



DREXEL UNIVERSITY

Graduate School of

**Biomedical Sciences
and Professional Studies**

College of Medicine

**Drexel University College of Medicine
Graduate School of Biomedical Sciences &
Professional Studies**

**MOLECULAR & CELL BIOLOGY & GENETICS
M.S. PROGRAM**

POLICIES AND PROCEDURES

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I. INTRODUCTION

This booklet:

- describes academic policies and procedures pertaining to M.S. graduate study in the Molecular & Cell Biology & Genetics (MCBG) Graduate Program;
- supplements policies, procedures, and general rules of the Division of Biomedical Science Programs;
- contains current guidelines that are revised periodically by faculty in the Program.

The Graduate Program offers coursework and research opportunities leading to the M.S. degree. The goal of the Graduate Program is to provide an intensive interdisciplinary research training and classroom experience in order to prepare graduates for significant contributions to their field. Research interests of the faculty members are described elsewhere.

There are three components of requirements to be fulfilled for obtaining an M.S. degree:

1. Research rotation(s)
2. Required and elective courses
- 3A. Research thesis and defense (Thesis Track)
- 3B. Literature Review (Non-Thesis Track)

M.S. students will have specific research goals, relating to a chosen area of Molecular & Cell Biology & Genetics. There is an increasing demand within biotechnology industries for M.S. level research professionals with expertise in all areas of Molecular Cell Biology & Genetics. Students who achieve outstanding performance during the M.S. program may apply to the Ph.D. program. The admission into the Ph.D. program is contingent upon successful completion of the M.S. degree, successful completion of MCBG Preliminary Examination, and financial support from their mentor for Ph.D. dissertation studies.

Full time M.S. students are expected to complete their program within two years, and in no more than four years. General requirements for admission to and completion of the M.S. program may be found in the policies and procedures of the Division of Biomedical Science Programs.

II. BASIC GUIDELINES FOR THE M.S. DEGREE (Thesis Track)

A. CURRICULUM

1. Required Core Courses

IDPT-533S	Core Principles in Biochemistry & Cell Biology
MCBG 515S	Techniques in Molecular & Cell Biology & Genetics
MCBG-506S	Advanced Cell Biology

Statistics Requirement

Select at least one of the following statistics courses for a minimum of two credits.

BIOC 521S	Introduction to Biochemical Data
CR 520S	Applications of Clinical Research Biostatistics
IDPT 501S	Biostatistics I
MIIM 517S	Applied Statistics for Biomedical Sciences
NEUR 500S	Statistics for Neuro/Pharm Research

Required Courses for Biomedical Graduate Studies

IDPT-500S	Responsible Conduct of Research
IDPT-502S	Learn Early as Professionals (LEAP I)
IDPT-504S	Learn Early and Practice (LEAP II)

2. Advanced Elective Courses

In consultation with the Advisory Committee and according to the area of selected research, the student must select a minimum of 2 advanced elective courses from a diverse range of topics that complement the core curriculum and provide relevant, in-depth knowledge. A minimum of 5 credits is required to satisfy the advanced elective course requirements. Suggested elective courses are listed toward the end of this document.

NOTE: All formal courses must be completed within the first two years.

3. Seminars and Journal Club

Students are required to sign up for and participate in the Molecular and Cell Biology and Genetics Student Seminar Series (MCBG-513S) and Journal Club (MCBG-512S).

4. Lab Rotations

The Molecular & Cell Biology & Genetics (MCBG) Graduate Program is an interdisciplinary Program that includes participating faculty from several departments. The student therefore has the opportunity to pursue laboratory rotation(s) in participating laboratories.

At least one and no more than three rotations must be arranged during the first year in consultation with the Program Director and faculty members within the Graduate Program. It is highly recommended that M.S. students do no more

than two laboratory rotations. These rotations are designed to expose the student to a variety of important techniques and research problems.

The research areas may be chosen to complement the student's long-term research interests. Research rotations should provide an opportunity to:

- Practice scientific logic and experimental design.
- Acquire useful technical expertise.
- Extend scientific and personal interactions within and between labs.
- Explore the possibility for a future thesis research topic.

At least 20 hours per week (minimum) for a three-month period are required for each rotation. The first rotation must begin no later than September 1st of the first year, and students must satisfactorily complete all rotations by the end of summer of the first year. The second rotation of MS students starts at the beginning of the Spring Semester of their 1st year. A written summary and oral presentation of the research experience is prepared by the student at the end of each rotation. Rotation studies are evaluated by the faculty and the student at three stages during each rotation (intake, midterm, end-evaluations). Upon completion of the rotation(s), a student must immediately choose and enter a research lab to start thesis research.

At any time after the first laboratory rotation, M.S. students can choose a thesis advisor. The student in conjunction with his/her thesis committee and advisor will select a research project with clearly defined objectives and feasibility. The thesis committee will consist of at least three members of the MCBG graduate faculty.

5. Research

The research project requires approximately one year of full-time research. A suitable objective is the preparation of a publishable research paper. Additional time may be required for writing the thesis.

The preparation and defense of the M.S. Thesis is conducted as described in the policies and procedures of the Division of Biomedical Science Programs. The Thesis may follow the traditional format, or may consist of a research paper submitted or accepted for publication, with any additional material deemed necessary by the Thesis Committee

6. Committee Meetings

Meetings between the student and his/her Thesis Committee serve to provide an objective, supportive and critical feedback evaluation of academic and scientific progress throughout Graduate School training. They are an essential part of the mentoring process.

Committee meetings must be held every six months, or more frequently if deemed necessary by the research advisor, student, or thesis committee. It is the responsibility of each student to convene committee meetings at a mutually convenient time and to provide evidence of such meetings in writing to the Program Director and the Division of Biomedical Science Programs.

7. Teaching

Teaching is not required but may be arranged if requested by the student and approved by the Advisory Committee.

8. Academic Standing

A GPA of 3.0 must be maintained to successfully complete the program.

B. ADVISORY COMMITTEES

1. The Program Director will serve as advisor during the first year. Student must meet with the Program Director every six months. The Program Director will inform the MCBG steering committee of the progress of first year graduate students at least twice during the first year. The Steering Committee will serve as the Advisory Committee for an MCBG student until a thesis committee is formed for that student.
2. By the end of the 1st year of graduate studies, the M. S. Student must identify their thesis mentor. The student and advisor select a three-member Thesis Committee that consists of three faculty members in the MCBG program, including the research advisor. At this time, the chair of the thesis committee will be selected who is **not** the thesis advisor. The thesis committee will evaluate the student's progress every 6 months or more frequently if deemed necessary by the research advisor, student, or thesis committee. It is the responsibility of each student to convene committee meetings every six months and to provide evidence of such meetings in writing to the Program Director and the Division of Biomedical Science Programs.

C. EXAMINATIONS

1. **Preliminary Examination:** MCBG MS Students are not eligible for taking the MCBG preliminary examination. However, if MCBG MS students are accepted to the MCBG PhD program with advanced standing, they are required to take and pass the MCBG preliminary examination at the end of the second year. The admissions to the MCBG PhD program with advanced standing is contingent upon the successful completion of the MCBG preliminary examination. The purpose of the Preliminary Exam is to assess the student's ability to integrate, process and utilize knowledge gained prior to and during the first year of Graduate School. Molecular and Cell Biology and Genetics Graduate Program faculty are involved in preparing and evaluating this exam. The results of the exam are included in the student's permanent file.

Format: The students are given specific research questions whose complete answer requires the integration of several overlapping fields of scientific investigation. The student is given general hypothesis-driven questions whose solution requires the student to integrate the core curriculum. Students have approximately 10 days to research and evaluate the given topic in the form of a written outline (3-5 pages with additional space for diagrams and references). Students orally present their solution to the assignment to a panel of MCBG faculty. The oral exam lasts 60-120 minutes. Successful completion of the preliminary exam is necessary for admission into the MCBG Ph.D. program with advanced standing.

Pass on Preliminary Exam - qualifies the student to enroll in the MCBG Ph.D. program with advanced standing.

Failure or Deficiency on Preliminary Exam - the student is permitted a single retake of the Exam, to be scheduled within one month of the original examination.

Failure on retake of Preliminary Exam - the student is not allowed enroll in the MCBG Ph.D. program with advanced standing.

D. EVALUATION OF PROGRESS

The Program Director, Advisory Committee, or Thesis Committee will evaluate performance in coursework, on exams, in laboratory rotations and oral presentations every 6 months or more frequently if deemed necessary by the research advisor, student, or thesis committee. In addition:

E. THESIS AND DEFENSE

M.S. Students must conduct at least two semesters of Thesis Research in order to conduct "Thesis Defense". M.S. Students are not required to register for "Thesis Defense". However, the student's thesis committee, research advisor, and the program director must approve thesis writing during the second semester of Thesis Research. If the student's thesis committee determines that the student needs additional time to complete his or her thesis, the student may register for "Thesis Defense" after the second semester of Thesis Research.

The preparation and public oral defense of the M.S. thesis are conducted as outlined in the policies and procedures of the Division of Biomedical Science Programs. The Thesis may follow the traditional format or may consist of a research paper submitted or accepted for publication, with any additional material deemed necessary by the Thesis Committee. The student's thesis committee must approve the thesis and is responsible for evaluating the thesis, conducting the oral defense, and recommending approval to the Director of the Division of Biomedical Science Programs. Students in the Molecular & Cell Biology & Genetics Graduate Program must submit their final, completed thesis to their thesis committee at least two weeks prior to the oral defense date.

III. BASIC GUIDELINES FOR THE M.S. DEGREE (Non-Thesis Track)

Students may enter the M.S. program in the non-thesis track. This track is predominately designed for individuals who may want to acquire an advanced degree so as to enhance already existing skills. For example, a typical student might be an individual already working in industry or an individual wanting to learn specific laboratory skills. This track may also be an option for students unable to successfully complete the standard Ph.D. preliminary exam.

A. GENERAL REQUIREMENTS

1. Students in the non-thesis master of science track are expected to complete their program within two years, and in no more than four years.
2. A temporary advisory committee will be assigned upon admission to the program. After satisfactory completion of the first year, a formal advisory committee will be selected as described in the policies and procedures of the

Division of Biomedical Science Programs.

3. The teaching requirement is waived; however, opportunities for teaching are available to interested students.
4. At beginning of the second year, the student will choose an MCBG faculty advisor and, in consultation with the advisor, choose a topic for a scholarly literature review. Student will choose two additional committee members to evaluate the review. This review will be publication quality (although publication is not required for graduation). At the discretion of the student's evaluation committee, the student may be asked to present an oral summary of the written review. This work is conducted by taking IDPT 850S: Literature Review Non-Thesis MS.
6. Total credits required: minimum of 36 credits. Student must fulfill all course requirements including a minimum of 3 advanced level graduate courses. Students must maintain a minimum 3.0 grade-point-average to be considered in good academic standing.

B. COURSE REQUIREMENTS

1. Required Core Courses

IDPT-533S	Core Principles in Biochemistry & Cell Biology
MCBG 515S	Techniques in Molecular & Cell Biology & Genetics
MCBG-506S	Advanced Cell Biology (Spring 1 st year)

Statistics Requirement

Select at least one of the following statistics courses for a minimum of two credits.

BIOC 521S	Introduction to Biochemical Data
CR 520S	Applications of Clinical Research Biostatistics
IDPT 501S	Biostatistics I
MIIM 517S	Applied Statistics for Biomedical Sciences
NEUR 500S	Statistics for Neuro/Pharm Research

Required Courses for Biomedical Graduate Studies

IDPT-500S	Responsible Conduct of Research
IDPT-502S	Learn Early as Professionals (LEAP I)
IDPT-504S	Learn Early and Practice (LEAP II)

2. Advanced Elective Courses

In consultation with the Advisory Committee and according to the area of selected research, the student must select a minimum of 3 advanced elective courses from a diverse range of topics that complement the core curriculum and provide relevant, in-depth knowledge. A minimum of 9 credits is required to satisfy the advanced elective course requirements. Suggested elective courses are listed toward the end of this document.

NOTE: All formal courses must be completed within the first two years.

3. Seminars and Journal Club

Students are required to sign up for and participate in the Molecular and Cell Biology and Genetics Student Seminar Series (MCBG-513S) and Journal Club (MCBG-512S).

4. Literature Review (IDPT-850S)

5. Academic Standing

A GPA of 3.0 must be maintained to successfully complete the program.

C. RESEARCH and LITERATURE REVIEW

1. Two lab rotations are suggested but not required (general elective). These would be designed to provide skills that would be useful for an industrial job search or supplement already existing skills (if student is already employed in industry).
2. Committee meetings will be held every six months or more frequently if deemed necessary by the student, mentor, or advisory committee. Advisory Committee will evaluate performance in coursework, on exams, and in literature review. It is the responsibility of each student to convene committee meetings at a mutually convenient time and to provide evidence of such meetings in writing to the Program Director and the Division of Biomedical Science Programs.

CODE OF BEHAVIOR

The Graduate Program in Molecular & Cell Biology & Genetics subscribes to the **Code of Behavior** for all of its members. This policy states that professional behavior appropriate to a faculty and students in an academic research setting is expected and required at all times. Admission to and continued participation in the Graduate Program is therefore contingent upon the student's understanding of this policy, and their agreement to adhere to its guidelines.

CODE OF ETHICS

The Graduate Program in Molecular & Cell Biology & Genetics subscribes to the **Code of Academic Integrity** (presented in its complete form in the policies and procedures of the Division of Biomedical Science Programs) for all its members. This policy states that cheating, plagiarism, forgery, or other forms of academic misconduct are not tolerated at our institution. Admission to and continued participation in the Graduate Program is therefore contingent upon the student's understanding of this policy, and their agreement to adhere to its guidelines.

JOURNAL CLUBS, SEMINARS AND LABORATORY ROTATIONS

Participation in the graduate program journal club and seminar series and successful completion of laboratory rotations are considered an integral part of the education of a graduate student. Accordingly, the Division of Biomedical Science Programs Education Committee has established the following guidelines for all graduate programs:

Unsatisfactory Performance in Journal Clubs and Seminar

Three unexcused absences are allowed per year for journal clubs and seminar. More than three absences will result in a grade of Unsatisfactory (U). The "U" must be remediated to the satisfaction of the program. If not, it will be grounds for dismissal.

Students who are registered for thesis defense during the semester are exempted from attending Journal clubs and Seminar Series.

Unsatisfactory Performance in Laboratory Rotations

Laboratory rotations are graded on a Satisfactory (S) or Unsatisfactory (U) basis. Students receiving an "S" are rated on a performance scale ranging from Outstanding (1) to Poor (5). A "U" for a lab rotation is reserved for students that do not meet performance requirements, including attendance, of the rotation as stipulated by the program. A "U" for a laboratory rotation is grounds for dismissal.

**Drexel University College of Medicine
Molecular & Cell Biology & Genetics (Thesis MS Track)
Typical Graduate Program Schedule for First Year
Required Courses**

FALL

Meet with Dr. Eishi Noguchi, Advisor to New Graduate Students

Core Principles in Biochemistry & Cell Biology	4 credits	IDPT-533S
Learn Early as Professionals (LEAP I)	1 credit	IDPT-502S
Techniques in Molecular and Cell Biology & Genetics	2 credits	MCBG-515S
Molecular & Cell Biology & Genetics 1st Lab Rotation	4 credits	MCBG-501S
Molecular & Cell Biology & Genetics Journal Club	1 credit	MCBG-512S
Molecular & Cell Biology & Genetics Seminar	1 credit	MCBG-513S

SPRING

Meet with Dr. Eishi Noguchi, Advisor to New Graduate Students

Learn Early and Practice (LEAP II)	1 credit	IDPT-504S
Responsible Conduct of Research	2 credits	IDPT-500S
Advanced Cell Biology	2 credits	MCBG-506S
Molecular & Cell Biology & Genetics 2nd Lab Rotation (suggested as a general elective)	4 credits	MCBG-502S
Molecular & Cell Biology & Genetics Journal Club	1 credit	MCBG-512S
Molecular & Cell Biology & Genetics Seminar	1 credit	MCBG-513S
Select at least one of the following statistics courses for a minimum of two credits.		
Introduction to Biochemical Data	2 credits	BIOC 521S
Applications of Clinical Research Biostatistics	3 credits	CR 520S
Biostatistics I	2 credits	IDPT 501S
Applied Statistics for Biomedical Sciences	2 credits	MIIM 517S
Statistics for Neuro/Pharm Research	2 credits	NEUR 500S

**Choose Research Advisor by 8/1

**Drexel University College of Medicine
Molecular & Cell Biology & Genetics (Thesis MS Track)
Typical Graduate Program Schedule for Second Year
Required and Elective Courses**

FALL

Thesis Research	9 credits	MCBG-600S
Molecular & Cell Biology & Genetics Journal Club	1 credit	MCBG-512S
Molecular & Cell Biology & Genetics Seminar	1 credit	MCBG-513S
Advanced Elective	2-3 credits	
*Committee Meeting		

SPRING

Thesis Research	9 credits	MCBG-600S
Molecular & Cell Biology & Genetics Journal Club	1 credit	MCBG-512S
Molecular & Cell Biology & Genetics Seminar	1 credit	MCBG-513S
Advanced Elective	2-3 credits	
*Committee Meeting		
*Thesis Defense		

The student has the opportunity to take elective courses chosen with consent from the Advisory Committee. Suggested Electives are listed on the next page.

Advanced Electives – Thesis M.S. Track		
In consultation with the Advisory Committee and according to the area of selected research, the student must select a minimum of 2 advanced elective courses from a diverse range of topics that complement the core curriculum and provide relevant, in-depth knowledge. A minimum of 5 credits is required to satisfy the advance elective requirements.		5 - 7
BIOC 508S	Experimental Approaches to Biochemical Problems	
BIOC 511S	Communication for Researchers	
BIOC 520S	Macromolecular Structure & Function	
BIOC 521S	Introduction to Biochemical Data	
BIOC 603S	Advanced Topics in Biochemistry and Molecular Biology	
CBIO 510S	Cancer Biology	
CBIO 512S	Advanced Cancer Biology	
CR 515S	Intro to Clinical Trials	
MCBG 514S	Cell Cycle and Apoptosis	
MIIM 508S	Immunology I	
MIIM 555S	Molecular Mechanisms of Microbial Pathogenesis	
MIIM 607S	Immunology II	
MIIM 613S	Emerging Infectious Diseases	
MIIM 615S	Experimental Therapeutics	
MIIM 630S	Advanced Molecular Biology	
NEUR 508S	Graduate Neuroscience I	
NEUR 511S	Advanced Cellular and Developmental Neuroscience	
NEUR 512S	Advanced Systems and Behavioral Neuroscience	
PHRM 507S	Prin of Neuropharmacology	
PHRM 512S	Graduate Pharmacology	
PHRM 518S	New Frontiers in Therapy	
PHRM 525S	Drug Discovery and Development I	
PHRM 526S	Drug Discovery and Development II	
PHRM 602S	Research Methods in Pharmacology	

General Electives – Thesis M.S. Track		
BIOC 513S	Biotechnology Practicum I	
BIOC 514S	Biotechnology Practicum II	
BIOC 515S	Biotechnology Practicum III	
BIOC 516S	Biotechnology Practicum IV	
IDPT 508S	Teaching Practicum II	
IDPT 507S	Teaching Practicum I	
IDPT 509S	Teaching Practicum III	
IDPT 600S	Thesis Defense	
MCBG 502S	MCBG 2nd Lab Rotation *	
MCBG 503S	MCBG 3rd Lab Rotation	

* Required if the student has not identified a thesis laboratory.

**Drexel University College of Medicine
Molecular & Cell Biology & Genetics (Non-Thesis MS Track)
Typical Graduate Program Schedule for First Year
Required Courses**

FALL

Meet with Dr. Eishi Noguchi, Advisor to New Graduate Students

Core Principles in Biochemistry & Cell Biology	4 credits	IDPT-533S
Learn Early as Professionals (LEAP I)	1 credit	IDPT-502S
Techniques in Molecular and Cell Biology & Genetics	2 credits	MCBG-515S
Molecular & Cell Biology & Genetics Journal Club	1 credit	MCBG-512S
Molecular & Cell Biology & Genetics Seminar	1 credit	MCBG-513S

SPRING

Meet with Dr. Eishi Noguchi, Advisor to New Graduate Students

Learn Early and Practice (LEAP II)	1 credit	IDPT-504S
Responsible Conduct of Research	2 credits	IDPT-500S
Advanced Cell Biology	2 credits	MCBG-506S
Molecular & Cell Biology & Genetics Journal Club	1 credit	MCBG-512S
Molecular & Cell Biology & Genetics Seminar	1 credit	MCBG-513S
Advanced Elective	2 credits	

**Drexel University College of Medicine
Molecular & Cell Biology & Genetics (Non-Thesis MS Track)
Typical Graduate Program Schedule for Second Year
Required and Elective Courses**

FALL

Molecular & Cell Biology & Genetics Journal Club	1 credit	MCBG-512S
Molecular & Cell Biology & Genetics Seminar	1 credit	MCBG-513S
Advanced Elective	3 credits	
Advanced Elective	4 credits	

*Committee Meeting

SPRING

Literature Review Non-Thesis	5 credits	IDPT-850S
Molecular & Cell Biology & Genetics Journal Club	1 credit	MCBG-512S
Molecular & Cell Biology & Genetics Seminar	1 credit	MCBG-513S
Select at least one of the following statistics courses for a minimum of two credits.		
Introduction to Biochemical Data	2 credits	BIOC 521S
Applications of Clinical Research Biostatistics	3 credits	CR 520S
Biostatistics I	2 credits	IDPT 501S
Applied Statistics for Biomedical Sciences	2 credits	MIIM 517S
Statistics for Neuro/Pharm Research	2 credits	NEUR 500S

*Committee Meeting

The student has the opportunity to take elective courses chosen with consent from the Advisory Committee. Suggested Electives are listed on the next page.

Advanced Electives – Non-Thesis M.S. Track		
In consultation with the Advisory Committee and according to the area of selected research, the student must select a minimum of 3 advanced elective courses from a diverse range of topics that complement the core curriculum and provide relevant, in-depth knowledge. A minimum of 9 credits is required to satisfy the advance elective requirements.		9 - 11
BIOC 508S	Experimental Approaches to Biochemical Problems	
BIOC 511S	Communication for Researchers	
BIOC 513S	Biotechnology Practicum I	
BIOC 514S	Biotechnology Practicum II	
BIOC 515S	Biotechnology Practicum III	
BIOC 516S	Biotechnology Practicum IV	
BIOC 520S	Macromolecular Structure & Function	
BIOC 521S	Introduction to Biochemical Data	
BIOC 603S	Advanced Topics in Biochemistry and Molecular Biology	
CBIO 510S	Cancer Biology	
CBIO 512S	Advanced Cancer Biology	
CR 515S	Intro to Clinical Trials	
MCBG 501S	MCBG 1st Lab Rotation	
MCBG 514S	Cell Cycle and Apoptosis	
MIIM 508S	Immunology I	
MIIM 555S	Molecular Mechanisms of Microbial Pathogenesis	
MIIM 607S	Immunology II	
MIIM 613S	Emerging Infectious Diseases	
MIIM 615S	Experimental Therapeutics	
MIIM 630S	Advanced Molecular Biology	
NEUR 508S	Graduate Neuroscience I	
NEUR 511S	Advanced Cellular and Developmental Neuroscience	
NEUR 512S	Advanced Systems and Behavioral Neuroscience	
PHRM 507S	Prin of Neuropharmacology	
PHRM 512S	Graduate Pharmacology	
PHRM 525S	Drug Discovery and Development I	
PHRM 518S	New Frontiers in Therapy	
PHRM 526S	Drug Discovery and Development II	
PHRM 602S	Research Methods in Pharmacology	

General Electives – Non-Thesis M.S. Track		
IDPT 507S	Teaching Practicum I	
IDPT 508S	Teaching Practicum II	
IDPT 509S	Teaching Practicum III	
MCBG 501S	MCBG 1st Lab Rotation	
MCBG 600S	MCBG Thesis Research	