

Michigan State University
College of Natural Science

Biomedical Laboratory Diagnostics
Graduate Student Handbook

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This handbook is intended to be used in conjunction with the official sources of information on graduate study published by Michigan State University's Graduate School and is, therefore, not a comprehensive document.

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I. Program Overview

Michigan State University has been educating medical laboratory scientists since 1926. Throughout the years, MSU has been a leader in the advancement of biomedical laboratory diagnostics by teaching at both the undergraduate and graduate levels and by participating in research activities. Consistent with MSU’s land grant philosophy and the mission of the College of Natural Science, the Biomedical Laboratory Diagnostics (BLD) faculty continue to carry out our commitment to our profession through our two Master of Science degree programs and our Master of Arts degree program. These programs are intended to enhance and expand the professional skills of medical laboratory professionals by presenting new technologies and advanced concepts in laboratory medicine. We emphasize a multi-disciplinary approach and encourage the innovative thinking that is necessary for professionals navigating the rapidly changing medical landscape.

Our program draws students, mostly individuals already working in the medical laboratory, from all over the country. The diversity of their cultural and professional backgrounds gives our students exposure to a depth and breadth of viewpoints that benefit them and the profession as a whole. We are committed to advancing the education of working professionals, and so we make our master’s degree programs available online.

The following is an outline of the typical progression through one of our M.S. programs:

Admission
Begin Coursework
Within completion of 7 credit hours – determine focus of study and track (plan A or B)
Within completion of 12 credit hours – selection of major professor; selection of guidance committee (major professor + 1 BLD faculty + 1 non-BLD faculty)
Submit thesis proposal to major professor, edit as needed
Submit revised thesis proposal and program of study to committee for approval 15 days prior to meeting where you will give a short presentation and discuss your proposal
Following acceptance of proposal and program and IRB approval (if needed), perform research/data collection (enroll in research credits)
Write thesis/report and submit to major professor, edit as needed
Submit thesis/report to guidance committee 15 days prior to defense
Defense of thesis/project presentation
Perform required edits and submit final document to major professor
Graduate

Major differences between the outline above and a student's progression through our M.A. degree program are as follows:

A guidance committee, proposal, and defense are not required. Students work with their major professor on their capstone project, which is an extensive literature review (min. 15-20 pages, 20-30 references) on a topic agreed upon by both the student and the major professor. The topic is generally a new clinical analyte. The final capstone paper is reviewed by the major professor and a BLD faculty member. Students present their capstone project in a 15-minute pecha kucha presentation reviewed by BLD faculty. Edits may be required as part of the process.

II. Master's Degree Program/Plan Options

There are three master's degree in the Biomedical Laboratory Diagnostics Program: Master of Science in Clinical Laboratory Science, Master of Science in Biomedical Laboratory Operations, and Master of Arts in Biomedical Laboratory Science.

A. Admission Requirements

In addition to meeting the requirements of the university and the College of Natural Science, students must meet the following requirements for regular admission status.

Master of Science in Clinical Laboratory Science

Student must complete a Bachelor of Science degree with a minimum grade point average of 3.0. Applicants must submit official transcripts, three letters of recommendation, a letter of intent or purpose statement, a brief resume, and the General GRE (Graduate Record Exam) score. For applicants in which English is not their first language, the Test of English as a Foreign Language (TOEFL) must be taken. Certification as a medical laboratory scientist (MLS or equivalent) is preferred but not required. Scholastic record, experience, personal qualifications and career goals are taken into consideration to determine the applicant's acceptability.

Master of Science in Biomedical Laboratory Operations

Student must complete a Bachelor of Science degree with a minimum grade point average of 3.0. Applicants must submit official transcripts, three letters of recommendation, a letter of intent or purpose statement, a brief resume, and the General GRE (Graduate Record Exam) score. A minimum of two years of experience in a clinical laboratory setting is required. Applicants with certification in a clinical laboratory profession may apply their clinical education or internship experience towards the two-year experience requirement. For applicants in which English is not their first language, the Test of English as a Foreign Language (TOEFL) must be taken. Certification as a medical laboratory scientist (MLS or equivalent) is preferred but not required. Scholastic record, experience, personal qualifications and career goals are taken into consideration to determine the applicant's acceptability.

Master of Arts in Biomedical Laboratory Science

Student must complete a Bachelor of Science degree with a minimum grade point average of 3.0. Applicants must submit official transcripts, three letters of recommendation, a letter of intent or purpose statement, a brief resume, and the General GRE (Graduate Record Exam) score. The GRE exam score can be waived in lieu of a professional credential or a waiver request to the Biomedical Laboratory Diagnostics Program Admissions Committee. For applicants in

which English is not their first language, the Test of English as a Foreign Language (TOEFL) must be taken. Certification as a medical laboratory scientist (MLS or equivalent) is preferred but not required. Scholastic record, experience, personal qualifications and career goals are taken into consideration to determine the applicant's acceptability.

B. Admission Status

There are three different admission status levels:

Regular admission

Students who meet all admission criteria and whose intent is compatible with the resources and mission of the Biomedical Laboratory Diagnostics Program will be granted regular admission status.

Provisional admission

Students of promise who have a minor deficiency may be accepted provisionally. The provisional status is intended to be temporary. Students are not expected to remain on provisional admission for more than one year. Conversion to regular status occurs when specific written conditions have been met. These written conditions are established by the Director of the Graduate program as part of the admissions process. Failure to acquire regular admission status within the first year (or designated time frame) of study may result in dismissal from the program.

Readmission

Any student who has not been in attendance at Michigan State University for three or more consecutive semesters including summer must apply for readmission. Application must be filed with the registrar one month prior to the first day of registration of the semester in which he/she expects to resume study. Readmission is subject to the approval of the BLD Program's Graduate Committee or graduate director and program director if no committee was established.

C. Program Descriptions

Master of Science in Clinical Laboratory Science

This degree emphasizes the multi-disciplinary nature of the clinical laboratory and requires research in the clinical laboratory. This degree can be customized to your interests and research project. There are two tracks in the M.S. CLS degree: Plan A (with thesis) or Plan B (without thesis). Plan A emphasizes the production of data through scientific research and requires a written thesis and oral defense of the project. The second track, referred to as Plan B, requires completion of a non-data producing project. Similar to Plan A, this track requires a written summary and an oral presentation of the project. Both tracks require a written thesis proposal and proposal defense, the purpose of which is to assess the depth of the student's understanding of the background of their chosen research or projects and to clearly define

objectives for the completion of the project. Both plans also require prescribed course work discussed below under degree requirements. This includes a core set of courses common to both tracks and additional courses that augment the theme of the thesis work or project. Oversight of both Plan A research or Plan B projects is provided by a mentor and a guidance committee, composed of either resident or adjunct faculty members. Guidance committee members, including those from outside Michigan State University, must be approved by the graduate school. The minimum number of credit hours required for the M.S. degree is 30 semester hours beyond the bachelor's degree.

Master of Science in Biomedical Laboratory Operation

This degree program is designed for individuals with previous clinical laboratory experience who seek career advancement as managers, administrators, researchers, entrepreneurs, and policymakers. The core of this program has three major components: science, management, and practice. The science component focuses on post baccalaureate courses planned to develop a high level of competence within the student's chosen biomedical laboratory discipline. The management component provides a solid foundation in general business including resource management, communication skills, organizational structures, decision making, and essential aspects of working in a regulated industry. The degree is intended to expose students to real-life problems with the expectation of generating practical, realistic solutions.

Master of Arts in Biomedical Laboratory Science

The program is designed to enhance the student's knowledge base and broaden their perspectives across the profession. To this end, students complete an extensive literature review on a pertinent topic agreed upon with the major advisor for degree completion. While there is no research or thesis work involved, the knowledge gained during the completion of this capstone project prepares students for practical projects such as new test development and methodology choice.

Certificate Programs

We also offer certificates in Immunodiagnostics and Clinical Flow Cytometry, Advanced Flow Cytometry, Clinical Mass Spectrometry, Molecular Laboratory Diagnostics, Managing Biomedical Laboratory Operations, and Transfusion Service Management. Further information about BLD certificate programs can be found at <https://bld.natsci.msu.edu/academics/certificate-programs/>.

III. Degree Requirements

Please find the requirements for each of our three degrees below. **Checklists are provided in Appendix 1 for each degree path. Please utilize the appropriate checklist to track your progress through the program.**

A. Degree Requirements for Master of Science in Clinical Laboratory Science

There are two tracks for the Master of Science degree in Clinical Laboratory Sciences, Plan A (with thesis) or Plan B (without thesis). The student's program of study must be approved by the student's academic advisor. A total of 30 credits is required for degree completion.

For both Plan A and Plan B, the student must be registered during the semester in which the examination or evaluation is administered. The final oral examination, which covers both course work and research, is administered by the student's guidance committee.

Requirements for both Plan A and Plan B:

1. All of the following courses:
 - BLD 801 Biomedical Laboratory Diagnostics Seminar (2 credits)
 - BLD 805 Communication in the Sciences (2 credits)
 - BLD 811 Fundamentals of Scientific Research (1 credit)
2. At least 4 credits of 800-level Biomedical Laboratory Diagnostics courses approved by the student's academic advisor
3. One course in biochemistry of cell biology approved by committee
4. One 400-level or above course in statistics approved by committee
5. Not more than 9 credits in 400-level courses which must be approved by the guidance committee
6. Pass a final oral examination

Additional requirements for Plan A

BLD 899 Master's Thesis Research (7 credits)

Additional requirements for Plan B

BLD 890 Selected Problems in Clinical Laboratory Science (3 credits)

B. Degree Requirements for Master of Science in Biomedical Laboratory Operations

The student must complete 31 credits. The specific program of study includes competence in statistics and completion of a project in Biomedical Laboratory Operations as determined in consultation with the student's guidance committee. The final oral examination, which covers both course work and research, is administered by the student's guidance committee.

Requirements:

1. All of the following courses:
 - BLD 801 Biomedical Laboratory Diagnostics Seminar (1 credit)
 - BLD 805 Communication in the Sciences (2 credits)
 - BLD 811 Fundamentals of Scientific Research (1 credit)
 - BLD 842 Managing Biomedical Laboratory Operations (2 credits)
 - BLD 844 Topics in Biomedical Laboratory Operations (1 credit)
 - BLD 846 Decision Processes for Biomedical Laboratory Operations (2 credits)
2. Complete a minimum of 6 credits in courses with a business or management focus or electives as approved by the guidance committee.
3. Complete a minimum of 13 credits in courses with a science focus
4. Complete a minimum of 3 credits of BLD 895 Projects in Biomedical Laboratory Operation. The project will be determined in consultation with the student's guidance committee
5. Pass a final oral examination

C. Degree Requirements for Master of Arts in Biomedical Laboratory Science

Requirements:

1. All of the following courses (9 or 10 credits)
 - BLD 801 Biomedical Laboratory Diagnostics Seminar (2 credits)
 - BLD 805 Communication in the Sciences (2 credits)

- BLD 811 Fundamentals of Scientific Research (1 credit)
- BLD 890 Selected Problems in Clinical Laboratory Science (2 or 3 credits)
- PHM 830 Experimental Design and Analysis (3 credits)
- 2. Complete at least 14 credits from the following courses:
 - BLD 815 Cell Biology in Health and Disease (2 credits)
 - BLD 816 Cell Biology in Health and Disease (2 credits)
 - BLD 821 Advanced Clinical Laboratory Practice (1 credit)
 - BLD 830 Concepts in Molecular Biology (2 credits)
 - BLD 831 Clinical Applications of Molecular Biology (2 credits)
 - BLD 832 Molecular Pathology Laboratory (2 credits)
 - BLD 835 Hemostasis, Thrombosis and Effective Resource Management (3 credits)
 - BLD 836 Adverse Transfusion Outcomes: Detection, Monitoring, and Prevention (2 credits)
 - BLD 837 Transfusion Service Operations and Management (1 credit)
 - BLD 838 Clinical Context of Blood Product Management (1 credit)
 - BLD 842 Managing Biomedical Laboratory Operations (2 credits)
 - BLD 844 Topics in Biomedical Laboratory Operations (1 credit)
 - BLD 846 Decision Processes for Biomedical Laboratory Operations (2 credits)
 - BLD 850 Concepts in Immunodiagnosics (2 credits)
 - BLD 851 Clinical Application of Immunodiagnostic Principles (2 credits)
 - BLD 852 Immunodiagnosics Laboratory (2 credits)
 - BLD 853 Advanced Flow Cytometry (2 credits)
 - BLD 861 Emerging Infections, Emerging Technology (2 credits)
 - BLD 870 Clinical Mass Spectrometry Theory (2 credits)
 - BLD 871 Applied Clinical Mass Spectrometry (2 credits)
 - BLD 872 Clinical Mass Spectrometry Laboratory (2 credits)
- 3. Complete 5 credits of electives as approved by the major professor
- 4. Successfully complete a capstone project.

The completion of a capstone project is reviewed by the major professor and a BLD faculty member. In addition, the student is required to present a 15-minute presentation, reviewed by the major professor and another BLD faculty member.

IV. Transfer Credits

A maximum of 9 transferred credits can be applied towards degree requirements. Transferred credit hours include those acquired through Lifelong Education enrollment status or from other institutions. Acceptance of non-MSU credits will be determined by the Graduate Committee of the BLD program.

V. Selection of Major Advisor

The primary role of the major professor/thesis advisor is to provide guidance in research for Plan A or in completion of the project for Plan B or in completion of the capstone project for the M.A. degree. It is expected that the student will choose a major professor during the completion of their first 12 credits of coursework. Until the process of choosing a major advisor is complete, students will be advised by the Graduate Program Director and/or the Graduate Programs Coordinator. They will also aid the student in choosing a major professor.

The major professor must be a regular faculty member of Michigan State University. As defined in the Faculty Handbook, “ The ‘regular faculty’ of Michigan State University shall consist of all persons appointed under the rules of tenure and holding the rank of professor, associate professor, assistant professor, or instructor, and persons appointed as librarians. In addition, the principal administrative officer of each major educational and research unit of the university shall be a member of the ‘regular faculty.’ ”

An exception may be granted by the Dean of the Graduate School to allow a non–tenure stream faculty member or an Academic Specialist to serve on a master's student's committee as one of the two required faculty members or as the chairperson of a master's student's guidance committee. Procedures for obtaining this approval can be found here: <https://grad.msu.edu/non-regular-faculty-committees>. BLD master’s committees also include one non-MSU faculty member. The procedure for approval for this faculty member is the same as those for non-tenure stream MSU faculty.

With the approval of the chairperson or director of the department or school, an exception may be granted to allow an Emeritus faculty member to serve as one of the two required faculty members on a master's student's committee; in addition, an Emeritus faculty member may continue to serve as a chairperson of a committee. In the event of significant discrepancy between the two assessments, the unit chair or coordinator would arrange for a third assessment to break the tie. The content and format of the examination or evaluation are specified by the department or school and college.

Once the student has identified a prospective major professor, the selection must be submitted for approval to the Director of Graduate Studies. This is done to ensure the student has an understanding of the commitment that is being made, the mentoring relationship with the major professor, and the expectations of the graduate program.

As the student’s mentor, the major professor assumes many responsibilities. These responsibilities include, but are not limited to:

- Ensuring the student receives information on requirements and policies of the graduate program
- Advising students on developing a curricular plan, including appropriate course work and research or creative activity
- Informing students of available resources and opportunities related to the curricular plan.
- Advising students on the selection of thesis or project focus with a realistic perspective for successful completion within an appropriate time frame
- Advising students on the formation of a guidance committee
- Providing training and oversight of creative activities so that technical and theoretical aspects reflect an appropriate degree of academic rigor and also emphasize professional integrity
- Helping students in the development of professional communication skills such as those used in presentations and writing both scientific and non-scientific documents
- Facilitating career development by promoting activities in professional societies, and assisting in the preparation of application material for career advancement or job placement

If circumstances occur where the major professor is no longer physically available and the student has not completed degree requirements, the Director of the Graduate Program must make a

reasonable effort to provide the student with the resources and expertise needed for the student to complete his or her degree. However, if such resources and/or expertise is not available and the student has not significantly completed the objectives of his/her proposal, the student may be asked to find a new major professor and new project.

On rare occasion, situations arise where the student and their major professor encounter incompatibilities that hinder cooperation and are counter to the mentoring relationship needed for a quality educational experience. In these situations, the relationship between student and major professor may be terminated after the following have been accomplished.

- Individual consultation of student and major professor with both the Director of the Graduate Program and the Director of the BLD Program
- Group consultation with all involved, including the student, the major professor, the Director of the Graduate Program, and the Director of the BLD Program. If no resolution can be reached and the student and major professor agree, the relationship can be terminated
- If a mutual agreement between student and major professor cannot be reached, the involved parties will be referred to the unit/university grievance process

If the mentoring relationship is terminated, the student- with the guidance of the Graduate Director- must identify a new major professor within one semester.

VI. Formation of the Guidance Committee

Within one semester of choosing a major professor, the student in conjunction with the major professor must select a guidance committee. The guidance committee will consist of at least three members including the major professor. The composition of the guidance committee should reflect expertise that will assist the student in the completion of degree requirements. Ideally, the composition of the guidance committee will consist of at least two BLD faculty members and one member from outside the Biomedical Laboratory Diagnostics Program. The purpose of this position is to ensure the requirements for completion of the Master's Degree in question are being met. Specialists or adjunct faculty may serve as voting members of the guidance committee with approval by the Director of the BLD Program. **Members who do not work at or for Michigan State University require special approval from the Graduate School. Therefore, students who wish to have an off-campus member on their guidance committee are encouraged to make sure the appropriate paper work for this approval is filed early and completely. The requirements for this process can be found here: <https://grad.msu.edu/non-regular-faculty-committees>.** To ensure uniform standards and/or address quality assurance issues, the Director may add one appropriate member to the guidance committee. This additional member will have the same rights and responsibilities as other guidance committee members.

The guidance committee responsibilities include but are not limited to:

- Approval of the student's program of study
- Approval of the student's proposal for thesis research or project
- Annual review of the student's progress towards completion of the degree
- Reviewing the thesis/project report in a timely, constructive, and critical manner
- Serving as examination committee member for the student's thesis or project defense

VII. Thesis/Project Proposal and Report, Thesis Defense, and Final Oral Examination

Thesis/Project Proposal for M.S. Students

Thesis/Project proposals provide background for the chosen project and state the research objectives, including a brief description of how that they will be achieved. The proposal document must be written with guidance from the major professor and must be approved by the major professor before presentation to the rest of the guidance committee. The proposal document should be given to the guidance committee at least two weeks before the proposal defense meeting. During the meeting, the student will give a brief presentation of their objectives and discuss the proposal with the committee. The student's final course plan is often also approved by the committee at this meeting. Guidelines for the Graduate Thesis Proposals can be found in Appendix 2 of this document.

Thesis/Project Report for M.S. Students

Consistent with the "Graduate Student Rights and Responsibilities at Michigan State University" document (2.4.6), the scope and breadth of thesis or project reports shall be defined by the guidance committee. The content should address the objectives as defined in the proposal. For plan A, the thesis must be written in the style defined by the Graduate School Guidelines for Thesis Preparation. Details regarding this format can be acquired at <http://grad.msu.edu/etd/docs/formattingguide.pdf>. For plan B, the project reports format will be defined by the guidance committee. **The writing of the thesis/project report must be done in concert with the major professor. The major professor must deem the thesis/project report as acceptable before it can be distributed to other guidance committee members or defended.** The thesis/project report should be distributed to all members of the guidance committee at least **15 days prior** to the expected date of the defense. After successful completion of the defense and completion of changes required by the guidance committee, appropriately bound final copies of the thesis or project report must be distributed to the major professor and the Director of the BLD Program. Guidance committee members will also be provided with a copy (unbound) on request.

Oral Presentation for M.S. Students

The date of the defense/presentation will be established by the student at a time convenient for all guidance committee members. A notice of the defense/presentation will be posted in the BLD Program office and distributed to all BLD faculty, guidance committee members, BLD graduate students, and other appropriate parties. The defense/presentation is an oral presentation of the thesis or project in an open, public forum. The oral presentation should highlight and complement the written document. It should be a formal, professional presentation, consistent with those seen at a professional or scientific conference.

Qualifying Examination for M.S. Students

Immediately following the oral presentation and open questioning period, the guidance committee will convene with the student in private. In this closed forum, an oral examination will be conducted by the guidance committee members. The content of this examination should be agreed upon by the major professor and guidance committee members and relayed to the student prior to the oral defense. In general, oral examination content should focus, either directly or indirectly, to material in the written thesis/project report and/or the oral presentation.

To ensure fairness in the examination procedure and maintenance of academic standards, the Dean of the College of Natural Science or the Director of the BLD Program has the option of assigning an

outside observer to the examining committee. The outside observer will read and critique the thesis/project report, will participate in the oral part of the exam, and will submit a report to the Dean of the College and/or the Director of the BLD Program.

Upon completion of the oral examination, the guidance committee will then deliberate in private. Two issues will be addressed by the guidance committee during deliberations:

1. The first issue is the determination of passing or failing the oral examination. This will be based on a majority vote of guidance committee members. If the student fails, provisions will be made for the examination to be repeated. The repeat should be taken within 3 months of the failure. Again, it is the student's responsibility to organize the repeat exam. The repeat can only be attempted once. A second failure would result in dismissal from the program.
2. The other issue concerns assignment of a numerical grade for BLD 899, BLD 890, or BLD 895 grades that have been deferred until graduation. Determination of this grade should focus on the accomplishment of the objectives set forth in the proposal and the student's performance in the oral examination. A Master's Examination Evaluation form will be completed by the guidance committee at this time and will be made part of the student's record.

For Master of Arts in Biomedical Laboratory Science only:

The major professor will define the project report format. The paper will consist of an extensive literature review, 15-20 pages long citing 20-30 references. The writing of the project report must be done in concert with the major professor. The major professor and a BLD faculty member review the completion of the project report and may require edits as needed. In addition, the student is required to present a 15-minute pecha kucha presentation, and reviewed by another BLD faculty member.

VIII. Departmental Policies: Academic Performance

A "Graduate Student Progress Report" form will be sent to all graduate students annually. It is the student's responsibility to complete this form and return it to the Director of the Graduate Program or Graduate Program Coordinator by the due date indicated on the form. It should be noted that completion of this form requires input from the student's major professor. At the time of submission, the Director of the Graduate Program will review the content of the completed form and if necessary, confer with the student. If this meeting occurs, the student's academic standing and progress towards degree will be reviewed. **In compliance with Academic Programs standards for Academic Standards, a 3.00 cumulative grade–point average for all courses counting toward the master's degree is required.**

For students who were admitted provisionally, the transition to regular status will be discussed at the first progress report review. For students who have failed to meet the criteria for transition to regular status, dismissal from the program will be considered.

A summary of the student's status and recommendations based on the review of the progress report will be communicated to the major professor and the student within two weeks of the review. The progress report will be placed in the student's file. Like all educational records, the student has the right to access all filed progress reports, summaries, etc. (GSRR 3.2.3)

Students who wish to appeal any part of the progress report or summary may do so in writing. This document will be reviewed by the Director of the BLD Program. After consultation with the

Graduate Director, the Director of the BLD Program has the option to support or modify the progress report or summary.

IX. Departmental Policies: Integrity and Safety in Research and Creative Activities

All BLD graduate students are expected to conduct themselves in a manner that is fair, equitable, honest, safe, and respectful of all. Michigan State University has established policies on the integrity of scholarship and grades that are contained in the All University Policy on Integrity of Scholarship and Grades (<http://splife.studentlife.msu.edu/regulations/student-group-regulations-administrative-rulings-all-university-policies-and-selected-ordinances/integrity-of-scholarship-and-grades>), General Student Regulation (<http://splife.studentlife.msu.edu/regulations/general-student-regulations>), Protection of Scholarship and Grades (<https://www.msu.edu/unit/ombud/academic-integrity/#integrity>), Ordinance on Examinations (<https://www.msu.edu/unit/ombud/academic-integrity/#ordinance>), and Academic Rights and Responsibilities for Students (<http://splife.studentlife.msu.edu/academic-freedom-for-students-at-michigan-state-university/article-2-academic-rights-and-responsibilities>). Graduate students are expected to adhere to these standards of academic honesty at all times.

Expectations regarding responsible conduct in research and creative activities are given in the “Graduate Student Rights and Responsibilities at Michigan State University” document (2.4.7). Details regarding these expectations can be found in the “Guidelines for Integrity in Research and Creative Activities”. This document can be accessed at the following URL: <http://grad.msu.edu/researchintegrity/docs/guidelines.pdf>. University guidelines for academic authorship (<http://vpgrs.msu.edu/michigan-state-university-guidelines-authorship>), data usage and storage (<https://tech.msu.edu/about/guidelines-policies/msu-institutional-data-policy/>) and plagiarism (<https://www.msu.edu/unit/ombud/academic-integrity/plagiarism-policy.html>) will also be strictly adhered to by BLD graduate students.

MSU and the BLD program are committed to responsible conduct in research (RCR). Therefore, graduate students are required to complete certain training modules and participate in certain classroom discussions. The required training is outline below. If you have any questions about the RC requirements, please contact the graduate director or graduate program coordinator.

CITI Modules

Year 1 (completion required for all)

- Introduction to the Responsible Conduct of Research
- Authorship
- Plagiarism
- Research Misconduct

Year 2 (required for Plan A only)

Complete three from list below, chosen at discretion of mentor:

- Collaborative Research
- Conflicts of Interest
- Data Management
- Financial Responsibility
- Mentoring
- Peer Review

- IACUC tutorial
- IRB Certification
- Rigor and Responsibility Course (in production)

Discussion-based Training

Six hours required by graduation for all. Orientation, BLD 805, and BLD 811 are required for all students.

Hour 1: Grad Student Orientation (Zoom meeting, each semester for each entering class) will include introduction to RCR with case-based discussions.

Hour 2: BLD 805 Discussion Forum on Authorship

Hour 3: BLD 805 Discussion Forum on Plagiarism

Hour 4: BLD 811 Discussion Forum on Research Misconduct

Hour 5: BLD 811 Discussion Forum on Data Management

Hour 6: BLD 811 Discussion Forum on IACUC/IRB Approval

If applicable, the major professor will inform students of all policies related to the use of human or animal subjects for research purposes. This will include instructions on how to obtain approval for research involving humans (<http://hrpp.msu.edu/>) or animals (<https://animalcare.msu.edu/IACUC>). **If approval of either type is required, it must be obtained prior to beginning the research or project and after the proposal has been approved by the committee.**

The major professor will also inform the student about the office for Environment Health and Safety (http://www.ehs.msu.edu/training/training_toc.htm) and make sure that the student is trained to meet all regulations and policies related to laboratory safety and security. Information about general MSU safety resources can be found here: http://www.hr.msu.edu/resources_links.htm. MSU also provides training about active shooters' situations (<http://edwp.educ.msu.edu/ead/hale-happenings/2015/active-shooter-violence-prevention-workshop-for-msu-graduate-students-postdocs/>) and domestic violence and sexual misconduct policy and training (<http://inclusion.msu.edu/equity/SexualHarassmentAssault.html>)

X. Student Conduct and Conflict Resolution

Expectations for Graduate Student Conduct

Students are expected to familiarize themselves with the policies described in the above documents (Section VIII). Guidance in adherence to these policies and guidelines will be provided by communication from the student's major professor and by coursework. Students who violate MSU policies regarding academic integrity, safety, research integrity or any other policy of Michigan State University are subject to disciplinary actions up to and including dismissal from the BLD graduate program.

Conflict Resolution

The following conflict resolution policy applies to all graduate students in the Biomedical Laboratory Diagnostics program. The "Academic Freedom for Students at Michigan State University" (AFR) and the "Graduate Students Rights and Responsibilities" (GSRR) documents outline standards for student conduct and prescribe procedures for resolving allegations of violations of these standards. They also provide the procedural basis for defending student rights through a formal grievance process. Consistent with these documents, the first venue to resolve conflicts formally or informally

rests within the academic unit. The following is the procedure for adjudicating student grievances within the Biomedical Laboratory Diagnostics Program.

These procedures are intended to resolve disputes regarding student academic grievances including allegations of academic dishonesty and violations of professional standards. This includes penalty grades of 0.0 in a course and academic dismissal (AFR 2.4.4.1). An overview of who may grieve and whom against can be found in the GSRR 5.3.5. Note: References to the AFR and GSRR are not exhaustive. Involved parties should consult the appropriate document. An overview of this documentation can be found at: <https://www.msu.edu/unit/ombud/grievrequest.html>

The Complaint Process

- A. A student who believes his/her rights have been violated shall first attempt to resolve the dispute in an informal discussion with the instructor, major professor (or graduate director if no major professor has been chosen), or other involved individual. See GSRR 5.3.1 and 5.3.2.
- B. If after this discussion the dispute remains unresolved, the student should consult with the Director of the BLD Program and/or the University Ombudsman.
- C. If after this discussion the dispute remains unresolved, the student may submit a written, signed statement requesting a grievance hearing to the Director of the BLD Program. In a detailed manner, this statement must explain the alleged violation sufficient to justify the hearing, identify the individual(s) against whom the complaint is being lodged, and state the redress the student seeks. A request for a grievance hearing must be initiated by the middle of the next semester following the alleged violation. Details on initiation of the grievance process can be found in GSRR 5.3.6, GSRR 5.3.6.1, and GSRR 5.3.6.2.
- D. The student (the complainant) may proceed with Grievance proceedings even if the respondent (instructor, major professor, etc.) is no longer employed by the University.

Composition of the Hearing Board

- A. Consistent with GSRR 5.1.2, upon receipt of a written request for a grievance hearing, the Director of the Biomedical Laboratory Diagnostics Program will refer to College of Natural Science Grievance procedure. If after consultation it is deemed appropriate for the grievance hearing to be conducted within the Biomedical Laboratory Diagnostics Program, the Director of the Biomedical Laboratory Diagnostics Program will assemble a hearing board and deliver the written request for a hearing. This must be done within ten class days from the time the written request was submitted. See GSRR 5.4.3 and GSRR 5.1.2 for details.
- B. The Hearing Board will be composed of two faculty members, two graduate students, and the Director of the BLD Program or their designee.
 - The Director of the BLD Program is responsible for assigning faculty members to the hearing board with attention to ensure no conflicts of interest exist in its composition. If needed, one of the faculty members may be acquired from outside of the Biomedical Laboratory Diagnostics Program. Details regarding board member selection can be found in GSRR 5.1.7.
 - The graduate student composition of the hearing board will be determined by lottery. All graduate students are eligible for the lottery pool. Individuals will be excluded from the pool based on conflicts of interest and other factors agreed upon by the Director of Program

Graduate Studies and the complainant. Via a random lottery process, the complainant will choose two from the pool to serve on the hearing board. A third name will be drawn to serve as an alternate.

- Once assembled, the Hearing Board will choose a Chair of the Hearing Board between the assigned faculty members.

Preliminary Hearing

- A. Within five days of the Hearing Board receiving the written request for a grievance, they shall review the document for jurisdiction and merit. After considering all submitted material, the Hearing Board may:
 - a. Request further information from the respondent, complainant, or other involved parties. This information may be presented in written response or by informal discussions with the Hearing Board. Such discussions shall not preclude a later hearing.
 - b. Decide that sufficient reasons for a hearing do not exist and dismiss the grievance.
 - c. Decide that sufficient reasons for a hearing do exist and accept the request, in full or part. The Hearing Board will then proceed with plans for a formal hearing. See GSSR 5.4.6 and AFR 4.4.2.
- B. If the decision for a formal hearing is made, the Chair of the Hearing Board will schedule the formal hearing. In most circumstances, these deliberations should occur in a single day. However, an additional day should be scheduled in the event of extended deliberations. It is the Chair of the Hearing Board's responsibility to ensure the formal hearing is scheduled in a timely manner and ensure all involved parties are available on that date. At least three days prior to the formal hearing, the Chair of the Hearing Board will notify all involved parties in writing of the time, place, and day of the hearing. This notification will also include the names of the parties to the grievance, the names of the Hearing Board members, the names of the witnesses to be present, and all documentation related to the allegation. The Hearing Board may set reasonable time limits on each party to present its case. These times should be indicated in the written notification.
- C. Either party to the grievance may request a postponement of the formal hearing. The Hearing Board may either grant or deny the request. If granted, a time limit will be defined by the Hearing Board.
- D. If the preliminary hearing determines there is no merit to the grievance, the complainant may appeal this decision to the College of Natural Science Hearing Board.

Formal Hearing (See GSRR 5.4.10 and 5.4.10.1)

- A. The Chair of the Hearing Board shall convene the hearing within six days of the preliminary hearing.
- B. If the complainant fails to appear at the formal hearing, the Board may either postpone the hearing or dismiss the case. If the respondent fails to appear at the formal hearing, the board may either postpone the hearing or hear the case in the respondent's absence.

- C. The Chair shall ensure that a collegial atmosphere prevails and enforce the time limits for each party's presentations. Both parties will have equal time. To ensure orderly proceedings, the Chair of the Hearing Board must recognize individuals before they speak. All parties have the right to speak without interruption.
- D. To protect the confidentiality of the information to be presented, attendance at the hearing should be limited to the Hearing Board, the complainant, the respondent, witnesses for either party, and an advisor/consultant for each party if desired. Each party must present their own case. Thus, involvement of an advisor or consultant in the direct presentation of evidence or supporting arguments is not permitted. Exceptions may be granted with the approval of the chair. Witnesses shall be excluded from the proceedings except when testifying. Witness testimonies will be limited to their own independent recollection and they may not speak to the recollection of others. The Hearing Board may limit the number of witnesses. Unless otherwise approved by the Hearing Board Chair, witnesses and advisors/consultants shall be limited to members of the MSU community (students, faculty, or staff).
- E. The hearing will proceed as follows:
 - 1. The Chair of the Hearing Board will introduce all attendees. The Chair will then review the hearing procedures including time constraints. The Chair explains that the burden of proof rests on the complainant, with the exception of appeals of allegations of academic dishonesty, in which case the instructor bears the burden of proof.
 - 2. The proceedings start with opening statements first by the complainant, followed by the respondent.
 - 3. Presentation of complainant case, including witnesses and questioning by the complainant. The respondent and the Hearing Board may question complainant witnesses.
 - 4. Presentation of respondent case, including witnesses and questioning by respondent. The complainant and Hearing Board may question respondent witnesses.
 - 5. Closing statements by the complainant will be followed by the respondent.
 - 6. Final questions by the Hearing Board
- F. Upon completion of the hearing, the Hearing Board will excuse all parties and confer in private to determine its findings. Ideally, these deliberations should immediately follow the hearing.
- G. The Hearing Board will prepare a written report of its findings within five working days after deliberations. This report shall include a rationale for the findings based on elements of the evidence or lack thereof. The Chair of the Hearing Board will distribute this report to the complainant, respondent, and the Director of the Biomedical Laboratory Diagnostics program or designee. All recipients of the report are expected to maintain its confidential nature. The report will be reviewed by the Director. After such, copies will be sent to the Dean of Natural Science, Dean of the Graduate School, and the Ombudsman. If the Hearing Board finds a violation of student rights has occurred, the Director in consultation with the Hearing Board will discuss mechanisms to redress the situation. The Director of BLD or designee is responsible for implementation of the appropriate remedy.

Appeals

- A. Either party involved in the grievance may appeal the decision of the Hearing Board to the College of Natural Science Hearing Board. The appeal must be in writing, signed and submitted to the Dean's office within ten class days of the Biomedical Laboratory Diagnostics Hearing Board decision. While under appeal, the decision of the initial Hearing Board will be held in abeyance.
- B. Details regarding the College level appeal and the hearing process can be found in the GSSR (5.4.12 through 5.4.12.3).

XI. Work Related Policies

At this time, the BLD Graduate Program does not offer graduate assistantships, either for teaching or research.

XII. University Resources

Policy

The following websites contain university policies that pertain to graduate students. Any discrepancies between this handbook and university policy are unintentional. University policies included in the following documents override any inconsistencies between this document and the policies of MSU.

Academic Programs:

<https://reg.msu.edu/AcademicPrograms/>

Graduate Students Rights and Responsibilities (GSRR):

<http://grad.msu.edu/gsrr/docs/GSRR.pdf>

MSU/GEU Contract:

<http://www.hr.msu.edu/documents/contracts/GEU2015-2019.pdf>

Guidelines for Graduate Student Advising and Mentoring Relationships:

<http://grad.msu.edu/researchintegrity/docs/guidelines.pdf>

Guidelines for Integrity in Research and Creative Activities:

<http://grad.msu.edu/researchintegrity/docs/guidelines.pdf>

Policy on Relationship Violence and Sexual Misconduct :

http://www.hr.msu.edu/documents/uwidepolproc/RVSM_Policy.htm

Anti-Discrimination Policy (ADP) user manual:

<http://oie.msu.edu/policies-procedures-forms/documents/ADPUsersManual-updated2015.07.24.pdf>

Other Resources

The following resources for career and professional development are provided by the Graduate School:

<http://grad.msu.edu/docs/CPD%20Resource%20eBook%20-%20Spreads2014.pdf>

Appendix 1: Checklists and Typical Progression Outlines for BLD Graduate Programs

Master of Science in Clinical Laboratory Science Program Checklist - Plan A

Target Graduation Date _____

Date complete
(sem., year)

1. Orientation

Initial admittance to program	
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2. Enroll in Department Requirements

#of Credits

BLD 811 - Fundamentals of Scientific Research (offered Fall semester of every year)		1
BLD 805 - Communications in the Sciences (offered Summer semester of every year)		2
BLD 801 - BLD Seminar (offered Fall and Spring of every year) (take twice)		2
		5

4. Thesis Project

Discuss project ideas with graduate director, agreement on project topic and selection of major professor <i>Identify major professor:</i> _____	
Formation of graduate guidance committee. <i>Faculty Member:</i> _____ <i>Outside member:</i> _____	
Completion of outside guidance committee paperwork (https://grad.msu.edu/non-regular-faculty-committees)	
Project proposal presentaion	
Thesis defense	
Final thesis submitted to Graduate School (see https://grad.msu.edu/etd)	

3. Enroll in Degree Requirements

BLD - 899 Selected Problem's in Clinical Laboratory Science <i>*need approval of Grad Director to enroll</i>		7
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At least 4 credits of 800-level BLD courses approved by academic advisor

One course in biochemistry or cell biology as approved by guidance committee

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One 400-level or 800-level course in statistics as approved by guidance committee

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Note: Not more that 9 credits should be taken in 400 level courses. All 400-level courses must be approved by guidance committee.

Total Credits (30)

Master of Science in Clinical Laboratory Science Program Checklist - Plan B

Target Graduation Date _____

Date
Complete
(sem., year)

1. Orientation

Initial admittance to program	
-------------------------------	--

2. Enroll in Department Requirements

#of Credits

BLD 811 - Fundamentals of Scientific Research (offered Fall semester of every year)		1
BLD 805 - Communications in the Sciences (offered Summer semester of every year)		2
BLD 801 - BLD Seminar (offered Fall and Spring of every year) (take twice)		2
		5

4. Thesis Project

Discuss project ideas with graduate director, agreement on project topic and selection of major professor <i>Identify major professor:</i> _____	
Formation of graduate guidance committee <i>Faculty Member:</i> _____ <i>Outside member:</i> _____	
Completion of outside guidance committee paperwork (https://grad.msu.edu/non-regular-faculty-committees)	
Project proposal presentaion	
Project defense	
Revisions accepted	

3. Enroll in Degree Requirements

BLD - 890 Selected Problem's in Clinical Laboratory Science * <i>need approval of Grad. Director to enroll</i>		3
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At least 4 credits of 800-level BLD courses approved by academic advisor

One course in biochemistry or cell biology as approved by guidance committee

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One 400-level or 800-level course in statistics as approved by guidance committee

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Note: Not more that 9 credits should be taken in 400 level courses. All 400-level courses must be approved by guidance committee.

Total Credits (30)

Master of Science in Biomedical Laboratory Operations Program Checklist

Target Graduation Date _____

Date
complete
(sem., year)

1. Orientation

Initial admittance to program	
-------------------------------	--

2. Enroll in Department Requirements

#of Credits

BLD 805 - Communications in the Sciences (offered Summer semester of every year)		2
BLD 801 - BLD Seminar (offered Fall and Spring of every year)		1
BLD 811 - Fundamentals of Scientific Research (offered Fall semester of every year)		1
		4

3. Enroll in Degree Requirements

BLD - 842 Managing BMLO (offered fall and spring of every year)		2
BLD - 844 Topics in BMLO (offered spring of every year)		1
BLD - 846 Decision Processes for BMLO (offered Fall of every year)		2
BLD 895 - Projects in BLMO * <i>need Grad. Director approval to enroll</i>		3
		8

4. Thesis Project

Discuss project ideas with graduate director, agreement on project topic and selection of major professor <i>Identify major professor:</i> _____	
Formation of graduate guidance committee. <i>Faculty Member:</i> _____ <i>Outside Member:</i> _____	
Completion of outside guidance committee paperwork turned into graduate school (https://grad.msu.edu/non-regular-faculty-committees)	
Proposal presentaion	
Final project presentaion	
Revisions accepted	

*****Additional credits: 14 credits in courses with a scientific focus, 6 credits of electives as approved by guidance committee (elective credits may have a scietific focus)*****

Total Credits (31)		

Master of Arts in Biomedical Laboratory Science Program Checklist

Target Graduation Date _____		Date Complete (sem., year)
1. Orientation		
Initial admittance to program		
2. Enroll in Department Requirements		
		#of Credits
BLD 811 - Fundamentals of Scientific Research (offered Fall semester of every year)		1
BLD 805 - Communications in the Sciences (offered Summer semester of every year)		2
BLD 801 - BLD Seminar (offered Fall and Spring of every year, take twice- in 730 and 731 sections)		2
		5
3. Enroll in Degree Requirements		
PHM 830 - Experimental Design and Analysis (offered Fall and Summer of every year)		3
BLD - 890 Selected Problems in CLS <i>*need Grad. Director approval to enroll</i>		3
		6
4. Capstone Project - begin after completion of BLD 805		
Contact and discuss project ideas with graduate director and agreement on project topic - <i>before enrolling in BLD 980</i>		
Presentation of capstone project - capstone paper and pecha kucha		
Revisions accepted		
14 credits from addition BLD 800 level offerings (list below)		
	(14)	
Complete 5 credits of electives as approved from guidance committee		
	(5)	
Total Credits (30)		

Appendix 2: Graduate Thesis Proposal Guidelines

Part I: The Literature Review

The literature review is your introduction, providing background from a thorough search of the literature to support your thesis statement. It gives context and information for the reader to understand why you are doing what you are doing. It should cover all relevant information about your topic, from the big picture down to your specific thesis statement. Tell the reader why what you are doing is important and why we should care.

Your thesis statement can be your hypothesis or research question or some sort of goal statement. It's what you will complete and defend at the end of your master's degree. You want to make sure that the statement clearly defines your project, so don't make it too broad.

Of course, make sure that you cite all your references in a complete bibliography.

(The good news about this part is that it will form a big basis for the same sort of section in your actual thesis.)

Part II: Objectives

Your research objectives are clear statements of how you intend to achieve your goals (often called aims in this type of writing). For the purpose of our master's degrees, you should have 2-3 clearly defined objectives. Graduate students are often too broad or ambitious in their goals. Try to limit your objectives to reasonable amounts of work and be as clear as possible. Your mentor can help provide guidance for this. Using the S.M.A.R.T. goal-setting method may be helpful in designing your objectives. If you are not familiar with S.M.A.R.T., you can find information about that here: <https://www.mindtools.com/pages/article/smart-goals.htm>.

After you have stated the objectives, provide a brief description of how they will be achieved, basically describe your methods and what information you will obtain from them.

Part III: Final Discussion

This section should "wrap up" your proposal, suggesting the implications of your research. What will be done with the data that you acquire? How will it benefit your lab, the world, or whatever your target audience is? This only needs to be a paragraph or two.

Other requirements:

Title page: includes a title, author, institution, date, program.

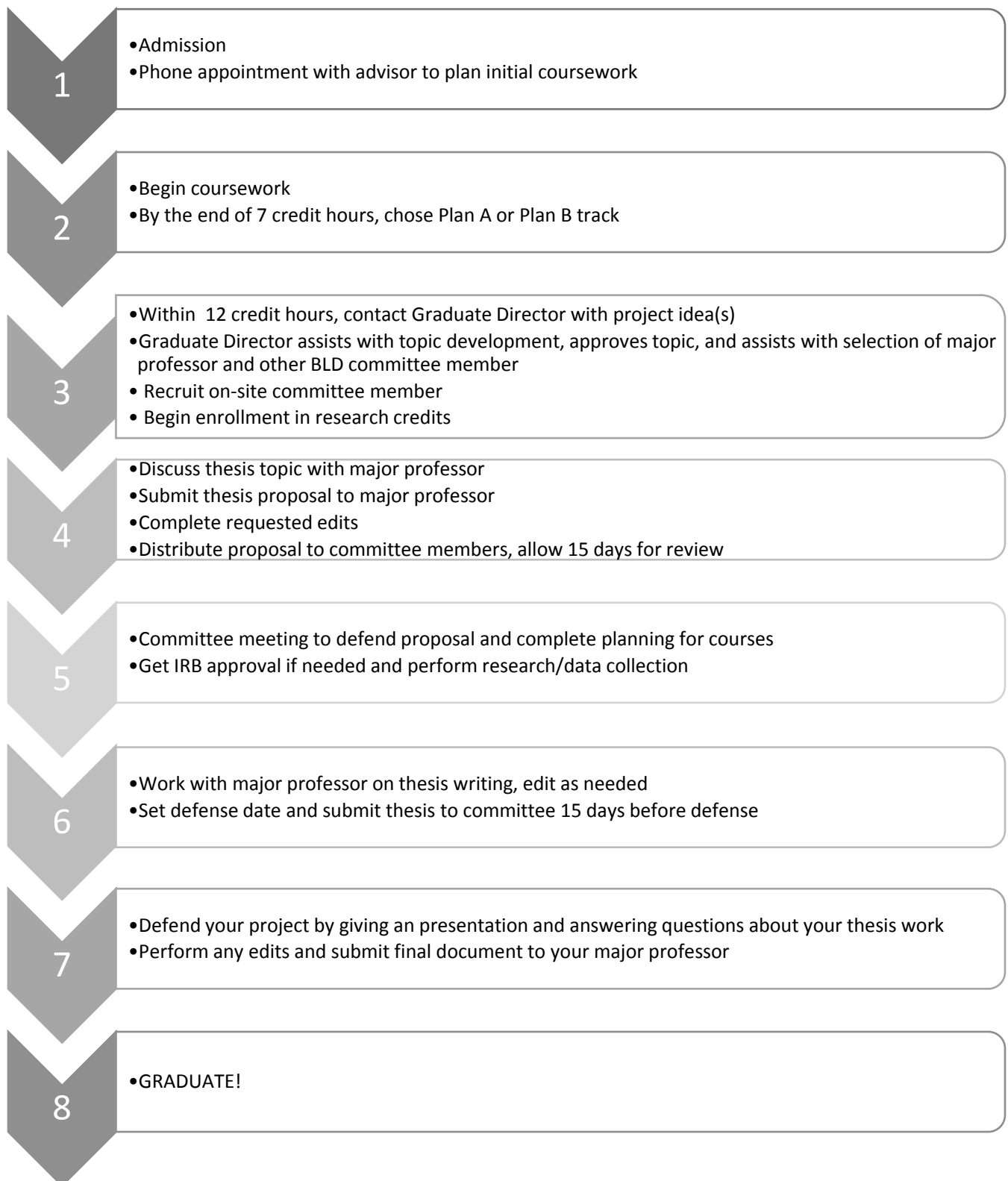
Figures and Tables: If you include figures or tables in any section, make sure that they have a clear legend that would allow them to stand alone. Also, number them and reference them in the text by the number (i.e. Figure 2).

Bibliography: I highly recommend Endnote Web or Mendeley or some other citation program that will help you to organize your references and cite them easily. Use a *Nature* journals type format for references, with a number in the text that refers to a paper in the bibliography.

If you are plan A, you must conform to MSU Graduate School formatting guidelines for theses. If you want to get a head start on formatting, here is the link to the MSU formatting guide: <https://grad.msu.edu/etd>.

Appendix 3: Graduate Degree Progression Flow Charts

Master of Science



Master of Arts

