



Ph.D. PROGRAM IN MICROBIOLOGY AND IMMUNOLOGY

STUDENT/FACULTY HANDBOOK

Updated: January 16, 2026

The PMI web site is: <https://www.pmi.pitt.edu>

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A. ORGANIZATION OF THE SCHOOL OF MEDICINE (SOM) GRADUATE PROGRAMS

Origin of the Program in Microbiology and Immunology (PMI).

The PMI came into existence upon approval by the University Provost, Dr. Patricia Beeson, in May 2017. PMI is administered by the Dean of the School of Medicine (SOM), Dr. Anantha Shekhar, and conforms to academic governance by the Provost of the University. PMI is a successor to the separate PhD programs in Molecular Virology & Microbiology and Immunology. These two programs combined to form PMI as part of a reorganization.

A.1. Office of the Dean

Associate Dean for Graduate Studies Saleem Khan, Ph.D. oversees graduate programs in the SOM and reports to Dean Anantha Shekhar, M.D., Ph.D.

A.2. SOM Graduate Council

The Graduate Council is a standing committee in the SOM chaired by the Associate Dean for Graduate Studies. Council members include the director of each SOM graduate program, the director of the M.D./Ph.D. program, and one student representative, usually the president of the Biomedical Graduate Student Association (BGSA).

A.3. Program in Microbiology and Immunology Committees

Admissions and Recruitment Committees

Curriculum Committee

Student Evaluation and Progress Committee

Comprehensive Examination Committee

A.4. Biomedical Graduate Student Association (BGSA) and Microbiology and Immunology Student Association (MISA)

The BGSA is the University sanctioned organization of graduate students within the SOM. Web link: <http://www.bgsa.pitt.edu/>. MISA was founded in fall 2022 by our graduate students. The purpose of MISA at Pitt is to provide the graduate students of the Program of Microbiology and Immunology (PMI) with opportunities to strengthen our graduate community, to supply professional development workshops, and bolster the relationship between students and faculty. Web link: <https://www.pmi.pitt.edu/about/misa-at-pmi>.

A.5. Graduate Stipends/Financial Aid

All students in good standing receive support in the form of a stipend, health insurance, and tuition remission. Students are appointed annually on a 12-month, full-time basis. In the first year, students are supported through Dean's fellowships administered through the SOM. Afterwards the dissertation advisor is responsible for the student stipend and related costs.

After the first year, students may be supported through the following funding mechanisms:

1. **Research Grants:** Students working on thesis research may be supported from research grants from their main advisor. These students would be considered *Graduate Student Researchers* (GSRs).
2. **Training Grants:** Several students working on thesis research may be supported from an institutional training grant (such as an NIH T32) from various departments associated with PMI. These students would be considered *Predoctoral Trainees*.
3. **Foundation/Government Fellowships:** Students who qualify for foundation and government individual fellowship awarded to the student by an external funder (such as NSF, NIH (F30 or F31) would be considered *Predoctoral Fellows*. Completion of the grant writing course and comprehensive exam provide excellent preparation for timely submission of a competitive grant application.

4. **Emergency Insurance Assistance:** PMI students in good standing and who are enrolled in the Pitt Student Health Plan are eligible to apply for assistance if they are experiencing financial hardship due to medical bills after insurance was applied to the expenses. Questions can be directed to emergencyfund@pitt.edu.

Regardless of the source of the support, all PMI students receive a stipend of \$41,200 (2024-2025). Current stipend levels are posted at <https://www.somgrad.pitt.edu/prospective-students/phd-programs>. Should a student receive a funding opportunity that is less than this level, the student's advisor is expected to make up for the difference. The University of Pittsburgh will provide the student with individual health coverage. *Please note that the process and payment for health insurance will vary depending on how the student is being funded.* If the student wishes to enroll in a family plan, they will be responsible for paying the difference in cost.

A.6. Physical and Mental Health Services

All University students can take advantage of the Student Health Service for health care, prevention, and pharmacy services. Web link: <https://www.studentaffairs.pitt.edu/shs/>.

PMI students also have access to campus exercise and fitness facilities: Web link: <https://www.studentaffairs.pitt.edu/campus-recreation/>

In addition, a variety of resources are available to PMI students for mental health and counseling. Information on these resources can be found at:

- School of Medicine Mental Health Team: <https://www.medstudentaffairs.pitt.edu/contact-us/mental-health-team>
- University Counseling Center: <https://www.studentaffairs.pitt.edu/cc/>
- Care and Resource Support (CARS): <https://www.studentaffairs.pitt.edu/cars/>
- BGSA Mental Health Counseling Guide: <https://bgsauniversityofpittsburgh.squarespace.com/mental-health-resources>

Students should direct questions about the PMI and the procedures and policies described herein to their research mentor, the Program Director (or Associate Director), the Program Administrator/Coordinator, or to the Graduate Office, M240 Alan Magee Scaife Hall (412-648-8957).

B. GRADUATE DEGREE REQUIREMENTS

B.1. Requirements for a Ph.D.

The PMI is comprised of formal course work and original laboratory research, which is designed to allow attainment of a Ph.D. in 4-6 years. The University requires students seeking the Ph.D. degree to engage in a minimum of one term of full-time doctoral study that excludes any other employment, except as approved by their departments. Ph.D. degree work must be completed within ten years from initial registration for graduate study. If the student has received credit for a master's degree appropriate to the field of study, then all requirements for the Ph.D. degree must be completed within eight years.

A minimum total of **72 credits** is required to satisfy the Ph.D. requirement. Of this, **32 credits** must come from approved courses, not including directed study credits or dissertation research credits.

Students are graded according to the A-F letter grade or S/NS (sufficient/not-sufficient) grading system for most courses. An "I" (incomplete) grade must be made up according to the stipulations of the faculty director of the course, the Program Director, and University policy.

Graduate students not fluent in English are strongly encouraged to take a University course in conversational English to allow active and full participation in the program. This course does not have to be taken for credit and does not contribute to the student's Quality Grade Point Average (QPA).

University policy requires a cumulative QPA of at least 3.0 for graduation. PMI further requires a minimum grade of a B in all required courses and in those elective courses counted toward the 32-credit requirement and maintain at least a 3.0 QPA. If a student fails to maintain the minimum grade requirement, then the curriculum, executive and/or student evaluation committee will decide whether to dismiss the student from the program or allow the student to retake any required course for which a grade less than a B was received. In such cases, the student will be placed on academic probation.

B.2. Requirements for a Master's Degree.

Students are not admitted to the PMI graduate program with the express purpose of obtaining a M.S. degree. In certain cases, however, it may be necessary that a student in the Ph.D. program be transferred to a terminal M.S. degree. Students pursuing a M.S. degree in Microbiology and Immunology will be required to complete the same course work as described for the Ph.D. program and to prepare a written master's thesis in accord with specifications stipulated in the Format Guidelines for Electronic Thesis and Dissertation Preparation at the University of Pittsburgh. The thesis examining committee will consist of the previous Ph.D. thesis committee members. The final oral examination in defense of the master's thesis will be conducted by the thesis committee, and a report of this examination signed by all members of the committee must be filed in the Office of the Dean.

C. THE PMI GRADUATE TRAINING PROGRAM

C.1. Introduction

This document contains general information about the PMI graduate program. The most up-to-date information can be found at the PMI web site: <https://www.pmi.pitt.edu>

C.2. Administrative Structure of the PMI Program

Program Director: Greg Delgoffe, Ph.D. (term 2025-2027)

Associate Director: Anthony (Tony) Richardson, Ph.D. (term 2025-2027)

Admissions Committee: voting members consisting of 3 faculty each from the general areas of interest of immunology and microbiology (the latter with a mixture of interest in bacteria and viruses), plus two current PMI graduate students in good standing, one from each general area of interest indicated above. Finally, the committee is chaired by one faculty member from PMI, who will assign applications for review and serve as a non-voting member. Terms are for 3 years.

Comprehensive Examination:

Tony Cillo, Ph.D (Chair)

Curriculum Committee:

Lawrence Kane, Ph.D. (Chair)

Alok Joglekar, Ph.D.

Melissa Kane, Ph.D.

Penny Morel, M.D.

Greg Delgoffe, Ph.D.

Zandrea Ambrose, Ph.D.

Executive Committee:

Zandrea Ambrose, Ph.D.

Greg Delgoffe, Ph.D.

Lawrence Kane, Ph.D.

Anthony Richardson, Ph.D.

Dario Vignali, Ph.D.

JoAnne Flynn, Ph.D.

+ The current chair of the Admissions Committee

C.3 Responsibilities of Program Representatives

Program Director: The Program Director will oversee the program, administer program activities as needed, serve on the SOM graduate council, serve on the Executive Committee, serve as a mentor to all first year PMI graduate students, and participate in the evaluation of the first-year class. Course directors will report directly to the Program Director. The Director's term will span a period of two years and is renewable upon subsequent nominations and elections (by the Executive Committee). The directorship will alternate between investigators with a primary focus in microbiology or immunology.

Associate Director: The Associate Director will serve on the Executive Committee, substitute for the director at the graduate council meetings, and communicate program updates to their department. The associate directorship will also alternate between investigators with a primary focus in microbiology or immunology, always being the opposite of the Director.

Admissions and Recruitment Committees: Representatives will supervise the maintenance of the PMI admissions website, evaluate applicants to PMI, help organize the recruitment weekend visits of applicants, participate in selection of members of the incoming class, and represent the interests of PMI during orientation events. Terms on the Admissions Committee will last three years and members will be appointed by the Executive Committee.

A representative from this committee will also attend regular meetings of the school-wide Recruitment Committee, which addresses issues such as increasing the quality and diversity of applicants applying to Pitt graduate programs and competing successfully with other top-level graduate programs.

Curriculum Committee: Members of the Curriculum Committee will meet on a bi-annual basis to evaluate the content and quality of the Program Course Offerings.

Comprehensive Examination Committee: The committee will be responsible for overseeing the comprehensive examination required of each student in the fall of the second year. The committee will consist of five PMI faculty members (a chair and 4 members equally distributed with expertise in microbiology/immunology research). The chair will receive abstracts from students and distribute to Examination Committee members to review. The committee will form individual comprehensive exam committees (3 evaluators with one serving as chair). This 3-member committee will be responsible for administering both the written and oral components of the exam for the student, as described in Section F of this document.

Executive Committee: Members of the committee will meet frequently to discuss time-sensitive PMI issues, such as the nomination and election of the Program Director and the processing of faculty membership applications. The chair of the committee will be responsible for scheduling meetings on an as-needed basis, but no less than four times during the academic year.

Student Evaluation Committee: The format of this evaluation will be determined by the Program Director and Student Evaluation Committee. Annual evaluations completed by the PMI student and their mentor will be reviewed.

Student Representative to the BGSA: This individual will be elected by the students, represent PMI within the BGSA, and coordinate student-sponsored events as needed.

C.4. PMI Faculty Membership Criteria

- 1) Graduate Faculty status
- 2) Extramural research funding: current or recent history
- 3) Independence: space and funding
- 4) Experience mentoring graduate students: past and present
- 5) Appropriateness of research program for immunology/microbiology graduate student training
- 6) Participation in the teaching of PMI and/or other graduate students

- 7) Participation in other PMI graduate program activities: journal clubs, seminar series, graduate thesis committees, comprehensive examination committees

C.5. PMI Program Faculty

A comprehensive and current list of PMI Graduate Program faculty is available at: <https://www.pmi.pitt.edu/faculty>

C.6. PMI Program Students

A comprehensive and current list of PMI Graduate Program students and graduates is available at <https://www.pmi.pitt.edu/students>

D. PMI CURRICULUM

D.1. Advising and Evaluation

Upon admission to PMI, students will be assigned a first-year mentor, specifically either the Director or the Associate Director of the program. The first-year mentor will provide advice on research and academic requirements and choices, choice of rotation labs, as well as assist in the decision regarding ultimate choice of a laboratory in which to complete their Ph.D. research. The mentor also will represent the student's interests at meetings with the PMI curriculum and evaluations committee should there be concerns about academic progress. Once a student formally joins a laboratory in which to complete their Ph.D. research, their primary mentor will be the faculty member who heads that lab.

Students will be continually evaluated by the Student Evaluation Committee with respect to grade point average and grades from laboratory rotations. Students will be assessed based on coursework and laboratory rotations. If a student is not performing at a satisfactory level, remedial action will be suggested, or the student may be placed on academic probation or may be dismissed from the program.

D.2. Curriculum

PMI students will take Principles of Microbiology and Immunology in the Fall term of the first year. Principles of Microbiology and Immunology is a required course for all incoming students in PMI. The course is team-taught and designed to introduce and reinforce core concepts of the microbiological and immunological sciences. Students will also be taught how to read and analyze the scientific literature, through a weekly paper discussion session, with an emphasis on both current and classic papers in the field. Two laboratory rotations, lasting 7 weeks each, also will be completed during the Fall term of the first year.

In the Spring term of the first year, PMI students will take either Advanced Immunology or Advanced Microbiology. These lecture and discussion courses will introduce the students to the advanced concepts of modern immunology and microbiology, respectively. Experimental Basis of Immunology or Experimental Pathogen Biology and two additional laboratory rotations, each lasting 7 weeks, will also be completed during the Spring term of the first year.

Classes are generally scheduled in the morning to allow time for laboratory rotation work in the afternoon, and the schedules for the classes will not overlap. Consultation with the Program Director is required prior to enrolling in classes for the second semester.

PMI students are required to take Data to Knowledge, Scientific Writing, and Biomedical Ethics during the Summer term at the end of the first year.

Students will have more flexibility in the second-year curriculum. In Fall and Spring semesters of their second and/or third year, PMI students will choose elective courses as needed or desired. Electives appropriate for PMI students are listed here: <https://www.pmi.pitt.edu/curriculum>

In addition, students will take Immuno RIP plus Contemporary Topics in Immunology or Micro RIP plus Microbiology Seminar.

Serving as a teaching assistant for graduate or undergraduate courses and other teaching opportunities for middle and high school students are available for elective credit.

The sequence of classes is summarized in the table below (credits in parentheses);

Year 1 (Fall)	Year 1 (Spring)	Year 1 (Summer)	Year 2 (Fall)	Year 2 (Spring)
Principles of Microbiology and Immunology (6) 2 lab rotations (4)	Advanced Immunology (2) Experimental Basis of Immunology (2) OR Advanced Microbiology (4) Experimental Pathogen Biology (2) AND 2 lab rotations (4)	Biomedical Ethics (2) D2K (3) Scientific Writing (2)	Electives (2+) (optional) Immunology RIP (1) AND Contemporary topics in Immuno (1) OR Micro RIP (1) AND Microbiology Seminar (1)	Electives (2+) Immunology RIP (1) AND Contemporary topics in Immuno (1) OR Micro RIP (1) AND Microbiology Seminar (1)

If a student fails to achieve a passing grade in any course, students can retake the course. Make-up exams may be offered, which is entirely at the discretion of the course director and in consultation with the Program Director. Students concerned about performance in a course should discuss this with the course director at the earliest opportunity.

A wide range of additional graduate courses are available through the SOM, which can be taken as electives. The most current list of courses is available from the web site (<http://www.gradbiomed.pitt.edu/current-students/course-information>).

D.3. Research

Laboratory research is the major component of all biomedical Ph.D. programs. PMI supervises the process of research rotations during the first year. Students are expected to complete 4 research rotations during the first year. At the end of each rotation, the student is required to complete a written report of 2-3 pages (including figures) and prepared according to the style suggested for contributors to the Journal of Biological Chemistry. When the written report is complete, the rotation mentor will review the performance of the student and assign a letter grade for the rotation. Failure to maintain satisfactory laboratory performance will result in dismissal from the program.

It is expected that four rotations of seven weeks each will be performed in different laboratories of members of the PMI training faculty. This will provide the student with an adequate opportunity to identify an area of research interest and to establish a relationship with a potential dissertation advisor, and potential dissertation committee members. All rotations must be approved by the Program Director.

Inability of a student to identify a dissertation advisor after four rotations could constitute grounds for dismissal of the student from the program. In rare instances, a student may petition the Program Director for permission to take a fifth rotation. If granted, the student will be placed on academic probation. By June 10th your rotation advisor will submit an evaluation of your rotation to the Program Director and a recommendation as to whether the student should continue dissertation research in their laboratory. Upon satisfactory completion of the fifth rotation, identification of a dissertation advisor and

passing the comprehensive exam, the probation status will be removed and the student will be in good standing. However, if the 5th rotation does not work out, the student's performance will be considered unsatisfactory and the student will be subject to dismissal by the PMI Executive Committee from PMI and hence the University of Pittsburgh.

It is recommended that M.D./Ph.D. students perform at least 2 rotations in the summer before and after their first year of medical school. A third rotation is possible after the second year of medical school, if necessary. All rotations must be approved by the Program Director.

There are several circumstances where the requirement for four rotations or laboratories might be relaxed. For example, if a student has completed a Master's degree thesis based on original research, a report of this project may be submitted in place of a rotation report. Alternatively, students may have identified a dissertation advisor after 3 rotations. In such cases the student must petition the Program Director for approval and can perform their fourth rotation in the same laboratory as their newly identified dissertation advisor.

D.4. Additional Program Activities

In addition to coursework and seminars, members of the PMI community will also come together at an annual PMI Retreat Day, organized by a committee of PMI graduate students and faculty, and sponsored by the MMG and Immunology departments. This retreat will feature faculty and student speakers representing PMI. In this regard, it will be open to all faculty and trainees interested in microbiology and immunology, including those residing in affiliated departments, such as Pediatrics, Medicine and Surgery. **All PMI students are required to attend the event for its duration and to present a poster.** A subset of students will be chosen to present oral presentations, based on the poster abstracts.

The Pitt Biomedical Graduate Student Association (BGSA) organizes an annual symposium each fall to highlight graduate student research. Please note that **all PMI students are required to attend the event. All second-year students and above are required to submit an abstract for a poster presentation and to attend the symposium each year until their thesis defense is scheduled.**

All PMI students will be required to attend and present at Research in Progress (RIP).

E. PMI DEGREE REQUIREMENTS

E.1. Course Requirements - PhD Track

COURSE TITLE	CREDITS
Principles of Micro & Immuno	6 Cr
Rotations (4)	8 Cr
Biomedical ethics	1 Cr
Data to Knowledge	3 Cr
Scientific Writing	1 Cr
Advanced Microbiology	4 Cr
Experimental Pathogens	2 Cr
<u>or</u>	
Advanced Immunology	
Experimental Basis of Immunology	2-4 Cr
Cont. Topics or Micro Seminars	
(2 semesters minimum)	2-4 Cr
RIP (Micro <u>or</u> Immuno)	2-4 Cr
Electives (2)	4-6 Cr

~35-43 Credits

(at least 34 course credits needed)

Per University guidelines, a minimum of 72 credits is required for a Ph.D. in Microbiology and Immunology over a minimum of 6 full-time terms. 9 to 15 credits constitute full-time study in the Fall and Spring terms and 3 credits is considered full-time for the Summer term. A minimum of 37 of those credits will come from coursework while a minimum of 40 credits must be earned for dissertation research, acquired after passing the doctoral comprehensive examination.

E2. Course Requirements - M.D./Ph.D. Track

Admission into PMI for medical students who wish to pursue a dual degree is subject to prior approval by the Program Director and their graduate advisor, who is a member of the graduate faculty in the PMI. This will apply to students who matriculate directly into the combined M.D./Ph.D. Program (MSTP) and also to medical students who apply to join the MSTP during or after year 1 or year 2 of medical school. M.D./Ph.D. students must meet with the PMI Program Director prior to entering PMI. It is also recommended that M.D./Ph.D. students attend PMI graduate student orientation at the beginning of their first year in PMI.

Per University of Pittsburgh guidelines, a minimum of 72 credits is required for a Ph.D. in Microbiology and Immunology over a minimum of 6 full-time terms. 9 to 15 credits constitute full-time study in the fall and spring terms and 3 credits is considered full-time for the summer term. A minimum of 34 of those credits will come from coursework while a minimum of 40 credits must be earned for dissertation research, acquired after passing the doctoral comprehensive examination.

For M.D./Ph.D. students, because a thesis mentor already has been identified, M.D./Ph.D. students will not perform any rotations during their first year in the program. However, all MSTP students will be required to take Principles of Microbiology and Immunology (first fall term) and Advanced Microbiology/Immunology (first spring term).

In addition, a minimum of 24 credits of remaining coursework will be fulfilled by the following courses:

COURSE TITLE	CREDITS
Transfer credits from medical school rotations	6 Cr
Transfer credits from MS ethics course	2 Cr
Transfer credits from MS statistics course	2 Cr
Principles of Microbiology & Immunology	6 Cr
Advanced Microbiology	4 Cr
Experimental Pathogens	2 Cr
<u>or</u>	
Advanced Immunology	4 Cr
Experimental Basis of Immunology	2-4 Cr
Cont. Topics or Micro Seminars	
(2 semesters minimum)	2-4 Cr
RIP (Micro <u>or</u> Immuno)	2-4 Cr
Electives (2)	4-6 Cr

~34 credits (or more)

*Electives may include the Molecular Medicine course (1 credit), the PMI Scientific Writing course, the Professional Development course (1 credit), and/or non-required courses offered by medical school graduate programs (as approved by the Program Director).

M.D./Ph.D. students will be subject to maintaining the same GPA requirements and ethical standards as are applied to Ph.D. students as described in the Graduate Student and the MSTP Handbooks.

E3. Course Descriptions

MSMI 2000 Principles of Microbiology and Immunology (6 cr)

This is a required course for all incoming students in PMI to be taken in the Fall of the first year. This is a team-taught course designed to introduce, and reinforce, core concepts of the microbiological and immunological sciences. Students will also be taught how to read and analyze the scientific literature, through a weekly paper discussion session, with an emphasis on both current and classic papers in the field. Fall semester.

MSMI 2200 Advanced Microbiology (4 cr) / MSMI 2420 Experimental Pathogen Biology (2 cr)

This course will focus on the molecular basis of bacterial, parasitic and viral pathogenesis. Topics include microbial physiology and genetics, gene expression, virulence factors, pathogenic strategies of bacterial agents, the molecular basis of viral pathogenesis and current advances in therapeutic strategies.

Experimental Pathogen Biology is a second-tier course that will expose the students to classical and contemporary literature in modern microbiology (including both bacteriology and virology). Emphasis will be on paper analysis, methods, and critical evaluation of primary data. This course will parallel the topics presented in the Advanced Microbiology lecture course, which is recommended to be taken simultaneously with Experimental Pathogen Biology. Principles of Microbiology and Immunology, or an equivalent course (approved by the course director) is a prerequisite. Spring semester.

MSMI 2210 Advanced Immunology (2 cr) / MSMI 2230 Experimental Basis of Immunology (2 cr)

This is a second-tier lecture and discussion course that will introduce the students to the fundamental concepts of modern immunology. The course will cover cells, tissues and organs of the immune system. Furthermore, in depth analyses of the development, activation, effector functions, and regulation of immune response will be presented in this course.

Experimental Basis is a second-tier course that will expose the students to classical and contemporary literature in modern immunology. Emphasis will be on paper analysis and critical evaluation of primary data. This course will parallel the topics presented in Advanced Immunology lecture course, which must be taken before or simultaneously with Experimental Basis of Immunology. Spring semester.

MSMI 2240 Intro to Immunobiotherapeutics (2 cr)

This course provides a comprehensive overview of the principles and the technology upon which immunobiotherapeutics are based. The course focuses on the overall aims of using small molecules, antibodies, genes, and cells as immunotherapeutic agents. It covers the use of viral and non-viral agents as gene delivery vehicles, cells as therapeutic agents, and small molecules as delivery and therapeutic vehicles. The course also covers diseases and disorders in which immunobiotherapy has proven safety and demonstrated successful outcomes like cancer, mendelian disorders, and autoimmunity. Fall semester.

MSMI 2250 Teaching Assistant (1 cr)

Students can serve as teaching assistants for Principles of Microbiology and Immunology, Comprehensive Microbiology, Comprehensive Immunology, and D2K. In addition, teaching opportunities can be found in the Department of Biological Sciences, Evolving STEM, and the Hillman Academy. This is not a requirement of the PMI but can serve as elective credits. Contact the Program Director for more information. All semesters.

MSMI 2290 Directed Study (1 – 9 cr)

This course provides the student an opportunity to carry out a specific laboratory project in any area of interest relevant to microbiology and/or immunology. All semesters.

MSMI 2300 Scientific Writing in Microbiology and Immunology (2 cr)

This course is designed to familiarize students with the basics of submitting research grants. The course includes a review of the types of research grants most commonly applied for by principal investigators, the general structure and content of these applications, and the most common mistakes made by new grant writers. Students will be provided with example research grants and will be expected to review these grants and serve as reviewers of writing sections. Summer semester.

MSMI 2460 Microbiology and Related Topics Seminar Series (1 cr)

Beginning in the second year of the program, microbiology leaning students will be required to attend a seminar series. Seminar attendance once a week at a seminar of the student's choice is required for each the Fall and Spring semesters, which will include presentations by nationally and internationally recognized visiting researchers, as well as internal researchers, in microbiology and related fields. Fall and Spring semesters.

MSMI 2480 Mechanisms of Microbial Persistence and Pathogenesis (2 cr) Microorganisms have evolved a vast array of mechanisms to avoid detection or elimination by host defenses, and to establish persistent infections that can lead to chronic or recurrent disease. The ability to establish persistent infections often complicates the successful therapeutic treatment of disease caused by such microorganisms. This course is designed to familiarize students with the mechanisms by which select bacterial and viral pathogens establish persistence in their host cells and/or organisms, and the subsequent considerations for pathogenesis and therapy. Alternate Fall semesters.

MSMI 3200 PhD Dissertation Research (1 – 14 cr)

After advancement to candidacy for the Ph.D. degree, students enroll in this course to pursue original experimental laboratory research, the results of which will provide the substance of their doctoral dissertation. A minimum of 40 credits of this course is required for the Ph.D. degree in the SOM. All semesters.

MSMI 3220 Contemporary Topics in Immunology (1 cr)

This is a third-tier course in which students will read, present, and evaluate the primary literature in immunology. Each semester will feature an integrated set of papers addressing a current issue of interest to modern immunologists. The course may be taken more than once since the topic addressed will change each semester. The prerequisite is Comprehensive Immunology or permission from the course director. Fall and Spring semesters.

MSMI 3230 Microbiology Research in Progress (1 cr)

The Micro Research in Progress (RIP) course meets weekly during which students, in their second year or later, report on their research progress, including the background, reasoning, analyses, critical evaluation of experimental strategies, data analysis, and interpretation of their experimental results. Students are expected to discuss issues and answer questions from graduate students, faculty, and others in attendance. Emphasis is placed on the development of teaching and speaking skills needed for scientific presentation. Fall and Spring semesters.

MSMI 3240 Immunology Research in Progress (1 cr)

The Immuno Research in Progress (RIP) course meets weekly during which students, in their second year or later, report on their research progress, including the background, reasoning, analyses, critical evaluation of experimental strategies, data analysis, and interpretation of their experimental results. Students are expected to discuss issues and answer questions from graduate students, faculty, and others in attendance. Emphasis is placed on the development of teaching and speaking skills needed for scientific presentation. Fall and Spring semesters.

MSMI 3270 Innate Immunity (2 cr)

This course will focus on several aspects of host innate immunity against infection. Topics will include the conceptual basis for innate versus adaptive immunity, induction of innate immunity by pathogens, signaling by innate immune receptors, effector cells of the innate immune system, secreted effectors of innate immune signaling, and subversion of innate immune signaling by pathogens. Comprehensive Immunology is highly recommended but is not a prerequisite for the course. Alternate Spring semesters.

MSMI 3280 Immunology of Infectious Diseases (2 cr)

This course examines the immune responses to pathogens, as well as the immune evasion of microbes. The organisms studied include bacteria, parasites, and viruses. Topics focus on host-pathogen interaction and include innate immunity, modulation of antigen processing and presentation, pathogenic strategies for subversion of immune responses, effector functions of immune cells, and immunopathology. Principles of Microbiology and Immunology is a prerequisite. Lecture/paper discussion format. Fall semester.

MSIMM 3290 Autoimmunity and Immunopathology (2 cr)

This course will familiarize students with basic concepts of immune tolerance, autoimmunity, and immunopathology. The course will focus on basic mechanisms, animal models of human disease, and novel therapeutic approaches arising from these models. Applications to human disease will be discussed. Alternate Spring semesters.

MSMI 3435 Tumor Virology (2 cr)

This course introduces students to viruses known or suspected of causing tumors, with special emphasis on viruses causally linked to human cancer, including polyomaviruses, Epstein-Barr virus, Kaposi's sarcoma-associated herpesvirus, adenoviruses, papillomaviruses, hepatitis viruses, and human T-cell lymphotropic virus. Topics focus on establishing causality between specific virus infections and cancer, oncogenes, tumor suppressors, oncogenic cofactors, disruption of innate/adaptive immune responses, latency, viral mimicry/piracy of cellular regulatory genes, genomic instability, and role of non-coding RNAs in viral pathogenesis. Alternate Spring semesters.

MSMI 3440 Immunology and Immunotherapy of Cancer – Principles and Practice (2 cr)

It is now generally appreciated that cancer is an immune-mediated disease, such that therapeutic modalities aimed at reinvigorating or stimulating immune responses to cancer can have immense clinical benefit. In this course, students will learn the history of the study of cancer immunity, including the analysis of both seminal and modern literature. Further, we will also discuss the various immunotherapeutic modalities for cancer treatment and their underlying scientific principles. Spring semesters.

INTBP 2013 D2K: From Data to Knowledge - Biomedical Experimental Design & Analysis (3 cr)

This team-taught course will focus on basic principles of experimental design together with measurements and sources of experimental error. The course will provide a practical introduction to the quantitative tools required for experimental research using cellular, molecular, and systems methods. Topics will include rigor and reproducibility, experimental design; measurement errors; principles of parametric and non-parametric statistical inference; use of MS Excel, GraphPad PRISM and Minitab; design of publication graphics; and an introduction to big data approaches. In addition to lectures, students will work in small groups to construct capstone projects by making YouTube style videos to illustrate key principles of scientific rigor, experimental design, and analysis. Summer semester.

INTBP 2290 Scientific Ethics and the Responsible Conduct of Research (1 cr)

The course is an introduction to the basic ethical issues which arise in the course of conducting scientific research. It is intended for all graduate students and fellows in the biomedical sciences who have

completed at least one year of graduate work. The course will be composed of informal lecture presentations followed by discussion of issues in small groups. Summer semester.

Additional Microbiology and Immunology program courses can and will be developed, as dictated by student and faculty interests and needs.

E.4. Publication Requirement

Publication of novel findings is an important part of being a research scientist and the principal way that scientific findings are disseminated. Students are therefore required to publish **at least** one first-author paper of original research for completion of the Ph.D. in PMI.

F. COMPREHENSIVE EXAMINATION

F.1. Introduction

The comprehensive exam is a critical component of the PMI PhD training process. The comprehensive exam establishes a student's candidacy for the PhD degree and is meant to test both a student's depth and breadth of knowledge in their chosen field.

Students enrolled in the Ph.D. program, including students in the M.D./Ph.D. track, should take the comprehensive examination in the fall of the second year. The comprehensive examination will be administered after the student has completed most required course work and has chosen a major advisor. In the summer at the end of the first year, students will meet with the chair of the Comprehensive Examination Committee to discuss these guidelines.

F.2. Comprehensive Examination Proposal (written component)

Written comprehensive examination is based off a student's general research area. PhD track students will submit an abstract of their project by November 15th, and a full written proposal by December 20th of their 2nd year after passing all PMI required courses. The format of the written proposal is roughly in the style/format of a NIH F31/F30 grant application (1 Specific Aims page and a 6-page Research Strategy).

The written exam is expected to be conceptually sound and adequately documented, and original to the student. Dissertation advisors and others may be consulted on specific scientific issues, but the document must be prepared exclusively by the student. Advisors may not directly discuss the written proposal with the student or edit the document, although conceptual discussions are acceptable. Generally, the proposal may be outlined in an advisor's grant application, but the content must be prepared directly by the student, including well-defined hypotheses and rationale, interpretations, as well as expected results and alternative approaches. Overall significance of the experiments to the field should be discussed. Innovation will not be scored.

Students are encouraged to seek feedback on the written proposal from other students, **but not faculty members**. Those whose written English skills are considered weak may wish to consult the Writing Center in the Cathedral of Learning (<http://www.writingcenter.pitt.edu>), which provides individualized help with writing skills.

The abstract submission on November 15th will be forwarded to the Comprehensive Exam Committee. These abstracts will be evaluated by the committee, which will then reach out to faculty to form the student's individual comprehensive exam committee (three evaluators with one serving as Chair). The

final 3-person committee will be responsible for administering **both** the written and oral component of the comprehensive exam.

The individual comprehensive exam committee will receive the full document (cover page with name and title, abstract, aims page, and research strategy) on December 20th (or next business day per NIH rules) for evaluation. The written proposal will be assessed mainly for clarity, scientific accuracy, and internal consistency. The proposal should not be evaluated like an NIH R01 proposal (i.e., significance and innovation should be given less weight than the above criteria, although the student should be able to explain significance and novelty). They will then convene an initial assessment in person or virtually, and deliver one of four initial outcomes:

<i>Outcome</i>	<i>Description</i>	<i>Time for revision</i>
Pass	No changes or revisions required	N/A
Minor Revision	Small factual or stylistic comments	2 weeks (Chair can render decision)
Major Revision	One component in need of significant revision	4 weeks (full CE committee review)
Fail / Rewrite	Flawed hypothesis or approach/ rewrite needed	6 weeks (full CE committee review)

The individual comprehensive exam committee should return their evaluation to the student no later than January 15th. If revisions are required, the students will have the indicated time to revise their proposal for review, after which the committee will re-review the revised proposal and reach a pass/fail decision. If the revised document is still judged to be inadequate, the student will fail the written component. A second unacceptable written exam performance shall constitute a second failure and the student will be subject to dismissal.

F.3. Oral Comprehensive Examination

The oral examination will take place, at the earliest, March 1st of the second year, 6 weeks after the January 15th date (in the instance of a pass). Otherwise, the student will have 6 weeks from the passing of their written exam to prepare for the oral examination.

The examination will be held in a closed session with only the student and the individual comprehensive exam committee in attendance. It is the student's responsibility to work with their individual committee and their administrators (if applicable) to find an appropriate time.

After a brief introduction of the ground rules by the committee Chair without the student present, the student will give a 15-minute uninterrupted presentation of their written proposal, in a slide presentation format. After the presentation, the oral examination will begin.

The oral examination is intended to assess the student's mastery of the principles of their field, using the written examination as a guide/jumping off point. That is, questions are not restricted to solely the content of the proposal but may be from any concepts of the field at large, including from PMI courses. Students must demonstrate both depth and breadth of knowledge, and likely will need to both design

novel experiments as well as demonstrate complete knowledge of pathways and processes as a part of their examination.

The oral examination should last a maximum of 2 hours, inclusive of the 15-minute presentation. After this time, the student is dismissed from the room and discussion between the individual comprehensive exam committee members takes place.

Oral exams are given either a pass or a fail: there are no conditional pass options.

In the event of a failing grade, the student will be provided with rationale for the decision and four weeks of preparation for a new exam. At least one comprehensive exam committee member will be replaced by a new faculty member.

In the event of a second failure, the student will be subject to dismissal.

F.4. Preparation for the Oral Comprehensive Exam

Students should expect that any topics covered in their coursework and associated literature may be addressed in the oral examination. Deep knowledge of the associated literature is expected, as well as the historical underpinnings of their project. Examination questions may deviate significantly from the proposed research as the examiner deems appropriate.

In this way, preparation for the oral examination should be the major focus of the student during the six-week preparation period. During this time, the student's mentor should be lenient with expectations for work in the laboratory to allow for adequate preparation.

A key component of successful oral examinations is practice. Students preparing for their oral exam should work with current students and postdocs to schedule mock comprehensive exams.

A note about mentor involvement: mentors are permitted to assist students as they prepare for the oral examination, with the understanding that examiners have the field in its entirety to draw upon for questions.

G. ADVANCEMENT TO CANDIDACY & FORMATION OF A DISSERTATION COMMITTEE

Following completion of course work and passing the comprehensive examination, the student undertakes the steps required for advancement to candidacy for the Ph.D. degree, outlined below.

Students should form a dissertation committee within one month of passing their comprehensive examination. The committee shall consist of at least five faculty members. The dissertation advisor is included in the committee, but another faculty member must be designated chair of the committee. The majority of members must be from the PMI faculty, and the majority of members must have Graduate Faculty status. The student is not limited to faculty from the SOM or the University of Pittsburgh. The Director of PMI will approve the committee. Upon approval from the Director, the student should then email the PMI coordinators to discuss the required DocuSign forms needed.

The thesis committee should meet within three months of formation, before the end of May in the student's second year (or later depending on when the oral examination is passed). Per the policy of the Graduate Office, all committee members must be present at the first meeting. Prior to the meeting, a written thesis proposal should be provided to each committee member. At this meeting, the dissertation research project is presented in detail to the committee; if the committee approves the proposal, the student should make certain that the required graduate school forms were emailed from the PMI coordinators (via DocuSign) are signed by all committee members for advancement to candidacy for the Ph.D. degree. PMI Coordinators will forward the completed DocuSign forms to the

Graduate Office. Final approval of committee membership must be obtained from the Associate Dean for Graduate Studies.

Following the initial thesis committee meeting, additional meetings must be held at six-month intervals. The student must submit, one week prior to the scheduled committee meeting, a brief written summary (1-2 pages) of their research progress since the previous committee meeting.

Each time a thesis committee meets (including the first meeting), a brief report of this meeting (see Appendix), written by the committee chair, must be sent to all thesis committee members and to the PMI coordinators so that this information can be included in the student's academic file. The committee and student should schedule the next committee meeting date and time, which should be included on the committee meeting report.

H. DISSERTATION AND FINAL ORAL EXAMINATION

When a determination has been made by the thesis committee that the student is nearing completion of their degree, the committee may give the student permission to begin working on their written dissertation. This generally occurs about six months from the anticipated defense date. This should be documented on a thesis committee report form and submitted to PMI coordinators by the committee chair to be added to the student's file. At this time, students should refer to the "*PMI Checklist to Schedule and Defend Your Thesis*" document.

Prior to setting a date for defense, the student must meet with the Director of the PMI and one of the PMI Coordinators. The School of Medicine stipulates that the following requirements must be met before the last day of the term in which the student has applied for graduation. Students apply for graduation through PeopleSoft.

The student's dissertation must provide evidence of original scholarly research of sufficient quality to be published in a leading scientific journal. Laboratory work for which a student receives wages (for example, work performed when the student was employed as a technician) is not eligible for any part of the dissertation research. The style and format of the dissertation must conform to the standards set forth by the Graduate Council. It is strongly recommended that the student attend an Electronic Thesis Defense (ETD) Workshop and share a preliminary draft of the dissertation with their committee chair and/or dissertation advisor.

A final copy of the written dissertation must be submitted to the entire committee **at least two weeks prior** to the dissertation defense date.

The dissertation defense consists of a formal, public seminar on the subject of the dissertation. This is followed by a closed-door examination of the student by the thesis committee members. If the decision of the committee is not unanimous, the case is referred to the Dean for resolution. The degree in Microbiology and Immunology, will be granted by the School of Medicine, University of Pittsburgh.

A student must be on active status (must be registered for a minimum of three credits during a 12-month period) and must register for at least one credit during the term in which they graduate. Students who complete all the degree requirements in one term but graduate the next term may petition the Dean for a waiver of this requirement. A student who is on inactive status must be readmitted and registered for three credits in order to graduate.

After the final defense, the following *must* be delivered to the Graduate Office electronically and can be found on the [SOM Grad website](#):

1. Dissertation Defense Report (sent via DocuSign by the PMI Coordinator on day of defense)
2. Dissertation Approval Report (sent via DocuSign by the PMI Coordinator on day of defense)
3. ETD Approval Form (sent via DocuSign by the PMI Coordinator on day of defense)

4. An official receipt from Student Payment Center (G-7 Thackeray Hall) for payment of the processing fee for a Ph.D. degree.
5. Survey of Earned Doctorate (used by National Research Council)
6. AAUDE Doctoral Exit Survey
7. ProQuest UMI Dissertation Publishing Agreement
8. A copy of your updated curriculum vitae
9. Alumni Form (found on the SOMGrad website)

Students are required to submit an electronic version of the thesis using the ETD submission process (<https://etd.pitt.edu/submit>) as required by University Policy.

Appendix – Forms (all are available by contacting the PMI Coordinator)

- Rotation form (Available via DocuSign, contact Program Coordinator)
- Template for rotation report
- Rotation evaluation
- Thesis committee meeting report form (To be filled out by the thesis committee chair and returned to Program Coordinator Rebecca Case)
- Yearly progress evaluation (review committee summary, mentor and self)
- PMI checklist to schedule and defend



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PMI Rotation Form

Date:

Student name:

Rotation mentor:

This confirms that both the student and mentor named above have agreed to a rotation in the mentor's lab.

Signature of Student

Signature of Rotation Mentor

Signature of Program Director



PMI Rotation Report

Guidelines for Writing and Submitting a Laboratory Rotation Report

Students are responsible for submitting a copy of the rotation report to the Rotation Advisor, the PMI Program Director and the PMI Coordinators by the due date.

Students and Rotation Advisors are asked to discuss the rotation as well as the report and complete the attached evaluation form. Rotation Advisors should complete the evaluation form and must submit the form to the program coordinators, via email, by the due date.

Writing the rotation report is a required exercise that provides an opportunity to gain experience writing a scientific paper. While the faculty understand that it is often difficult to obtain a “real paper’s worth” of data in the course of a laboratory, writing the report will be a valuable experience in organizing your thoughts and experimental results in a scholarly way that brings the rotation project to a proper conclusion.

At the end of each rotation, the student is required to complete a written report of 2-3 pages (including figures) and prepared according to the style suggested for contributors to The Journal of Biological Chemistry, which can be found here:

<http://www.jbc.org/site/misc/ifora.xhtml>.

When the written report is complete, the rotation mentor will review the performance of the student and assign a letter grade for the rotation. As per our program guidelines, failure to maintain satisfactory laboratory performance will result in dismissal from the program.



PMI Rotation Evaluation

Student name:

Date:

Lab Mentor:

Overall GRADE (select from drop down): A+

	Excellent	Acceptable	Unacceptable	Unable to Assess
Effort in Lab	☐	☐	☐	☐
Reads Primary Literature	☐	☐	☐	☐
Independence	☐	☐	☐	☐
Analytical Skills	☐	☐	☐	☐
Technical Skills	☐	☐	☐	☐
Verbal Communication	☐	☐	☐	☐
Written Communication	☐	☐	☐	☐
Interpersonal Skills	☐	☐	☐	☐
Responsible Conduct of Research	☐	☐	☐	☐
Intellectual Contributions to Lab	☐	☐	☐	☐
Rotation Report	☐	☐	☐	☐

Comments:



PMI Thesis Committee Meeting Report

Student name: Meeting date: Permission to write? Yes ☐ No ☐

Current graduate year of student (select from drop down): 2

Committee members present:

Progress as judged by the committee:

Exceeds expectations ☐ Meets expectations ☐ Room for Improvement ☐ Unsatisfactory ☐

Status of first-author original manuscript (required after year 3) – select only one:

<i>Conceptual</i> ☐	<i>In Preparation</i> ☐	<i>Submitted</i> ☐	<i>Revising</i> ☐	<i>Accepted</i> ☐
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Student Strengths as measured by committee:

Student Weaknesses as measured by committee:

Student Relationship with Major Advisor:

Summarize the student's progress, thesis committee comments and future research plans/directions decided at the meeting:

The next committee meeting MUST be scheduled before the close of the meeting.

The next meeting will be held on:



PMI Yearly Progress Evaluation - Summary

Student: Degree Sought:
Mentor: Evaluation Date:

1) Academic standing (select one): Satisfactory ☐ Unsatisfactory ☐

- a) Date entered graduate program:
- b) Comprehensive Exam (date passed):
- c) Comments:

2) Coursework:

- a) Post-first year courses successfully completed? Yes ☐ No ☐
- b) Comments:

3) Participation in Other Required PMI Activities: Satisfactory ☐ Unsatisfactory ☐
(retreat, RIP, journal club, seminars, etc.)

- a) Comments:

4) Research progress: Satisfactory ☐ Unsatisfactory ☐
(append advisor's research appraisal)

- a) Comments:

5) Thesis Committee Meetings (if relevant)

- a) Date committee formed:
- b) Date of last committee meeting:
- c) Comments:

Overall Evaluation: Excellent ☐ Satisfactory ☐ Unsatisfactory ☐ Probation ☐

Recommendations/Comments (if any):



Yearly Student Self-evaluation

1. Name and Date:
2. Advisor:
3. Date entered graduate program (month & year):
4. Have you passed the comprehensive exam? ☐ Yes ☐ No
5. List all journal clubs and seminar series you attended regularly this year and indicate how many times you presented in each of them in the past year.
6. Have you formed a dissertation committee? ☐ Yes ☐ No
7. Has your dissertation proposal been approved at the first meeting? ☐ Yes ☐ No
 - a. Please list the members of the committee (* next to committee chair name):
8. Dates of all dissertation committee meetings (Not just this past year):
9. How often do you formally meet with your advisor to discuss your research, progress, and career options? (For example: weekly, twice a month, monthly, rarely, never, etc.)
 - a. Do not include meetings/discussions in the context of lab meetings.
10. List all papers submitted or accepted for publication from your doctoral studies.
11. List all abstracts presented at meetings thus far during your time in the program. Include abstracts submitted/accepted for upcoming meetings. Indicate whether poster or oral presentations.
12. List your major research and career goals for the next year (e.g., plan to submit a paper; defend thesis; start looking for a post-doc, etc.)
13. What are your goals for further training and/or employment after completion of your thesis?
14. Please attach or send a current NIH Biosketch.
15. **Optional:** Please discuss any concerns you have with your mentor that you feel should be brought to the attention of the PMI Evaluations Committee. This statement will NOT be shared with the mentor it will be kept confidential.



Yearly Student Evaluation - Mentor

Student name:

Date:

	Outstanding	Excellent	Acceptable	Not Acceptable	Unable to Assess
Effort in Lab	☐	☐	☐	☐	☐
Reads Primary Literature	☐	☐	☐	☐	☐
Independence	☐	☐	☐	☐	☐
Analytical Skills	☐	☐	☐	☐	☐
Ability to Perform Technical Tasks	☐	☐	☐	☐	☐
Ability to Express Self Verbally	☐	☐	☐	☐	☐
Ability to Express Self in Writing	☐	☐	☐	☐	☐
Ability to Interact with Others	☐	☐	☐	☐	☐
Integrity in Lab Work	☐	☐	☐	☐	☐
Contributes Intellectually to Lab	☐	☐	☐	☐	☐
Overall Evaluation:	☐	☐	☐	☐	☐

Please provide a brief synopsis of the student's progress, noting any major concerns. Specifically comment on the status of current and upcoming publications*. This statement will be shared with the student. *All students are required to have published [or accepted for publication] at least one first-author manuscript of original research before defending their dissertation.

Optional: Please discuss any major concerns you have with the student that you feel should be brought to the attention of the PMI Evaluations Committee. *This statement will NOT be shared with the student.*



PMI Checklist to Schedule and Defend Your Thesis

So, you're preparing to defend your thesis, that's wonderful! Below is a 3-part checklist that you, your mentor and your thesis committee chair should review and complete ***before*** you are permitted to move ahead further. If you have any questions about this, please contact Rebecca Case (rsc63@pitt.edu)

PART 1

- ☐ Have you completed all coursework requirements for the PMI? Check with Ms. Case if you are unsure.
- ☐ Have you received permission from your committee (per the Thesis Committee Report Form) to write your thesis? Again, check with Ms. Case to ensure that your report form is on file.
- ☐ Do you have a first-author, original research publication (i.e., not a review or commentary) from your graduate thesis laboratory? *Please note: this publication **must** be "accepted" – simply having a paper "in submission" is not acceptable.

Before moving to Part 2, please contact the PMI Program Director and discuss your plans. DO NOT move on until you have had your meeting.

PART 2

- ☐ Did you register for the **required** Electronic Theses and Dissertations (ETD) Workshop? [Click here](#) to register now.
- ☐ Did you visit the [SOMGRAD graduation website](#) to check the timeline for the term you are planning to defend?
- ☐ If you are planning a hybrid defense, please contact Ms. Candy Kuo (cak94@pitt.edu) for the Zoom link and assistance with the online portion.
- ☐ Do you need help scheduling a room for your defense? Contact Ms. Case for BRDG2 or Ms. Kuo or the BST or the Assembly Building in Shadyside.
- ☐ At least 4 weeks before you want to schedule your defense, fill out the online [Dissertation Defense Information Form](#) and include both the physical location and the Zoom Link for your defense.

PART 3

- ☐ Write! Write! Write!
- ☐ Submit your fully written thesis to all members of your thesis committee no later than 2 weeks ***before*** your scheduled defense date.