# Graduate Student Handbook

## Department of Biological Sciences

## Michigan Technological University

## 2023-2024

# Table of Contents

## 1. INFORMATION FOR GRADUATE STUDENTS IN THE DEPARTMENT

The following information has been compiled to assist graduate students with their adjustment to Graduate School and to outline the requirements and procedures for obtaining an advanced degree in the Department of Biological Sciences at Michigan Technological University. The information supplied herein is more specific than that in the Graduate School Catalog as it applies to our programs: M.S. in Biological Sciences, and Ph.D. in Biological Sciences. Students should familiarize themselves with this handbook and the general regulations of the Graduate School as found in their *Policies and Procedures* web pages https://www.mtu.edu/gradschool/policies-procedures/, which covers degree requirements, necessary forms, and more. Students should follow the guidelines that appear in the handbook from the term they entered the program.

**Graduate School requirements take precedence over information in this handbook.** The Graduate School website http://www.mtu.edu/gradschool/resources-for/students/ also contains a wealth of information for current students.

Convenient links to many of these resources are also available on the Biological Sciences department website https://www.mtu.edu/biological/graduate/program/.

## 2. FACILITIES AND GENERAL INFORMATION

### 2.1 Department Structure

The Biological Sciences department is a community of scholars and professional staff who work together to further the mission of the department and the University. Major academic responsibilities in the department are handled by the department chair and several important faculty committees. Students should familiarize themselves with the department webpage and the list of faculty and staff:
https://www.mtu.edu/biological/people-groups/faculty-staff/.

### 2.2 Keys, Desk, Computers, and Research Space Assignments

Students should obtain a student ID (Husky Card) from IT at the Technical Assistance Center on the first floor of the Van Pelt and Opie Library. Office and teaching laboratory keys are ordered by the Biological Sciences office and are available for pick-up at Public Safety and Police Services. Students working on research projects may be issued keys to project laboratories upon approval of the faculty member responsible for that laboratory. Requests for new keys, replacements for lost keys, or swipe-card access to restricted areas should be made to the Biological Sciences office. Keys must not be passed on to anyone else or duplicated under ANY circumstances. Lending or duplication of keys is grounds for dismissal. Lost keys need to be reported to supervisors as soon as they are noticed to be missing. A fee (amount set by Public Safety) is assessed for any key lost/replaced or not returned to public safety when no longer needed.

Graduate students are provided computer access through computer labs in several common areas and offices. Questions and problems with computers should be directed to Information Technology (IT) help desk, found on the first floor in the library or via email at it- help@mtu.edu . The IT staff will supply you with your username and password; change your password the first time you log into your account.

Students should pay particular attention to Michigan Tech computer use policies regarding copyrights, privacy, passwords, and hacking. These can be found at IT's web site http://www.mtu.edu/it/security/security-resources-tools/online-security-privacy/

### 2.3 E-Mail, Mail Service, Photocopier, Supplies, Printers

E-mail is the university's and department's primary communication tool with graduate students regarding issues such as financial support, graduate program obligations & responsibilities, and semester timelines & deadlines, to name a few. You are expected to be responsive to departmental e-mails in a timely manner and use your Michigan Tech email address.

Mail is delivered to the Biological Sciences department. Student mailboxes are located in the Biology Department's main office, Dow 740 (copy room). It is advisable to check your mailbox daily for mail and messages.

Photocopiers, laser printers, and office supplies in Dow 740 are available for biology graduate students **to use for teaching purposes only**. They should use IT printers that are available across campus **for their research printing**. Departmental resources are limited, so efficiencies such as double-sided printing and copying are appreciated. Please see the office assistant for office supplies. Also, note that there are important national laws regarding photocopying copyrighted materials. If you have a question about copyright law please inquire in the library or see http://www.admin.mtu.edu/admin/procman/ch13/ch13p10.htm

### 2.4 Safety

There are a number of safety policies and procedures in effect at Michigan Tech that particularly apply to graduate students such as those concerning general safety and hazardous waste. Annual online safety training is mandatory for ALL employees and will be communicated to you via email when assigned. Additional safety policies and training required to use the machine shop, any research or teaching laboratories, or chemicals will be communicated and assigned by respective Biological Sciences personnel (Lab Supervisor). Please consult your research advisor regarding all applicable safety policies and procedures before beginning work. Questions can also be directed to the safety coordinator who our laboratory supervisor is.

For safety purposes, visitors are not permitted in research and instructional labs unless written permission has been granted by the department chair; this includes spouses and

children. There have been incidents in other departments where unauthorized visitors, including children, have had accidents causing themselves harm. This rule is designed to prevent this type of tragedy.

For your reference, the Michigan Tech safety manual is available online at: http://www.mtu.edu/ehs/documents/safety-manual/

### 2.5 Absence Policy

Students receiving financial aid through the University (teaching assistantship, research assistantship, fellowship) are entitled to staff holidays, which are listed on the Michigan Tech calendar. Please note that the breaks between academic terms and the break at Christmas are not automatically considered as holidays or time off. **PRIOR written approval** is required for business and personal absences in consultation with the student's advisor, the course instructor if the student is GTA, and the department coordinator. The absence forms for the Biological Sciences department are to be completed for the requisite signatures.

In general, graduate students may take up to two weeks of personal time each year with their advisor's approval. Personal absences more than two weeks will result in prorated stipend (a decrease in pay for the balance of time absent).

Additionally, **PRIOR written approval** is required for international travel on official business https://www.mtu.edu/fso/forms/travel/.

Any absence that does not follow this policy will result in an automatic deduction of pay and may be subject to disciplinary action.

### 2.6 Seminar Series

The Biological Sciences department organizes a seminar series to broaden the education of each student through presentations and interactions with leaders in various areas of biological sciences from on- and off-campus. **Attendance is strongly recommended for students seeking graduate degrees from our department**, and is explicitly required in the course description for the department's graduate seminar course (BL5012). In addition to being an important educational experience, attendance at seminars is also a professional courtesy to your colleagues and to the invited speakers. Students habitually missing departmental seminars will face appropriate actions. Information on the seminar series is available on the department website: https://www.mtu.edu/biological/department/seminar/.

Graduate students in their second year of study (second semester for M.S. students) and beyond are encouraged to participate in the departmental seminar series through a 20-30 minute talk outlining their proposed research, results to date or completed thesis/dissertation chapter work. These seminars provide an opportunity for constructive

feedback, practice in giving professional presentations, and increases awareness of the exciting research being conducted in the department.

### 2.7 Academic Integrity

The University and the Biological Sciences department expect all students to maintain the highest level of academic and scientific integrity in all aspects of their studies, from class work, to exams, to research.

A detailed booklet describing Michigan Tech's academic integrity policy and procedures, including definitions of plagiarism, cheating, fabrication, and facilitating academic dishonesty, is available in the Dean of Students office, or on the web at: http://www.admin.mtu.edu/usenate/policies/p109-1.htm. All graduate students should carefully read this policy.

Further information regarding Academic and Scientific Misconduct Procedures can be found at https://www.mtu.edu/research/administration/integrity-compliance/misconduct/.

### 2.8 International Students

Upon arrival on campus all international students must register with the Office of International Programs and Services located in room 200 of the Administration Building. All matters concerning employment practices, visa renewals, and related matters are handled through this office http://www.mtu.edu/international/students/current/f1-students/

All international students whose native language is not English and who intend to be graduate teaching assistants must take an English Language Assessment. Find details at http://www.mtu.edu/ctl/for-graduate-teaching-assistants/language-assessment/. International students may also optionally participate in the Graduate Language Assessment Support (GLAS) program to work on improving language skills and/or become more oriented to classroom culture.

In order to remain visa compliant, international students must register as full-time students (enroll in at least 9 credits each semester). Questions regarding I-20 forms and full-time status may be directed to the Graduate School.

### 2.9 Financial support: Stipend, Work Obligations, Tuition, and Insurance

General information about the Graduate assistantships at Michigan Tech can be found at https://www.mtu.edu/gradschool/financial/assistantships/. Assistantships are available only to full-time, graduate degree-seeking students, as defined by the Graduate School. Graduate Student Assistantships are a form of student employment, which includes compensation in the form of a stipend, tuition, and lab/course fees. Assistantship recipients perform research, teaching, or administrative services for the University as part

of a student's academic and professional training and development. Assistantships provide graduate students with experiences that strengthen and enhance their education.

Funding for a limited number of Graduate Teaching Assistantships (GTAs) are available in the Biological Sciences department and all funding decisions about GTAs are made by the Department Chair depending on the teaching needs. In addition, many of our faculty receive external grants that could be used to support graduate students as Graduate Research Assistants (GRAs). As indicated in each student's contract letter, continued funding is based on successful job performance and satisfactory academic progress.

All funding decisions are generally made during the spring semester. However, some funding opportunities may become available at other times during the year. Potential graduate students are encouraged to visit our web site to view the list of faculty (https://www.mtu.edu/biological/people-groups/faculty-staff/faculty/) and look for a faculty member who work in their areas of research interest. Please contact those faculty by email first before submitting a formal application to discuss the possible research projects as well as funding availability as GRAs in their labs. Potential graduate students may also contact Graduate Program Director or Department Chair (https://www.mtu.edu/biological/graduate/funding/) if they have any questions about funding or research opportunities.

***Work Obligation of Teaching Assistants***

Graduate teaching assistants (GTAs) should expect to devote up to 20 hours per week to their teaching obligations. This commitment includes office hours set aside to help individual students. Office hours should be a minimum of two hours per week and should be posted in the syllabus. Students employed by the Department of Biological Sciences as teaching assistants are reminded that they serve as representatives of the department and this must be reflected in their comportment and instruction of undergraduates. Teaching assistants are required to follow all applicable employee policies (https://www.mtu.edu/policy/policies/general/). Their immediate supervisor in their position as a teaching assistant is the laboratory course instructor of record who is generally a faculty member.

***Work Obligation of Research Assistants***

Graduate students are expected to work on their research according to the General Requirements of Credit Expectations (https://www.mtu.edu/gradschool/policies-procedures/academic/credits/).

In summary, these guidelines state: "One credit should average 3.5 hours of a student's time per week for one semester. One hour in class and 2.5 hours in individual study is a typical division. Thus, a graduate student enrolled in 9 credits of research should spend approximately 31.5 hours per week on their research.

Students supported by graduate research assistantships (GRAs) funded by external grants are expected to work 20 hours per week for the research project from which the stipend and tuition are paid. This 20 hours per week is IN ADDITION to time spend on their coursework or research credits they are enrolled in. This commitment supports full-time degree pursuit and typically amounts to a total workload of more than 40 but less than 60 hours per week.

It is the student's responsibility to perform assigned research tasks in a timely manner. It should be noted that most contracts require formal progress reports on the research performed and confidentiality at times. The immediate supervisor of research assistants is their research advisor.

GTA and GRA stipend rates are set by the Graduate School (https://www.mtu.edu/gradschool/financial/assistantships/stipends/). Programs may offer less than a full appointment, resulting in three-quarter, one-half, or one-quarter assistantship appointments at the departments' discretion. A student's workload, including teaching preparation and grading, should not exceed the level of their appointment. All assistantship recipients must make satisfactory degree progress and maintain status as full-time students who perform their duties in concurrence with work appropriate for the number of credits required by the Graduate School in coursework or research (usually 9 per semester and one during summer). Tuition charges in excess of these values will be the student's responsibility, along with student voted fees and late registration fees.

Graduate students are required to enroll in the Michigan Tech graduate student health insurance program or provide proof of comparable insurance coverage. Financially supported students receive support toward their health insurance cost. More information about health insurance and health care can be found at http://www.mtu.edu/hr/students/insurance/. Questions regarding health insurance coverage can be addressed to Human Resources or to the Biological Sciences department representative to the Graduate Student Government (https://gsg.mtu.edu/about-gsg/department-representatives/).

### 2.10 Accommodation Policies under the Americans with Disabilities Act

Michigan Tech complies with all federal and state laws and regulations regarding discrimination, including the Americans with Disability Act of 1990 (ADA) (http://www.mtu.edu/equity/access-disability/ada/). If any student has a disability and needs a reasonable accommodation for equal access to education or services at Michigan Tech, please call the Dean of Students Office, Coordinator for Student Disability Services (extension 7-1494 from a campus phone). For other concerns about discrimination, contact your advisor, department head, or the Affirmative Action Office (extension 7-3310 from a campus phone).

## 2.11 Grievance Procedure

Graduate students with concerns or complaints about the behavior of other faculty members, staffs, or students in professional situations should consult with the graduate program director and department chair to address the issue. However, questions of plagiarism should be taken to the Dean of graduate school,

These procedures are designed to protect the rights and privacy of both faculty and students and to equitably adjudicate conflicts among faculty and students. Students have the right to fair and equal treatment by faculty members, staffs, and fellow students. If the issue raised by the students cannot be resolved by the program director and chair of Biological Sciences or in the case of conflict, student should consult the dean of graduate school or the Ombudsperson on campus (https://www.mtu.edu/ombuds/) and sexual discrimination and sexual harassment issues should be taken to the University Title IX Coordinator (https://www.mtu.edu/title-ix/assault-harassment/).

## 3. ADVISORS

### 3.1 Research Advisor

Incoming students should complete the Advisor portion of the Advisor and Committee Recommendation Form as soon as an advisor is identified. Your Advisor is a member of the faculty with whom you work to propose, design, conduct and defend your thesis and dissertation. The ideas generated are not only yours but are intellectual property of many (you, your advisor and committee members, and possibly the funding source) and should be acknowledged as such.

***Student and Advisor Expectations***
Visit the Graduate School webpage on Succeeding in Graduate School to familiarize yourself with general expectations from research advisors and your expectations of research advisors, as well as where to go for help and how to use the tools available to support your success: https://www.mtu.edu/gradschool/resources-for/students/academic/succeeding/index.html. If for some reason you believe you are not getting the guidance you need, please see the Graduate Director before considering any change in advisor.

***Accelerated M.S.***
To help expedite degree completion, a student should ideally begin conducting degree research with a faculty research advisor no later than during the senior year. Each student will work with a faculty research advisor who is a member of the Department of Biological Sciences graduate faculty. The advisor's primary responsibility is to supervise the student's research and academic & professional growth, as well as to work with the student to develop an academic plan for enrolling in appropriate courses. The academic plan developed by the student and academic advisor will need written approval from the faculty advisor.

### 3.2 Coursework M.S. Advisor:

The Graduate Program Director will serve as the advisor for coursework M.S. Students will choose their courses, based on students' career goals, in consultation with the Program Director. The Graduate Program Director will keep track of students' grades and progress in the program.

### 3.3 Advisory Committee or Committee Members
Select your committee in consultation with your advisor and meet with your committee by second semester; submit Advisor and Committee Recommendation Form once your committee has been formed. Meet with committee members to: working relationship with the committee, get feedback on your research plans, ask for committee advice on coursework, and ask for future career direction/tools, etc.

Graduate student supervisory committees in the Department of Biological Sciences for dissertation or thesis (research-based) degree programs must meet the following requirements:

### 3.4 Ph.D. degree supervisory committee

The student committee will consist of the primary departmental supervisor (advisor) along with a minimum of one additional graduate faculty member from the Department of Biological Sciences, one external member* to the department, and a fourth member who may be either internal or external to the department*. The minimum committee members are four.

### 3.5 M.S. thesis-based degree supervisory committee

The student committee will consist of the immediate departmental supervisor (advisor) plus at least one additional graduate faculty member from the Department of Biological Sciences** and one member who can be external to the department*. The minimum committee members are three.

* Supervisory committee members from external institutions must be approved by the Graduate School to act on MTU graduate student supervisory committees.

**Under special circumstances, the Graduate Committee may approve an MS advisory committee consisting of the advisor and two external members if that is more appropriate.

### 3.6 Changing Advisors or Committee Members

Before initiating the process to change your graduate advisor, please visit the Graduate School's website *(https://www.mtu.edu/gradschool/resources-for/students/academic/succeeding/index.html)* and click on the tab "how can I change my Advisor". Once you have decided to change your graduate advisor, you must follow the steps listed below.

1) Meet with the Graduate Program Director to initiate the process to change advisor. If meeting with the graduate program director is not feasible or appropriate, meet with the Chair of the department. If you are in a non-departmental program, you may meet with the Chair of your administrative home department.
2) Discuss the following with the graduate program director (or Chair) and, if appropriate, the current advisor:
   - Whether additional resources within or outside the department including the Ombuds office (https://www.mtu.edu/ombuds/) could help resolve the situation.
   - The impact of the change of advisor on your degree completion schedule. Coursework, qualifying exam(s), and the research proposal examination are all factors that could be impacted with a change in advisor.
   - Your current and future funding.
   - Research already conducted. Whether this will be incorporated into the dissertation, thesis, or report, and if so, how.

- Impact on immigration status (if any). Consult International Programs and Services (IPS), if necessary.
- Record the agreement from the discussions in writing, including indications of agreement from all affected faculty advisors. The Graduate program Director will ensure that copies of all written agreements will be distributed among the student, the faculty advisor, and the student's graduate committee members and retain a copy for departmental graduate program records.

3) File an updated *Advisor and Committee Recommendation Form* for approval by the Graduate School (https://www.mtu.edu/gradschool/documents/policies-procedures/forms/advisor-committee.pdf).
4) If the student and the Graduate Program Director are unable to reach agreement on the advisor change, contact the Graduate School to determine additional steps to resolve the situation.

### 3.7 Satisfactory Degree Progress

The earned grade in each course must be a B or better to count towards degree completion. If your GPA falls below 3.0, you are automatically on probation, and funding may be affected. It is the responsibility of each student to inform their advisor as soon as they are aware of a grade of GPA shortfall.

Each student is expected to meet with his or her committee annually to update them, in a form of a presentation, on research progress. The committee will assess the following Graduate Learning Objectives (GLOs) (https://www.mtu.edu/biological/graduate/program/, under Faculty Resources) and record the results. A copy of the form will be submitted to the Graduate Program Director.

**Graduate Learning Objectives (GLOs) for Ph.D. and M.S (Thesis and Report) Students**:

- Demonstrate mastery of the subject matter (GLO1)
- Demonstrate advanced research skills (for example, design and executing a research project) (GLO2)
- Make an original and substantial contribution to the discipline (GLO3)
- Demonstrate professional skills (effective oral communication) (GLO4)
- Demonstrate professional skills (effective written communication) (GLO4)
- Practice of responsible conduct of research (GLO5)

**Graduate Learning Objectives (GLOs) for M.S. Students (Coursework):**

- Students will meet with the Graduate Program director to assess GLO1, GLO4, and GLO5.

## 4. GRADUATE DEGREES AND REQUIREMENTS

The Department of Biological Sciences offers Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degree programs. For the M.S. degree program, there exists *regular* and *accelerated* degree paths. The accelerated M.S. degree permits students with an undergraduate degree from Michigan Technological University or another approved program (https://www.mtu.edu/accelerated/masters/) to earn an Accelerated M.S. degree by completing an additional year of coursework and continuing research that began while an undergraduate student. More details of this degree program are available under the Graduate Program section of the Biology department website (https://www.mtu.edu/biological/graduate/accelerated/).

### 4.1 Graduate Coursework Requirements

It is recommended that students complete their required coursework by the end of their fourth semester (i.e., year 2) in their respective degree program, with the exception of the Accelerated M.S. degree, which must be completed in its entirety in two semesters. A list of graduate level courses (5000 and 6000 level) is available through the Graduate courses link (https://www.banweb.mtu.edu/pls/owa/studev.stu_ctg_utils.p_display_class_facbio?ps_department=BL&PS_STYLE_DEPT=biological&ps_level=5000&ps_faculty=all).

#### *4.1.1 Departmental Coursework Requirements*

*Seminar:* Graduate students in Biological Sciences are required to take 2 credits of graduate seminar unless they are in the Accelerated MS program, in which case only 1 credit is required. For all graduate students, at least one seminar credit must be BL5012. Additional campus-wide seminar courses (for example, FW5000-Distinguished Ecologist Lecture Series, Special Topics in Physiology course KIP5350) can be substituted for the second credit. Regular attendance at the Departmental Seminar Series is required of all Biological Sciences graduate students when enrolled in BL5012 for credit and is expected at all other times. In addition to being a professional courtesy, seminar attendance and participation is critical toward developing scientific communication and collaborative skills and thus integral to a comprehensive graduate education.

*The Scientific Profession:* all Biological Sciences graduate students must complete The Scientific Profession Course (**BL5025**), which also fulfills Responsible Conduct of Research requirement (below).

#### *4.1.2 University Coursework Requirements*

*Responsible Conduct of Research (RCR)* is required for all graduate students (https://www.mtu.edu/research/integrity/responsible-conduct/training/). RCR involves being aware of and putting into practice the established professional norms and ethical principles of research. Intellectual honesty and responsible conduct are necessary for

excellence in research and for maintenance of public trust. RCR is an essential component of your graduate training.

Michigan Tech has developed several training programs to support graduate students and postdoctoral fellows in their professional development and fulfill obligations to sponsors of our research programs.

All graduate students must complete basic responsible conduct of research training within their first two semesters at Michigan Tech, or a registration hold will be placed on the student's account. Students may not graduate or enter research only mode if the training is not complete.

To fulfill this requirement, students may:

- Attend the Graduate School's on-campus orientation program (held before the start of each semester), or
- Complete the basic online CITI training course.
- Alternatively, students can fulfil the Responsible Code of Research requirement by enrolling and completing The Scientific Profession Course (BL5025).

### 4.2 Graduate Degrees in Biological Sciences

#### 4.2.1 Regular Master of Science in Biological Sciences Options and Timeline

There are three M.S. options within the regular M.S. degree program (See above for information on the Accelerated M.S. option):

- Thesis M.S. (Research)
- Coursework M.S.
- Report-based M.S.

The specific requirements of these options are outlined below and also available through the Biological Sciences Graduate program website (https://www.mtu.edu/biological/graduate/bio-sci/). Students selecting one of these three options within the regular M.S. degree program are expected to complete their respective degree requirements within approximately 2 years.

**Thesis (Research) option**

This option requires a research thesis prepared under the supervision of a departmental faculty advisor. The thesis describes a research investigation and its results. The scope of the research topic for the thesis should be defined in such a way that a full-time student could complete the requirements for a master's degree in twelve months or three semesters following the completion of coursework by regularly scheduling graduate research credits. Visit the Graduate School website (https://www.mtu.edu/gradschool/policies-procedures/timelines/thesis/) for a 2-year

degree timeline. Students should consult current instructions for thesis formatting and guidelines available through the Graduate School website (https://www.mtu.edu/gradschool/policies-procedures/theses-dissertations/formatting/).

*Credit Requirements*: A minimum of 30 credits are required for the completion of the M.S., at least 20 of which must be earned in coursework other than research credits.

The minimum requirements are as follows:

| | |
|---|---|
| **Coursework (minimum)** | 20 credits |
| **Thesis research** | 6–10 credits |
| Total (minimum) | 30 credits |
| **Distribution of coursework credit** | |
| 5000–6000 level (minimum) | 12 credits |
| 3000–4000 level (maximum) | 12 credits |

*Research Only Mode*: Students who have completed certain requirements may register for research credits at a reduced tuition rate and register as research mode. For M.S. students, all required courses must be completed in addition to the required number of credits for the degree (30).

*Oral Examination of the Thesis (Defense):* The completion of the M.S. includes a public presentation and oral examination by the student's committee. **At least two weeks** prior to the oral examination, students must:

- Schedule their examination in MyMichiganTech
- Submit a draft thesis to the Graduate School
- Distribute the thesis to the examining committee

A Degree completion form must be approved before a defense is scheduled. Students must also report the results of the oral examination on Report on Final Oral Examination Form and submit a final thesis to the Graduate School prior to completing their degrees.

*Post defense*:

- Make all required editorial and technical corrections received from the advisor and examining committee. Also make all required formatting corrections from Graduate School. Submit the Approval of a dissertation, thesis, or report form to the Graduate School.
- Within one week of submitting the Approval of a dissertation, thesis, or report form and by the deadline for the semester you wish to complete your degree, Submit thesis to Digital Commons and also to ProQuest.
- Complete Exit Survey.
- After thesis is approved by Graduate School, pay fees (if needed)
- Within two weeks after the end of the semester, watch your e-mail or MyMichiganTech for notification that your degree is awarded.

- Two months after the end of the semester, watch your e-mail for notification that your diploma is ready.
- One month after Degree is awarded, check Digital Commons to see your published thesis.

## Report Option

This option requires a report describing the results of an independent study. The scope of the research topic should be defined in such a way that a full-time student could complete the requirements for a master's degree in twelve months or three semesters following the completion of coursework by regularly scheduling graduate research credits. Visit the Graduate School website (https://www.mtu.edu/gradschool/policies-procedures/timelines/report/) for a 2-year degree timeline. A report must be prepared and formatted following the current procedures (https://www.mtu.edu/gradschool/policies-procedures/reports/formatting/).

*Credit Requirements*: A minimum of 30 credits are required for the completion of the M.S., at least 20 of which must be earned in coursework other than research credits.

The minimum requirements are as follows:

| | |
|---|---|
| **Coursework** | 24 credits |
| **Report** | 2–6 credits |
| Total (minimum) | 30 credits |
| **Distribution of coursework credit** | |
| 5000–6000 series (minimum) | 12 credits |
| 3000–4000 level (maximum) | 12 credits |

*Oral Examination of the Report (Defense):* The completion of the M.S. includes a public presentation and oral examination by the student's committee. **At least two weeks** prior to the oral examination, students must:

- Schedule their examination in MyMichiganTech
- Submit a draft thesis to the Graduate School
- Distribute the thesis to the examining committee

A Degree completion form must be approved before a defense is scheduled. Students must also report the results of the oral examination on Report on Final Oral Examination Form and submit a final thesis to the Graduate School prior to completing their degrees.

*Post defense*:

- Make all required editorial and technical corrections received from the advisor and examining committee. Also make all required formatting corrections from Graduate

School. Submit the Approval of a dissertation, thesis, or report form to the Graduate School.
- Within one week of submitting the Approval of a dissertation, thesis, or report form and by the deadline for the semester you wish to complete your degree, Submit thesis to Digital Commons and also to ProQuest.
- Complete Exit Survey.
- After thesis is approved by Graduate School, pay fees (if needed)
- Within two weeks after the end of the semester, watch your e-mail or MyMichiganTech for notification that your degree is awarded.
- Two months after the end of the semester, watch your e-mail for notification that your diploma is ready.
- One month after Degree is awarded, check Digital Commons to see your published thesis.

### *4.2.2 Coursework M.S.*

This option allows students to take only courses. Students are expected to take a total of 30 credits of courses. Visit the Graduate School Website for a 2-year degree timeline of items required for the coursework M.S. degree option. The proceeding table provides the credit requirements and allowances for this option.

The minimum requirements are as follows:

| | |
|---|---|
| **Coursework** | 30 credits |
| Total (minimum) | 30 credits |
| **Distribution of coursework credit** | |
| 5000–6000 series (minimum) | 18 credits |
| 3000–4000 level (maximum) | 12 credits |

*Completion of the Degree:*
- During finals week of planned degree completion, submit Verification of final degree requirements form
- Complete the Exit Survey
- Within two weeks after the end of the semester, watch your e-mail or MyMichiganTech for notification that your degree has been awarded.
- Two months after the end of the semester, watch your e-mail for notification that your diploma is ready.

### *4.2.3 Doctor of Philosophy in Biological Sciences*

*Ph.D. Timeline and General Expectations*
Students choosing to pursue a Ph.D. in the Biological Sciences Department should anticipate a timeline of between 4 – 6 years to complete the necessary degree requirements. Doctoral students will be required to develop and conduct original research,

pass both written and oral qualifying examinations to demonstrate competency in the discipline, and complete an original written dissertation that is publicly defended.

Students who enter the PhD program and already hold an M.S. degree are required to take 30 coursework and research credits (determined by the advisor and committee? ) in addition to completing the necessary Ph.D. degree qualifying and research proposal examinations. Students who enter the PhD program with a B.S. degree (i.e. no M.S.) are required to take 60 total coursework and research credits; they also need to fulfill the M.S. requirements of 12 graduate credits of 5000 or above. Visit the Graduate School Website (https://www.mtu.edu/gradschool/policies-procedures/requirements/phd/) for an expected PhD degree timeline.

All students enrolled in the Ph.D. program are expected to have completed their **qualifying exams** (written and oral) and their **Ph.D. proposal defense** by their 6th semester (year 3) in the Ph.D. program.

*Qualifying exam*
The advisor and committee will administer the qualifying examination. The examination consists of written and oral components, each designed to test the student's breadth and depth of fundamental knowledge in Biological Sciences, with emphasis on their potential area of research. Each of the four-committee members is responsible for providing individual written exam questions (based on courses that the student has taken or on the student's research area); each committee member grades his/her option of the exam and notifies the student's PI/student of the outcome. The student is allowed to retake, one more time, the written exam (or parts of the exam) in case of unsatisfactory performance. After successfully completing the written exam, the student undergoes an oral examination by the committee. The oral exam is also administered by the Ph.D. student's committee members. Outcomes from the qualifying exam are documented in the PhD Qualifying Exam/Proposal Exam (D4 Form) form and submitted to the Graduate Program Director for signature, and to the Departmental Administrator for entry into Banner. Furthermore, the committee is required to fulfill the GLO form for the PhD qualifying exam and submit it to the Graduate Program Director for assessment of Graduate Learning Objectives (see section III).

*Research proposal and defense*
Students are expected to write (in consultation with their supervisors) and defend a proposal of their research. The proposal should include project objectives, background and significance, testable hypotheses, detailed methods, and an anticipated timeline for completing the research. Students should send a copy of the proposal to their committee at least 2 weeks before a research proposal defense date. In coordination with their examining committee, students will schedule a proposal defense date, prepare a presentation, and defend their proposal in front of their committee. Students progress to candidacy status only once they pass their Qualifying Exam (above) and PhD proposal defense. Outcomes from the qualifying exam are documented in the PhD Qualifying Exam/Proposal Exam (D4 Form) form and submitted to the Graduate Program Director for signature, and to the Departmental Administrator for entry into Banner. Furthermore,

the committee is required to fulfill the GLO form for the PhD qualifying exam and submit it to the Graduate Program Director for assessment of Graduate Learning Objectives (see section III).

*Entering Candidacy*
Students must apply to enter candidacy according to the graduate school guidelines. https://www.mtu.edu/gradschool/policies-procedures/academic/candidacy/ The semester before you intend to enter candidacy and research mode, submit Degree schedule to Graduate School; the designated number of coursework credits must be completed before you enter research mode. Adhere to the Graduate School deadlines for applying for candidacy.

*Research only mode*
Students who have entered candidacy and met credit requirements may register for research credits at a reduced tuition rate and register as research mode. PhD students are eligible for research mode at the start of the first semester following successful completion of their qualifying and research proposal examinations, as well as following the completion of the required number of credits for their degree as applicable.

*Doctoral dissertation and defense*
The completion of the Ph.D. includes a public presentation and oral examination by the student's committee. The dissertation must be prepared and formatted following the current procedures (https://www.mtu.edu/gradschool/policies-procedures/theses-dissertations/formatting/). The defense schedule must be agreed on with the advisor and committee. Follow the guidelines and timelines laid out by the Graduate School. A few key points are:

**At least two weeks** prior to the oral examination, students must

- Schedule their examination using via MyMichiganTech
- Submit a draft dissertation to the Graduate School via Canvas. The Graduate School will provide formatting feedback.
- Distribute the dissertation to the examining committee
- Reserve a location for your defense

**After the defense:**

- Students must report the results of the oral examination on Report on Final Oral Examination Form.
- Make any technical corrections required by the committee and advisor.
- Make any formatting corrections required by the Graduate School.
- Submit a final thesis to Digital Commons. Pay any fees, if required.
- Complete the Survey of Earned Doctorates.
- Complete Exit Survey.

## 5. PROFESSIONAL DEVELOPMENT OPPORTUNITIES AND SUPPORT SERVICES

### 5.1 Individual development plan (IDP)

Graduate School has developed an IDP to help you plan, in advance, your future career goals (short- and long-term), while you pursue your education. Link to IDP: https://www.mtu.edu/gradschool/resources-for/students/professional/idp/. You are advised to use it with your advisor to help you prepare for your career goals.

### 5.2 Graduate Student Government

The website of the Graduate Student Government lists resources and activities for graduate students, both social and academic. It also contains a helpful FAQ section in case you have problems: http://gsg.mtu.edu/

### 5.3 Support Services

*Graduate Student Professional Development Seminars*. The following links provide current schedule of events and archived seminars for professional development:https://www.mtu.edu/gradschool/resources-for/students/academic/seminar/.

*Thesis, Dissertation, Report Guide and Seminars*. Graduate School Newsblog provides help with these activities: https://blogs.mtu.edu/gradschool/.

*Writing and Technology Resources at Walker*
The Michigan Tech Multiliteracies Center (MTMC) coaches can help with anything in the realm of multiliteracies. This can include resumes, drafting emails, and design or production of multimodal projects. Dissertation boot camps are also offered as writing-focused sessions, where graduate students can set writing goals to make progress in long projects. MTMC is located in Walker 107. In addition, MTMC offers online appointments, so that graduate students can find writing support anytime, anywhere.

*The J.R. Van Pelt and Opie Library*. Online resources offered by MTU library can be found at: https://www.mtu.edu/library/

Literature items that the library cannot offer can be requested through the Inter Library Loan website and usually arrive within a day or two: https://www.mtu.edu/library/borrowing/other-libraries/.

*General Resources*. If you are a current student and have questions about academic resources, planning for your future, or making Houghton your home, check out the Graduate School website at https://www.mtu.edu/gradschool/resources-for/students/ or email gradschool@mtu.edu.

## 5.4 RUBRICS AND EVALUATION AND FEEDBACK FORMS

Graduate Learning Objective Forms are required to be filed for each degree milestone (annual committee meetings [Ph.D.], qualifying exams [Ph.D.], Proposal defenses [Ph.D.], and degree completion [all degrees]). These forms are meant to provide feedback to students. The scores on the forms can be interpreted by referring to the rubrics attached below (see section III; also, the form is available at https://www.mtu.edu/biological/graduate/program/, under Faculty Resources).

## A. Rubric for Ph.D. Evaluations

| Graduate Learning Objective | What is being assessed | Unacceptable | Marginal / Needs Improvement | Satisfactory | Excellent |
|---|---|---|---|---|---|
| 1. Demonstrates mastery of the subject matter | Synthesizes existing knowledge. | Does not understand basic concepts or conventions. Misinterprets or misuses sources. | Displays a basic understanding of the field. | Displays a solid understanding of the field. Adequate exploration of interesting issues and connections. | Demonstrates Thorough mastery as well as creativity in drawing on multiple sources. Synthetic and interdisciplinary. Demonstrates a deep understanding of relevant literatures |
| 2. Demonstrates advanced research skills | Mastered application of existing methodologies and techniques. | Misapplies or uses non-standard techniques without adequate rationalization. | Applies standard techniques. Does not recognize limitations of data / techniques were applicable. | Uses appropriate, theory, methods and techniques. Appropriately explains limitations of data / techniques were applicable. | Suggests and utilizes improvements to standard methods and techniques. Limitations are thoroughly and competently discussed. |
| | Critically analyzes and evaluate their own findings and those of others. | Does not recognize improbable results. | Relies on others to suggest data that are relevant to solving a problem. Literature review is adequate but not critical. | Identifies weaknesses in own work but discussion is not comprehensive. | Provides critical evaluation of previous works. Identifies and corrects weaknesses or flaws in referenced work. Identifies and discusses shortcomings in own work. |
| 3. Make an original and substantial contribution to the discipline | Think originally & independently to develop concepts & methodologies; identify new opportunities. | No independent research. Question or problem is trivial, weak, unoriginal, or previously solved. | Demonstrates competence but is not very original or significant. Displays little creativity, imagination, or insight. | Argument is strong, comprehensive, and coherent. Has some original ideas, insights, and observations. | Has a compelling question or problem. Project is original, ambitious, creative, and thoughtful. Asks or addresses new / important questions. |
| 4. Demonstrates professional skills | Displays effective written communication skills. | Writing is disorganized, has frequent spelling and grammatical errors. Illustrations poorly selected or illegible. | Writing is adequate. Structure and organization are weak, but sufficient. Illustrations legible, technically correct, and appropriate. | Well written and organized. | Concise, elegant, engaging. Technical content and graphic design of illustrations well planned / executed. |
| | …Oral communication skills. | Disorganized or unable to articulate an argument. Does not grasp intent of questions. | Clear and coherent, partially understands or addresses questions, responses may have some gaps in logic or inconsistencies. | Clear & coherent. Engages appropriate audiences. Grasps intent. | Compelling, persuasive, and accessible to multiple audiences. Articulately addresses questions. |

| | | | | | |
|---|---|---|---|---|---|
| 5. Practice responsible conduct of research (field-appropriate) | Understand and abide by the principles of Responsible Conduct of Research (RCR). | Little knowledge and understanding of RCR and/or displays willingness to violate principles of RCR. | knowledge and Partial but inadequate knowledge and understanding of principles of RCR and/or displays tendency to violate principles of RCR unintentionally or through negligence | Adequate knowledge and understanding of principles of RCR and abides by principles of RCR. | Thorough knowledge and understanding of principles of RCR and strives to promote RCR in his/her own research and the research of others. |

## B. Rubric for M.S. Thesis/Report Evaluations

| Graduate Learning Objective | What is being assessed | Deficient | Marginal / Needs Improvement | Satisfactory | Excellent |
|---|---|---|---|---|---|
| 1. Demonstrates proficiency of the subject matter | Is proficient in existing knowledge. | Does not understand basic concepts or conventions. Misinterprets or misuses sources. | Displays a basic understanding of the field. | Displays an understanding of the field. Adequate exploration of interesting issues and connections. | Demonstrates proficiency as well as creativity indrawing on multiple sources. Synthetic and interdisciplinary. |
| 2. Demonstrates research skills | Applied existing methodologies and techniques. | Misapplies or uses non-standard techniques without adequate rationalization. | Applies standard techniques. Does not recognize limitations of data / techniques where applicable. | Uses appropriate, techniques.Appropriately explains limitations of data / techniques where applicable. | Suggests and utilizes improvements to standard techniques. Limitations are competently discussed. |
| | Critically analyzes and evaluate their own findings and those of others. | Does not recognize improbable results. | Relies on others to suggest data that are relevant to solving a problem. Literature review is adequate but not critical. | Identifies weaknesses in own work but discussion is not comprehensive. | Provides critical evaluation of previous works. Identifies and corrects weaknesses or flaws in referenced work. Identifies and discusses shortcomings in own work. |
| 3. Make a contribution to the discipline (thesis only) | Thinks to develop concepts & methodologies; identify opportunities. | Question or problem is trivial, weak, or previously solved. | Demonstrates competence but is not much of a contribution. Displays little insight. | Argument is present with reasonable structure. Is connected to observations. | Argument is strong, comprehensive, and coherent. Has some original ideas, insights, and observations. |
| 4. Demonstrates professional skills | Displays effective written communication skills. | Writing is disorganized, hasfrequent spelling and grammatical errors. Illustrations poorly selected or illegible. | Writing is adequate.Structure and organization are weak, but sufficient. Illustrations legible, technically correct, andappropriate. | Well written and organized. | Concise, elegant, engaging. Technical content and graphic design of illustrations well-planned / executed. |
| | Oral communication skills. | Disorganized or unable to articulate an argument. Does not grasp intent of questions. | Clear and coherent, partially understands or addresses questions, responses may have some gaps in logic or inconsistencies. Partial but inadequate. | Clear & coherent. Engages appropriate audiences. Grasps intent. | Compelling, persuasive, and accessible to multiple audiences. Articulately addresses questions. |

| | | | | | |
|---|---|---|---|---|---|
| 5. Practice responsible conduct of research (field-appropriate) | Understand and abide by the principles of Responsible Conduct of Research (RCR). | Little knowledge and understanding of RCR and/or displays willingness to violate principles of RCR. | knowledge and understanding of principles of RCR and/or displays tendency to violate principles of RCR unintentionally or through negligence. | Adequate knowledge and understanding of principles of RCR and abides by principles of RCR. | Thorough knowledge and understanding of principles of RCR and strives to promote RCR in his/her own research and the research of others. |

## C. Rubric for Coursework M.S. Evaulations

| Graduate Learning Objective | What is being assessed | Deficient | Marginal / Needs Improvement | Satisfactory | Excellent |
|---|---|---|---|---|---|
| 1. Demonstrates proficiency of the subject matter | Is proficient in existing knowledge. | Does not understand basic concepts or conventions. Misinterprets or misuses sources. | Displays a basic understanding of the field. | Displays an understanding of the field. Adequate exploration of interesting issues and connections. | Demonstrates proficiency as well as creativity in drawing on multiple sources. Synthetic and interdisciplinary. |
| 2. Knowledge of core competencies in selected, complementing areas of the discipline. | Is proficient in core competencies. | Does not understand basic concepts of the core competencies. | Displays a basic understanding of the core competencies. | Displays an understanding of the core competencies. | Demonstrates proficiency in the core competencies. |
| 3. Demonstrates professional skills | Displays effective written communication skills. | Writing is disorganized, has frequent spelling and grammatical errors. Illustrations poorly selected or illegible. | Writing is adequate. Structure and organization are weak, but sufficient. Illustrations legible, technically correct, and Appropriate. | Well written and organized. | Concise, elegant, engaging. Technical content and graphic design of illustrations well planned / executed. |
| | …oral communication skills. | Disorganized or unable to articulate an argument. Does not grasp intent of questions. | Clear and coherent, partially understands or addresses questions, responses may have some gaps in logic or inconsistencies through negligence. | Clear & coherent. Engages appropriate audiences. Grasps intent. | Compelling, persuasive, and accessible to multiple audiences. Articulately addresses questions. |
| 4. Practice responsible conduct in the discipline | Understand and abide by the principles of Responsible Conduct within the discipline. | Little knowledge and understanding of academic integrity and/or displays willingness to violate principles of academic integrity. | Partial but inadequate knowledge and understanding of academic integrity and/or displays tendency to violate principles of academic integrity unintentionally or through negligence. | Adequate knowledge and understanding of principles of academic integrity and abides by principles of academic integrity. | Thorough knowledge and understanding of principles of academic integrity and strives to promote academic integrity. |