

# **Medicinal Chemistry Graduate Student Handbook**



**COLLEGE OF PHARMACY AND  
PHARMACEUTICAL SCIENCES**

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THE UNIVERSITY OF TOLEDO

**Fall 2016**

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## THE MASTERS PROGRAM

### Courses and Research

Requirements for the Master of Science Degree in Medicinal Chemistry are defined in the College of Pharmacy Graduate Programs portion of the Graduate School section of the University of Toledo General Catalog. As part of the 30 credit hours specified in the Catalog, at least two elective courses (totaling 3 or 4 semester hours) are selected by the student in consultation with the student's Research Director and, when appropriate, the Director of Graduate Studies. The graduate course curriculum is listed below:

<i>Course</i>	<i>Course Name</i>	<i>Credit Hours</i>
MBC5100	Ethical Conduct of Research	1
MBC5900	Medicinal Chemistry Seminar	3-4 <sup>a</sup>
MBC6190	Advanced Medicinal Chemistry	4
MBC6960	M.S. Thesis Research in Medicinal Chemistry	6-16 <sup>b</sup>
	Electives	$\geq 5^c$
Total		30 <sup>d</sup>

#### Comments:

- <sup>a</sup> One hour can be taken during each semester (fall or spring, not summer). A minimum of 3 hours is required, up to 4 hours count towards degree completion.
- <sup>b</sup> A minimum of 6 hours is required, up to 16 hours count towards degree completion.
- <sup>c</sup> Other 5000- to 6000-level courses should be taken as electives, as advised. A minimum of 5 hours of electives are required, but more than 5 hours can be taken and will be counted towards degree completion. Typically, students with more biological interests will take MBC 6550 Biochemistry and/or MBC 6200 Biomedical Chemistry as electives and students with more chemical interests will take CHEM 6400 Advanced Organic Chemistry and CHEM 6410 Organic Synthesis. A list of recommended elective courses is given on page 13.
- <sup>d</sup> The total number of credit hours at the graduate level (course numbers 5000 and above) including classroom courses, seminar and *M.S. Thesis Research* needs to be at least 30. This total can be achieved in different ways by varying the number of seminar, research and electives while maintaining the range limits for each category specified above.

#### **In addition, the following items must be completed**

1. Preparation of a written M.S. thesis based upon the results of an original research investigation performed by the student during the M.S. program at The University of Toledo.
2. Successful oral defense of the thesis before the thesis advisory committee (consisting of the thesis adviser and two other members) and presentation of the results of the thesis research in a seminar before the Department of Medicinal and Biological Chemistry.
3. Acceptance of this thesis by the M.S. thesis adviser and the thesis advisory committee.
4. Maintenance of a cumulative graduate GPA of 3.0 or higher.
5. One semester of experience as a teaching assistant. The program believes experience in teaching is critical to solidifying the student's understanding of the basics of the field and improving communication skills.

Generally, students are expected to complete course requirements in their two years of study. Additional courses may be required as defined by the Research Advisor, the Advisory Committee and the Director of Graduate Studies.

### **Laboratory Keys**

In order to obtain keys for the laboratories or areas in which you will be working, an online form must be filled out for each key and approved by the Chair of the Department. Prior to approval, a \$25 deposit for each key you request is required to be deposited with the departmental secretary. The deposit will be returned to you when you demonstrate to the departmental secretary that you have returned your keys to plant operations at the conclusion of your graduate study.

### **Medicinal Chemistry Seminars**

All full-time graduate students need to register for the minimum Medicinal Chemistry Seminar (MBC 5900) credit hours, but are allowed and encouraged to attend each term, even if they are not registered for the seminar course. Attendance at seminars given either by students or by outside speakers is an important part of every student's training. Attendance of registered students will be verified by student signature on forms in the department office for each seminar. Graduate students are also expected to meet with invited seminar speakers in the afternoon after the seminar. Master's students, are required to give one full-length seminar presentation. These presentations are typically part of the departmental seminar series. The presentation must be based on the completed thesis. It may be given in conjunction with the final oral examination.

### **Student Academic Standing**

The MBC Graduate Committee, consisting of the Director of Graduate Studies as Chairman, and at least two additional members of the Department, is charged with continuously monitoring the progress and academic standing of each student in all required activities of the department's graduate program. The MBC Graduate Committee takes action appropriate to each student's success or failure in meeting requirements of the graduate program. Written notification of each action is given to the student, the student's Research Director and to other appropriate University personnel. The Graduate Faculty of the department is the appellate body in actions involving deficiencies with respect to departmental requirements for graduate degrees. Any appeal must be made in writing through the Department Chair within two academic calendar weeks of the student's receipt of notice of MBC Graduate Committee action.

To be in *good academic standing* in the MBC Graduate Program, students:

1. Must maintain a minimum grade point average of 3.00 in graduate courses.
2. Must make satisfactory progress toward the degree for which they are studying. This includes:
  - (i) Satisfactory completion of all courses for which a student is registered,
  - (ii) The timely completion of the requirements for the degree, and
  - (iii) The performance of the student's thesis research.

3. Must satisfactorily perform the duties designated for their financial support, i.e., teaching or research.

If a student is found to be **not** in *good academic standing* by the MBC Graduate Committee, the student is given written notification of the academic deficiencies by the Committee and placed on *academic probation* for one semester. During that semester of probation, the student is required to remove any deficiencies. Two consecutive semesters of being found to be **not** in *good academic standing* can result in loss of assistantship support or dismissal from the MBC Graduate Program.

### **Advisory Committee**

The student must have an advisory committee composed of at least three (3) members of the University of Toledo Graduate Faculty, at least two of whom are selected from the Department of Medicinal & Biological Chemistry. The Research Advisor, who must be chosen by the student prior to the end of his or her first year of study, is the Chair of the Advisory Committee. The other committee members are chosen by the student in consultation with the Research Advisor but must be approved by the Director of Graduate Studies, the Department Chair and the Graduate School. The committee must be established by the beginning of the second year of graduate study. The first meeting of the committee to approve the plan of study should take place before or during the fall semester of the second year of study.

### **Thesis**

A thesis acceptable to the research director and the student's advisory committee is required (see form #3 below). The completed thesis should be given to the committee members at ***least fourteen (14) days prior*** to the oral examination. The Thesis committee must accept the thesis for defense (see form #3 below). The Graduate School has a University of Toledo "Handbook for Preparation of Graduate Theses and Dissertations" which provides you with the format and style with which your thesis is to be presented. You will want to get a copy of the handbook for yourself to ensure your thesis is formatted properly. The advisory committee may suggest changes to the thesis before approving the final form of the thesis after the oral examination (see form #4 below).

### **Oral Examination**

Upon completion of the written thesis, the advisory committee will administer an oral examination, which will emphasize, but not be limited to, the thesis research. You will choose a member of the graduate faculty who will be present at the examination and act as an observer of the examination on behalf of the College of Graduate Studies. After completion of the oral examination the advisory committee has to approve the final version of the thesis (see form #4 below).

### **Thesis Presentation to the Department**

The student will make an oral presentation of the results of the thesis research in a seminar to the Department of Medicinal & Biological Chemistry.

## Participation in Program Assessment

The MBC Department and the University are assessing all programs on a continuous basis. This is necessary for accreditation, helps improve the University's programs of study, and adds value for the students. The program director collects information about the student's progress and about any indicators of University-internal and external recognition. Students are required to forward any information about publications, participation in scientific meetings, fellowships, travel awards and any other achievements to the Program Director. Maintaining a resume and sharing it with the program director best achieve this.

## Teaching Assistantships/Financial Support

Although financial support in the form of teaching assistantships is not usually awarded to students seeking a Master of Science degree, all students entering the program are now required to gain experience as a teaching assistant for at least one semester. The program believes that experience in teaching is critical to solidifying the student's understanding of the basics of the field and improving communication skills.

Regardless of financial support, Teaching Assistants are expected to perform all required teaching, grading, exam proctoring, lab preparation and cleanup, and MBC seminar preparation and cleanup to the best of their ability. The Director of Graduate Studies makes TA assignments at the beginning of each semester after consultation with MBC faculty.

Students who earn financial support as Teaching Assistants have to work 20 hours per week through the entire semester to earn that support. This is mandated by the University of Toledo. Further details about requirements for receiving financial support are outlined below under GRADUATE ASSISTANTSHIPS.

Absences from the University should be approved at least two weeks in advance by the student's advisor and by the Director of Graduate Studies wherever possible, and students should establish provisions to make up work missed. Lack of compliance may result loss of good academic standing and/or in a reduction or loss of financial support.

## Forms Required

Form are available for download from the College for Graduate Studies website. Some of the forms are common to both Main Campus (MC) and Health Science Campus (HSC) programs; others are used by either MC or HSC programs.

1. *Plan of Study for the Master's Degree* (MC/HSC) - to be completed by the beginning of the second semester of graduate study. This form lists the coursework required for the degree. The Plan of Study can be amended using the *Plan of Study Course Substitution Form*.
2. *Graduate Research ADvisory (GRAD) Committee Approval & Assurances Form* (MC/HSC) - certifies regulatory compliance regarding human subjects, animal experiments, and handling of radioactive materials - to be completed before thesis research is started.
3. *Acceptance of Thesis or Dissertation for Defense* form (MC/HSC) - to be completed to document the advisory committee's approval of the thesis prior to the thesis examination. The advisory committee may suggest corrections/changes but certifies that the thesis is near completion. A Graduate Faculty Representative needs to be named on the form.

4. *Approval of Thesis* form (MC/HSC) – documents successful completion of the thesis examination and approval of the final form of the thesis, containing corrections made after approval of the thesis for examination.
5. *Intellectual Protection and Patent Sign-off Form* (MC/HSC)
6. *Application for Graduation* – can be submitted online or on paper. The application is to be completed prior to the filing deadline for the semester in which you plan to graduate. Visit the College of Graduate Studies Website for information on timelines. The College of Graduate Studies is providing a checklist that will help ensure that all requirements for graduation have been met (see link below).

Other forms pertaining to leave of absence, change of degree program and other situations are available for download from the Graduate School website. The requirements for forms at various stages in the program may change. Please check for updates. Your advisor is expected to provide a memo regarding your successful proposal defense and dissertation defense to the department.

**\*\*COPIES OF EACH FORM MUST BE SUBMITTED TO THE DEPARTMENT. A COPY OF YOUR THESIS FOR THE DEPARTMENT IS REQUIRED. A FORWARDING ADDRESS IS ALSO REQUESTED WHEN YOU LEAVE THE UNIVERSITY.**

Forms are available from the graduate school

<http://www.utoledo.edu/graduate/currentstudents/academicprogramforms/>  
<http://www.utoledo.edu/graduate/files/DegreeCompletionChecklistMasters.pdf>

## **THE DOCTORAL PROGRAM**

### **Courses and Research**

Requirements for the Doctor of Philosophy Degree in Medicinal Chemistry are defined in the College of Pharmacy Graduate Programs portion of the Graduate School section of the University of Toledo General Catalog. A minimum of 90 semester hours of graduate credit are required, of which at least 60 credit hours must be at the Ph.D. level (course numbers 7100 and above). Students will complete a minimum of 30 hours of Ph.D. dissertation research for graduate credit and a minimum of 15 hours of PhD level courses, laboratories and seminars (exclusive of dissertation research). The remaining 15 hours of PhD level credits may be either research or coursework. Students entering with a baccalaureate degree will take their initial 30-33 hours of courses, laboratories and seminars at the master's level (course numbers 5100 to 6980), while students entering with a master's degree will take comparable courses at the doctoral level (7100 to 8980). In addition to the required courses in medicinal chemistry, students will complete a minimum of 8 hours of graduate electives, selected by the student in consultation with the student's Research Advisor. The graduate course curriculum is listed below:

<i>Course</i>	<i>Course Name</i>	<i>Credit Hours</i>
MBC5100/7100	Ethical Conduct of Research	1
MBC 5900/7900	Medicinal Chemistry Seminar	6-8 <sup>a</sup>
MBC6190/8190	Advanced Medicinal Chemistry	4

MBC6200/8200	Biomedical Chemistry	4
MBC6300/8300	Biomedical Chemistry Laboratory I	1
MBC6310/8310	Biomedical Chemistry Laboratory II	3
MBC6550/8550	Biochemistry	4
MBC8960	Ph.D. Dissertation Research in Medicinal Chemistry	≥30 <sup>b</sup>
	Electives	≥8 <sup>c</sup>
Total		90

<sup>a</sup> One hour can be taken during each semester (fall or spring, not summer). A minimum of 6 hours, taken over 6 semesters, is required, up to 8 hours count towards degree completion.

<sup>b</sup> A minimum of 30 hours are required, but more than 30 hours can be taken and count towards degree completion.

<sup>c</sup> Other 5000- to 6000-level courses should be taken as electives, as advised. A minimum of 8 hours are required, but more than 8 hours can be taken and will be counted towards degree completion. A list of recommended elective courses is given on page 13.

All students must satisfy the following:

1. Minimum of 60 semester hours of graduate credit beyond the master's level (course numbers 7000 and above), including a minimum of 15 hours of courses, laboratories and seminars (exclusive of dissertation research) and a minimum of 30 hours of Ph.D. dissertation research.
2. Satisfactory overall performance on a written qualifying examination covering graduate-level medicinal chemistry, biochemistry and either organic chemistry or advanced cell/molecular biology.
3. Selection of a doctoral research adviser, preparation of an acceptable written Ph.D. dissertation proposal in consultation with the adviser, and the satisfactory oral defense of the proposal before the dissertation advisory committee. The written qualifying examination and the defense of the dissertation proposal will constitute the examination requirements necessary for advancement to candidacy for the Ph.D. in medicinal chemistry. The chair of the doctoral dissertation advisory committee will be the student's doctoral research adviser. The dissertation advisory committee will consist of two additional Medicinal and Biological Chemistry Department faculty plus one member from outside the student's department or college.
4. Subsequent to admission to candidacy for the Ph.D. degree, the student is expected to spend a minimum of two semesters in full-time study at The University of Toledo.
5. Preparation of a Ph.D. dissertation based on the results of an original research investigation performed by the student during his/her Ph.D. program at The University of Toledo.
6. Presentation of the results of the dissertation research in a public seminar before the Department of Medicinal and Biological Chemistry and successful oral defense of the dissertation before the dissertation advisory committee.
7. Acceptance of the dissertation by the Ph.D. dissertation adviser and the dissertation advisory committee.
8. Maintenance of a cumulative graduate GPA of 3.0 or higher.
9. Three semesters of experience as a teaching assistant. The program believes



experience in teaching is critical to solidifying the student's understanding of the basics of the field and improving communication skills.

Generally students are expected to complete non-dissertation course requirements in their first two calendar years. Additional courses may be required as defined by the student's Research Director and the Advisory Committee, and approved by the Director of Graduate Studies. All of these courses will be incorporated into the student's Plan of Study, which needs to be submitted to the College of Graduate Studies (see form #1 below).

### **Laboratory Keys**

In order to obtain keys for the laboratories or areas in which you will be working, an online form must be filled out for each key and approved by the Chair of the Department. Prior to approval, a \$25 deposit for each key you request is required to be deposited with the departmental secretary. The deposit will be returned to you when you demonstrate to the departmental secretary that you have returned your keys to plant operations at the conclusion of your graduate study.

### **Medicinal Chemistry Seminars**

All full-time graduate students need to register for the minimum Medicinal Chemistry Seminar (MBC 5900) credit hours, but are allowed and encouraged to attend each term, even if they are not registered for the seminar course. Attendance at seminars given either by students or by outside speakers is an important part of every student's training. Attendance of registered students will be verified by student signature on forms in the department office for each seminar. Graduate students are also expected to meet with invited seminar speakers in the afternoon after the seminar. Every fall, each student in the graduate program who has successfully completed the first year of graduate work will present a brief summary of his or her research progress, as a component of the weekly seminar program. In addition, for Ph.D. students, one full-length seminar presentation is required. The presentation must be based on the completed dissertation. It may be given in conjunction with the final oral examination.

### **Student Academic Standing**

The MBC Graduate Committee, consisting of the Director of Graduate Studies as Chairman, and at least two additional members of the Department, is charged with continuously monitoring the progress and academic standing of each student in all required activities of the department's graduate program. The MBC Graduate Committee takes action appropriate to each student's success or failure in meeting requirements of the graduate program. Written notification of each action is given to the student, the student's Research Director and to other appropriate University personnel. The Graduate Faculty of the department is the appellate body in actions involving deficiencies with respect to departmental requirements for graduate degrees. Any appeal must be made in writing through the Department Chair within two academic calendar weeks of the student's receipt of notice of MBC Graduate Committee action.

To be in *good academic standing* in the MBC Graduate Program, students:

1. Must maintain a minimum grade point average of 3.00 in graduate courses.

2. Must make satisfactory progress toward the degree for which they are studying. This includes:
  - a. Satisfactory completion of all courses for which a student is registered,
  - b. The timely completion of the requirements for the degree, and
  - c. The performance of the student's dissertation research.
3. Must satisfactorily perform the duties designated for their financial support, i.e., teaching or research.

If a student is found to be **not** in *good academic standing* by the MBC Graduate Committee, the student is given written notification of the academic deficiencies by the Committee and placed on *academic probation* for one semester. During that semester of probation, the student is required to remove any deficiencies. Two consecutive semesters of being found to be **not** in *good academic standing* can result in loss of assistantship support or dismissal from the MBC Graduate Program.

A doctoral student must meet additional requirements in the following areas:

1. Written qualifying examination
2. Doctoral advisor and graduate advisory committee
3. Dissertation research proposal (and oral qualifying examination); advancement to candidacy
4. Residency requirement
5. Dissertation research
6. Dissertation preparation and defense
7. Peer reviewed publication and other requirements
8. At least three semesters of experience as a teaching assistant

Specific requirements are below:

### **Written Qualifying Examination (Preliminary Exam)**

After successful completion of the first academic year of graduate study, students will take a written examination to assess their preparation for further work. Sections of this examination will cover medicinal chemistry plus either organic chemistry (including analytic and synthetic chemistry) or advanced cell biology/molecular biology/immunology. To pass this examination unconditionally, students must receive a passing grade for all but one of the different sections. Students who do not pass this examination in their first effort will be allowed one more opportunity to succeed in those areas where their initial grade was not acceptable.

### **Doctoral Advisor and Graduate Advisory Committee**

In the second and third semesters of residence, the student will gain experience in different laboratories by doing rotations in one or more MBC laboratories chosen both by the student and the faculty member (MBC 6300/8300 and 6310/8310). These experiences should help the student determine a research direction and facilitate the selection of a Research Advisor. By the end of the first calendar year of graduate study, the student should select a Research Advisor from the graduate faculty of the Department of Medicinal & Biological Chemistry. The Doctoral Research Advisor will be the chair of the student's doctoral advisory committee. There must be at least four members on the committee, all of whom are approved by the Research Advisor, the Department Chair and the Graduate School. At least three members of

the committee must be members of the faculty in Medicinal & Biological Chemistry. One member must be from outside the Department. The committee should be established early in the second academic year of graduate study. The committee considers the student's Ph.D. Program Proposal, evaluates the written dissertation proposal, and provides an oral examination of the student regarding his preparation for research and the proposed doctoral research. The student's Doctoral Advisory Committee, and in particular the Research Advisor, is responsible for monitoring progress and for judging whether the student's research is original and of acceptable quality. Note that prior to starting of any research projects a form documenting regulatory compliance needs to be submitted to the College of Graduate Studies (see form #2 below).

### **Dissertation Research Proposal and Oral Qualifying Examination (Proposal Defense)**

After successful completion of the written qualifying examination, the student must prepare a written Dissertation Research Proposal and orally defend the proposal before the Graduate Advisory Committee. The defense should occur prior to start of the third year of graduate study. The student must provide advisory committee members with copies of the written proposal at least *two weeks* prior to the oral presentation and defense of the proposal. Whenever appropriate, the format of the written Dissertation Research Proposal will resemble that of an NIH Grant proposal. Sections will include an Abstract, Specific Aims, Background and Significance of the dissertation research, Preliminary Results (whenever applicable), Proposed Methods to accomplish the dissertation research, and Proposed Further Work. The summary of preliminary results, the methods, and the proposed future work are particularly important components of the Dissertation Research Proposal. During the oral presentation and defense of the proposed dissertation research, the student must discuss both research progress and proposed further work. During the oral presentation and defense, the student will also be asked extensive questions about the background and objectives of the research and theoretical and technical questions about the techniques and instrumentation that will be employed in the research. The student will be admitted to Ph.D. candidacy upon successful defense of the Dissertation Research Proposal. The advisor will sign a form indicating advancement to candidacy for the Ph.D. degree in Medicinal Chemistry (see form #3 below).

### **Residency Requirement and Dissertation Research**

The Ph.D. program in Medicinal Chemistry is a full four-year program, with summer research included. Students are thus expected to devote full efforts to their graduate studies. Vacations are allowed during periods when University classes are not in session. Leaves of absence may be granted for unusual circumstances when requested in advance and in writing, or for exceptional medical circumstances. After admission to candidacy for the Ph.D. degree, the student is expected to spend a minimum of three semesters in full-time study at The University of Toledo. Typically, a Ph.D. student spends two to three years in laboratory research after achieving candidacy in order to complete the research involved in the Dissertation Proposal.

### **Dissertation Preparation and Defense**

To meet both departmental and University requirements, the student must describe the outcome of the graduate research in a written dissertation and defend the dissertation in a public seminar. The committee members should be given a copy of the dissertation *at least fourteen*

*(14) days* before the dissertation defense. The committee must approve a near final version of the dissertation prior to the defense (see form #4 below), but suggest changes before the dissertation is published. At this time the student will choose a member of the Graduate Faculty who will act as an observer of the defense on behalf of the College of Graduate Studies. Following the public seminar, the committee will administer an oral examination, which will emphasize, but not be limited to, the dissertation. Signatures of the Research Advisor and each member of the student's Graduate Advisory Committee certify successful dissertation defense and acceptance of the final version of the doctoral dissertation (see form #5 below).

The Graduate School has a University of Toledo "Handbook for Preparation of Graduate Theses and Dissertations" which provides you with the style with which your dissertation is to be presented. You will want to get a copy of the handbook for yourself to ensure your dissertation is formatted properly.

### **Publication of Graduate Research**

The MBC Department has stated that each Ph.D. student should publish at least one peer-reviewed research article prior to graduation.

### **Participation in Program Assessment**

The MBC department and the University are assessing all programs on a continuous basis. This is necessary for accreditation, helps improve the University's programs of study and enhances the value of the program for the students. The program director collects information about the student's progress and about any indicators of University-internal and external recognition. Students are required to forward any information about publications, participation in scientific meetings, fellowships, travel awards and any other achievements to the program director. Maintaining a resume and sharing it with the program director best achieve this.

### **Teaching Assistantships/Financial Support**

Although financial support in the form of teaching assistantships is not awarded to all students seeking a doctoral degree in medicinal chemistry, all students entering the doctoral program are now required to gain experience as a teaching assistant for at least three semesters. The program believes that experience in teaching is critical to solidifying the student's understanding of the basics of the field and improving communication skills.

Regardless of financial support, students are expected to perform all required teaching, grading, exam proctoring, lab preparation and cleanup, and MBC seminar preparation and cleanup to the best of their ability. TA assignments are made at the beginning of each semester by the Director of Graduate Studies after consultation with MBC faculty.

Students who earn financial support as Teaching Assistants have to work 20 hours per week through the entire semester to earn that financial support. This is mandated by the University of Toledo. Further details about requirements for receiving financial support are outlined below under GRADUATE ASSISTANTSHIPS.

Absences from the University should be approved at least two weeks in advance by the student's advisor and by the Director of Graduate Studies wherever possible, and students should establish provisions to make up work missed. Lack of compliance may result in a reduction or loss of financial support.

## Forms Required

Form are available for download from the College for Graduate Studies website. Most of the forms are common to both Main Campus (MC) and Health Science Campus (HSC) programs; others are used by either MC or HSC programs, as indicated in brackets.

1. *Plan of Study for the Doctoral Degree* - to be completed by the beginning of the second semester of graduate study. This form lists the coursework required for the degree. The Plan of Study can be amended using the *Plan of Study Course Substitution Form*.
2. *Graduate Research ADvisory (GRAD) Committee Approval & Assurances Form* - certifies regulatory compliance regarding human subjects, animal experiments, and handling of radioactive materials - to be completed before thesis research is started.
3. *Application for Admission to Candidacy for the Doctoral Degree (MC)* – to be submitted after the proposal defense. This form has is used by Main Campus doctoral programs to document successful completion of both parts of the qualifying examination, i.e. the written (Prelim Exam) and oral portion (Proposal Defense). On the form note the date of both parts of the qualifying exam.
4. *Acceptance of Thesis or Dissertation for Defense form (MC/HSC)* - to be completed to document the advisory committee’s approval of the Dissertation for defense, which may not necessarily be the final form of the dissertation. The advisory committee may suggest corrections/changes but certify that the dissertation is “defendable”. A Graduate Faculty Representative needs to be named on the form.
5. *Approval of Dissertation form (MC/HSC)* – documents successful dissertation defense and approval of the final form of the dissertation, containing corrections made after approval of the dissertation for defense.
6. *Intellectual Protection and Patent Sign-Off Form (MC/HSC)*
7. *Application for Graduation* – to be completed prior to the filing deadline for the semester in which you plan to graduate. Visit the College of Graduate Studies Website for information on timelines. The College of Graduate Studies is providing a checklist that will help ensure that all requirements for graduation have been met (see link below).

Other forms pertaining to leave of absence, change of degree and other situations are available for download from the Graduate School website. The requirements for forms at various stages in the program may change. Please check for updates. Your advisor is expected to provide a memo regarding your successful proposal defense and dissertation defense to the department.

**\*\*COPIES OF EACH FORM MUST BE SUBMITTED TO THE DEPARTMENT. A COPY OF YOUR THESIS FOR THE DEPARTMENT IS REQUIRED. A FORWARDING ADDRESS IS ALSO REQUESTED WHEN YOU LEAVE THE UNIVERSITY.**

Forms are available from the graduate school

<http://www.utoledo.edu/graduate/currentstudents/academicprogramforms/>  
<http://www.utoledo.edu/graduate/files/DegreeCompletionChecklistDoctoral.pdf>

## LIST OF RECOMMENDED ELECTIVES

### Chemistry Courses

*Course*

*Course Name*

*Credit Hours*

CHEM6330	Spectroscopic Methods	2-4
CHEM6400/8400	Advanced Organic Chemistry	2-4
CHEM6410/8410	Organic Synthesis	2-4
CHEM6420	Physical Organic Chemistry	2-4
CHEM6510/8510	Protein Chemistry	2-4
CHEM6520/8520	Enzymology	2-4
CHEM6530/8530	Nucleic Acid Chemistry	2-4

### Biology Courses

<i>Course</i>	<i>Course Name</i>	<i>Credit Hours</i>
BIOL5050/7050	Advanced Immunology	3
BIOL6010/8010	Advanced Molecular Biology	4
BIOL6020/8020	Advanced Molecular Biology Laboratory	3
BIOL6090/8090	Advanced Cell Biology	4
BIOL6100/8100	Research Methodology: Cell and Molecular Biology	3

### Medicinal and Biological Chemistry Courses

<i>Course</i>	<i>Course Name</i>	<i>Credit Hours</i>
MBC5380/7380	Medicinal and Poisonous Plants	3
MBC6100/8100	Advanced Immunology	2
MBC6450/8450	Advanced Synthetic and Medicinal Chemistry	2
MBC6800/8800	Methods in Biotechnology	3

Other 5000/7000 or 6000/8000 level courses as advised

## **CHOOSING A RESEARCH DIRECTOR**

Each student should choose a research director by the end of the first year of graduate study. The choice of a research director is an important step since research is an important part of graduate student's training. In the process of doing research, the student learns to evaluate published results, devise experiments to be carried out to answer well-defined questions and the methods for doing them, to interact with other scientists, to write clearly, and (hopefully) to think clearly. Graduate research is more than just going into the laboratory and doing experiments.

To facilitate the process of choosing a research advisor, faculty will be invited to present informal 20-minute seminars during the fall semester for graduate students on topics from their research activities. Entering graduate students will be required to attend all of these research seminars. During the fall semester, graduate students may also meet with faculty members for individual conferences to discuss projects available for student involvement. Students should talk to at least half of the faculty members who presented research seminars.

Each faculty member interacts with students in a unique way, and you should feel comfortable with the research director you choose. Both students and faculty members are human beings, and thus personal relations are important. A great deal of your graduate education involves research. Thus the importance of your choice of a research director is difficult to overstate. You should also recognize that doing research takes you into the unknown, and that both you and your research director will learn as the research progresses. It

is hoped that you will become more knowledgeable in some areas than your research director. This is appropriate, because a goal of your graduate education is to make you a mature scientist who is able to independently plan and conduct research.

A graduate student may anticipate that his or her research director will, among other things:

1. Provide conscientious academic advice (regarding elective courses, for example).
2. Teach necessary laboratory techniques (some of this teaching may be provided by more senior personnel who work in the lab; some techniques are developed by the student using other sources).
3. Consult regularly with the student and review the student's progress in research, and particularly the progress and challenges of the dissertation project.
4. Provide timely review and helpful critique of student-generated written materials.
5. Work with the student's committee members and help the student resolve issues that arise.
6. Write letters of support and recommendation when the student leaves the lab for further career development.

## **GRADUATE ASSISTANTSHIPS**

### **Graduate School Policies**

In order to receive a graduate assistantship, a student must have regular admission to the Graduate School. If the grade point of a graduate assistant falls below 3.00, the student has one semester in which to raise the average to at least 3.00 or the assistantship is subject to termination. Tuition and tuition surcharges for up to 16 credits per semester are paid for all graduate assistants; the student must pay the general fee. Graduate assistants must register for 12 to 16 credit hours during each semester of their appointment.

Teaching assignments are made by the department; since the appointment is considered half time, the student is liable for up to 20 hours per week including class time, grading, proctoring, and class preparation.

The student is expected to be working full-time toward a degree and therefore, ***no additional employment should be obtained by the student.*** Exceptions to this policy must be recommended by the student's Advisor and approved by the Graduate School. Exceptions will be made only for assignments of short duration, which involve only a few hours of work per week.

Graduate assistants are eligible for a discounted parking permit. Students should bring proof of their appointment when purchasing a parking permit.

### **Department Policies**

Graduate assistantships may be awarded to full-time graduate students in the Department of Medicinal & Biological Chemistry who are in good standing in the M.S. or Ph.D. program. Students in their first academic year of studies who began in the fall or spring semesters must

be in good standing at the end of the spring semester in order to qualify for further assistantship support.

Graduate assistants may be assigned to a variety of duties connected with the instructional program of the department. For each class, the faculty member in charge will give specific instructions and responsibilities. Often, the graduate assistant will assist with proctoring and grading examinations or homework assignments. Other assignments may include preparation of lecture demonstrations, preparation for laboratories, preparation for seminars, or cleanup after either labs or seminars. Each graduate assistant with a laboratory teaching assignment will be expected to maintain office hours. Graduate assistants will be expected to perform their teaching duties in a satisfactory manner in order to remain in good standing and to continue receiving assistantship support.

The department office will provide the necessary supplies for teaching such as paper, pens, pencils, etc.

### **Duration of Financial Support**

The department may provide financial support (either teaching or research) for a student working toward a **M.S. degree for no more than 4 semesters and toward a Ph.D. for no more than 8 semesters** (additional support for summer semesters may be added as well). For a student who earns a M.S. degree at UT and then continues on to the Ph.D., total support will be for no more than 8 semesters (plus the opportunity for additional summer support). Upon recommendation of the student's research director, the Department Chair may extend support in cases of unusual circumstances. The time limits to obtain each degree are set by the Graduate School, but the duration of financial support is limited to the times specified above, and is typically **only two years** for the M.S. degree or **a maximum of five years for the Ph.D. degree.**

### **Accountability and Responsibility**

Teaching assistants are important partners in the educational mission of the department. We are committed to quality instruction at all levels. We all want to work together to provide an outstanding educational experience for students in our classes. The efforts of our teaching assistants are recognized and very much appreciated by the faculty and the students.

Teaching assistants are strongly urged to seek the assistance of members of the faculty if they believe that their instructional techniques can be improved. Teaching assistants who appear to be having difficulty with providing quality instruction to their students will be advised to seek the assistance of a person who can be of help with the particular problem they are experiencing. Teaching assistants have an important responsibility to address any issues raised by students and to make progress toward improvement. A lack of progress in correcting any deficiencies in instruction will be considered inconsistent with the provisions of the assistantship contract and may require disciplinary action.

A teaching assistant is responsible for conducting all teaching duties in accordance with federal, state, university and department regulations. Specific course policies and requirements will be administered by the faculty member(s) in charge of the class.



Sickness and attendance at professional meetings are examples of valid excused absences as long as the department is properly notified and arrangements have been made in advance to cover any teaching duties. A form is available from the department office to facilitate information exchange in the case of an absence due to travel. The department should also be notified in the case of sudden sickness and emergencies.

### **Disciplinary Action**

Failure to satisfactorily perform teaching duties or the neglect of duties or course policies will be dealt with in the manner outlined below. Each situation will be discussed with the teaching assistant prior to formal action. A major dereliction of duties could lead to an immediate loss of the assistantship. Minor infractions will accumulate throughout the student's course of study. Instances of academic dishonesty will be dealt with according to the Graduate Student Academic Dishonesty Policy on the College of Graduate Studies website.

#### *First Infraction*

A written warning will be issued and placed in the teaching assistant's permanent file.

#### *Second Infraction*

A second written warning will be issued and placed in the teaching assistant's permanent file. The student will be notified that a third offense could result in the loss of all or part of the assistantship.

#### *Third Infraction*

The teaching assistant will be removed from his/her teaching duties. This may cause revocation of all or a portion of the stipend and the tuition scholarship. The decision to terminate will involve the MBC Graduate Committee, the College of Graduate Studies, and the graduate assistant's immediate supervisor.

At all points in the process, teaching assistants may submit written responses regarding the incident in question to the Vice Chair of the department. Written responses will be considered before any action is taken. All decisions may be appealed to the Chair of the department. The Chair's decision will be final.

### **Teaching a Class**

The purpose of a recitation class is (1) to permit students to ask questions about the subject matter, (2) to observe how problems are solved, (3) to identify important concepts, and (4) to take short quizzes. The ways in which you can accomplish these tasks differ from person to person and from class to class. The suggestions given here should serve as guidelines; you need to apply common sense and adapt the suggestions to your own style and to the class.

You should try to establish an attitude in the class that will encourage students to ask questions. This means being positive and reinforcing correct answers without being too critical of wrong answers or of "dumb" questions. There are times when it is necessary to say things like, "Did you read page xxx?" or "Did you try to do the problem?" when you suspect students are not trying. There will be students who just come to class and who are not prepared; even so, try to include as many students as possible in the discussion. Do not lecture to the class, but teach by asking questions. When working a problem, write what you are doing on the board,

but get the students to tell you what to write. If you ask the class in general, it will be the same students who will answer the questions. This doesn't help the other students very much, so call on specific students for answers to specific questions. If a student does not know the answer, try to help that student figure out the answer before going on to another student for the answer. When you get an answer, ask a different student for confirmation of the answer. That way, two students get involved in answering one question.

In the process of working together with the class, you demonstrate to the class how to work on problems and how to think about concepts. That is, you serve as a role model, which is an important function; so make sure that you know how to work all the assigned homework problems. We want students to enjoy science, but we must recognize that not everyone will. However, the tools learned in science are valuable in other fields and in other situations. So we are also teaching more than science; we are teaching how to learn, how to think, and how to deal with problems.

The faculty member in charge will give you appropriate instruction regarding quizzes. If you are unsure about the number of quizzes, the length of the quizzes, the content of the quizzes, etc., talk to the faculty member responsible for your particular section.

In order to keep up to date on the class materials, TA's for recitation sections are required to attend the lectures of the course.

Since a faculty member is responsible for your teaching, any action that you may take in response to another student's academic dishonesty must be cleared with that faculty member. The best approach to academic dishonesty is to take steps to prevent it in the first place. When giving quizzes in a crowded classroom or laboratory, use two forms of the quiz so those students sitting next to each other have different versions. Do not sit at the front of the room during a quiz or exam, but walk around and watch the students carefully. If you suspect a student of looking around, move the student to a seat at the front of the room without making any accusations. In cases where cheating is suspected, make photocopies of all papers and discuss the situation with the faculty member in charge of the course. If a student asks for an excused absence, get a signed written statement from the student detailing the reasons for the absence. In the lab, watch for students who may be "dry-labbing" (not using their own data). If two students turn in identical reports, you might split the score between them. If a student turns in a report using data other than that taken by the student during the regular lab period, an appropriate grade on the report is zero.

### **Teaching a Laboratory Class**

The techniques in teaching a laboratory class are somewhat different from those in teaching a recitation class. Exactly what is expected will vary from course to course; the faculty member in charge will give you specific directions. Not all of the suggestions here will apply to every laboratory class, so adapt your approach to the particular course you are teaching.

There usually needs to be some sort of pre-lab lecture or instruction. Its length will vary from course to course and even from experiment to experiment. You should focus the instructions on items that need to be particularly emphasized, such as matters of safety, or manipulations that are particularly difficult. The faculty member in charge will keep you

informed of what concepts need to be covered and what background you should expect the students to have.

Safety in the lab is very important. Laboratory exercises may involve pathogenic substances. Be sure to instruct and show students how to properly handle instruments used to manipulate such substances, and be sure that all biohazards are properly disposed of at the end of each lab.

The faculty member in charge will give you specific instructions regarding any quizzes to be given and how laboratory reports are to be graded. At the end of the term, you will be asked to recommend grades to the faculty member in charge. Remember that your grades are recommendations only. The faculty member is ultimately responsible for the grades and will make the final assignments.

Some procedural suggestions for lab are as follows. Not all procedures apply to all lab courses but the general idea is to plan ahead before lab and clean up and check things thoroughly after lab.

#### BEFORE LAB

1. Pre-run each experiment at least one day in advance. Prepare all necessary materials BEFORE the day of the first lab.
2. If there are papers to be returned, go to lab and distribute papers on the lab bench so that they will be ready for the students at the beginning of the period and no lab time will be lost.
3. If special equipment or supplies are needed, get the equipment or supplies in adequate quantities for the lab.
4. Check the chemical supplies and refill any bottles that are nearly empty (such as stains or disinfectants).
5. When microscopes are used, be sure that they are properly adjusted.
6. If you are giving a quiz, submit it to the office for typing and duplicating **at least 2 days** prior to when you need it.

#### AFTER LAB

1. Have students clean up the lab, especially their own bench areas. Check the sinks for solid waste.
2. Check all gas valves to be sure they all have been turned off.
3. Check all locks to be certain that none have been left unlocked. If you find one unlocked, hang an iron ring or similar object through the lock and then lock it. This will serve as a reminder to the student that the drawer was not locked.
4. Check the chemicals and have the stockroom refill any bottles that are nearly empty. If the chemical bottles have become scattered, return them to their proper places.
5. Check laboratory equipment such as balances, microscopes, pH meters, etc. to be certain they are left in proper condition. Inform the faculty member in charge of any faulty equipment.

#### **Confidentiality**

Federal law prohibits revealing grades of a student to anyone other than the student or to duly authorized university personnel. This means you should not post grades using names or student numbers and you should be careful how you dispose of any sheets of paper, especially computer printout, with scores or grades on them. The list of grades, whether in a grade book or on computer printout should be stored out of sight and away from access by students.

In a similar manner, answer keys, instructor's manuals, etc. are considered confidential and should not be left where students will have access to them.

## **ACADEMIC HONESTY/DISHONESTY**

The faculty of the College of Pharmacy expect students to do their part in maintaining their own integrity as well as the academic integrity and reputation of their institution's degree. Students who seek to better their records in dishonest ways demean themselves and show a lack of moral regard for others. Thus, students should neither indulge in nor condone academic dishonesty. Instead, students should take full advantage of the opportunities offered in the University to ensure that their academic time here is well-spent, their experience productive, and their academic credentials valuable. Such students will be better prepared for future endeavors and are likely to meet with success in a world in which their own performance will be the main criterion for recognition and advancement.

The Department of Medicinal & Biological Chemistry has issued the following policy statement on academic dishonesty:

*Academic dishonesty will not be tolerated. Among the aims of education are the acquisition of knowledge and the development of the critical thinking skills necessary for independent learning. Activities inconsistent with these aims will not be permitted. It is the students' responsibility to know what constitutes academic dishonesty. If students are uncertain, for example about what constitutes plagiarism or cheating, they should seek the advice of their instructor.*

*Examples of academic dishonesty include, but are not limited to:*

- 1. Plagiarism (using the exact written wording of an author without a citation and/or quotation marks);*
- 2. Giving or receiving, prior to an examination, any unauthorized information concerning the content of that examination;*
- 3. Referring to or displaying any unauthorized materials inside or outside of the examination room, during the course of an examination;*
- 4. Communicating, during an examination, in any manner with any unauthorized person concerning the examination or any part of it;*
- 5. Giving or receiving substantive aid during the course of an examination;*
- 6. Commencing an examination before the stipulated time or continuing to work on an examination after the announced conclusion of the examination period;*
- 7. Taking, converting, concealing, defacing, damaging, or destroying any property related to the preparation or completion of assignments, research or examination.*
- 8. Fabricating or falsifying research data/results.*

*The penalty for academic dishonesty depends on the circumstances of the infraction but can be instant dismissal from the academic program. The college policy on academic dishonesty also applies to graduate students in their courses and during their research.*

## **DEPARTMENT INSTRUMENTATION AND FACILITIES**

Instructions to Instrument Operators: department instruments are to be operated only by those who have been authorized to do so by the appropriate faculty supervisors. The faculty supervisor for each instrument will be indicated on a notice posted by the instrument and in the back of the instrument logbook.

When using an instrument, each operator must follow these rules:

1. Obtain sufficient instruction on the use of the instrument, with particular reference to any special requirements of your present project. Check the logbook for any recent special instructions or notices.
2. Use the instrument properly and follow any instructions from the faculty supervisor.
3. Maintain and use auxiliary equipment, accessories, etc. properly.
4. Make major adjustments in instrument operation (interior settings, attachment or removal of auxiliary equipment, etc.) only with the consent of the faculty supervisor or the designated representative.
5. Post and enter in the log any major instrument changes so as to inform other operators.
6. Return the instrument to normal operation as soon as possible after the need for major adjustments has ended.
7. Report any malfunctions, breakage, shortage of components, and/or supplies to the faculty supervisor.
8. Record in the instrument log all pertinent operations, specifically including the following: name of user, date, time and general purpose of usage; any malfunctions, repairs, and alterations, comments on the condition of the instrument, particularly including any indication of trouble that you observe, regular maintenance performed.

A list of authorized operators will be kept in the back of the instrument logbook. The faculty supervisor may withdraw authorization at any time for reason of improper use or misuse of the instrument.

## **UT LIBRARIES' RESEARCH SUPPORT**

<http://www.utoledo.edu/library/index.html>

The Student Resource Center in Wolfe Hall, Main Campus, contains computers for student use in obtaining drug information. Most books and journals are in the Carlson Library, the Mulford Library, or are available online (OhioLink Electronic Journal Collection). Please check the library catalog, UTMOST, (<http://utmost.cl.utoledo.edu/search>) to see the location and online availability of a particular title.

Graduate students have extended book loan privileges on books from the Carlson and Mulford Libraries. Extended loan means that books may be checked out until the end of the current

semester while journals and reference books never circulate, but you may obtain photocopies of journal articles. Prudent use of the copy cards is very important. The Department maintains an individual account of the use of each card.

Books not available in the Carlson or Mulford Library may be obtained through OhioLink. Books in other Ohio university libraries can be sent to Toledo in 3-5 business days and checked out with your ID card. Search the OhioLINK central catalog (<http://www.ohiolink.edu/>) to find a copy of the book in Ohio to be requested.

Books not available in Ohio or reprints (photocopies) of journal articles not available at UT may be obtained through Interlibrary Loan. This service takes longer than OhioLINK (above), usually a few days to weeks for books, shorter for article reprints. Requests can be made through online forms at <http://libguides.utoledo.edu/ill>. Electronic copies of journal articles can be obtained by e-mail.

An online version of Chemical Abstracts, known as SciFinder Scholar, is available online and can be downloaded and installed on your personal or laboratory computer. Many other article research databases are available from OhioLINK on the OhioLINK homepage: <http://www.ohiolink.edu>

Any questions about the library services can be directed to Wade M. Lee, Science Reference Librarian. He can be reached at [wade.lee@utoledo.edu](mailto:wade.lee@utoledo.edu), by phone at (419) 530-4490, or in his office in 0100H Carlson Library.

## SAMPLE CURRICULA

### Sample Graduate Curriculum for Med. Chem M.S.

#### First year

Fall			Spring			Summer		
MBC 6190	Adv MC	4	MBC 6960	Research	4	MBC 6960	Research	3
	Elective	4		Elective	4	MBC 5100	Eth. Con.	1
MBC 5900	Seminar	<u>1</u>	MBC 5900	Seminar	<u>1</u>			
		9			9			<u>4</u>

#### Second year

Fall			Spring		
MBC 5900	Seminar	1	MBC 5900	Seminar	1
MBC 6960	Research	<u>8</u>			
		9			<u>1</u>

	sum	req.	max
Total credits	32	30	
Research M.S.	15	6	16
Seminar	4	3	4
Electives	8	5	

The total number of credit hours at the graduate level (course numbers 5000 and above) including classroom courses, seminar and “M.S. Thesis Research” needs to be at least 30. This total can be achieved in different ways by varying the number of seminar, research and electives while maintaining the range limits for each category.

## Sample Graduate Curriculum for Med. Chem. Ph.D.

### First year §

Fall			Spring			Summer		
MBC 6550	Biochem	4	MBC 6200	BiomedC	4	MBC 6310	BCLab II	3
MBC 6190	Adv MC	4	MBC 6300	BCLab I	1	MBC 5100	Eth. Cond.	1
Elective		<u>4</u>	Elective		<u>4</u>	Qualifying	exam	<u>—</u>
		12			9			4

### 2nd year #

Fall			Spring			Summer		
Electives	5000/6000	4	Electives	7000/8000	4			
MBC 8960	Research	4	MBC 8960	Research	4	MBC 8960	Research	4
MBC 5900	Seminar	<u>1</u>	MBC 7900	Seminar	<u>1</u>	Proposal defense		<u>—</u>
		9			9			4

### 3rd year #

Fall		Spring			Summer			
MBC 8980	Spec Top <sup>‡</sup>	3	MBC 8980	Spec Top	3			
MBC 8960	Research	5	MBC 8960	Research	5	MBC 8960	Research	4
MBC 7900	Sem.	<u>1</u>	MBC 7900	Sem.	<u>1</u>			<u>—</u>
		9			9			4

### 4th year # \*

Fall			Spring			Summer		
MBC 8960	Research	8	MBC 8960	Research	8	MBC 8960	Research	4
MBC 7900	Sem.	<u>1</u>	MBC 7900	Sem.	<u>1</u>			<u>—</u>
		9			9			4

	sum	req.	max
MS level courses	30	30	
Electives	16	8	
Seminar	6	6	8
PhD level non-res	15	15	
PhD level res	46	30	
PhD level all	61	60	
Total credits	91	90	

§ A student entering with a Master's degree should take all courses at the 7000/8000 levels.

† Courses from the list of electives listed on page 7 may be chosen, for example CHEM 6400/8400 or BIOL 6010/8010. Take at the 5000/6000 (MS) levels until a total of 30 credits is reached. Some electives may need to be taken as a condition for passing the qualifying exam.

‡ May be replaced by other courses as appropriate.

# In years 2 through 4, a student may register for electives approved by the research advisor. The number of dissertation research hours should be adjusted to bring the total to 9 credits per spring/fall semesters and 4 credits for the summer semester.

\* If the program cannot be completed in four years, a fifth year may be added, typically with nine credit hours in the fall and one credit hour in the spring, the last semester in the program.