3896

Student Services Manager: Brenda Brock, [brenda\\_brock@med.unc.edu](mailto:brenda_brock@med.unc.edu), 966-4683

Biophysics Program Administrator: Lisa Phillipie, [ldh@med.unc.edu](mailto:ldh@med.unc.edu), 843-9737

---

### Basic Listing of Course Requirements - (term, # credit hours in parentheses)

#### **REQUIRED COURSES**

- **BIOC 701 OR 704** Seminars in Biochemistry OR Biophysics (Fall/Spring, 2)
- **BIOC 712** Scientific Writing (Spring, 3)
- **BIOC 715** Oral Scientific Presentation (Fall, 1)

#### **CORE COURSES** - 9 credit hours required; credits over 9 hrs will be used as electives

- **BIOC 601** Enzyme Properties, Mechanisms and Regulation (Fall, 3)
- **BIOC 631** Advanced Molecular Biology I (Fall, 3) - combined course w/GNET 631
- **BIOC 632** Advanced Molecular Biology II (Spring, 3) - combined course w/GNET 632
- **BIOC 643** Cell Structure, Function, and Growth I (Fall, 3) - combined course w/CBIO 643
- **BIOC 644** Cell Structure, Function, and Growth II (Spring, 3) - combined course w/CBIO 644
- **BIOC 655** Case Studies in Structural Molecular Biology (Spring, 3)
- **BIOC 649-652** Physical Biochemistry Modules (Fall, 1.5 hrs ea, 3 hrs = 1)
- **BIOC 653-674** Methods in Biophysics Modules (Fall & Spring, 1 & 2 hrs ea, 3 hrs = 1)

#### **POSSIBLE ELECTIVES** - 9 credit hours required

*Electives can be any graduate-level course in a biomedical discipline.*

Suggested Electives:

- BIOC 700 Current Topics In RNA Structure, Function, and Technology (Fall, Spring, 2)
- BIOC 706 Biochemistry of Human Disease (Fall, 3) **NEW COURSE**
- BIOC 707 Cellular Metabolism of Human Disease (Spring, 3) **NEW COURSE**
- BIOC 722A,B,&C Cellular and Molecular Neurobiology: Intro (Fall, 2)
- BIOC 723A&B Cellular and Molecular Neurobiology (Spring, 2) - combined w/NBIO 723
- BIOC 738 Nanomedicine (Spring, 3) - combined course w/PHCO 738
- BIOC 805 Molecular Modeling (Fall, 3) - combined course w/MEDC 805
- CHEM 733 Advances in Macromolecular Structure and Function (Fall, 3)
- MCRO 614 Immunobiology (Fall, 3)
- MCRO 630 Virology (Fall, 3)

#### **TEACHING - \*NEW OPTIONS FOR BIOCHEMISTRY TRACK\***

Students must obtain 1 semester of teaching assistant (TA) experience. Biochemistry Track students can serve as TAs in BIOC 107 or 108 (*for 2 credit hours or noncredit via **NEW COURSES** BIOC 702 or 703 Teaching in Biochemistry*) or as TAs in other science departments on campus (e.g. Biology, Chemistry) with documentation of satisfactory performance. Biophysics track students satisfy their teaching requirement by serving as TAs in the Biophysics modules.

---

For more information, please visit [www.med.unc.edu/biochem/students/degree-requirements](http://www.med.unc.edu/biochem/students/degree-requirements) or consult your BBSP course guide. For other questions concerning the Biochemistry and Biophysics program and/or about how your interests and course selections fit with the program's requirements, please contact Director of Graduate Studies, Dr. Brian Strahl ([brian\\_strahl@med.unc.edu](mailto:brian_strahl@med.unc.edu)).

**“EXAMPLE” COURSE SEQUENCE** - Below is an example of typical courses that would be taken by a BBSP student interested in either the Biochemistry or Biophysics track. Although sample courses are listed, our department offers and accepts many different classes as cores or electives. For more information, please visit [www.med.unc.edu/biochem/students/degree-requirements](http://www.med.unc.edu/biochem/students/degree-requirements). Please note that the number of credit hours required in core courses (9) is the same for both tracks; however, each track has separate core course requirements.

### Biochemistry Track

<b>FIRST YEAR BBSP</b> <i>(Students typically choose 2-3 courses each semester in addition to satisfying BBSP requirements)</i>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• Core – e.g. BIOC 631, 643</li> <li>• Elective – e.g. BIOC 601, 700, 706, 722, 805 (or any other elective)</li> <li>• BIOC 701 (can be taken 2<sup>nd</sup> yr)</li> <li>• Required – BBSP 901 (1 Rotation)</li> <li>• Required – BBSP 902 (FYG)</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• Core – e.g. BIOC 632</li> <li>• Elective – e.g. BIOC 644, 655, 700, 707, 723, 738, (or any other elective)</li> <li>• Required – BBSP 901 (2 Rotations)</li> <li>• Required – BBSP 902 (FYG)</li> <li>• BIOC 703 or noncredit TA</li> </ul>
<b>Summer - Join the Biochemistry and Biophysics Program</b> <ul style="list-style-type: none"> <li>• Attend Summer Seminars - BIOC 715</li> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b> <i>(Students typically choose 2-3 courses each semester to complete remaining course requirements)</i>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• Required – BIOC 701 (if not taken 1<sup>st</sup> yr)</li> <li>• Core or Elective – e.g. BIOC 601, 643, 706, 722, 805</li> <li>• Dissertation Research</li> <li>• BIOC 702 or noncredit TA (if not taken 1<sup>st</sup> yr)</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• Required – BIOC 712</li> <li>• Core or Elective – e.g. BIOC 644, 632, 655, 700, 707, 723, 738,</li> <li>• Doctoral Oral Exam Administered</li> <li>• Dissertation Research</li> </ul>
<b>Summer</b> <ul style="list-style-type: none"> <li>• Doctoral Written Exam Administered, Attend Summer Seminars, Dissertation Research</li> </ul>	
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Required BIOC 715 (give presentation in 3<sup>rd</sup> year) all other years attend Summer Seminars, Dissertation Research, and Defend Dissertation</li> </ul>	

### Biophysics Track

<b>FIRST YEAR BBSP</b> <i>(Students typically choose 2-3 courses each semester in addition to satisfying BBSP requirements)</i>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• Core (required) – BIOC 649, 650, 651</li> <li>• Core or Elective – e.g. BIOC 601</li> <li>• Required – BBSP 901 (1 Rotation)</li> <li>• Required – BBSP 902 (FYG)</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• Required – BIOC 652, 704</li> <li>• Core – 3 modules from BIOC 653-674</li> <li>• Elective – e.g. BIOC 655 (or any other elective)</li> <li>• Required – BBSP 901 (2 Rotations)</li> </ul>
<b>Summer - Join the Biochemistry and Biophysics Program</b> <ul style="list-style-type: none"> <li>• Attend Summer Seminars – BIOC 715</li> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b> <i>(Students typically choose 2-3 courses each semester to complete remaining course requirements)</i>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• Elective – e.g. BIOC 631, 643, 706, 733, 805, (or any other elective)</li> <li>• Dissertation Research</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• Required – BIOC 712</li> <li>• Elective – e.g. BIOC 632 (or any other elective)</li> <li>• Doctoral Oral Exam Administered</li> <li>• Dissertation Research</li> </ul>
<b>Summer</b> <ul style="list-style-type: none"> <li>• Doctoral Written Exam Administered, Attend Summer Seminars, Dissertation Research</li> </ul>	
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Required BIOC 715 (give presentation in 3<sup>rd</sup> year) all other years attend Summer Seminars, Dissertation Research, and Defend Dissertation</li> </ul>	

## Curriculum in Bioinformatics and Computational Biology (BCB)

<http://bcb.unc.edu>

Program Director: Tim Elston, [telston@med.unc.edu](mailto:telston@med.unc.edu), 843-7670

Program Administrator: Sausyty Hermreck, [sausytyh@med.unc.edu](mailto:sausytyh@med.unc.edu), 966-2681

### Basic Listing of Course Requirements (numbers in parentheses are credit hours)

1. BCB 712,713,715,716,717,720– BCB core modules (1 credit hour each, except for 720, which is worth 2 credits)
2. **BCB 710** – BCB colloquium (1 credit hour).
3. **Electives and Foundational Courses** (3 credit hours each, 4 required,) – The electives and foundational courses are chosen in consultation with faculty advisors and serve several purposes: 1) to gain in depth training in a particular area bioinformatics and computational biology, 2) to gain knowledge in a field of biology and 3) up to two electives can be foundational courses to fill deficiencies in students' backgrounds.

For more detailed information about the courses listed above please visit the 'Training' section of the BCB website or consult your BBSP course guide. If you have more questions about courses in the BCB Curriculum or about how your interests and course selections fit with the program's requirements please feel free to contact the Program Director, Tim Elston.

For Students Interested in BCB PhD program from the start of graduate school

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• core 2 BCB modules (1 or 2 cr. each)<sup>*,†</sup></li> <li>• 1 elective or foundational<sup>**</sup> course</li> <li>• BBSP 902 (FYG)</li> <li>• BCB colloquium (BCB 710)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• core 4 BCB modules (1 cr. each)<sup>*</sup></li> <li>• 1 elective or foundational<sup>**</sup> course</li> <li>• BBSP 902 (FYG)</li> <li>• BCB colloquium (BCB 710)</li> <li>• Rotations</li> </ul>
<p><b>Summer (Join the BCB Program)</b></p> <ul style="list-style-type: none"> <li>• Qualifying exam<sup>†</sup></li> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• Elective</li> <li>• BCB colloquium (BCB710)</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• Elective</li> <li>• BCB colloquium (BCB710)</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

\*BCB modules do not need to be taken in order

\*\* Examples of foundational courses include the following:

Course number (credits)	Course title
BIOS 600 (3)	Principles of Statistical Inference
CHEM 430 (3)	Introduction to Biological Chemistry
BMME 570 (4)	From Genes to Tissues: Molecular Biology and Genetics for Biomedical Engineers
COMP 410 (3)	Data Structures

†Students who decide on the Curriculum in BCB during or after the first year can complete the modules and take the qualifying exam in the second year.

## Biology Department MCDB Program

<http://www.bio.unc.edu/>

Director of Graduate Studies: Gregory Copenhaver, [gcopenhaver@bio.unc.edu](mailto:gcopenhaver@bio.unc.edu), 843-4026

Student Services Manager: Kenyetta Farrington, [kfarrington@bio.unc.edu](mailto:kfarrington@bio.unc.edu), 962-3391

### Course Requirements:

- 4 courses during the first 2 years
  - 2 must be 3-hour (minimum) graduate-level lecture courses
  - 1 must be a seminar/journal club course
  - the 4<sup>th</sup> can be either a lecture or seminar/journal club course
- Specific courses are NOT mandated
- Lecture courses must include two of the following major topic areas
  - Molecular Biology (e.g. BIOL 631, BIOL 632)
  - Genetics (e.g. GENET 621, GENET 622)
  - Cell/Developmental Biology (e.g. BIOL 624, CBIO 643, CBIO 644)
  - Biochemistry/Biophysics (e.g. BIOC 601)
  - Microbiology/Immunology (e.g. MCRO 614, MCRO 630, MCRO 635)
  - Other appropriate courses (Bioinformatics for example) can be selected in consultation with an advisor.

### Typical Sequence:

Because MCDB (Molecular, Cellular and Developmental Biology) students in the Department of Biology may select from a wide variety of course offerings individual sequences will vary. The Department of Biology also requires, as a condition of graduation, that all students TA for at least one semester so that they receive exposure to teaching techniques. As a result, many students will arrange their course sequence to accommodate their TA experience. For example, a typical sequence can be:

- First semester: one lecture course, a seminar/journal club, and TA
- Second semester: two lecture courses or a lecture course and a seminar/journal club

Note: one or more courses (especially the specialty courses) can also easily be done during the second year as well.

The over-arching principle in the Biology Graduate curricula is to enable the student to construct a set of courses that best fits their needs and interests.

## Cell and Developmental Biology Program

<http://www-cellbio.med.unc.edu/>

Director of Graduate Studies: Doug Cyr, [dmcyr@med.unc.edu](mailto:dmcyr@med.unc.edu), 843-4805

Student Services Manager: Janice Warfford, [Janice\\_Warfford@med.unc.edu](mailto:Janice_Warfford@med.unc.edu), 962-9873

Basic Listing of Courses (numbers in parentheses are credit hours)

For First Year Students

1. CBIO 893 – Advanced Cell Biology I (4)
2. CBIO 894 - Advanced Cell Biology II (4)

For Second Year Students

3. CBIO 891 - Grant Writing I (3)
4. CBIO 892 - Grant Writing II (3)

Other courses cross-listed with other programs

5. CBIO/BIOC/MCRO/PHCO 643- Super Cell I (3)
6. CBIO/BIOC/MCRO/PHCO 644- Super Cell II (3)

On the following page we have outlined two sample course sequences. The first sequence shows typical courses taken by a student who is sure about joining the Cell and Developmental Biology program from the beginning of graduate school. The second sequence shows what course work might look like for a student who isn't sure about joining Cell and Developmental Biology until after joining a PhD lab.

For more detailed information about the courses listed above please visit the 'Graduate Program' section of the Cell and Developmental Biology website or consult your BBSP course guide. If you have more questions about courses in the Cell and Developmental Biology program or about how your interests and course selections fit with the program's requirements please feel free to contact the Director of Graduate Studies, Doug Cyr.

For Students Interested in Cell and Developmental Biology PhD program from the start of graduate school

<b>FIRST YEAR: BBSP</b>	
<i>Fall Semester</i> <ul style="list-style-type: none"> <li>• CBIO 893</li> <li>• any other equivalent course</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<i>Spring Semester</i> <ul style="list-style-type: none"> <li>• CBIO 894</li> <li>• any other equivalent course</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>
<i>Summer (Join the Cell and Developmental Biology Program)</i> <ul style="list-style-type: none"> <li>• <i>Doctoral Written Exam</i></li> </ul>	
<b>SECOND YEAR</b>	
<i>Fall Semester</i> <ul style="list-style-type: none"> <li>• CBIO 891</li> </ul>	<i>Spring Semester</i> <ul style="list-style-type: none"> <li>• CBIO 892 or another elective</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• <i>Doctoral Oral Exam (By Oct.1 of Year 3)</i></li> <li>• Dissertation research</li> <li>• In-House Seminar Presentation</li> <li>• Defend Dissertation (within a total of 6 years)</li> </ul>	

For students not sure about joining Cell and Developmental Biology until after joining a PhD lab

<b>FIRST YEAR: BBSP</b>	
<i>Fall Semester</i> <ul style="list-style-type: none"> <li>• Two Graduate level courses (<i>e.g</i> CBIO 893, CBIO 643, NBIO 722, others)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<i>Spring Semester</i> <ul style="list-style-type: none"> <li>• Two Graduate level courses (<i>e.g</i>. CBIO 894, CBIO 644, NBIO 723, others)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>
<i>Summer (Join the Cell and Developmental Biology Program)</i> <ul style="list-style-type: none"> <li>• <i>Doctoral Written Exam</i></li> </ul>	
<b>SECOND YEAR</b>	
<i>Fall Semester</i> <ul style="list-style-type: none"> <li>• CBIO 891</li> </ul>	<i>Spring Semester</i> <ul style="list-style-type: none"> <li>• CBIO 892 or another elective</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• <i>Doctoral Oral Exam (By Oct.1 of Year 3)</i></li> <li>• Dissertation research</li> <li>• In-House Seminar Presentation</li> <li>• Defend Dissertation (within a total of 6 years)</li> </ul>	

## Cell & Molecular Physiology Program

<http://www.med.unc.edu/physiology/>

Director of Graduate Studies: Manzoor Bhat, [manzoor\\_bhat@med.unc.edu](mailto:manzoor_bhat@med.unc.edu), 966-1018

Student Services Manager: Adriana Tavernise, [adrianat@med.unc.edu](mailto:adrianat@med.unc.edu), 966-9396

### Basic Listing of Courses (numbers in parentheses are credit hours)

1. Either: **PHYI 702** - Experimental Physiology of Human Health and Disease I (3) and **PHYI 703** - Experimental Physiology of Human Health and Disease II (3) or **PHYI 722/723** - Cellular and Molecular Neurobiology (6/6)
2. **PHYI 705/706** - Communicating Scientific Results [years 2 & first semester of year 3; (1/1)]
3. **PHYI 751/752** - Seminars in Physiology (1/1)
4. **Elective courses** - Four graduate-level elective courses\* (3 ea.)

We expect that students wishing to join the Cell & Molecular Physiology program will select a strong series of electives in basic biomedical sciences in Year 1, and we strongly encourage you to take PHYI 702/703 (or the 722/723 series, for neuro-focused students) at that time.

At least one elective should be a literature-intensive seminar-style class that develops skills in critical thinking, such as Advanced Cell Biology (CBIO 893, 894), Seminar in Pathology (PATH 801), or other similar courses approved by the DGS. For the second year, electives should be chosen in consultation with the thesis adviser, taking into account the likely needs of the thesis project and the interests and likely career path of the student.

Most graduate-level elective courses in any discipline or scientific area related to biomedical science will satisfy these requirements. Areas that are likely to be particularly pertinent are cell biology, biochemistry, neurobiology, molecular biology, genetics, statistics, and pharmacology.

*\*Elective credit hours for students taking PHYI 722/723 series will be adjusted accordingly.*

On the following page we have outlined two sample course sequences. The first sequence shows typical courses taken by a student who is sure about joining the Physiology program from the beginning of graduate school. The second sequence shows what course work might look like for a student who isn't sure about joining Physiology until completing first-year rotations.

For more detailed information about the courses listed above please visit the 'Graduate Program' section of the Cell & Molecular Physiology website or consult your BBSP course guide. If you have more questions about courses in the Cell & Molecular Physiology program, or about how your interests and course selections fit with the program's requirements, please feel free to contact the Director of Graduate Studies (contact information listed above).

For Students Interested in the C&M Physiology PhD program from the start of graduate school

FIRST YEAR: BBSP	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 702 (or PHYI 722A, B, and C)</li> <li>• Electives</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 703 (or PHYI 723A, B, and C)</li> <li>• Electives</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<p><b>Summer (Join a C&amp;M Physiology lab and the Program in June)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> <li>• Possibly a course at UNC or elsewhere (e. g., Woods Hole) as appropriate</li> </ul>	
SECOND YEAR	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 705 Professional Development</li> <li>• PHYI 751 Seminar series</li> <li>• Elective(s)</li> <li>• Dissertation research</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 706 Professional Development</li> <li>• PHYI 752 Seminar series</li> <li>• Elective(s)</li> <li>• Dissertation research</li> <li>• Qualifying exam</li> </ul>
THIRD YEAR AND BEYOND	
<p><b>Fall semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 705 Professional Development (in Year 3)</li> <li>• PHYI 751 Seminar series</li> <li>• Dissertation proposal and fellowship application no later than December</li> <li>• Dissertation research</li> </ul>	<p><b>Spring semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 752 Seminar series</li> <li>• Dissertation research</li> </ul>

For students not sure about joining C&M Physiology during the BBSP year

FIRST YEAR: BBSP	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• Electives (interested in neurobiology? Don't wait until second year to take PHYI 722 &amp; 723)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• Electives</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<p><b>Summer (Join the C&amp;M Physiology Program in June)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
SECOND YEAR	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 702 (optional for neuro track)</li> <li>• PHYI 705 Professional Development</li> <li>• PHYI 751 Seminar series</li> <li>• Elective(s)</li> <li>• Dissertation research</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 703 (optional for neuro track)</li> <li>• PHYI 706 Professional Development</li> <li>• PHYI 752 Seminar series</li> <li>• Elective(s)</li> <li>• Dissertation research</li> <li>• Qualifying exam</li> </ul>
THIRD YEAR AND BEYOND	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 705 Professional Development (in Year 3)</li> <li>• PHYI 751 Seminar series</li> <li>• Dissertation proposal and fellowship application no later than December of year 3</li> <li>• Dissertation research</li> </ul>	<p><b>Spring semester</b></p> <ul style="list-style-type: none"> <li>• PHYI 752 Seminar series</li> <li>• Dissertation research</li> </ul>

## Biological Chemistry Program - Chemical Biology and Biochemistry

<http://www.chem.unc.edu/biochemistry>

Graduate Studies Representative: Kevin Weeks, [weeks@unc.edu](mailto:weeks@unc.edu), 962-7486

Student Services Manager: Donnyell Batts, [dlbatts@email.unc.edu](mailto:dlbatts@email.unc.edu), 843-7827

### General Program of Study

The vision for graduate training in Chemistry is to continue the Department's long tradition of preparing students for leadership roles in academia and industry in the fields of biological chemistry and chemical biology.

The overall program is designed to be flexible and to meet the diverse scientific goals of individual students. Formal course and exam requirements that prepare students for research are completed by the end of the second year. The Department is proud of its record of graduating the vast majority of its students within five years. Over five years, the general program is:

Year one: Class work, rotations, teaching, selection of a research mentor.

Year two: Begin the research experience, pass a written qualifying exam, and write and defend a Prospectus on the topic of your proposed doctoral research project.

Year three: Become intensively involved in research and present a seminar on your doctoral research project.

By year five: Publish, write a doctoral dissertation, and present a public seminar of your research results.

### Coursework

Course selection is flexible and is developed in consultation with a faculty advisor with the goal of meeting the training needs of each student. In general, the Department emphasizes small enrollment didactic and literature-based courses. Courses are explained in detail at the website given above.

On the following page, we have outlined a sample course sequence for students wishing to emphasize Chemical Biology or Biochemistry in their BBSP training. In general, our program accepts courses from many departments.

For Students Interested in Biological Chemistry:

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <p><b>Strongly Recommended:</b></p> <ul style="list-style-type: none"> <li>• CHEM 732: Advances in Macromolecular Structure and Function (3)</li> </ul> <p><b>Plus one of the following:</b></p> <ul style="list-style-type: none"> <li>• CHEM 431: Macromolecular Structure &amp; Function (3)</li> <li>• BIOC 650–BIOC 652: Biophysics Series (3)</li> <li>• CBIO 643: Cell Structure and Function I (3)</li> </ul> <ul style="list-style-type: none"> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <p><b>Strongly Recommended:</b></p> <ul style="list-style-type: none"> <li>• CHEM 730: Chemical Biology (3)</li> </ul> <p><b>Elective courses selected from, but not limited to, the following (2-4 hrs):</b></p> <ul style="list-style-type: none"> <li>• CHEM 734: Biomolecular NMR (1-2)</li> <li>• CHEM 735: Macromolecular Interactions (1)</li> <li>• CHEM 736: Macromol. Crystallography (2)</li> <li>• BIOC 664: Macromolecular Spectroscopy (1)</li> <li>• BIOC 700: Current Top. in RNA Structure (2)</li> </ul> <ul style="list-style-type: none"> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<p><b>Summer (Join the Chemistry Program)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• (Optional) Electives</li> <li>• Qualifying Exam in September</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• Write and defend Doctoral Prospectus</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Dissertation research</li> <li>• Give formal seminar on dissertation research in third year</li> <li>• Publish</li> <li>• Defend Dissertation</li> </ul>	

## Curriculum in Genetics and Molecular Biology

<http://gmb.unc.edu/>

Director of Graduate Studies: Bob Duronio, Ph.D. [durochio@med.unc.edu](mailto:durochio@med.unc.edu), 962-7749

Student Services Manager: Sausyty Hermreck, [sausytyh@med.unc.edu](mailto:sausytyh@med.unc.edu), 966-5881

### Basic Listing of Course Requirements (numbers in parentheses are credit hours)

*Four Didactic and One Seminar Course are required*

Required Courses (mandatory):

1. **GNET 621** - Principles of Genetic Analysis (3)
2. Either **GNET 631** - Advanced Molecular Biology I (3)  
or **GNET 632** - Advanced Molecular Biology II (3)

Core Courses – 2 courses from the following list required

1. **GNET622** – Genetic Analysis II: Molecular Biology (4)
2. **GNET 631** - Advanced Molecular Biology I (3)
3. **GNET 632** - Advanced Molecular Biology II (3)
4. **BIOL 624** - Developmental Biology (3)
5. **GNET 641** - Intro to Bioinformatics (4)
6. one semester of **BCB711-717** modules
7. CBIO 643 – SuperCell I (3)
8. CBIO 644 – SuperCell II (3)

Seminar Course – required

*The seminar requirement is fulfilled by any course where at least 1/3 of the evaluation is based on class participation (such as a journal article reading course; e.g. GNET 625).*

On the following page we have outlined two sample course sequences. The first sequence shows typical courses taken by a student who is sure about joining the GMB program from the beginning of graduate school. The second sequence shows what course work might look like for a student who isn't sure about joining GMB until after joining a PhD lab.

If you have more questions about courses in the GMB program or about how your interests and course selections fit with the program's requirements please feel free to contact the Director of Graduate Studies, Bob Duronio.

One example for students interested in the GMB PhD program from the start of graduate school

<b>FIRST YEAR: BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• GNET 621</li> <li>• GNET 631</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• GNET 622</li> <li>• GNET 632</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<b>Summer (Join the GMB program)</b> <ul style="list-style-type: none"> <li>• Written Qualifying Exam in June</li> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR: Finish GMB course work if necessary</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• Elective (e.g. GNET 631, BIOL 624)</li> <li>• Dissertation Research</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• Elective (e.g. GNET 632, 622, 641)</li> <li>• Dissertation Research</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Oral Qualifying Exam</li> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

One example for students not sure about joining GMB until after joining a PhD lab

<b>FIRST YEAR: BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• GNET 621</li> <li>• GNET 625</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• GNET 632</li> <li>• CBIO 644</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<b>Summer (Join the GMB program)</b> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR: Finish GMB course work if necessary</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• GNET 631</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• GNET 641</li> </ul>
<b>Summer</b> <ul style="list-style-type: none"> <li>• Written Qualifying Exam in June</li> </ul>	
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Oral Qualifying Exam</li> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

## Microbiology & Immunology Program

<http://www.med.unc.edu/microimm>

Director of Graduate Studies: Bob Bourret, [bourret@med.unc.edu](mailto:bourret@med.unc.edu), 966-2679

Student Services Manager: Dixie Flannery, [dixie\\_flannery@med.unc.edu](mailto:dixie_flannery@med.unc.edu), 966-9005

### Basic Listing of Courses (numbers in parentheses are credit hours)

Fall Semester:

1. **MCRO 614** – Immunobiology (3)
2. **MCRO 615** – Immunobiology Recitation (for students planning to join MCRO) (1)
3. **MCRO 630** – Virology (4)
4. **MCRO 635** – Microbial Pathogenesis (prokaryotes) (3)
5. **MCRO 701** – Seminar in MCRO (Department & Student Seminars) (1)
6. **MCRO 711** – Seminar/Tutorial in Virology (var)
7. **MCRO 712** – Seminar/Tutorial in Immunology (var)
8. **MCRO 795** – Research Concepts (3) (Majors only)

Spring Semester:

1. **MCRO 640** – Microbial Pathogenesis (viruses) (3)
2. **MCRO 702** – Seminar in MCRO (Department & Student Seminars) (1)
3. **MCRO 710** – Seminar/Tutorial in Prokaryotic Molecular Biology (var)
4. **MCRO 712** – Seminar/Tutorial in Immunology (var)

Other electives commonly taken by students interested in Microbiology & Immunology:

1. **GNET 631** – Advanced Molecular Biology I (3) - Fall
2. **GNET 632** – Advanced Molecular biology II (3) - Spring
3. **CBIO 643** – Cell Biology I (Cell Structure, Signaling, and Growth Control) (3) - Fall
4. **CBIO 644** – Cell Biology II (3) - Spring

The course requirements for Microbiology & Immunology are a minimum of six graduate level courses in relevant subjects. At least two of the six must be seminar/tutorials. At least one of the seminar/tutorials must be MCRO 710, 711, or 712. Because the topics change every year, MCRO 710, 711, and 712 can be taken more than once for credit. The second seminar/tutorial class can be MCRO 710, 711, 712 or (if approved by the Director of Graduate Studies) a class from another department that is primarily based on reading and critical analysis of the scientific literature. Students usually complete four of their six classes during their first year in BBSP. When planning how to meet our course requirements, note that virtually all Microbiology & Immunology students take MCRO 795 in their second year even though it is not specifically required. After joining the department, students are also required to take MCRO 701 or 702 every semester.

Students act as Teaching Assistants for two semesters (typically one each in the second and third years) in courses approved by the Director of Graduate Studies.

The next page contains sample course sequences for students with differing degrees of certainty during their first year about joining the Microbiology & Immunology program.

For more detailed information about courses and the Microbiology & Immunology Ph.D. program, please visit the "Graduate Program" section of our website (<http://www.med.unc.edu/microimm/graduate-program-1>). If you have additional questions, please contact the Director of Graduate Studies, Bob Bourret, or the Student Services Manager, Dixie Flannery.

For students interested in Microbiology & Immunology Ph.D. program in year one:

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• MCRO 614/615, 630, 631, 635, 643 (choose two)</li> <li>• BBSP 902 (First Year Group)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• MCRO 632, 640, 644 (choose two or choose one and an elective)</li> <li>• BBSP 902 (First Year Group)</li> <li>• Rotations</li> </ul>

For Students not sure about joining Microbiology & Immunology until after joining a Ph.D. lab:

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• MCRO 614, 630 or 635</li> <li>• Elective</li> <li>• BBSP 902 (First Year Group)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• MCRO 640 or an elective</li> <li>• Elective</li> <li>• BBSP 902 (First Year Group)</li> <li>• Rotations</li> </ul>

For all students after joining the Microbiology & Immunology Ph.D. program

<p><b>Summer (join the Microbiology &amp; Immunology program)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• MCRO 711 or 712 (as needed to complete seminar/tutorial requirement)</li> <li>• MCRO 795 (scientific writing)</li> <li>• MCRO 614/615, 630, or 635 (electives if needed to complete six course requirement or to fulfill professional interests)</li> <li>• MCRO 701</li> <li>• TAsip (option 1)</li> <li>• Dissertation research</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• MCRO 710 or 712 (as needed to complete seminar/tutorial requirement)</li> <li>• MCRO 640 (elective if needed to complete six course requirement or to fulfill professional interests)</li> <li>• MCRO 702</li> <li>• <b>Doctoral Written Exam</b></li> <li>• TAsip (option 2)</li> <li>• Dissertation research</li> </ul>
<b>THIRD YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• <b>Doctoral oral exam</b></li> <li>• MCRO 701</li> <li>• MCRO 711 or 712 (optional to fulfill professional interests)</li> <li>• TAsip (option 3)</li> <li>• Dissertation research</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• MCRO 702</li> <li>• MCRO 710 or 712 (optional to fulfill professional interests)</li> <li>• TAsip (option 4)</li> <li>• Dissertation research</li> </ul>

## Molecular and Cellular Pathology Ph.D. Program

<http://www.med.unc.edu/pathology>

Director of Graduate Studies: William B. Coleman, [william.coleman@pathology.unc.edu](mailto:william.coleman@pathology.unc.edu), 966-2699

Associate Director of Graduate Studies:

Jonathon W. Homeister, [jonathon.homeister@pathology.unc.edu](mailto:jonathon.homeister@pathology.unc.edu), 966-9748

Student Services Manager: Dorothy Poteat, [dorothy.poteat@pathology.unc.edu](mailto:dorothy.poteat@pathology.unc.edu), 843-5878

### Basic Listing of Course Requirements (numbers in parentheses are credit hours)

1. **PATH 713/714** – Molecular and Cellular Pathophysiological Basis of Disease: Mechanisms of Disease (3) and Laboratory I (2)
2. **PATH 715/716** – Molecular and Cellular Pathophysiological Basis of Disease: Systemic Pathology (3) and Laboratory II (2)
3. **PATH 723** – Translational Pathology and Laboratory Medicine (2)
4. **PATH 801** – Scientific Critical Thinking (3)
5. **BIOS 600** – Biostatistics (3)  
*Students that have previously taken an appropriate biostatistics course can have this requirement waived with permission of the Director of Graduate Studies.*
6. **Electives**  
*The number of elective courses that are required varies with the background of the student. The course sequence for a particular student is designed with consideration of the needs of that specific student. Most students will take at least two electives to ensure a strong background in molecular genetics and cell biology. Some students will select elective courses to support their dissertation research projects (for instance developmental biology, vascular biology, microbiology/immunology, or cancer biology).*

On the following page we have outlined two sample course sequences. The first sequence provides a typical sequence of courses taken by a student who is sure about joining the Molecular and Cellular Pathology program from the beginning of graduate school. The second sequence of courses is representative of that for a student that does not decide to join the Molecular and Cellular Pathology program until after joining a specific laboratory at the end of the first year.

For more detailed information about the courses listed above please visit the Department of Pathology and Laboratory Medicine website or consult your BBSP course guide. If you have specific questions about courses in the Molecular and Cellular Pathology program, or about how your interests and course selections fit with the program's requirements please feel free to contact the Director of Graduate Studies (Bill Coleman) or the Associate Director of Graduate Studies (Jon Homeister).

Typical sequence of courses taken by a student who is sure about joining the Molecular and Cellular Pathology program from the beginning of graduate school.

<b>FIRST YEAR: BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• PATH 713/714</li> <li>• Elective (GENT 631 or C BIO 643)</li> <li>• BBSP 902 (FYG)</li> <li>• First Laboratory Rotation</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• PATH 715/716</li> <li>• Elective (GENT 632 or C BIO 644)</li> <li>• BBSP 902 (FYG)</li> <li>• Second and Third Laboratory Rotations</li> </ul>
<b>Summer (Join the Molecular and Cellular Pathology Program)</b> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• PATH 801</li> <li>• BIOS 600</li> <li>• Elective (GENT 631 or C BIO 643 or other)</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• PATH 723</li> <li>• Elective (GENT 632 or C BIO 644 or other)</li> <li>• <i>Doctoral Written Exam Due</i></li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• <i>Doctoral Oral Exam Administered</i></li> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

This sequence of courses is representative of that for a student that does not decide to join the Molecular and Cellular Pathology program until after joining a specific laboratory at the end of the first year.

<b>FIRST YEAR: BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• GENT 631 or C BIO 643</li> <li>• Elective</li> <li>• BBSP 902 (FYG)</li> <li>• First Laboratory Rotation</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• GENT 632 or C BIO 644</li> <li>• Elective</li> <li>• BBSP 902 (FYG)</li> <li>• Second and Third Laboratory Rotations</li> </ul>
<b>Summer (Join the Molecular and Cellular Pathology Program)</b> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• PATH 713/714</li> <li>• PATH 801</li> <li>• BIOS 600</li> <li>• Elective (GENT 631 or C BIO 643 or other)</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• PATH 715/716</li> <li>• PATH 723</li> <li>• Elective (GENT 632 or C BIO 644 or other)</li> <li>• <i>Doctoral Written Exam Due</i></li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• <i>Doctoral Oral Exam Administered</i></li> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

## Neurobiology Curriculum

<http://www.med.unc.edu/Neurobiology/>

Director of Graduate Studies: Aldo Rustioni, [aldo\\_rustioni@med.unc.edu](mailto:aldo_rustioni@med.unc.edu), 966-6808

Student Services Manager: Denise Kenney, [denise\\_kenney@med.unc.edu](mailto:denise_kenney@med.unc.edu), 966-1260

**Basic Listing of Course Requirements** (numbers in parentheses are credit hours per semester)

1. **NBIO 722 and 723** – Cellular and Molecular Neurobiology (6)
2. **NBIO 850** – Communicating Science (3)
3. **Electives**—2 elective courses; any graduate-level courses in any discipline or scientific area will satisfy this requirement.

On the following page we have outlined two sample course sequences. The first sequence shows typical courses taken by a student who is sure about joining the Neurobiology Curriculum from the beginning of graduate school. The second sequence shows what course work might look like for a student who isn't sure about joining Neurobiology until after joining a PhD lab.

For more detailed information about the courses listed above please visit the 'Program' section of the Neurobiology website or consult your BBSP course guide. If you have more questions about courses in the Neurobiology Curriculum or about how your interests and course selections fit with the program's requirements please feel free to contact the Director of Graduate Studies, Aldo Rustioni.

We expect that students wishing to join the Neurobiology Curriculum will select a strong series of elective course in basic biomedical sciences in the first year. For the second year, elective courses should be chosen in consultation with the thesis advisor, taking into account the likely needs of the thesis project and the interests and likely career path of the student. Electives that may be included among the "suggested " list are NBIO 724 Developmental Neurobiology, NBIO 890 Microscopy & Imaging in Neurobiology, PSYC 701/702 Biology and Bases of Behavior, BIOL 443 Cell & Developmental Biology, PHCO 728 Neuropharmacology of Alcohol and Substance Abuse, NBIO 727 Translational Seminars in Cognitive & Clinical Neuroscience. An important part of the training of students in Neurobiology is also participation in a variety of activities and events that are held on a regular basis: these include a student-run journal club, a student-run student research day (PMRD), a Neurobiology Symposium in the fall, the seminar series organized by the Neuroscience Center, and the post-doctoral seminar mini-series.

The following page outlines two sample course sequence: one for those student who have made up their mind to join NBIO Curriculum, and one for those who have not yet.

For Students interested in Neurobiology from the start of graduate school (ideal schedule)

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• NBIO 722</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• NBIO 723</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>
<p><b>Summer (Join the Neurobiology Curriculum and chose P.I. lab)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> <li>• Preferably a course at UNC or elsewhere (e.g. Woods Hole) as appropriate</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• NBIO 724</li> <li>• NBIO 705</li> <li>• Elective</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• PSYC 702</li> <li>• NBIO 706</li> <li>• Elective</li> <li>• Doctoral Written Exam (summer)</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Doctoral Oral Exam (middle of 3<sup>rd</sup> year)</li> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

For students not sure about joining Neurobiology at the end of the first year:

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• Elective</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> <li>• At least one seminar per week from any series</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• Elective</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> <li>• At least one seminar per week from any series</li> </ul>
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• NBIO 722</li> <li>• Suggested Electives</li> <li>• Journal Club</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• NBIO 723</li> <li>• Suggested Electives</li> <li>• Journal Club</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Dissertation proposal and fellowship application no later than December of year 3</li> <li>• Defend Dissertation</li> </ul>	<ul style="list-style-type: none"> <li>• In-House Seminar Presentation</li> <li>• Dissertation Research</li> </ul>

## Curriculum in Oral Biology

<http://www.dent.unc.edu/academic/programs/ade/bio/>

Director of Graduate Studies: Patrick Flood, [pat\\_flood@dentistry.unc.edu](mailto:pat_flood@dentistry.unc.edu), 425-3586

Student Services Manager: Cindy Blake, [cindy\\_blake@dentistry.unc.edu](mailto:cindy_blake@dentistry.unc.edu), 843-8072

### Basic Listing of Courses (numbers in parentheses are credit hours)

Fall:

1. **OBIO 730** – Concepts in Oral Biology – Extracellular Matrices (1.5).
2. **OBIO 731** – Concepts in Oral Biology – Host-Pathogen Interactions (1.5).
3. **OBIO 710** – Discussion in Oral Biology (1)
4. **OBIO 770** – Selected Topics in Oral Biology (1).
5. **OBIO 701** – Research Techniques in Oral Biology (Majors only)

Spring:

1. **OBIO 732** – Concepts in Oral Biology – Sensory Neurobiology (1.5).
2. **OBIO 711** – Discussion in Oral Biology (1)
3. **OBIO 741** – Molecular Control of Bone Mass (3)
4. **OBIO 762** – Molecular/Cellular Pathogenesis of Inflammatory Diseases (3)
5. **OBIO 771** – Selected Topics in Oral Biology (1).
6. **OBIO 780** – Scientific Writing (3) (Majors only)
7. **OBIO 702** – Research Techniques in Oral Biology (Majors only)

Other electives commonly taken by students interested in Oral Biology:

1. **GNET 631/632** – Advanced Molecular Biology I (3 or 6)
2. **CBIO 643/644** – Cell Biology (3 or 6)
3. **MCRO 614** – Immunobiology (3).
4. **MCRO 630** – Virology (4).
5. **MCRO 635** – Microbial Pathogenesis (prokaryotes) (3).
6. **NEURO 722/723** – Cellular and Molecular Neurobiology (3 or 6)
7. **CHEM 430** – Introduction to Biological Chemistry (3)

A minimum of 8 courses, core courses OBIO 730,731, 732, 770, 771, and 780; and participation in OBIO 710/711 are required. Basic proficiency in Biochemistry, Molecular Biology, and Cell Biology are required, but programmatically determined by academic background. Several advanced electives are track specific that have prerequisites and are usually taken after the first year.

On the following page, we have outlined a sample of course sequences. The sequence shows the track taken by a student who is unsure about joining the Curriculum in Oral Biology. Students interested in joining the program from year one can take the OBIO 730/731/732 core sequence in year one, leaving more time in year two for advanced electives with the training track of choice. Coursework for each training track is determined by student background and is determined by the DGS.

For more detailed information about the courses listed above, please visit the 'Graduate Program' section of the Oral Biology website (<http://microimm.med.unc.edu/home.aspx>). If you have additional questions, please feel free to contact the Director of Graduate Studies, Patrick Flood.

For Students joining the Host Pathogen Track of PhD program following year one:

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• CHEM 430</li> <li>• CBIO643</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• CHEM 431</li> <li>• CBIO644</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>
<p><b>Summer (Join the Oral Biology Program)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• OBIO 730/731</li> <li>• OBIO 770</li> <li>• MCRO 614, 630 or 635</li> <li>• Dissertation research</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• OBIO 732</li> <li>• OBIO 771</li> <li>• MCRO 640 or elective</li> <li>• OBIO 762</li> <li>• <b>Doctoral Written Exam &amp; Oral Exam</b></li> <li>• Dissertation research</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Translational Research Courses (option)</li> <li>• Dissertation research</li> </ul>	<ul style="list-style-type: none"> <li>• Translational Research Courses (option)</li> <li>• Dissertation research</li> </ul>

For Students joining the Extracellular Matrices Track of PhD program following year one:

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• CHEM 430</li> <li>• GNET631/CBIO643 (choose 1)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• CHEM 432</li> <li>• GNET632/CBIO644 (choose 1)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>
<p><b>Summer (Join the Oral Biology Program)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• OBIO 730/731</li> <li>• OBIO 770</li> <li>• GNET 631/CBIO643 or electives</li> <li>• Dissertation research</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• OBIO 732</li> <li>• OBIO 771</li> <li>• GNET 632/CBIO644 or elective</li> <li>• OBIO 741 (or elective)</li> <li>• <b>Doctoral Written Exam &amp; Oral Exam</b></li> <li>• Dissertation research</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Translational Research Courses (option)</li> <li>• Dissertation research</li> </ul>	<ul style="list-style-type: none"> <li>• Translational Research Courses (option)</li> <li>• Dissertation research</li> </ul>

For Students joining the Sensory Neuroscience Track of PhD program following year one:

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• NEURO 722</li> <li>• GNET631/CBIO643 (choose 1)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• NEURO723</li> <li>• GNET632/CBIO644 (choose 1)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>
<p><b>Summer (Join the Oral Biology Program)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• OBIO 730/731</li> <li>• OBIO 770</li> <li>• GNET 631/CBIO643 or electives</li> <li>• Dissertation research</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• OBIO 732</li> <li>• OBIO 771</li> <li>• GNET 632/CBIO644 or electives</li> <li>• <b>Doctoral Written Exam &amp; Oral Exam</b></li> <li>• Dissertation research</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Translational Research Courses (option)</li> <li>• Dissertation research</li> </ul>	<ul style="list-style-type: none"> <li>• Translational Research Courses (option)</li> <li>• Dissertation research</li> </ul>

## Pharmaceutical Sciences Program – Concentration in Medicinal Chemistry and Natural Products

<http://www.pharmacy.unc.edu/mcnp/>

Division Director of Graduate Admissions: Michael Jarstfer, [jarstfer@unc.edu](mailto:jarstfer@unc.edu), 966-6422

Division Student Services Manager: Carrie Goldsmith, [carrieg@email.unc.edu](mailto:carrieg@email.unc.edu), 843-8113

Students entering the Pharmaceutical Sciences Ph.D. Program choose a concentration in one of the academic divisions in the UNC Eshelman School of Pharmacy: Medicinal Chemistry and Natural Products (MCNP) or Molecular Pharmaceutics (MOPH). For information about the program overall, or for differences between the concentrations, please contact Scott Singleton (Director of Graduate Studies, [sfs@unc.edu](mailto:sfs@unc.edu), 966-7954) or Amber Allen (Student Services Manager, [amber\\_allen@unc.edu](mailto:amber_allen@unc.edu), 843-9759).

### Basic Listing of MCNP Course Requirements (numbers in parentheses are credit hours)

1. **MEDC 804** — Drug Discovery Targets I (3)
2. **MEDC 805** — Molecular Modeling (3)
3. **MEDC 807** — Foundations of Chemical Biology: Organic and Medicinal Chemistry (3)
4. **MEDC 833** — Molecular Targets-Based Drug Discovery (3)
5. **PHCO 644** — Cell Biology (3)
6. **MEDC 899** — Seminar in Medicinal Chemistry and Natural Products (1)  
*once they've joined the MCNP program, students must register for seminar every semester in which they are in residence.*
7. **Electives** — electives in areas of student interest are encouraged

On the following page we have outlined a sample course sequence typical of a student who is sure about joining the Pharmaceutical Sciences – MNCP program from the beginning of graduate school. For more detailed information, including course sequencing for a student who isn't sure about joining Pharmaceutical Sciences until after joining a Ph.D. lab, please feel free to contact the MCNP Division Director of Graduate Admissions, Mike Jarstfer.

For Students Interested in Pharmaceutical Sciences PhD Program – concentration in Medicinal Chemistry and Natural Products – from the start of graduate school:

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• MEDC 805</li> <li>• MEDC 807</li> <li>• MEDC 833</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• MEDC 804</li> <li>• PHCO 644</li> <li>• Elective (optional)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<p><b>Summer (Join the Pharmaceutical Sciences – MCNP Program)</b></p> <ul style="list-style-type: none"> <li>• <i>Cumulative Examinations (comprise the Doctoral Written Exam)</i></li> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• MEDC 899</li> <li>• Electives (optional)</li> <li>• <i>Cumulative Examinations</i></li> <li>• Dissertation Research</li> <li>• Give formal seminar on a literature topic in third or fourth semester</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• MEDC 899</li> <li>• <i>Cumulative Examinations</i></li> <li>• Dissertation Research</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• <i>Write and defend Doctoral Prospectus before the end of the 5th semester</i></li> <li>• Participate in seminar every semester</li> <li>• Dissertation research</li> <li>• Give formal seminar on dissertation research in third or fourth year</li> <li>• Present progress at annual dissertation committee meetings</li> <li>• Defend Dissertation</li> </ul>	

For students not sure about joining Pharmaceutical Sciences until after joining a PhD lab

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• MEDC 807 or MEDC 833</li> <li>• Elective</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• MEDC 804</li> <li>• PHCO 644</li> <li>• Elective (optional)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<p><b>Summer (Join the Pharmaceutical Sciences – MCNP Program)</b></p> <ul style="list-style-type: none"> <li>• <i>Cumulative Examinations (comprise the Doctoral Written Exam)</i></li> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• MEDC 805</li> <li>• MEDC 833 or MEDC 807</li> <li>• MEDC 899</li> <li>• <i>Cumulative Examinations</i></li> <li>• Dissertation Research</li> <li>• Give formal seminar on a literature topic in third or fourth semester</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• MEDC 899</li> <li>• <i>Cumulative Examinations</i></li> <li>• Dissertation Research</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• <i>Write and defend Doctoral Prospectus before the end of the 5th semester</i></li> <li>• Participate in seminar every semester</li> <li>• Dissertation research</li> <li>• Give formal seminar on dissertation research in third or fourth year</li> <li>• Present progress at annual dissertation committee meetings</li> <li>• Defend Dissertation</li> </ul>	

## Pharmaceutical Sciences Program – Concentration in Molecular Pharmaceutics

<http://www.pharmacy.unc.edu/moph/>

Division Director of Graduate Studies: Philip C Smith, [pcs@email.unc.edu](mailto:pcs@email.unc.edu), 962-0095

Division Student Services Manager: Jubina Bregu, [jbregu@unc.edu](mailto:jbregu@unc.edu), 966-4350

Students entering the Pharmaceutical Sciences Ph.D. Program choose a concentration in one of two of the academic divisions in the UNC Eshelman School of Pharmacy: Medicinal Chemistry and Natural Products (MCNP) or Molecular Pharmaceutics (MOPH). For information about the program overall, or for differences between the concentrations, please contact Scott Singleton (Director of Graduate Studies, [sfs@unc.edu](mailto:sfs@unc.edu), 966-7954) or Amber Allen (Student Services Manager, [amber\\_allen@unc.edu](mailto:amber_allen@unc.edu), 843-9759).

### Basic Listing of MOPH Course Requirements (numbers in parentheses are credit hours)

1. **MOPH 864** — Advances in Drug Delivery (3)
2. **MOPH 738** — Nanomedicine (3)  
**MOPH 862** — Advanced Pharmaceutics (3)
3. **MOPH 810** — Drug Metabolism (3)
4. **DPET 855** — Pharmacokinetics Theory and Applications (3)
5. **DPET 831** — Clinical Drug Trial/Pharmaceutical Statistics (3)
6. **MOPH 899** — Seminar in Molecular Pharmaceutics (1)  
*once they've joined the MOPH program, students must register for seminar every semester in which they are in residence.*
7. **Electives**—2 electives required:  
*3-hour graduate-level elective courses in any related discipline or scientific area will satisfy this requirement. Consultation with MOPH is advised.*

On the following page we have outlined a sample course sequence typical of a student who is sure about joining the Pharmaceutical Sciences – MOPH program from the beginning of graduate school. Some courses are offered every other year, therefore, the sequence will vary, though course work is completed in three semester. For more detailed information, including course sequencing for a student who isn't sure about joining Pharmaceutical Sciences until after joining a Ph.D. lab, please feel free to contact the MOPH Division Director of Graduate Studies, Philip Smith.

For Students Interested in Pharmaceutical Sciences PhD Program – concentration in Molecular  
Pharmaceutics – from the start of graduate school:

<b>FIRST YEAR: BBSP</b>	
<p><b><i>Fall Semester</i></b></p> <ul style="list-style-type: none"> <li>• MOPH 864</li> <li>• Elective</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<p><b><i>Spring Semester</i></b></p> <ul style="list-style-type: none"> <li>• MOPH 831 or equivalent</li> <li>• MOPH 862</li> <li>• MOPH 738</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<p><b><i>Summer (Join the Pharmaceutical Sciences – MOPH Program)</i></b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b><i>Fall Semester</i></b></p> <ul style="list-style-type: none"> <li>• MOPH 810</li> <li>• DPET 855</li> <li>• MOPH 899</li> <li>• Elective</li> </ul>	<p><b><i>Spring Semester</i></b></p> <ul style="list-style-type: none"> <li>• MOPH 899</li> <li>• <i>Doctoral Written Exam Due</i></li> <li>• <i>Doctoral Oral Exam Administered</i></li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Participate in seminar every semester</li> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

## Pharmacology Program

<http://www.med.unc.edu/pharm/>

Director of Graduate Studies: Ken Harden, [kendall\\_harden@med.unc.edu](mailto:kendall_harden@med.unc.edu), 966-4816

Student Services Manager: Kathy Justice, [kcj@med.unc.edu](mailto:kcj@med.unc.edu), 966-1153

### Basic Listing of Course Requirements (numbers in parentheses are credit hours)

1. Either: **CBIO 643/644**--Cell Structure, Signaling, and Growth Control I (3)  
or **NBIO 722/723**--Cellular and Molecular Neurobiology (6)
2. **PHCO 701**—Introduction to Molecular Pharmacology (2)
3. **PHCO 702**—Principles of Pharmacology and Physiology (3).
4. **PHCO 730**—Seminar in Pharmacology. (1)  
*2-semester of PHCO 730 are required, but students can proficiency out if they receive an H in their first semester.*
5. **PHCO 732**—Grant Writing Workshop (1).
6. **Electives**—2 electives required:  
*any graduate-level elective courses in any discipline or scientific area will satisfy this requirement. Examples offered by faculty in the Pharmacology department include courses focused on Signal Transduction, Drug Discovery, Small GTPases, Bioinformatics and Protein Kinases*

On the following page we have outlined two sample course sequences. The first sequence shows typical courses taken by a student who is sure about joining the Pharmacology program from the beginning of graduate school. The second sequence shows what course work might look like for a student who isn't sure about joining Pharmacology until after joining a PhD lab.

For more detailed information about the courses listed above please visit the 'Graduate Program' section of the Pharmacology website or consult your BBSP course guide. If you have more questions about courses in the Pharmacology program or about how your interests and course selections fit with the program's requirements please feel free to contact the Director of Graduate Studies, Ken Harden.

For Students Interested in Pharmacology PhD program from the start of graduate school

<b>FIRST YEAR: BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• CBIO 643 or NBIO 722</li> <li>• PHCO 701</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• CBIO 644 or NBIO 723</li> <li>• PHCO 702</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<b>Summer (Join the Pharmacology Program)</b> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• PHCO 730</li> <li>• Elective</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• PHCO 730*</li> <li>• PHCO 732 (Grant Writing)</li> <li>• <i>Doctoral Written Exam Due</i></li> <li>• <i>Doctoral Oral Exam Administered</i></li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Elective</li> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

For students not sure about joining Pharmacology until after joining a PhD lab

<b>FIRST YEAR: BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• CBIO 643 or NBIO 722</li> <li>• Elective</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• CBIO 644 or NBIO 723</li> <li>• Elective</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<b>Summer (Join the Pharmacology Program)</b> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• PHCO 701</li> <li>• PHCO 730</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• PHCO 702</li> <li>• PHCO 730*</li> <li>• PHCO 732 (Grant Writing)</li> <li>• <i>Doctoral Written Exam Due</i></li> <li>• <i>Doctoral Oral Exam Administered</i></li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Elective</li> <li>• Dissertation research</li> <li>• Defend Dissertation</li> </ul>	

\*students can proficiency out of second semester of PHCO 730 with a grade of H in the first

## Curriculum in Toxicology

<http://www.med.unc.edu/toxicology>

Director of Graduate Studies: Marila Cordeiro-Stone, [uncmcs@med.unc.edu](mailto:uncmcs@med.unc.edu), 966-1396

Student Services Manager: Julie Cannefax, [jcanefax@med.unc.edu](mailto:jcanefax@med.unc.edu), 962-8400

### Listing of Recommended Core Courses (numbers in parentheses are credit hours)

1. **PHCO 701**—Introduction to Molecular Pharmacology (2)
2. **PHCO/TOXC 702**—Principles of Pharmacology and Toxicology (3)
3. **PATH 713/PATH 714L**—Disease Mechanisms, lecture (3) and laboratory (2)
4. **PATH 715/PATH 716L**—Systemic Pathology, lecture (3) and laboratory (2)
5. **TOXC 442\***—Molecular and Biochemical Toxicology (3)
6. **TOXC 707\***—Advanced Toxicology (3)
7. **Electives**—2 graduate-level courses in any discipline or scientific area  
(*courses in the area of research concentration chosen in the second year with help from the research advisor; or, courses taken in the first year prior to selection of Toxicology as the degree-granting program*)

\*Program requirements include these two courses and a combination of at least two of the options listed under 1-4 (for example, 1+2, 3+4, 1+4). TOXC 442 must be taken before TOXC 707. PHCO 701 is a pre-requisite for PHCO/TOXC 702.

### Skills Development Courses and Seminars

1. **TOXC 721**—Toxicology Seminar II (1)  
(*In this course, second year students continue to hone their critical reading and oral presentation skills by focusing on topics of interest to toxicologists in training*)
2. **TOXC 821**—Scientific Writing (1)  
(*In addition to workshop-style discussions on different types of scientific writing, students receive guidance on the organization of the doctoral research proposal and complete a first draft of their own proposal by end of the course*)
3. **TOXC 722**—Curriculum in Toxicology Weekly Seminar Series (1)  
(*Toxicology students formally register for this activity during each semester until graduation. This series includes presentations by advanced students (third year and up), postdoctoral fellows, and invited local and national leaders in toxicology*)

### Research Courses (formulation and development of doctoral research)

1. **TOXC 901**—Research in Toxicology (3) during the second year
2. **TOXC 994**—Doctoral Dissertation Research (3) after passing the written exam

**Biostatistics:** The need for a formal course and course choice will vary among students and research directions. **BIOS 610** (Biostatistics for Laboratory Scientists) is the recommended course for biomedical graduate students doing bench research. **BIOS 600** (Principles of Statistical Inference) is another option for students whose research includes a population/epidemiological studies component.

Two sample course sequences are outlined in the following page. The first shows the sequence of courses recommended to the student who is interested in Toxicology from the beginning of the first year. The second is for the student who selects the Toxicology program only after joining the laboratory of the doctoral research advisor.

Need more information? Please contact Marila Cordeiro-Stone

For students interested in the Toxicology PhD program from the first year of Graduate School

<b>FIRST YEAR: BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• PHCO 701 and PATH 713/714L</li> <li>• BBSP 902 (FYG); TOXC 722</li> <li>• Rotation</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• TOXC 702 and PATH 715/716L</li> <li>• BBSP 902 (FYG); TOXC 722</li> <li>• Rotations</li> </ul>
<b>Summer (Join the Toxicology Program)</b> <ul style="list-style-type: none"> <li>• Research</li> </ul>	
<b>SECOND YEAR</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• TOXC 442 and Elective Course</li> <li>• TOXC 721 (Communication Skills)</li> <li>• TOXC 722</li> <li>• TOXC 901 (Dissertation Research)</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• TOXC 707 and Elective Course</li> <li>• TOXC 722</li> <li>• TOXC 901 (Dissertation Research)</li> </ul> <i>(Doctoral Written Exam in May)</i>
<b>THIRD YEAR</b>	<b>FOURTH YEAR AND BEYOND</b>
<ul style="list-style-type: none"> <li>• BIOS 610 (Biostatistics; spring)**</li> <li>• TOXC 821 (Scientific Writing; fall)</li> <li>• TOXC 722 (fall and spring)</li> <li>• TOXC 994 (Dissertation Research; fall and spring)</li> </ul> <i>(Doctoral Oral Exam and Defense of PhD Proposal)</i>	<ul style="list-style-type: none"> <li>• TOXC 994 (Dissertation Research; fall and spring)</li> <li>• TOXC 722 (fall and spring)</li> </ul> <i>(Dissertation defense by the end of the 5<sup>th</sup> year)</i>

For students not sure about joining Toxicology until after selecting a PhD lab

<b>FIRST YEAR: BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• Biomedical science graduate course(s)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotation</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• Biomedical science graduate course(s)</li> <li>• BBSP 902 (FYG)</li> <li>• Rotations</li> </ul>
<b>Summer (Join the Toxicology Program)</b> <ul style="list-style-type: none"> <li>• Research</li> </ul>	
<b>SECOND YEAR</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• TOXC 442 and PHCO 701 (or PATH 713/714L)***</li> <li>• TOXC 721 (Communication Skills)</li> <li>• TOXC 722</li> <li>• TOXC 901 (Dissertation Research)</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• TOXC 707 and PATH 715/716L***</li> <li>• TOXC 722</li> <li>• TOXC 901 (Dissertation Research)</li> </ul> <i>(Doctoral Written Exam in May)</i>
<b>THIRD YEAR</b>	<b>FOURTH YEAR AND BEYOND</b>
<ul style="list-style-type: none"> <li>• BIOS 610 (Biostatistics; spring)**</li> <li>• TOXC 821 (Scientific Writing; fall)</li> <li>• TOXC 722 (fall and spring)</li> <li>• TOXC 994 (Dissertation Research; fall and spring)</li> </ul> <i>(Doctoral Oral Exam and Defense of PhD Proposal)</i>	<ul style="list-style-type: none"> <li>• TOXC 994 (Dissertation Research; fall and spring)</li> <li>• TOXC 722 (fall and spring)</li> </ul> <i>(Dissertation defense before the end of 5<sup>th</sup> year)</i>

\*\* BIOS 600 is offered in fall, spring, and first summer session

\*\*\* Research advisor to help guide the selection of the PHCO 701 or PATH 713/714L in the fall semester of the second year. Note that PATH 713/714L is not a pre-requisite for PATH 715/716L, but PHCO 701 is a pre-requisite for TOXC 702. TOXC 707 schedule conflicts with PHCO/TOXC 702 in the spring semester.

# Non-PhD Training Programs Requiring Coursework in the First Year

UNC has a number of interdepartmental 'Training Programs' students can participate in outside their standard course of study for the PhD. The programs are focused on a specific scientific interest and many can provide financial support to students, but, unlike the PhD programs, they do not grant degrees. Student participants are usually required to take some additional coursework and attend additional activities such as journal clubs, poster presentations or more. These programs create a community of researchers with a common scientific interest and can be a valuable addition to your graduate training.

Since BBSP supports all students during the first year, students don't formally join these programs until their second year or beyond. For that reason, we usually do not discuss these much during orientation. However two of the programs, Biophysics and Chemical Biology, are unique in that they require coursework in the first year. If you think you may want to be part of one of these programs you need to be aware of the requirements up front. For this reason we have included documentation here about these two programs with a particular focus on the course requirements. This should help you as you consider what courses to take in your first year. We will provide information about the other training programs at a 'Training Programs Fair' in September.

## Chemical Biology Training Program (CBTP)

<http://chembiol.unc.edu/>

Contacts: Kevin Weeks, Ph.D. [weeks@unc.edu](mailto:weeks@unc.edu), 962-7486

David Lawrence, Ph.D. [lawrencd@email.unc.edu](mailto:lawrencd@email.unc.edu), 962-8907

Student Services Manager: Donnyell Batts, [dlbatts@email.unc.edu](mailto:dlbatts@email.unc.edu), 843-7827

### Basic Listing of Program Requirements

Students can participate in the Chemical Biology Training Program by joining any of the allied laboratories at UNC. For a listing of faculty and laboratories, see the Chemical Biology homepage (above). Major participating departments include Chemistry, Medicinal Chemistry and Natural Products (Pharmacy), Biochemistry, and Cell Biology.

#### ***Three core courses:***

**MEDC 807:** Molecular Foundations of Chemical Biology (Fall)

**CBIO 643:** Cell Structure and Function I (Fall)

**CHEM 730:** Chemical Biology (Spring)

***Plus 1-2 elective courses, selected based on student interests.***

***Participation in the Seminar in Chemical Biology*** (CHEM 731 or MEDC 899), in years 2 and 3.

Chemical Biology Training Program, other requirements will depend on which Ph.D.-granting program the student joins.

<b>FIRST YEAR: BBSP</b>	
<p><b>Fall Semester</b></p> <p><b>Required:</b></p> <ul style="list-style-type: none"> <li>• MEDC 807: Molecular Foundations of Chemical Biology (3)</li> <li>• CBIO 643: Cell Structure and Function I (3)</li>   <li>• BBSP 902 (FYG)</li>   <li>• Rotation</li> </ul>	<p><b>Spring Semester</b></p> <p><b>Required:</b></p> <ul style="list-style-type: none"> <li>• CHEM 730: Chemical Biology (3)</li>   <li><b>Plus 1-2 elective courses, including but not limited to the following (2-4 hrs):</b></li> <li>• CHEM 735: Macromolecular Interactions (1)</li> <li>• BIOC 700: RNA Biology (2)</li> <li>• Courses in the Biophysics Series</li> <li>• Med Chem Elective Courses</li>   <li>• BBSP 902 (FYG)</li>   <li>• Rotations</li> </ul>
<p><b>Summer (Join a Ph.D.-Granting Program)</b></p> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<p><b>Fall Semester</b></p> <ul style="list-style-type: none"> <li>• (Optional) Electives</li> <li>• CHEM 731/MEDC 899 Seminar</li> <li>• Qualifying Exam</li> </ul>	<p><b>Spring Semester</b></p> <ul style="list-style-type: none"> <li>• Write and defend Doctoral Prospectus</li> <li>• CHEM 731/MEDC 899 Seminar</li> </ul>
<b>THIRD YEAR AND BEYOND</b>	
<ul style="list-style-type: none"> <li>• Dissertation research</li> <li>• Give formal seminar on dissertation research in Chemical Biology Seminar</li> <li>• Publish</li> <li>• Defend Dissertation</li> </ul>	

## **PROGRAM IN MOLECULAR AND CELLULAR BIOPHYSICS (PMCB)**

Program Website: <http://biophysics.med.unc.edu/>

Program Director: Barry Lentz, [uncbri@med.unc.edu](mailto:uncbri@med.unc.edu), 966-5384

Program Administrator: Lisa Phillipie, [ldh@med.unc.edu](mailto:ldh@med.unc.edu), 843-9737

The primary function of the PMCB is **training highly qualified doctoral students in the field of biophysics**. Biophysics is an interdisciplinary field; thus, we consider applicants with undergraduate degrees in any of several subjects (e.g., Biology, Biochemistry, Chemistry, Mathematics, Computer Science, and Physics). All activities and training experiences are designed to maximize sharing of expertise between Trainees from these diverse backgrounds. The second goal of the PMCB is **creating an intellectual community focused on molecular level and mechanistic understanding of cellular processes**. Several activities encourage interactions and exchange of ideas within this community.

### **Basic Course Requirements (numbers in parentheses are credit hours)**

- **BIOC 704** Seminars in Biophysics (Fall/Spring, 2)
- **BIOC 712** Scientific Writing (Spring, 3)
- **BIOC 650-652** Core Physical Biochemistry Modules (Fall, 1.5 hrs ea)
- **BIOC 660-674** Methods in Biophysics Modules (Spring, 1 hr ea) BIOC 660 Imaging (1)
- **BIOC 662** Macromolecular Interactions (1)
- **BIOC 663A and 663B** Macromolecular NMR: Practice and Theory (1 credit each)
- **BIOC 665** Advanced NMR (1)
- **BIOC 666** X-ray Crystallography of Macromolecules (1)
- **BIOC 664** Macromolecular Spectroscopy: Principles and Applications (1)
- **BIOC 670** Structural Bioinformatics (1)
- **BIOC 667** Macromolecular Crystallographic Methods (1)
- **BIOC 673** Proteomics, Protein Identification and Characterization by Mass Spectroscopy (1)
- **BIOC 674** Ion Channels Transporters (1)
- **BCB 715** Mathematical and Computational Approaches to Modeling Signaling Pathways and Regulatory Networks (1)

### **Other Requirements**

At present, the PMCB does not offer a graduate degree in Biophysics. Thus, students receive degrees in the department or curriculum in which they enroll and satisfy the qualifying requirements of that degree-granting unit. While ten UNC departments and curricula contribute faculty and students to the MCBP, most PMCB students enroll in the Biochemistry and Biophysics, Chemistry, and Physics Departments. Most Departments require an orally defended thesis proposal, which meets the PMCB requirement. A teaching assistant (TA) experience is required. Biophysics students satisfy their teaching requirement by serving as TAs in Biophysics modules or the Biophysics Summer Course.

For more information, please visit <http://biophysics.med.unc.edu/> or consult your BBSP course guide. If you have more questions concerning the Biophysics Program and/or about how your interests and course selections fit with the program's requirements please contact Dr. Barry Lentz, ([uncbri@med.unc.edu](mailto:uncbri@med.unc.edu)).

**Students Interested in the Biophysics Training Program should apply for admission during the BBSP admissions process, as enrollment is limited to 12 students per year and course work begins during the first year of Graduate School\*\*.**

<b>FIRST YEAR BBSP</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• Core Biophysics Modules – BIOC 650, 651, 652</li> <li>• 1 Elective or Core</li> <li>• BBSP 901 (1 Rotation)</li> <li>• BBSP 902 (FYG)</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• Biophysics Seminar Course - BIOC 704</li> <li>• Core – 3 modules from BIOC 660-674</li> <li>• 1 Elective or Core</li> <li>• Required – BBSP 901 (2 Rotations)</li> </ul>
<b>Summer – <i>Join the Biophysics Program</i></b> <ul style="list-style-type: none"> <li>• Dissertation Research</li> </ul>	
<b>SECOND YEAR</b>	
<b>Fall Semester</b> <ul style="list-style-type: none"> <li>• Elective or Core</li> <li>• Dissertation Research</li> </ul>	<b>Spring Semester</b> <ul style="list-style-type: none"> <li>• Required – BIOC 712</li> <li>• Elective or Core</li> <li>• Dissertation Research</li> </ul>

\*\*Students who decide to join the Biophysics Program during or after the first year can complete the core modules and the seminar course in the second year, although this is not recommended as it can slow the progression to degree.