

**DEPARTMENT OF BIOLOGY  
GRADUATE STUDENT GUIDEBOOK**

**NORTHEASTERN UNIVERSITY**

**Fall 2019**

<b>CONTENTS</b>	<b>Page</b>
<b>I. LIST OF BIOLOGY FACULTY MEMBERS</b> _____	<b>1</b>
<b>A) Faculty Training Ph.D. Students</b> _____	<b>1</b>
<b>B) Faculty not currently accepting graduate students</b>	<b>2</b>
<b>C) Teaching Professors, Affiliated and Joint Faculty</b>	<b>2</b>
<b>II. DOCTOR OF PHILOSOPHY</b> _____	<b>3</b>
<b>A) Advisor</b> _____	<b>3</b>
<b>B) Academic Requirements</b> _____	<b>3</b>
<b>1) PhD without Concentration</b>	<b>3</b>
<b>2) PhD with a Concentration in Cell and Molecular Biology</b>	<b>4</b>
<b>3) PhD with a Concentration in Molecular Microbiology</b>	<b>5</b>
<b>4) For students with an NU Masters Degree</b>	<b>5</b>
<b>5) For students with an external Masters Degree</b>	<b>6</b>
<b>6) Further Information for all PhD students</b>	<b>6</b>
<b>C) Rotation Guidelines</b> _____	<b>7</b>
<b>D) Graduate Student Presentations</b> _____	<b>8</b>
<b>E) Residency Requirement</b> _____	<b>8</b>
<b>F) Teaching</b> _____	<b>8</b>
<b>G) Off Campus Research</b> _____	<b>8</b>
<b>H) Qualifying Examinations</b> _____	<b>9</b>
<b>1) General Description</b> _____	<b>9</b>
<b>2) Timetable</b> _____	<b>9</b>
<b>3) Written Examination</b> _____	<b>9</b>
<b>4) Oral Examination</b> _____	<b>13</b>
<b>5) Candidacy</b> _____	<b>15</b>
<b>I) Dissertation</b> _____	<b>16</b>
<b>1) Dissertation Committee</b> _____	<b>16</b>
<b>2) Dissertation Preparation Guidelines</b> _____	<b>16</b>
<b>3) Dissertation Defense</b> _____	<b>17</b>
<b>J) Ph.D. Requirements Checklist</b> _____	<b>18</b>
<b>III. MASTER OF SCIENCE</b> _____	<b>21</b>

A) Advisor	21
B) Academic Requirements	21
C) Graduate Student Presentations	22
D) Research	22
1) Thesis	22
2) Thesis Proposal Format	22
3) Thesis Defense	24
4) Thesis Work Conducted in Off-Campus Laboratories	24
E) M.S. Literature Thesis	25
F) M.S. Requirements Checklist	26
<b>IV. PROFESSIONAL SCIENCE MASTER'S DEGREE (PSM)</b>	<b>28</b>
<b>V. FINANCIAL SUPPORT</b>	<b>29</b>
A) Eligibility	29
B) Categories	29
C) Departmental Policies Re Teaching Assistantships	29
1) Total number of available assistantships	29
2) Full-time Status	29
3) Academic Standing	29
4) Specialized Teaching Needs	30
5) Previous Performance as T.A.	30
6) English as a Second Language Students	30
D) Time Limits on Appointment of Teaching Assistantships	30
E) Leave Policies	30
F) Professional Meetings	30
<b>VI. PROCEDURES FOR TRANSFER BETWEEN PROGRAMS IN BIOLOGY</b>	<b>31</b>
<b>VII. STUDENT'S RECORDS AND GRADES</b>	<b>32</b>
A) Graduate Student Folders	32
B) Grading of Research and Seminars	32
C) Minimum Q.P.A.	32
D) Grade of Incomplete	32
E) Clearing Entry Course Requirements	32
F) Annual Review	32

G) Time Limits on Course Credits	33
1) Ph.D.	33
2) Master's Degree	33
<b>VIII. THESIS/DISSERTATION: OBLIGATIONS</b>	<b>34</b>
A) Advisor	34
B) Committee Members	35
C) Student	35
D) Other Faculty	36
E) Committee Voting	36
<b>Appendix I. Definitions</b>	<b>37</b>
A) Full-time Status	37
B) Semester Hours	37
<b>Appendix II. University Policies</b>	<b>38</b>
<b>Appendix III. Mental Health Resources and Guidelines</b>	<b>40</b>
<b>Appendix IV. Dissertation Example Pages</b>	<b>41</b>
A) Graduate Approval Record	42
B) Sample Title Page	43
C) Copyright Page (Optional)	44
D) Dedication Page (Optional)	45
E) Acknowledgements Page	46
F) Abstract Page	47
G) Sample Table of Contents	48
<b>Appendix V. Departmental Forms</b>	<b>49</b>
A) M.S.-1. Change of Academic Advisor	50
B) M.S.-2. Petition for Approval of M.S. Thesis Proposal	51
C) M.S.-3. Results of M.S. Thesis Defense	52
D) M.S.-4/Ph.D.-9. T.A. Evaluation Form	53
E) M.S.-5/Ph.D.-10. Checklist for Graduate Student Progress	55
F) M.S.-6/Ph.D.-11. Application for Travel Award	56
G) Ph.D.-1. Intent to Take Written Qualifying Exam	57
H) Ph.D.-2. Schedule for Written Qualifying Examination	58

<b>I)</b>	<b>Ph.D.-3. Results of Written Qualifying Examination</b>	<b>59</b>
<b>J)</b>	<b>Ph.D.-4. Petition of Approval of Ph.D. Dissertation Topic and Committee</b>	<b>60</b>
<b>K)</b>	<b>Ph.D.-5. Letter to Outside Committee Member</b>	<b>61</b>
<b>L)</b>	<b>Ph.D.-6. Results of Oral Qualifying Examination</b>	<b>62</b>
<b>M)</b>	<b>Ph.D.-7: Confirmation of Annual Post-Oral Exam Committee Meeting</b>	<b>63</b>
<b>N)</b>	<b>Ph.D.-8. Results of Ph.D. Dissertation Defense</b>	<b>65</b>
<b>O)</b>	<b>Ph.D.-9. Annual Ph.D. Student Progress Report</b>	<b>66</b>

## I. LIST OF BIOLOGY FACULTY MEMBERS

### A) Faculty Training Ph.D. Students

- **Javier Apfeld**, Assistant Professor; Ph.D., University of California, San Francisco; Redox cell biology and aging.
- **Yunrong Chai**, Associate Professor; Ph.D., Cornell University; Microbial genomics, biofilm formation.
- **Erin J. Cram**, Professor; Ph.D., University of California, Berkeley; *In vivo* approaches to cell migration and mechanotransduction.
- **Justin Crane**, Assistant Professor; Ph.D., McMaster University; Metabolism, bioenergetics and aging.
- **Tovah Day**, Assistant Professor; Ph.D., Boston University School of Medicine, Cell biology and aging.
- **Slava S. Epstein**, Professor; Ph.D., Institute of Oceanology, Moscow, Russia; Microbial ecology.
- **Edward Geisinger**, Assistant Professor; M.D., Ph.D., New York University School of Medicine; Molecular basis of antibiotic resistance.
- **Veronica Godoy-Carter**, Associate Professor; Ph.D., Tufts University, School of Medicine; Molecular Biology and Microbiology, Regulation of error prone DNA polymerases in bacteria.
- **Konstantin Khrapko**, Professor; Ph.D., Engelhardt Institute of Molecular Biology, Moscow; Mitochondria and aging.
- **Kim Lewis**, Professor and Director of the Antimicrobial Discovery Center; Ph.D., Moscow University; Microbiology/biotechnology.
- **Jon Matthis**, Assistant Professor; Ph.D. Rensselaer Polytechnic Institute; Human movement neuroscience.
- **James Monaghan**, Associate Professor; Ph.D., University of Kentucky; Neural and limb development/regeneration.
- **Michail Sitkovsky**, Professor and Director of The New England Inflammation and Tissue Protection Institute Consortium at Northeastern University; Ph.D. Moscow State University; Biochemistry and Immunophysiology.
- **Dagmar Sternad**, Professor of Biology, Electrical & Computer Engineering; Ph.D., University of Connecticut; Motor Control and Neuroscience.
- **Jonathan L. Tilly**, Professor and Chair of Biology; PhD, Rutgers, the State University of NJ; Stem cell biology and regenerative Medicine, reproductive biology.
- **Dori C. Woods**, Associate Professor and Director of Graduate Studies; Ph.D., University of Notre Dame; Reproductive physiology and ovarian aging.

- **Günther K. H. Zupanc**, Professor; Ph.D., University of California, San Diego; Developmental, comparative, and behavioral neurobiology; regenerative biology.

**B) Faculty not currently accepting graduate students**

- **Frederick C. Davis**, Professor; Ph.D., University of Texas at Austin; Circadian rhythms, developmental neurobiology.
- **James M. Manning**, Professor; Ph.D., Tufts University; Protein structure/function.
- **Donald M. O'Malley**, Associate Professor; Ph.D., Harvard Medical School; Computational and systems neurobiology.
- **Susan G. Powers-Lee**, Professor; Ph.D., University of California, Berkeley; enzyme structure/function.
- **Wendy A. Smith**, Professor and Associate Chair of Biology; Ph.D., Duke University. Endocrinology, cell signaling.

**C) Teaching Professors, Affiliated and Joint Faculty**

Faculty members including Teaching Professors, Affiliated, and Joint Faculty may serve on thesis committees, or otherwise serve as resources for research and teaching. For a listing of Teaching Professors, Affiliated and Joint Faculty please see the Biology Department webpage.

(<http://www.northeastern.edu/cos/biology/people/faculty/>).

## II. DOCTOR OF PHILOSOPHY

After acceptance into the Ph.D. program, the student is classified as a Ph.D. student. After successful completion of both the written and the oral Qualifying Exams, the student is classified as a Ph.D. candidate.

### A) Advisor

Upon matriculation into the doctoral program, students will be assigned a member of the graduate faculty as an academic advisor. The academic advisor will help the student design a course of study until a dissertation advisor is agreed upon. Please note that the initial academic advisor need not become the dissertation advisor. If the student has already contacted a potential doctoral dissertation advisor, this person will typically serve as the academic advisor. A change in advisor can be made only after written notification to the Graduate Committee (Form M.S.-1).

Students must have a dissertation advisor by the end of the second semester of study. Some students have a committed doctoral dissertation advisor upon entering the program, however, students who do not have a committed doctoral dissertation advisor upon entry are encouraged to enroll in Laboratory Rotation 1, BIOL 8420, and, if needed, Biology Laboratory Rotation 2, BIOL 8421 (See C) Rotation Guidelines, below.

### B) Academic Requirements

#### 1) For students admitted with a bachelor's degree, pursuing a PhD in Biology without a concentration.

Students must complete 30 semester hours of graduate level coursework, 20 of which must be taken for a letter grade.

- a) 12 semester hours will consist of the following REQUIRED 4 SH courses taken for a letter grade: BIOL 7399 Research Problem Solving, Ethics, and Communication Skills or BIOL 5599 Principles of Data Management and Peer Review, and two out of the following six discipline-specific courses: Neurobiology and Behavior (BIOL 6303), Dynamics of Microbial Ecology (BIOL 6399), Research Methods and Critical Analysis in Molecular Cell Biology (BIOL 6401), Concepts and Trends in Evolution and Ecology (BIOL 6403), Prokaryotic Cell and Molecular Biology (BIOL 6405), and Biochemistry for Molecular Biologists (BIOL 6407).
- b) 8 or more semester hours will consist of approved BIOL 5000-level or higher graduate courses taken for a letter grade, with an option to petition the Graduate Committee for substitution of graduate courses from other departments. The following courses cannot be taken for a letter grade: Biology Colloquium (BIOL 5100), Biology Lab Rotation (BIOL 8420-8421), Master's Research (BIOL 8984), Full-time Master's Research (BIOL 8986), Doctoral Research (BIOL 9984), Thesis (BIOL 7990), Thesis Continuation (BIOL 7996), Dissertation (BIOL 9990), Dissertation Continuation (BIOL 9996), and other comparable research courses.



- c) 2 semester hours will consist of two semesters of Biology Colloquium (BIOL 5100) taken during the first two semesters of graduate study. Students are expected to attend Biology Colloquia thereafter.
  - d) Requests for transfer credit should be sent to the Graduate Assistant accompanied by a course description, transcript, and official GSAS transfer credit form. The recommendations of the Director of Graduate Studies will be forwarded to the Graduate School.
- 2) For students admitted with a bachelor's degree, pursuing a PhD in Biology with a concentration in Cell and Molecular Biology.**
- Students must complete 30 semester hours of graduate level coursework, 20 of which must be taken for a letter grade. Students interested in pursuing a concentration must inform the Director of Graduate Studies of their intention by the end of the fourth semester of study (typically Spring of the second year).
- a) 12 semester hours will consist of the following REQUIRED 4 SH courses taken for a letter grade: BIOL 7399 Research Problem Solving, Ethics, and Communication Skills or BIOL 5599 Principles of Data Management and Peer Review, and the following discipline-specific courses: Research Methods and Critical Analysis in Molecular Cell Biology (BIOL 6401) and Biochemistry for Molecular Biologists (BIOL 6407).
  - b) 8 or more semester hours will consist of approved BIOL 5000-level or higher graduate courses taken for a letter grade, with an option to petition the Graduate Committee for substitution of graduate courses from other departments. Recommended courses: BIOL5557 (Cell and Molecular Biology of Aging), BIOL5555 (Advanced Genomics), BIOL5543 (Stem Cells and Regeneration), BIOL5577 (Developmental Biology), BIOL5581 (Biological Imaging), BIOL5583 (Immunology), BIOL5587 (Comparative Neurobiology), BIOL5603 (Computational Neuroscience), Dynamics of Microbial Ecology (BIOL6639), Prokaryotic Molecular Cell Biology (BIOL6405), Neurobiology and Behavior (BIOL 6303).
  - c) The following courses cannot be taken for a letter grade: Biology Colloquium (BIOL 5100), Biology Lab Rotation (BIOL 8420-8421), Master's Research (BIOL 8984), Full-time Master's Research (BIOL 8986), Doctoral Research (BIOL 9984), Thesis (BIOL 7990), Thesis Continuation (BIOL 7996), Dissertation (BIOL 9990), Dissertation Continuation (BIOL 9996), and other comparable research courses.
  - d) 2 semester hours will consist of two semesters of Biology Colloquium (BIOL 5100) taken during the first two semesters of graduate study. Students are expected to attend Biology Colloquia thereafter.
  - e) Requests for transfer credit should be sent to the Graduate Assistant accompanied by a course description, transcript, and official GSAS

transfer credit form. The recommendations of the Director of Graduate Studies will be forwarded to the Graduate School.

**3) For students admitted with a bachelor's degree, pursuing a PhD in Biology with a concentration in Molecular Microbiology.**

Students must complete 30 semester hours of graduate level coursework, 20 of which must be taken for a letter grade. Students interested in pursuing a concentration must inform the Director of Graduate Studies of their intention by the end of the fourth semester of study (typically Spring of the second year).

- a) 12 semester hours will consist of the following REQUIRED 4 SH course taken for a letter grade: BIOL 7399 Research Problem Solving, Ethics, and Communication Skills or BIOL 5599 Principles of Data Management and Peer Review, and two of the following discipline-specific courses: Dynamics of Microbial Ecology (BIOL6399), Prokaryotic Cell and Molecular Biology (BIOL 6405) and Biochemistry for Molecular Biologists (BIOL 6407).
- b) 8 or more semester hours will consist of approved BIOL 5000-level or higher graduate courses taken for a letter grade, with an option to petition the Graduate Committee for substitution of graduate courses from other departments. Recommended courses: BIOL6401 (Crit. Analysis in Cell Biology), BIOL5549 (Microbial Biotechnology), BIOL5569 (Microbial Genetics and Physiology), BIOL5581 (Biological Imaging), BIOL5583 (Immunology), CHEM5620 (Protein Chemistry), CHEM5638 (Molecular Modeling).
- c) The following courses cannot be taken for a letter grade: Biology Colloquium (BIOL 5100), Biology Lab Rotation (BIOL 8420-8421), Master's Research (BIOL 8984), Full-time Master's Research (BIOL 8986), Doctoral Research (BIOL 9984), Thesis (BIOL 7990), Thesis Continuation (BIOL 7996), Dissertation (BIOL 9990), Dissertation Continuation (BIOL 9996), and other comparable research courses.
- d) 2 semester hours will consist of two semesters of Biology Colloquium (BIOL 5100) taken during the first two semesters of graduate study. Students are expected to attend Biology Colloquia thereafter.
- e) Requests for transfer credit should be sent to the Graduate Assistant accompanied by a course description, transcript, and official GSAS transfer credit form. The recommendations of the Director of Graduate Studies will be forwarded to the Graduate School.

**4) For students admitted from the Northeastern Biology Master's Program.**

Northeastern M.S. students admitted to the Biology PhD program must meet the coursework requirements listed under B.1 above. Coursework taken toward the master's degree is transferable to the doctoral program. For full-time students, the original entry date into the Master's program

becomes the entry date into the Ph.D. program.

**5) For students admitted with the Master's degree.**

The Graduate Committee will assess the previous coursework of students entering with a Master's degree and determine if further coursework is required on a case-by-case basis. Students with Masters degrees from other institutions will not be eligible for the concentrations, unless they take the full slate of required courses. Full-time students must be registered at all times except during summer term.

**6) For all Doctoral students.**

- a) The dissertation advisor may recommend or require courses for the student's general scientific development or for specific research objectives.
- b) Depending upon the student's performance on the Ph.D. Written Qualifying Examination, the Examination Committee may recommend or require specific courses.
- c) A cumulative average of 3.0 is required for graduation. All regulations of the Graduate School apply with regard to maintenance of academic standing.
- d) All Doctoral students are required to have one first authored publication submitted to a peer-reviewed journal prior to their defense.
- e) If a student is unable to work toward their degree for a period of time it is possible to request a Leave of Absence. After speaking with the Director of Graduate Studies, please submit your request on myNEU.  
<https://registrar.northeastern.edu/article/leaves-of-absence-university-withdrawal/>
- f) Once candidacy has been established by passing both qualifying exams, the Ph.D. student must take Ph.D. Dissertation (BIOL9990) for the next two semesters. Continuous registration is required in subsequent semesters and is satisfied by registering for Dissertation Continuation (BIOL 9996).

## C) Rotation Guidelines

The Biology Ph.D. program does not require students to perform rotations. Students may directly join the lab in which they will perform their thesis work. However, students who have not settled upon a doctoral dissertation advisor upon entry to the program are encouraged to enroll in Laboratory Rotation 1, BIOL 8420, and, if needed, Biology Laboratory Rotation 2, BIOL 8421.

Students are not required to work in more than one laboratory before choosing a thesis lab. If a student is enrolled in BIOL 8420 for the Fall Semester (i.e. technically “rotating”), the student may join that lab without doing another rotation.

Students may rotate in 1, 2 or 3 faculty labs before choosing a dissertation lab. Full-length rotations are 14 weeks (one semester). Depending on the needs of the project and the preferences of the rotation advisors, students may rotate in two different labs within the same semester (“split a rotation” into 7+7 weeks). In this situation, the initial rotation advisor will be the instructor of record for the course, and, in consultation with the second advisor, will be responsible for entering the final grade at the end of the semester. Although BIOL 8420/1 cannot be taken for a letter grade, these courses do count toward the 30 semester hours needed for graduation. Students must join a thesis lab by the end of the first year to remain in the program.

### a) How to set up a rotation:

Students interested in enrolling in BIOL 8420 should contact the advisors with whom they would like to work. Faculty may also contact admitted students and invite them to rotate. Students should inform the Director of Graduate Studies so that s/he can facilitate this process and provide assistance if the student would like to split the rotation between two laboratories.

Once an initial rotation advisor is selected, the student should register for that advisor’s section of BIOL 8420. If an appropriate section is not listed, a course creation form will need to be filled out and submitted to the registrar. Please complete the Registration form (<http://www.northeastern.edu/registrar/form-gs-thesis.pdf>) for courses not listed and place the form in Petya’s mailbox in 134 Mugar.

### b) Tips for conduct of a successful rotation:

Students and advisors should set expectations and clear goals for the rotation at the beginning of the semester, and should meet regularly throughout the semester to make sure the rotation is on track. The possibility of a rotation leading to a thesis project should be discussed openly and revisited as the rotation progresses. Students should expect to spend significant time in the rotation lab, working each day to learn the techniques and to plan and perform experiments. Students performing a second rotation should not “moonlight” in a

previous lab, but instead, should dedicate themselves to learning about the new laboratory.

**D) Graduate Student Presentations**

All graduate students, beginning in their second year of study, will be required to give a research talk on a yearly basis. Talks may be given during an annual Graduate Symposium, or at weekly Graduate Colloquia. Students will be notified well in advance of presentation dates and are expected to attend and actively participate in scheduled graduate symposia.

**E) Residency Requirement**

The Graduate School requires that a Ph.D. candidate spend at least one year as a full-time student in residence at the University. This requirement may be satisfied by either a full year or two six-month periods of full-time graduate study on campus. Time spent in residence prior to candidacy for the doctorate may not be used to meet the doctoral degree residence requirement.

**F) Teaching**

Teaching experience is an important part of our doctoral program. Students are expected to TA at least one semester during their graduate studies.

**G) Off-Campus Research**

It is hoped that at all times every Ph.D. student will be an active member of the Department's academic community. However, under special circumstances and with the approval of the Graduate Committee, dissertation work may be done in a laboratory external to the University. At a minimum, the residency requirement (section III-C, above) must be satisfied, as well as the requirements for M.S. work conducted in off-campus laboratories described in section III-D-4, below.

## H) Qualifying Examination

- 1) **General Description:** The Ph.D. Candidacy Examination consists of both written and oral examinations, with the written examination preceding the oral examination. *The written examination* is intended to evaluate the student's academic preparedness and graduate-level knowledge in areas of biology related to the student's specialization. *The oral examination*, termed the Ph.D. research proposal defense, will demonstrate the student's readiness to pursue a research program in their chosen area and also will provide experience in formulating a research plan in the format of an external grant proposal.
- 2) **Timetable:** For students who enter with the bachelor's degree, the written qualifying examination will be scheduled during the second semester of the second year of graduate study. For students who enter with an M.S. degree, the written examination may be taken in the spring of either their first or second year in the program. Requests to alter this schedule should be submitted in writing to the graduate committee the Director of Graduate Studies. The oral examination (the Ph.D. research proposal defense) should be completed within 6 months after the completion of the written examination. A student must successfully complete both the written examination and the oral research proposal defense in order to become a Ph.D. candidate.
- 3) **Written examination:**

The written examination is offered once a year in the spring semester. Students planning to take the qualifying exam should sign up for Qualifying Exam Preparation BIOL8960 in the Fall Semester preceding their written examination. To prepare for the written examination, each student will read 4 original research articles (see below for details) provided by the Qualifying Examination sub-Committee of the Graduate Committee (Drs Khrapko and Geisinger). Students will then be tested for their comprehensive understanding of these 4 articles.

  - a) **Assignment of research articles for the written examination**

The set of 4 research articles will be generated by 4 examiners: the student's advisor plus 3 additional Biology faculty members selected by the student in consultation with his/her advisor. By September 15<sup>th</sup> of their second year of graduate study, each student will obtain the consent of their advisor and 3 additional Biology faculty members to serve as written examiners and will submit this list of names to the Qualifying Examination Committee on form Ph.D.-1. The student may elect to substitute an outside examiner for one of the 3 Biology faculty

examiners. In this case, the student should provide on this form the outside examiner's name, title/position, contact information and a brief note explaining the outside examiner's credentials for this service. It is anticipated that some of the written examiners may subsequently join the student's Ph.D. thesis committee, but for the purpose of this exam their sole role is to provide research articles and to serve as graders for the written exam. By October 1<sup>st</sup>, each of the examiners will forward a research article to the Qualifying exam sub-committee on behalf of the student for approval. On or before January 1<sup>st</sup> the Qualifying Examination sub-Committee will provide the finalized set of research articles (as digital copy) to each student scheduled for the spring written exam.

**b) Criteria for selection of research articles and scope of the written examination**

The Qualifying Examination sub-Committee will solicit research articles from the written examiners in mid-September. Each examiner will then submit by October 1<sup>st</sup> a research article to the Qualifying Examination sub-Committee. The final set of articles should broadly represent the interests and expertise of the written examiners. The chosen articles may, in addition, be tailored to complement and inform the student's academic interests and planned research area. Suitable articles would include recent publications, classic papers in a field, and other articles published in peer-reviewed journals. The major objective is to test the student's ability to understand and write about the methodology, logic and implications of select articles within their general area of research. For each article, the student should read sufficient cited literature so as to discuss the article's significance in relation to extant knowledge at the time of publication. Students should be able to describe the methods and experimental techniques used, the logic of the sequence of experiments and the extent to which the paper accomplished (or failed to accomplish) its stated objectives. Examiners may also ask students to critique the authors' interpretations of their data and to evaluate the validity and ramifications of the results within the context of the article's Discussion section.

An overall goal is for the student to develop a viewpoint on the degree to which each article made new discoveries and/or extended knowledge in a given research area. The student may employ any and all means to obtain such an understanding of the 4 assigned articles

with one exception: they may not consult with any of the 4 examiners regarding any detail of the 4 assigned articles. However, students may consult with other faculty, other experts in the field and the authors of the assigned articles. Students are particularly encouraged to engage in study sessions with fellow students to discuss/present articles and to consider potential questions and answers. The Biology office will maintain a record of exam questions used in prior years and make this record available to students upon request.

**c) Examination Committee**

The Qualifying Examination sub-Committee is charged with the following responsibilities:

- i) Approving the set of 4 research articles provided to the committee and providing the articles to the students along with Form Ph.D.-2 informing them of the schedule for the written exam.
- ii) Soliciting questions from the four written examiners
- iii) Selecting the questions for the written examination;
- iv) Administering the written examination;
- v) Returning the questions to their respective originators and if needed to a second person in the field for independent grading;
- vi) Analyzing the overall performance of the student.

**d) Scheduling and conduct of the written examination**

Students will be notified upon admission to the Ph.D. program of the schedule for their written qualifying examination. The Graduate Committee must approve changes in this schedule. Once the set of 4 research articles is finalized (target date is November 1<sup>st</sup> for each spring examination), the Qualifying Examination sub-Committee will notify the student in writing of the scheduled date for the written exam. The written exam should be scheduled on or about March 15<sup>th</sup>, but students must be provided the 4 research articles at least 2 months in advance of the exam. In the semester that the examination is scheduled, the Qualifying Examination sub-Committee will solicit questions from the written examiners and will meet to select the questions to be used in the exam. The exam questions will specifically address the content of the assigned articles, but students should note that understanding this content depends upon an understanding of prior works that describe previous experiments, the underlying methodology and the prior state of knowledge in that field.



A student who is scheduled to take the written qualifying examination, and subsequently finds that he/she will not be able to take the exam on the appointed day, will immediately notify the Graduate Committee in writing of the reason for the absence.

The written examination will be given in a room reserved solely for taking the examination. Students taking the exam are not allowed access to notes, papers or any other written materials. Students will be provided with a digital copy of each of the original assigned papers. The examiners may, at their discretion, include figures or tables in the body of their questions. Answers will be written over a 4-hour examination period and a computer will be provided solely for writing of the answers. The student will answer all questions provided. In order to pass the exam, the student must pass 3 of the 4 questions (see grading, below).

**e) Grading of the written examination**

- i) High pass:** an exemplary answer
- ii) Pass:** a good, thorough and correct answer, lacking the polish or creativity of the High Pass answer
- iii) Low Pass:** a minimally acceptable answer
- iv) Fail:** an inadequate answer; one that is lacking in key aspects

Each completed written examination answer will be graded by the question originator. The graders will grade the questions as high pass, pass, low pass or fail, and make sufficient comments to convey the basis of their grades to both the Qualifying Examination sub-Committee and to the student. If any question receives a failing grade, the question will be submitted to a second grader. Receipt of two failing grades will result in failure of that question. In the case of a split decision, the Graduate Committee will make the final determination. Students must pass at least 3 of the 4 questions in order to pass the written exam. Before the end of the semester, the Qualifying Examination sub-Committee will meet to discuss the corrected answers.

The student's performance will result in one of four possible actions by the Committee:

- i) Successful completion;**
- ii) Successful completion with remedial requirements;**
- iii) Unsuccessful completion and reexamination or**

**iv)** Unsuccessful completion with termination of study.

The Graduate Committee will inform the student of the results and provide copies of the anonymous graders' notations and comments. For students who passed the exam, but cumulatively received two or more failing grades, the Graduate Committee will by a majority vote determine whether any specific requirements aimed at correcting problems identified in the examination must be satisfied by the student. Any such requirements must be satisfied before the Ph.D. degree will be awarded. If the examination results in unsuccessful completion, the student may retake the examination only once. The reexamination will consist of a new set of 4 research articles, selected by the above-described procedures. Reexamination must take place in the next fall semester.

The sub-Committee will submit a final report (Form Ph.D.-3) on each student to the Director of Graduate Studies.

#### **4) The Oral Examination (Ph.D. dissertation proposal defense):**

**a) General description of the oral examination**

You will need to write a proposal and prepare a 30-40 minute presentation of your major research questions, your specific aims, your preliminary data, and your plans. Your examination committee will ask you questions to determine whether or not you understand and can defend your project, and have sufficient knowledge of the background and experimental procedures to carry out the proposed work.

**b) Scheduling and conduct of the examination**

The oral examination must occur within 6 months of completing the written exam. The oral examination committee will consist of all members of the Ph.D. dissertation committee (see below). The student and thesis advisor will agree on the selection of another member of the dissertation committee (who must also be a graduate faculty member of the Department of Biology) to serve as chairperson for the oral examination. The student, thesis advisor and chairperson for the oral examination will discuss the format for the examination (e.g., length of presentation, order of questions from the committee, allowed times for questioning). At the beginning of the oral examination, the oral examination chairperson will present the predetermined examination format to the entire committee. At the end of this meeting, form Ph.D.-6 will be filled out and a copy placed in the student's permanent file.

**c) Dissertation Proposal Format**

In its initial form, the Dissertation Proposal should **not** be considered as a

written contract of the work to be performed for the dissertation. It is a document to: 1) outline an anticipated line of research for the Ph.D. dissertation, and 2) provide a focus for the oral examination. After the oral examination, the Dissertation Committee may require a revision of the proposal so that it more accurately reflects the proposed research that has been agreed to by the student and the Dissertation Committee. We recommend that an updated outline of the dissertation research be prepared for a Dissertation Committee meeting to be held at some time between the oral exam and the Ph.D. dissertation defense.

The doctoral dissertation proposal should be organized according to the format given below. No specific length is required, but generally, the proposal will consist of 10 -15 pages exclusive of the literature cited.

- i) **Title Page:** Title of the dissertation, the names of the student and advisor, and date of submission.
- ii) **Abstract:** An abstract of a maximum of 300 words which includes: 1) a statement of the broad area to which the research is relevant, 2) a statement of the hypotheses or questions to be addressed by the research, 3) a summary of methods to be used, and 4) a statement of how the proposed research is expected to contribute to the general field of study.
- iii) **Body of the proposal:**
  - (i) **Introduction:** brief background, rationale and significance of the project in relation to existing knowledge. Include a clear statement of the specific objectives and hypotheses to be tested.
  - (ii) **Preliminary Data:** summary of data already obtained including its relevance to either the feasibility of planned experiments or the overall objectives of the project.
  - (iii) **Research Plan:** detailed description of experiments designed to test the proposed hypotheses. Explain how the data will be collected, analyzed and interpreted. Discuss potential difficulties and limitations of the proposed plan.  
**Note:** Experimental methods that have already been used by the student to generate data should be described under Preliminary Data. New methods to be used for proposed experiments should be incorporated into the Research Plan.
- iv) **Literature cited:** Complete references with authors, year of publication, title, journal, volume and pages.
- v) **Timetable:** Outline of entry date, initiation of research and expected completion dates for the various portions of the project, including writing of the dissertation.

Once the thesis advisor approves the dissertation proposal, it should

be provided to all members of the dissertation committee at least 2 weeks in advance of the date of the oral examination.

Upon approval, the Department is obligated to pay for the expenses of the external committee member (see below) to attend the oral qualifying exam and the dissertation defense. Notice of a change in the outside member of the dissertation committee must be submitted to the Graduate Committee for approval.

**d) Evaluation of student performance**

The outcome of the oral examination (Form Ph.D.-6) will be decided by a majority of the Ph.D. dissertation committee. The student's performance will result in one of four possible actions by the committee:

- i) Successful completion;
- ii) Successful completion with recommendations;
- iii) Unsuccessful completion with reexamination; or,
- iv) Unsuccessful completion with termination of study.

If the examination results in **successful completion with recommendations**, and those recommendations include revision of the Ph.D. research proposal, then the student must complete such revisions within 2 months. The dissertation advisor will then sign Form Ph.D.-6 attesting that satisfactory revisions have been completed and that the revised proposal has been placed in the student's file.

If the examination results in **unsuccessful completion with reexamination**, the student may retake the oral examination only once. Reexamination must take place within one year. Another option is termination of study, if this is mutually agreeable between the student and the advisor.

**e) Required Annual Post Oral Exam Committee Meeting**

Students are required to schedule annual committee meetings after they have passed their oral exam. Two meetings per year are strongly encouraged, and are required to be held twice yearly in years 4-5. At least one of the meetings must include all committee members (including remote participation).

Students should submit form Ph.D.-7 (Confirmation of Annual Post Oral Exam Committee Meeting) each year after.

**5) Candidacy**

Upon successful completion of both written and oral examinations, the student will have advanced to Ph.D. Candidacy. Following candidacy, the student must sign up for Dissertation twice, consecutively, and then for Dissertation Continuation. After achieving candidacy, the student has a maximum of 5 years to complete the program.

## I) Dissertation

The dissertation must be an original and independent scientific study. The dissertation advisor and student will determine the problem and solicit members to serve on the dissertation committee.

### 1) Dissertation Committee

The dissertation committee is typically the same as the oral examination committee (see above), although substitutions can be made by re-filing Ph.D. form 4. The dissertation advisor will chair all meetings except the proposal defense.

### 2) Dissertation Preparation Guidelines

The Biology Department does not have a strict format that you need to follow when you write your dissertation, but you do need to meet all COS, UMI and University guidelines. Please refer to *A Guide to the Preparation and Submission of Theses and Dissertations* for details regarding dissertation preparation and approval. The best way to find the most updated version is to Google “Northeastern *A Guide to the Preparation and Submission of Theses and Dissertations*”. This will give you a link to a PDF document. Dissertations must be submitted electronically to Proquest. For formatting rules see: [http://www.etsadmin.com/UMI\\_PreparingYourManuscriptGuide.pdf](http://www.etsadmin.com/UMI_PreparingYourManuscriptGuide.pdf)

Please see Appendix IV for the following sample forms.

- f) Graduate Approval Record.
- g) Sample Title Page
- h) Copyright Page (Optional)
- i) Dedication Page (Optional)
- j) Acknowledgements Page
- k) Abstract Page
- l) Sample Table of Contents

### **3) Dissertation Defense**

The proposed final draft of the dissertation should be in the hands of each dissertation committee member at least two weeks prior to the defense. Notice of the dissertation defense must be posted in the Biology Department at least two weeks prior to the defense. The defense is public. The defense consists of three parts: student presentation of the work; public questions from non-committee members; and after dismissal of the public, questions from committee members. All committee members must be present at the defense. The results are transmitted to the Director of Graduate Studies on Form Ph.D. -8. You will also need to bring a copy of the Graduate Approval Record (Appendix V) to be signed. See checklist below for details.



- Choose advisor**  
You will be assigned an advisor upon entering the program. If your assigned advisor does not turn out to be your thesis advisor, use Form M.S.-1 to officially change your advisor.
  
- Complete coursework (30 semester hours)**  
**NOTE:** For students transferring from the Master's Program, see section II.B.2.  
For students admitted with a Master's degree, see section II.B.3.  
**For other Ph.D. students:**
  - 20 semester hours: Twenty semester hours of Biology graduate courses (or approved graduate courses from another department) carrying a letter grade. 12 semester hours will consist of the following REQUIRED 4 SH courses taken for a letter grade: BIOL 7399 Research Problem Solving, Ethics, and Communication Skills or BIOL 5599 Principles of Data Management and Peer Review, and two out of the following six discipline-specific courses: Neurobiology and Behavior (BIOL 6303), Dynamics of Microbial Ecology (BIOL 6399), Research Methods and Critical Analysis in Molecular Cell Biology (BIOL 6401), and Concepts and Trends in Evolution and Ecology (BIOL 6403) Prokaryotic Cell and Molecular Biology (BIOL 6405), and Biochemistry for Molecular Biologists (BIOL 6407). See guidelines above for Concentration-specific course requirements.
  - The remaining 8 SH of graded courses will be chosen by student and his or her advisor. Topics in Biochem/Cell (BIOL7383), Topics in Integrative Biology (BIOL7384), and graded Readings (BIOL8982) courses will "count" as graded courses. Rotations, Research, Thesis, Exam Preparation, Thesis, Dissertation, or any form of Continuation will NOT count as graded courses.
  - Students are encouraged to take Biology Colloquium (BIOL 5100) during each semester of graduate study.
  - Additional coursework, as needed, to total 30 SH.
  
- Residency requirement: at least one year full-time graduate study on campus**
  
- Written qualifying examination, scheduled at the end of the second semester of the second year of study (earlier if entering with an M.S.)** Note that student must ask faculty to serve on 4-person written examination committee, which is not necessarily identical to the dissertation committee. For details, see Section III.F.
  
- Oral qualifying examination, scheduled within 6 months of completion of written examination**  
**Sub requirements (continued on next page):**
  - Ask faculty to serve on your oral examination/dissertation committee (Advisor + four scientists, the majority of whom are Biology department faculty members, and at least one of whom is outside of the Biology department, see form Ph.D.-5).
  - Submit form Ph.D.-4 to graduate committee (title of thesis and committee including CV of any committee member from outside of the university).



- Select a Chairperson specifically for the oral qualifying examination (a Biology faculty committee member who is not your advisor). Discuss format of examination with advisor and chairperson.
- Complete proposal according to format provided in section II.H.4 of this guidebook. Provide committee with proposal at least two weeks prior to examination date.
- Schedule oral examination date, upon consultation with advisor and remainder of committee. Arrange for location through appropriate Biology staff member.
- Bring form Ph.D.-6 (Results of Oral Examination). Upon completion of the exam forward signed form to Biology office to be placed in your file.
- Schedule annual committee meetings after you have passed your oral exam and submit form Ph.D.-7 (Confirmation of Annual Post Oral Exam Committee Meeting)
- Make satisfactory research progress (yearly review)**
- Submit a first authored paper in a peer-reviewed journal.**
- After first full year of study, present yearly short seminar, as assigned**
- Defend Ph.D. dissertation**  
**Sub-requirements:**
  - Apply to graduate via myNEU.
    - a. You must apply to graduate regardless of whether you plan to participate in commencement ceremonies.
    - b. You should apply to graduate the semester before you plan to graduate even if there is a chance that you will not meet the requirements in time for a particular commencement date. It is much easier to remove your name from the commencement list than to complete the clearance process at the last minute.
  - Check Northeastern's Graduate Degree Deadlines to ensure you meet the requirements by the deadline for graduation and degree conferral. Failure to meet the deadlines will postpone degree conferral and **will require registration** in subsequent semesters. Deadlines are **firm**.
  - Schedule your defense date, upon consultation with advisor and remainder of committee. It can be challenging to assemble all your committee members. Once you have a date and time for your defense, contact an administrative assistant in the Biology office to reserve a space on campus.
  - Prepare and print your Graduate Approval Record. Bring this form with you to your defense. Be sure to fill in the actual names of your committee members!  
Sample at  
<https://cos.northeastern.edu/wp-content/uploads/2017/09/Sample-Pages-Dissertation-and-Thesis-COS-2017-18.pdf>
- Print form PhD-8 from the Department of Biology Graduate Student Guidebook. Bring this form with you to your defense.





- Make an appointment with Graduate Student Services (gradcos@neu.edu) in 205 Mugar Hall for a dissertation format review 1-2 weeks prior to your defense. Please **print** and bring the following to your appointment:
  - a. Graduate Approval Record
  - b. All introductory pages of dissertation (title page through table of abbreviations)
  - c. A few pages of text from chapters, including one figure and figure legend
  - d. Any pages for which you have formatting questions
- Submit your Survey of Earned Doctorates form for the National Opinion Research Center (SED) survey online prior to submitting Graduate Approval Record and uploading dissertation. <https://sed-nces.org/GradDateRouter.aspx>
- Provide your committee members with your dissertation at least two weeks prior to your scheduled defense.
- Post notice of your defense to the Department of Biology at least two weeks prior to your defense (contact an administrative assistant in the Biology office to distribute the email announcement).
- Defend your dissertation prior to the University deadline with adequate time for revisions as required by your committee.
  - e. Bring PhD-8 form to your defense and obtain all committee members signatures.
  - f. Bring Graduate Approval Record (Appendix V) and obtain all committee members signatures except your advisor.
- Finalize your edits in your dissertation and obtain your advisor's and the Chair of the Biology Department's signatures on the Graduate Approval Record. Please note that edits cannot be made once all signatures are obtained.
- Submit your PhD-8 form to the Department of Biology (with all committee member signatures) and the Graduate Approval Record to Graduate Student Services in 205 Mugar Hall (with all committee member signatures and the Chair of the Biology Department's signature).
- After submitting the Graduate Approval Record, upload your dissertation to the ProQuest/UMI website prior to the University deadline.
- Remember to make copies of all forms (with signatures) submitted to the Department of Biology and College of Science for your records.

### **Some Important Graduate School Science Rules**

1. Determination by the Department that adequate progress towards a degree is not being made is grounds for termination.
2. Two consecutive semesters of QPA under 3.0 is grounds for termination.
3. Only two courses may be repeated and any one course can be repeated only once.
4. Failure to register for classes for one year without an official leave of absence may require reapplication.
5. Course credits earned in the program or accepted for transfer are valid for a maximum of seven years, unless an extension is granted by the Director of the Graduate School of Science.
6. The Ph.D. requirements must be completed within five years after candidacy is established.

### III. MASTER OF SCIENCE (M.S.)

The M.S. program is a full-time program that students should plan to complete in two years. The thesis required for the M.S. may be fulfilled with either a research or literature thesis. For programs that may offer a part-time option, refer to Section IV, Professional Science Masters.

#### A) Advisor

An academic advisor is assigned to the M.S. student upon entering the program. The advisor is chosen according to the area of interest indicated in the student's application. The academic advisor will help the student design a course of study until a thesis advisor is chosen. A change of advisor must be reported in writing to the Director of Graduate Studies (Form M.S.-1).

Students must have a thesis advisor by the end of the second semester of study. If the advisor differs from the initial academic advisor, this change must be communicated to the Director of Graduate Studies using form M.S.-1.

#### B) Academic Requirements

##### 1) For Master's Program Students

Students must complete 30 semester hours of graduate level coursework, 20 of which must be taken for a letter grade.

- a) 12 semester hours will consist of the following REQUIRED courses taken for a letter grade: BIOL 7382 Research Problem Solving, Scientific Writing and Communication (4 SH), and two out of following six discipline-specific courses: Neurobiology and Behavior (BIOL 6303), Dynamics of Microbial Ecology (BIOL 6399), Research Methods and Critical Analysis in Molecular Cell Biology (BIOL 6401), and Concepts and Trends in Evolution and Ecology (BIOL 6403), Prokaryotic Cell and Molecular Biology (BIOL 6405), and Biochemistry for Molecular Biologists (BIOL 6407).
- b) 8 or more semester hours will consist of approved BIOL 5000-level or higher graduate courses taken for a letter grade, with an option to petition the Graduate Committee for substitution of graduate courses from other departments. The following courses cannot be taken for a letter grade: Biology Colloquium (BIOL 5100), Biology Lab Rotation (BIOL 8420-8421), Master's Research (BIOL 8984), Full-time Master's Research (BIOL 8986), Doctoral Research (BIOL 9984), Thesis (BIOL 7990), Thesis Continuation (BIOL 7996), Dissertation (BIOL 9990), Dissertation Continuation (BIOL 9996), and other comparable research courses.
- c) 2 semester hours will consist of two semesters of Biology Colloquium (BIOL 5100) taken during the first two semesters of graduate study. Students are expected to attend Biology Colloquia thereafter.
- d) Requests for transfer credit should be sent to the Graduate Assistant accompanied by a course description, transcript, and official GSAS transfer credit form. The recommendations of the Director of Graduate Studies will be forwarded to the Graduate School.

- 2) For full-time students continuous registration is required in the Fall and Spring semesters. After course work has been completed, this requirement is usually satisfied by registering for BIOL 7990, Thesis, followed by BIOL 7996, Thesis Continuation. If a student is unable to work toward their degree for a period of time, it is possible to request a Leave of Absence. A Request for Leave of Absence Form signed by the Director of Graduate Studies must be submitted to the Graduate School.
- 3) A cumulative average of 3.0 is required for the award of the M.S. degree. All regulations of the Graduate School apply with regard to maintenance of academic standing. (See Graduate Regulations of the Graduate School of Arts & Sciences).

### C) Graduate Student Presentations

All graduate students, beginning in their second year of study, will be required to give a research talk on a yearly basis. Talks may be given during an annual Graduate Symposium, or at weekly Graduate Colloquia. Students will be notified well in advance of presentation dates and should attend scheduled graduate symposia.

### D) Research

#### 1) Thesis

The M.S. program involves laboratory and/or field research leading to the writing and oral defense of a thesis. The candidate is under the direction of a member of the graduate faculty and a committee of two (or more) other scientists. A qualified individual outside of the department may serve as a member of the committee or, if appropriate, as co-advisor. The majority of the committee must be department of biology faculty members. Thesis committee members external to the department must be approved by the Graduate Committee. An adjunct faculty member of the Department of Biology may serve as the co-advisor, but may not serve as the sole major advisor.

At least one initial thesis committee meeting, before the thesis proposal is signed and submitted to the Graduate Committee, and a final thesis defense is required. Additional meetings are highly recommended and may be held as deemed necessary by the advisor or student.

The thesis proposal (format described below) must be submitted with Form M.S.-2 for approval by the Graduate Committee **no later than the end of the first semester of the second year of study**. Outside members' curriculum vitae must be submitted with the proposal. The Director of Graduate Studies will notify the student and advisor of the Graduate Committee's approval of the proposal and of any committee members external to the department.

#### 2) Thesis Proposal Format

The Master's thesis proposal should be organized according to the format given below. No specific length is required, but generally, the proposal will consist of 6 to 10 pages exclusive of the literature-cited section.

- a) **Title Page:** Title of the dissertation, the names of the student and advisor, and date of submission.
- b) **Abstract:** An abstract of a maximum of 300 words which summarizes all parts of the proposal, including: i) the broad area to which the research is relevant; ii) statement of hypotheses or questions to be addressed by the research; iii) summary of methods to be used; and iv) statement of expected contribution of the proposed research in context of the general field of study.
- c) **Body of the proposal:**
  - i) **Introduction:** brief background, rationale and significance of the project in relation to existing knowledge. Include a clear statement of the specific objectives and hypotheses to be tested.
  - ii) **Preliminary Data:** summary of data already obtained including its relevance to either the feasibility of planned experiments or the overall objectives of the project.
  - iii) **Research Plan:** detailed description of experiments designed to test the proposed hypotheses. Explain how the data will be collected, analyzed and interpreted. Discuss potential difficulties and limitations of the proposed plan.  
  
**Note:** Experimental methods that have already been used by the student to generate data should be described under Preliminary Data. New methods to be used for proposed experiments should be incorporated into the Research Plan.
- d) **Literature cited:** Complete references with authors, year of publication, title, journal, volume and pages.
- e) **Timetable:** Student should outline: their date of entry (month/year) into the program, date of initiation of research, and expected completion dates for the various portions of the project, including writing of the thesis.

Once the thesis proposal is approved by your thesis advisor, provide it to all members of the thesis committee at least 2 weeks in advance of the thesis proposal defense. At the conclusion of the proposal defense, Form M.S.-2 must be completed and submitted to the Director of Graduate Studies, accompanied by the final thesis proposal.

### **3) Thesis Defense**

Google Northeastern *and Submission of Theses and Dissertations* for the most up-to-date details regarding thesis preparation and approval. The proposed final draft of the thesis should be delivered to each thesis committee member at least two weeks prior to the defense. Notice of the thesis defense also must be posted in the Biology Department at least two weeks prior to the defense. The defense is public. The results are transmitted to the Director of Graduate Studies on Form M.S.-3. The defense consists of three parts: student presentation of the work; public questions from non-committee members; and, after dismissal of the public, questions from committee members. All members must be present for the defense. See section VIII.C for details regarding the presentation of the thesis.

### **4) Thesis Work Conducted In Off-Campus Laboratories**

With the approval of the Graduate Committee, thesis work may be done in a laboratory external to the University. The following criteria for the off-campus lab must be satisfied.

- a) Independent, original research by the student is required.
- b) Research may be conducted in an off-campus facility only when on-campus facilities are inadequate for the project. There must be a mutual agreement between the student, person in charge of the external facility and the student's N.U. thesis advisor.
- c) The off-campus supervisor must be on the thesis committee. As with all thesis committee members, that individual is expected to attend thesis committee meetings.
- d) The entire thesis committee is responsible for acceptance of the thesis proposal.
- e) The student is responsible for progress reports to the on-campus thesis advisor.
- f) The student must be listed as an author on any publication of the thesis work. The student's address must be listed as the Department of Biology, Northeastern University, Boston, MA 02115.

- g)** The Director of Graduate Studies must receive, with the thesis proposal, a letter from the student and off-campus advisor, that agrees to the above conditions and includes the following:
- i)** Student's name
  - ii)** Title of thesis project
  - iii)** Name and affiliation of person in charge of laboratory
  - iv)** Location of laboratory where thesis research will be performed
  - v)** Research Support: facilities, equipment and supplies.
    - (1)** Off-campus: Are these from a grant or contract source? If so, is there a terminal date for the support?
    - (2)** N.U. Biology Department: What if any is required?
  - vi)** Access to facilities: When and under what circumstances may the student use the off-campus facilities to work on this research?
  - vii)** Employment status: Is the student employed by the off-campus supervisor or institution? If so, will the student be reimbursed for services rendered while working on the thesis? To what extent will the student be engaged in thesis work during regular working hours?

**E) M.S. Literature Thesis**

A literature thesis involves extensive literature research leading to a comprehensive and critical written review of a significant biological problem and an oral examination on the thesis. The regulations for the structure of the thesis committee, the organization and submission of the thesis proposal, and the requirements of the thesis defense are the same as for the Research Thesis.



**Choose advisor**

You will be assigned an advisor upon entering the program. If your assigned advisor does not turn out to be your thesis advisor, use Form M.S.-1 to officially change your advisor.

**Complete coursework (30 semester hours)**

**Specific course requirements:**

20 semester hours: Twenty semester hours of Biology graduate courses (or approved graduate courses from another department) carrying a letter grade. 12 semester hours will consist of the following REQUIRED 4 SH courses taken for a letter grade: BIOL 7399 Research Problem Solving, Ethics, and Communication Skills or BIOL 5599 Principles of Data Management and Peer Review, and two out of the following six discipline-specific courses: Neurobiology and Behavior (BIOL 6303), Dynamics of Microbial Ecology (BIOL 6399), Research Methods and Critical Analysis in Molecular Cell Biology (BIOL 6401), and Concepts and Trends in Evolution and Ecology (BIOL 6403), Prokaryotic Cell and Molecular Biology (BIOL 6405), and Biochemistry for Molecular Biologists (BIOL 6407).

One 4-SH Research Ethics and Communication Skills course, offered annually, starting Spring 2011. Note that, for PhD and research MS students, this 4 SH course will replace the 2 SH Ethics class (BIOL6381), which will nonetheless continue to be offered for our current research students and P.S.M. students.

The remaining 8 SH of graded courses will be chosen by student and his or her advisor. Topics in Biochem/Cell (BIOL7383), Topics in Integrative Biology (BIOL7384), and graded Readings (BIOL8982) courses will “count” as graded courses. Rotations, Research, Thesis, Exam Preparation, Thesis, Dissertation, or any form of Continuation do NOT count as graded courses.

Students are encouraged to take Biology Colloquium (BIOL 5100) during each semester of graduate study.

Additional coursework, as needed, to total 30 SH.

**Complete research or literature thesis proposal** by end of first semester of second year of full-time study.

**Sub requirements:**

Ask faculty to serve on your committee (Advisor + two or more scientists, the majority of whom are Biology department faculty members)

Complete proposal according to format provided in section III.D.2 of this guidebook. Include CV of any outside member.

Arrange for initial thesis committee meeting at which thesis proposal is discussed and approved. Committee must sign M.S.-2: Petition for approval of M.S. Thesis Proposal

Forward signed M.S.-2 and copy of proposal, to Graduate Committee for final approval

**Make satisfactory research progress (yearly review)**

**After first full year of study, present yearly short seminar, as assigned**



**Defend M.S. thesis**

**Sub requirements:**

- Schedule defense date, upon consultation with advisor and remainder of committee. Arrange for location through appropriate Biology staff member.
- Deliver thesis to each committee member at least 2 weeks prior to defense.
- Post notice of defense in Biology department at least 2 weeks prior to defense
- Two crucial forms to bring to your defense:
  - One appropriate signature page for M.S. thesis (a sample is provided in A Guide To The Preparation And Submission Of Theses And Dissertations)
  - Form M.S.-3: Results of M.S. Thesis Defense
- For preparation of the final copy of your thesis, and approval by the Graduate School, follow instructions provided in A Guide To The Preparation And Submission Of Theses And Dissertations found on blackboard.  
<https://northeastern.blackboard.com/bbcswebdav/orgs/GRADCOS.portal.community/Thesis-Preparation-GuideCOS%202017-18.pdf>
- Commencement is optional. Deadlines and procedures are outlined in A Guide To The Preparation And Submission Of Theses And Dissertations



#### **IV. PROFESSIONAL SCIENCE MASTER'S DEGREE**

**THE MULTITRACK PSM IN BIOTECHNOLOGY** is offered by the Department of Biology of the College Science, the College of Engineering, and the Bouvé College of Health Sciences. For more information, please contact the Program Director ([gradbiotech@northeastern.edu](mailto:gradbiotech@northeastern.edu), ext. 2627).

## V. FINANCIAL SUPPORT

### A) Eligibility

All full-time students enrolled in the Ph.D. and M.S. programs of the Department of Biology are eligible to be considered for financial support. However, M.S. students are not eligible for TA support or Tuition Assistantship from the Graduate School. Awards are made after consideration of the documents accompanying the application, the number of awards available, and the candidate's teaching or research experience. Students in residence who did not initially receive an award may be eligible for support at a later time.

As noted in the Graduate School Catalogue, all students who hold assistantships and research fellowships are expected to devote full-time to their studies and the duties of the award. Pay and duties begin on the first day of orientation week of each semester and run through the last day of finals week or until all assigned duties are completed. A student taking a course may not assist as a teaching assistant in the same course at the same time.

### B) Categories

Financial support is available through the following categories:

- 1) Teaching Assistantship (TA) (Ph.D. only)
- 2) Tuition Assistantship (Graduate School Scholarship, GSS) (Ph.D. only)
- 3) Research Assistantship (RA).

Individual faculty with research grants may provide support for Research Assistants.

### C) Departmental Policies Regarding Teaching Assistantships

Appointment or reappointment to a teaching assistantship depends upon:

- 1) **Total number of available assistantships:** The Department is limited in the number of TA positions it can offer.
- 2) **Full-time status:** A TA must be a full-time student (Appendix I).
- 3) **Academic Standing:**
  - a) Provisional students are not eligible for TA or NUTA appointments.
  - b) A QPA of at least 3.0 for all graduate credits.
  - c) Completion of at least half (i.e. 15 S.H.) of the required graduate credits by the end of the second semester (except students entering with a Master's Degree).
  - d) All proposal and examination deadlines must be met and when appropriate, research progress must be acceptable.

- 4) Specialized teaching needs:** In many of the Department's courses, teaching is facilitated by previous training in certain special fields. Numerically, needs for TAs are greatest in introductory biology, human anatomy and physiology, and microbiology. Input from the faculty member teaching the course, scheduling needs, and student experience in the subject area is considered in the award of a teaching assistantship.
- 5) Previous Performance as a TA:** The faculty member responsible for each laboratory course is requested to evaluate the TA's performance in that course. In addition, the support staff, including the Assistant Laboratory Supervisors, are requested to evaluate the performance of each TA who has worked in their areas.
- 6) English as a Second Language Students:** International students are eligible for teaching assistantships (which require both excellent English skills and familiarity with the American academic system). The English skills of international students are evaluated as part of the Teaching Assistants' Orientation Program run by Northeastern University's Office of the Provost.
- D) Time Limits on Reappointment of Teaching Assistantships:** Doctoral students are considered high priority for reappointment for five years if they entered the Ph.D. program with a B.S. or B.A. degree or for four years if they entered with a Master's degree.
- E) Leave Policies**  
The Office of the Provost proscribes policies for all Northeastern University employees and students. Policies that specifically concern graduate students can be found at: <http://www.northeastern.edu/provost/policies/graduate.html>  
This page provides information on parental leave as well as the necessary form to request such a leave. More information about NU Policies can be found in Appendix II.
- F) Professional Meetings**  
Funds are available to defray a portion of registration and travel expenses for students delivering papers at professional meetings. As these funds are limited, students should apply as soon they know their travel plans. Applications (Form M.S. 6/Ph.D.-10) should be made through the Department Chairperson.

## **VI. PROCEDURES FOR TRANSFER BETWEEN PROGRAMS IN BIOLOGY**

A candidate for the M.S. degree may apply for admission to the Ph.D. program after 15 semester hours of full-time study. M.S. students must submit a complete application to the COS and be officially admitted to the Ph.D. program. Regular application deadlines apply. This application must include the application form, an up-to-date transcript of courses taken since admission to the Master's Program, and 3 letters of reference. Two letters must come from faculty members at Northeastern. One of the reference letters must be from the student's proposed doctoral dissertation advisor, and must indicate agreement to supervise the Ph.D. dissertation. The request for transfer will be considered by the Admissions subcommittee of the Graduate Committee along with other applications to the Ph.D. program.

A doctoral student who does not currently hold a master's degree in a biological science may apply for transfer to the M.S. program by petitioning the Director of Graduate Studies in writing. Upon transfer to the M.S. program, the student will no longer be eligible for TA or tuition support from the college.

A Ph.D. student in good standing, who has successfully completed the written qualifying examination, and completed the 30 semester hours of course and research credit required under II.B. with at least a 3.000 cumulative average, may apply to receive the M.S. degree without submitting a thesis. Students entering with a Master's degree are not eligible for this option.

## VII. STUDENT'S RECORDS, GRADES, AND EVALUATION

### A) Graduate Student Folders

All correspondence relevant to a student's program must be copied and placed in the student's folder (i.e. permanent record) in the Department's office. This includes the various forms.

### B) Grading of Research and Seminars

The grades of S, U, or I are the only grades to be given in Ph.D. Dissertation (BIOL 9990), Thesis (BIOL 7990), Master's Research (BIOL 8984), Full-time Master's Research (BIOL 8986), Doctoral Research (BIOL 9984), Full-time Doctoral Research (BIOL 8984), Biology Laboratory Rotation (BIOL 8420 - 8421), Thesis Continuation (BIOL 7996) or Dissertation Continuation (BIOL 9996). In Seminar courses, faculty have the discretion of deciding, at the beginning of a seminar, whether to assign A-F grades or S/U grades. However, there shall be no mixing of the two grading systems in the same seminar.

### C) Minimum Q.P.A.

Graduate students are required to maintain a 3.000 QPA for graduation and to be eligible for financial aid. QPA values are assigned as follows:

A = 4.0; A- = 3.667; B+ = 3.333; B = 3.000; B- = 2.667; C+ = 2.333; C = 2.000; C- = 1.667; F = 0

If after 15 semester hours of course work a student's QPA is less than 3.0, s/he will be released from the program.

### D) Grade of Incomplete

An incomplete may be given to students who fail to complete course work. The faculty member must complete an incomplete grade contract with the student. The "I" will be changed to a letter grade when the deficiency that led to the "I" is filled to the satisfaction of and in the manner determined by the course's instructor. The period for clearing an "I" is restricted to one calendar year from the date that it is first recorded on the student's permanent record.

### E) Clearing Entry Course Requirements

Entry course requirements must be cleared during the first 15 semester hours of graduate credit. Failure to clear requirements may be grounds for release from the program.

### F) Annual Review

The Graduate Committee will review all graduate students' records each year. This review will consider the students' performance, including QPA, status of thesis proposal and/or research, and will be considered by the Graduate Committee for appropriate action. Criteria for this review are given on Form M.S.-5/Ph.D.-11. A student who is not making satisfactory progress toward degree requirements may be released from the program.

**G) Time Limits**

Students in either degree program desiring an extension should formally petition the Graduate Committee. If the committee recommends the extension, the Director of Graduate Studies will notify the Dean's office of this recommendation and forward the petition to the Director of Graduate Studies.

- 1) **Ph.D.** After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of degree requirements.
- 2) **Master's Degree.** Course credits earned in the program or accepted by transfer are valid for a maximum of seven years.

## **VIII. THESIS/DISSERTATION: OBLIGATIONS OF COMMITTEE, ADVISOR, AND STUDENT**

### **A) Advisor**

- 1)** Faculty members have a general obligation to serve as academic and thesis advisors but retain an absolute right of refusal regarding any particular student. Appropriate grounds for refusal are described in Section B-1 below.
- 2)** The faculty member should agree to serve as the thesis advisor only after considering the feasibility of the project. Feasibility is decided on a variety of criteria including: time available; availability of materials and equipment; methods; conceptual design, including possible failure of portions of the research plan and alternate routes of exploration; space; advisor's own experience in the area and availability of experienced committee help; educational value to the student and contribution to scientific knowledge; and, the student's background (if insufficient, can deficiencies be remedied in time?).
- 3)** A thesis/dissertation advisor should confer with a student regarding the committee's composition. Under some circumstances the advisor may suggest the addition of a member beyond the required number (3 for M.S., 5 for Ph.D).
- 4)** A thesis/dissertation advisor is required to convene at least two meetings and should offer to convene one more as follows:
  - a)** The M.S. thesis committee must meet to approve the thesis proposal. The Ph.D. dissertation committee must meet for the Ph.D. proposal defense (oral qualifying exam).
  - b)** Ph.D. candidates must meet with their committees on a yearly basis after completion of the Oral Exam (form Ph.D.-7). Twice yearly meetings are strongly encouraged. M.S. candidates should also meet with their committees after significant progress has been made but while there is still time to modify some of the research. Committee meetings should include a report of the candidate's achievements, problems, and objectives. The candidate should be made aware of the committee members' expectations for an acceptable thesis/dissertation. Significant deviations may require another intermediate committee meeting. While calling a committee meeting is the responsibility of the advisor, this does not relieve the student of the responsibility of asking for a meeting to be convened.
  - c)** The final meeting is a defense of the thesis/dissertation. Each committee member will have a proposed final draft of the thesis/dissertation for at least two weeks prior to the defense.
- 5)** Finally, the thesis/dissertation advisor is to aid the student in the production and publication of appropriate parts of the thesis/dissertation and to encourage presentations of ongoing or finished work at meetings of scientific societies.

## **B) Committee Members**

- 1) Faculty members have a general obligation to serve on thesis committees, but the faculty member has absolute right of refusal regarding any particular committee. Appropriate grounds for refusal may be:
  - a) Inadequate background to serve on a committee;
  - b) A disagreement regarding feasibility or other aspects of the proposal that cannot be resolved;
  - c) A disagreement between the student and the advisor regarding whether or not the faculty member is appropriate;
  - d) An upcoming sabbatical;
  - e) Membership on too many thesis/dissertation committees.
- 2) A committee member is obligated to attend and join in planning at thesis/dissertation committee meetings, render advice, and read and render advice concerning the written thesis/dissertation and attend and vote at the final defense of thesis/dissertation.
- 3) Under rare circumstances, disagreement about the research may become so severe that a member may withdraw from a committee. However, withdrawal near the time of defense should be avoided.

## **C) Student**

- 1) To pursue research with honesty and vigor.
- 2) To ask the thesis/dissertation committee for advice as needed.
- 3) To inform the advisor promptly when problems arise.
- 4) To make appropriate progress in the program.
- 5) To provide the advisor with a first draft of the thesis/dissertation that has been proofread.
- 6) To provide a final revised draft to each member of the committee at least two weeks prior to the defense.
- 7) To present a defense of thesis/dissertation involving a public presentation with appropriate visual aids. This presentation should not exceed one hour. Even if the candidate passes the defense, changes in the thesis/dissertation may be required before acceptance.
- 8) To follow COS guidelines for electronic submission of the thesis. Note that release of the thesis may be embargoed so that the work may be published elsewhere before public release of the thesis.  
([www.northeastern.edu/cos/wp-content/uploads/2013/11/Thesis-Preparation-GuideCOSFall2013-November.pdf](http://www.northeastern.edu/cos/wp-content/uploads/2013/11/Thesis-Preparation-GuideCOSFall2013-November.pdf)).
- 9) To make prompt efforts to publish appropriate parts of the thesis.



**D) Other Faculty**

Graduate students should feel that they can go to any faculty member for advice concerning their research (e.g., regarding experimental design, method or analysis).

**E) Committee Voting at the Defense**

- 1) Satisfactory defense of the thesis/dissertation is defined by the delivery and defense of the thesis as adjudged by a simple majority of the committee.

The discussion and vote is taken in private after the defense and questioning is completed. All members of the committee must be present for the defense.

- 2) Unsatisfactory defense. This outcome should be avoided through thesis committee meetings and advising in advance of the defense. However, in such a case, the committee must decide the following:

- a) Whether to request another defense of the same thesis/dissertation.
- b) Whether to require further research. (Normally, the intermediate meeting would have addressed this issue.)

- 3) Second Unsatisfactory defense - After two unsatisfactory defenses, the student will be released from the program. However, a Ph.D. candidate may be eligible, upon application, to receive an M.S. in Biology.

## **APPENDIX I: DEFINITIONS**

### **A. Full-time Status**

A graduate student is considered to be full-time if enrolled in a minimum of 8 semester hours of credit with the following exceptions:

- 1) Students who hold Teaching Assistantships or Research Assistantships are considered full-time if enrolled for a minimum of 6 semester hours of credit.
- 2) Students enrolled in Full-time Research, Exam Preparation, Doctoral Dissertation, Thesis Continuation, or Dissertation Continuation are considered full-time students.

### **B. Semester Hours**

Credit hours are assigned to a course based on the established educational standard that one credit hour is equal to approximately three hours of student learning time per week over a period of a quarter, semester, or term, usually one hour of lecture or discussion, plus two hours of individual study outside of class. When individual study is involved as in Directing Reading or Laboratory Rotation, each hour of credit should represent at least three hours of student work per week.

## **APPENDIX II: UNIVERSITY POLICIES**

### **Antidiscrimination Policy**

Northeastern University is committed to a policy of equal opportunity for all students and employees without regard to race, color, religion, sex, sexual preference, national origin, handicap, or veteran status. The University prohibits discrimination in all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance.

### **Equal Opportunity Employment Policy**

Northeastern University is an equal opportunity employer. It is institutional policy that there shall be no discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, handicap, or veteran status.

Northeastern University also prohibits discrimination against any employee regarding upgrading, demotion or transfer, layoff or termination, rates of pay or other forms of compensation, and selection for training. In addition, Northeastern adheres to Affirmative Action guidelines in all recruitment endeavors.

### **Accreditation Statement**

Northeastern University is accredited by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.

### **Delivery of Services**

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

### **Precedence Statement**

The Graduate Programs Guidebook (M.S., Ph.D.) should be used in conjunction with the *Student Handbook*, the *Basic Day Colleges Course Description and Curriculum Guide*, *Cooperative Education Handbooks* and the *Northeastern University Bulletin*. Where differences exist between this Guidebook and those publications, please note that the *Bulletin*, *Curriculum Guide*, and *Handbooks* take precedence.

### **Northeastern University International Mission Statement**

Northeastern University, a world leader in cooperative education, acknowledges the increasing interdependence among nations, and, therefore, identifies its mission as preparing its graduates to live and work in an interdependent world. To accomplish this goal, Northeastern University actively seeks qualified students from abroad to enroll in its undergraduate and graduate programs in such numbers and with such geographic

origins so as to create and foster a truly global exchange of ideas and values among students, faculty, and staff. The University also encourages all colleges to continually develop and expand course offerings to include international issues and cross-cultural aspects and supports faculty to teach and conduct research in the interrelationship among nations and peoples. In addition, the University promotes international understanding and the sharing of ideas with institutions throughout the world by virtue of faculty and staff exchanges and study and work abroad programs for students.

### **Appendix III: Mental Health Resources and Guidelines**

Resources on campus for mental health are accessible through University Health and Counseling Services (UHCS).

Services provided are detailed on the UHCS website and include:

- What to expect
- Emergencies
- Behavioral Health Visits at UHCS
- Psychopharmacology Services
- Group Counseling

UHCS can also assist in seeking diagnosis and documentation for disability resources and accommodations.

Clinicians are available for on a walk-in basis for students seeking help. Students are never turned away from an initial assessment regardless of insurance and coverage. Non-eligible students are given advice and help in finding community resources. The front desk is always available and can be reached at x2772. Information is held privately and is confidential from other students and Faculty. UHCS clinicians can accept information but cannot disclose further or follow-up. If a student is referred to UHCS by a fellow student or Faculty member, UHCS will approach the student as a call of support to offer help and resources.

If students are in immediate danger to themselves or others, this should be addressed immediately through NUPD (x3333).

Student concerns within the Biology Department can be brought to the Director of Graduate Studies, the University Graduate Ombudsperson Dr. Kimberly Wong ([graduateombuds@northeastern.edu](mailto:graduateombuds@northeastern.edu), x6904), who is an external neutral party with expertise in mediation. The graduate ombudsperson works with every office in the University, and can therefore be consulted about anything ranging from career advice to interpersonal issues and ethical dilemmas.

## APPENDIX IV: SAMPLE DISSERTATION PAGES

### Graduate Approval Record

- Type out your own version of this form, with “Name, Title, University” replaced with the correct information for each of your committee members. For example: Erin J. Cram, Professor, Northeastern University. Do not include the page number.
- Sample Title Page
- Copyright Page (Optional)
- Dedication Page (Optional)
- Acknowledgements Page
- Abstract Page
- Sample Table of Contents

GRADUATE APPROVAL RECORD  
NORTHEASTERN UNIVERSITY

Dissertation Title:

Author:

Department:

Approved for Dissertation Requirements of the Doctor of Philosophy Degree

Dissertation Committee

\_\_\_\_\_  
Name, Title, University/Institution

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title, University/Institution

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title, University/Institution

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title, University/Institution

\_\_\_\_\_  
Date

\_\_\_\_\_  
Name, Title, University/Institution

\_\_\_\_\_  
Date

Head of Department

\_\_\_\_\_  
Name, Title

\_\_\_\_\_  
Date

Graduate Office Notified of Acceptance

\_\_\_\_\_  
Assistant Director of Graduate Administration

\_\_\_\_\_  
Date

*Sample Title Page*

Orthosteric and Allosteric Probes for Cannabinoid Receptors

by Ritesh B. Tichkule

B. Tech. in Chemical Engineering, Nagpur University  
M.S. in Chemistry, Texas A & M University

A dissertation [thesis] submitted to

The Faculty of  
the College of Science of  
Northeastern University  
in partial fulfillment of the requirements  
for the degree of Doctor of Philosophy [Master of Science]

Month Day, Year of Defense

Dissertation [Thesis] directed by

Alexandros Makriyannis  
Professor of Chemistry and Chemical Biology



***Copyright Page (optional)***

*The candidate may choose to copyright the dissertation or thesis. Information regarding copyright protections and application for copyright may be obtained from the U.S. Copyright Office, +1 (202) 707-3000. As the author of a thesis or dissertation, you may be interested to know that you own the copyright to your work just by virtue of being its author. When uploading your dissertation or thesis to the ProQuest database, you will have the option to ask that ProQuest register the copyright on your behalf. There is a fee associated with this copyright registration. If you choose to copyright your document, you will be responsible for the fee.*

***Dedication Page (optional)***

*This page is the customary place for a student to give a special dedication to persons, organizations, or others that provided encouragement and support to the student. The word "Dedication" should be centered on the page without punctuation and text should be below.*

Dedication

***Acknowledgements Page***

*Students can use this space to express recognition of and appreciation for any special assistance received during the academic career. This page is obligatory if special permission has been granted to use published or unpublished material. "Acknowledgements" should be centered on the page without punctuation and text should be below.*

Acknowledgements

***Abstract of Dissertation [Thesis]***

*The abstract consists of an essay-style summary of the thesis or dissertation, a statement of the experiment or problem, the procedure followed, the results, and the conclusion. The abstract should begin with the words "Abstract of Dissertation" centered on the page.*

Abstract of Dissertation

*Sample Table of Contents*

Table of Contents

Dedication	2
Acknowledgements	3
Abstract of Dissertation [Thesis]	4
Table of Contents	5
List of Figures	6
List of Tables	7
List of Symbols	8
Glossary of Terms	9
Introduction	
Chapter 1: Chapter Title	10
Chapter 2: Chapter Title	40
Chapter 3: Chapter Title	80
Chapter 4: Chapter Title	110
Chapter 5: Chapter Title	130
Chapter 6: Conclusions and Recommendations	150
References	185
Appendices	200

## **APPENDIX V: DEPARTMENTAL FORMS**

**(THESE FORMS MAY BE PHOTOCOPIED AND USED OR COPIES MAY BE OBTAINED FROM THE GRADUATE STAFF ASSISTANTS. PLEASE NOTE THAT THE GRADUATE SCHOOL FORMS NEEDED FOR THESIS OR DISSERTATION SUBMISSION TO THE LIBRARY ARE ONLY AVAILABLE IN THE GUIDE TO THESIS AND DISSERTATION SUBMISSION AS EXPLAINED IN SECTIONS II.H.3 AND III.D.3.)**



**M.S.-1: Change of Academic Advisor**

**TO:** \_\_\_\_\_, Director of Graduate Studies

**FROM:** \_\_\_\_\_, Graduate Student

**DATE:** \_\_\_\_\_

**This is to notify you that my academic advisor has been changed:**

**FROM:** \_\_\_\_\_

**TO:** \_\_\_\_\_

**My previous academic advisor has been notified of the change.**

**My thesis advisor is (Check One):**

Same as new academic advisor

Not yet determined

**My current local address, phone number and email address are:**

**Street Address 1:** \_\_\_\_\_

**Street Address 2:** \_\_\_\_\_

**City:** \_\_\_\_\_ **State:** \_\_\_\_\_ **Zip Code:** \_\_\_\_\_

**Phone Number:** \_\_\_\_\_ **Cell Number:** \_\_\_\_\_

**E-mail Address:** \_\_\_\_\_

(Use Northeastern E-mail only)

**SIGNATURES**

**Student:** \_\_\_\_\_

**New Academic Advisor:** \_\_\_\_\_



**M.S.-2: PETITION FOR APPROVAL OF M.S. THESIS PROPOSAL**

**TO:** \_\_\_\_\_, Director of Graduate Studies

**FROM:** \_\_\_\_\_, Thesis Advisor

**DATE:** \_\_\_\_\_  
(Date of Initial Thesis Committee Meeting at which the Proposal was Approved)

**M.S. Student's Name:** \_\_\_\_\_

**Type of Thesis (Check One):**      Research      Literature

**Title of Proposed Thesis:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**Proposed Committee (with signature indicating approval of proposal):**

	Name (Type or Print)	Signature
<b>Thesis Advisor:</b>	_____	_____
	_____	_____
	_____	_____
	_____	_____

**Action of the Graduate Committee (Check One):**    Approved      Not Approved

**Comments:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Signature of Director of Graduate Studies

\_\_\_\_\_  
Date





**M.S.-3: RESULTS OF M.S. THESIS DEFENSE**

**TO:** \_\_\_\_\_, Director of Graduate Studies

**FROM:** \_\_\_\_\_, Thesis Advisor

**DATE:** \_\_\_\_\_  
*(Date of Thesis Defense)*

**M.S. Student's Name:** \_\_\_\_\_

**Type of Thesis (Check One):**      Research      Literature

**Title of Thesis:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**The result of the oral defense is:**      Passed      Failed

**Committee Signatures:**

**Name (Type or Print)**

**Signature**

**Thesis Advisor:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



M.S.-4/Ph.D.-9: T. A. EVALUATION FORMS, page 1

Name of TA: \_\_\_\_\_

Date: \_\_\_\_\_

Term: \_\_\_\_\_ Course Number: \_\_\_\_\_ Course Name: \_\_\_\_\_

Rate how well this TA has met expectations.(1 = has not met expectations, 2 = has met expectations, 3 = has exceeded expectations, Do not circle anything if unknown or not applicable)

<b>Attendance and Punctuality</b>	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Attends all assigned lab sections	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Attends all TA meetings	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Attends all his/her office hours	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Is on time for all assigned lab sections	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Is on time for all TA meetings	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Is on time for office hours	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
<b>Lab execution</b>	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Is adequately prepared	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Completes all parts of each lab exercise	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Uses time effectively and efficiently	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Engages students on a face-to-face basis during lab	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Leaves the lab clean upon completion	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
<b>Attitude</b>	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Has a good attitude towards teaching	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Has a good attitude towards students	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
<b>Communication</b>	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Speaks clearly	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Organized	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Responds to student questions	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Makes an effort to find the answer to question if he/she does not know	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Responds to supervisor requests	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
<b>Grading</b>	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Assigns grades fairly	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
Returns graded assignments promptly	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3
<b>Overall effectiveness</b>			

TA Signature: \_\_\_\_\_

Supervisor Signature: \_\_\_\_\_



**M.S.-4/Ph.D.-9: T. A. EVALUATION FORM (Mid-Term Eval.), p. 2 of 2**

Name of TA: \_\_\_\_\_

Date: \_\_\_\_\_

Term: \_\_\_\_\_ Course Number: \_\_\_\_\_

Course Name: \_\_\_\_\_

**Part I - Supervisor Comments:**

What has this TA done well this term?

Please list any areas in which this TA needs to show improvement. Include suggestions as to how this improvement could be accomplished.

**Part II – Self Evaluation:**

How much time on average do you spend per week doing each of the following:

Preparing for lab \_\_\_\_\_

Grading (outside of office hours) \_\_\_\_\_

Meeting with students outside of lab or office hours \_\_\_\_\_

How would you assess your teaching effectiveness at this point of the term? Feel free to include responses to your supervisor's comments.



---

***M.S.-5/Ph.D.-10: CRITERIA FOR GRADUATE STUDENT PROGRESS***

As described in Section VII.F, there is a bi-yearly review of all graduate students. The following checklists for student progress are used in these reviews.

**M.S.**

1. 3.0 QPA is required at all times for financial aid; 3.0 QPA must be attained by 15 SH to remain in the program.
2. The research or literature thesis proposal must be submitted by the end of the first semester of the second year of full-time study.
3. Research progress must be evaluated by the research advisor as at least satisfactory.

**Ph.D.**

1. 3.0 QPA is required at all times for financial aid; 3.0 QPA must be attained by 15 SH to remain in the program.
2. The Graduate Committee must receive a letter of commitment from the proposed research advisor by the end of the third semester of study.
3. The written qualifying examination must be taken by the end of the first semester of the third year (entered with B.S.) or by the end of the first semester of the second year (entered with M.S. or transferred from the M.S. program).
4. The oral qualifying examination must be taken within six months of passing the written qualifying examination.
5. Research progress must be evaluated by the research advisor as at least satisfactory, and the student must have a first authored paper accepted in a peer-reviewed journal.

**Some Important Graduate School Rules**

1. Determination by the Department that adequate progress towards a degree is not being made is grounds for termination.
2. Two consecutive semesters of QPA under 3.0 is grounds for termination.
3. Only two courses may be repeated and any one course can be repeated only once.
4. Failure to register for classes for one year, without a formal leave of absence, may require reapplication.
5. Course credits earned in the program or accepted for transfer are valid for a maximum of seven years, unless an extension is granted by the Director of the Graduate School.
6. The Ph.D. requirements must be completed within five years after candidacy is established.



---

***M.S.-6/Ph.D.-11: APPLICATION FOR TRAVEL AWARD***

**TO:** \_\_\_\_\_, **Department Chairperson**

**FROM:** \_\_\_\_\_, **Graduate Student**

**DATE:** \_\_\_\_\_

---

I would like to apply for funds to support my travel to the following scientific meeting:

---

---

At this meeting I will be presenting a paper/poster entitled:

---

---

---

---

**Advisor's Endorsement:**

I support the request outlined above.

---

(advisor's signature)



**Ph.D.-1: IDENTIFICATION OF EXAMINERS FOR THE WRITTEN EXAM**

**TO:** \_\_\_\_\_, Chair, Written Qualifying Exam Committee

**FROM:** \_\_\_\_\_, Graduate Student

**DATE:** \_\_\_\_\_

I am scheduled to take the written qualifying examination during Spring Semester of \_\_\_\_\_.

I have obtained the consent of the following four Biology faculty members to serve as written examiners: (type or print names)

**Advisor:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

For students who would like to include an outside examiner (outside department or outside the university) and have already obtained that person's consent to serve, please provide the following information:

**Name:** \_\_\_\_\_

**Position/Title:** \_\_\_\_\_

**Department & University/Institution:** \_\_\_\_\_

**Mailing Address:** \_\_\_\_\_

**Telephone:** \_\_\_\_\_

**E-Mail Address:** \_\_\_\_\_

**Qualifications to Serve as Written Examiner:** (attach comments on a separate sheet)

**SIGNATURES:**

\_\_\_\_\_  
**Student**                      **E-mail:** \_\_\_\_\_                      **phone:** \_\_\_\_\_

\_\_\_\_\_  
**Advisor**                      **E-mail:** \_\_\_\_\_                      **phone:** \_\_\_\_\_



---

**Ph.D.-2: SCHEDULE FOR WRITTEN QUALIFYING EXAMINATION**

**TO:** \_\_\_\_\_, Graduate Student

**FROM:** \_\_\_\_\_, Chair, Written Qualifying Exam Committee

**DATE:** \_\_\_\_\_

---

You are scheduled to take the Ph.D. Written Qualifying examination this spring. You will be informed of the precise schedule approximately 2 weeks prior to the week of the examination. Computer access will be provided if you have requested that a computer be made available for you to take your exam.

To prepare for the written examination, you have received 8 original research articles that were approved by the Qualifying Examination Committee. You will be tested for your comprehensive understanding of these 8 articles.

cc: Ph.D. Written Qualifying Exam Committee  
Director of Graduate Studies



---

**Ph.D.-3: RESULTS OF WRITTEN QUALIFYING EXAMINATION**

**DATE:** \_\_\_\_\_

---

Ms./Mr. \_\_\_\_\_ has been examined regarding qualifications for the Ph.D. Program. The following action has been taken:

- Successful completion. No recommendations
- Successful completion with supplementary requirements
- Unsuccessful completion with remedial requirements and re-examination.
- Unsuccessful completion with termination of study

**Specific recommendations:**

**Signature of the Director of Graduate Studies:** The signature of the Director of Graduate Studies certifies that the Written Examination sub-committee of the Graduate Committee has determined the result of this written qualifying examination and communicated the results to the student.

\_\_\_\_\_  
(Director of Graduate Studies)

\_\_\_\_\_  
(Date)





**Ph.D.-4: PETITION FOR APPROVAL OF Ph.D. DISSERTATION TOPIC AND COMMITTEE**

**TO:** \_\_\_\_\_, Director of Graduate Studies

**FROM:** \_\_\_\_\_, Graduate Student

**DATE:** \_\_\_\_\_

**Title of Proposed Dissertation:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Proposed Committee** (signature indicates receipt of an abstract of the proposal and willingness to serve on the committee):

	<b>Name (Type or Print)</b>	<b>Signature</b>
<b>Chairperson:</b>	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____
	_____	_____

**Please attach:**

1. A title page and abstract of the dissertation proposal;
2. The Curriculum Vita of the committee member from outside the university.

**Action of the Graduate Committee (Check One):**  **Approved**     **Not Approved**

**Comments:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Signature of Director of Graduate Studies**

\_\_\_\_\_

**Date**



---

**Ph.D.-5: LETTER TO OUTSIDE COMMITTEE MEMBER**

Date

Address, line 1

Address, line 2

Address, line 3

Dear Dr. \_\_\_\_:

On behalf of the Department of Biology at Northeastern University, I would like to thank you for agreeing to serve as member of \_\_\_\_\_'s Ph.D. dissertation committee. Your contribution to the training and evaluation of this student is an important component of the degree program. We appreciate the contribution of your time and expertise and hope that you will find the experience enjoyable.

Please find enclosed information regarding the Ph.D. qualifying exam, dissertation committee, and dissertation defense. If you have any questions, please feel free to contact me.

Sincerely,

Advisor

Phone

e-mail



**Ph.D.-6: RESULTS OF ORAL QUALIFYING EXAM**

**TO:** \_\_\_\_\_, Director of Graduate Studies

**FROM:** \_\_\_\_\_, Chair for the oral qualifying exam

**DATE:** \_\_\_\_\_  
(Date of Oral Qualifying Exam)

Ms./Mr. \_\_\_\_\_ has been examined regarding his/her ability to pursue the proposed Ph.D. dissertation. The following action has been taken:

- Successful completion. No recommendations
- Successful completion with recommendations
- Unsuccessful completion with recommendations and re-examination.
- Unsuccessful completion with termination of study

**Specific recommendations:**

**Signatures of Ph.D. Oral Qualifying Examination Committee:**

\_\_\_\_\_  
(Chairperson)

\_\_\_\_\_  
(Date)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**For successful completion with recommendations:**

- No revisions to the proposal are required
- Revisions are required; advisor is required to certify once revisions are complete

A final version of the dissertation proposal incorporating the committee's recommendations has been satisfactorily completed and has been submitted to the Biology Office.

\_\_\_\_\_  
Dissertation Advisor



---

**Ph.D.-7: Annual Ph.D. Thesis Committee Meeting Report**

*\*This report must be submitted at least once per year by every PhD student.*

**Student Name:** \_\_\_\_\_

**Thesis Advisor:** \_\_\_\_\_

**Title of Proposed Dissertation:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Date of this meeting:**

**Student please fill out the following two sections:**

**Comments on progress to date:**

**Goals and improvements for the upcoming year:**



**Student Name:** \_\_\_\_\_

**Committee's Report**

Evaluation of overall progress since last report (select one):

**RATING** [E] Excellent [G] Good [M] Marginal [U] Unsatisfactory

	<b>Name (Type or Print)</b>	<b>Signature</b>
<b>Thesis Advisor:</b>	_____	_____
<b>Committee Member</b>	_____	_____
<b>Committee Member</b>	_____	_____
<b>Committee Member</b>	_____	_____
<b>Committee Member</b>	_____	_____

\*Where progress is deemed marginal or unsatisfactory, attach a detailed explanation of what must be accomplished between this meeting and the next committee meeting in order to remedy the situation.

Student's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Please submit this form to Petya Koeva-Dobrevva in the Biology Office.



**Ph.D.-8: RESULTS OF Ph.D. DISSERTATION DEFENSE**

**TO:** \_\_\_\_\_, Director of Graduate Studies

**FROM:** \_\_\_\_\_, Graduate Student

**DATE:** \_\_\_\_\_  
(Date of Dissertation Defense)

**Ph.D. Student's Name:** \_\_\_\_\_

**Title of Dissertation:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The result of the oral defense is:  Passed  Failed

**Signatures:**

**Name (Type or Print)**

**Signature**

**Dissertation Advisor:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Please list your publications on the back of this page, or, alternatively attach a CV that includes a publication list.



---

**Ph.D.-12: ANNUAL PhD STUDENT PROGRESS REPORT**

*\*To be filed in May of each year, for every PhD student, following a discussion between student and advisor.*

Student Name: \_\_\_\_\_

Thesis Advisor: \_\_\_\_\_

Date of this meeting: \_\_\_\_\_

**Overall Evaluation**

[E] Excellent [VG] Very good. [G] Good [M] Marginal [U] Unsatisfactory

**Student strengths and accomplishments:**

**Areas for growth or improvement in the coming year:**

Please submit to Petya Koeva-Dobreva in the Biology Office ([p.koeva-dobreva@northeastern.edu](mailto:p.koeva-dobreva@northeastern.edu)).

**If you have concerns, please schedule a meeting with the Director of Graduate Studies.**