School of Graduate Studies in the Health Sciences

MICROBIOLOGY AND IMMUNOLOGY CURRICULUM GUIDE 2017-2018

Program Description
The Department of Microbiology and Immunology offers qualified students the opportunity to earn a PhD in microbiology and immunology leading to challenging and rewarding careers in science. The graduate program in microbiology and immunology provides students with a foundation in the disciplines of immunology, bacteriology, parasitology, and virology, with intensive training in one of these areas. It emphasizes creative research productivity with a close relationship between faculty and graduate students. In addition to laboratory research under the direction of a faculty mentor, training consists of formal course work (including courses in medical microbiology, immunobiology, bacterial structure and function, medical bacteriology, biochemistry, and virology), seminars and journal clubs. These experiences provides the student with opportunities to develop the skills to critically read the scientific literature, design experiments and solve problems, as well as to speak and write effectively, all of which are critical for success in a scientific career.

Admission Requirements
Prospective students with B.A., B.S., or equivalent degrees will be evaluated based on Graduate Record Examination (GRE) scores, research interests, previous academic performance and their willingness to intensely pursue research as a long-term goal. Applicants for the program should have a high level of intellectual curiosity, an undergraduate grade point average (GPA) of at least 3.0, and a combined (quantitative and verbal) score of 300 or greater on the Graduate Record Examination (GRE). The department is flexible concerning specific course requirements for admission, although it is expected that undergraduate course work will have been in biological and/or chemical sciences. Qualified applicants will be interviewed by a standing committee of the faculty consisting of the director of the graduate program and representatives of the different research interests within the department who will report their assessments of applicants to the departmental faculty. The faculty will then advise the Chairman of the department by vote on possible admission of an applicant. Based on the faculty vote, the Chairman will decide whether to admit the applicant to the graduate program in the Department of Microbiology and Immunology. Should an interview with the applicant be impossible, the applicant’s records and credentials will be presented to the faculty for consideration.
Program Outcomes

The goals of the PhD program in Microbiology and Immunology are to train highly qualified researchers who will make significant contributions to the fields of Bacteriology, Virology, Parasitology and Immunology and educate those who will teach the next generation of health care professionals and research scientists.

Graduates of the Program in Microbiology and Immunology will be able to:

- master fundamental concepts of Microbiology and Immunology and apply these to independently design and perform experiments that extend our knowledge in the field
- critically read and evaluate current literature
- effectively communicate scientific information to a professional audience or in a classroom setting
- manage and prepare successful grant proposals
- produce and publish original research data in respected peer reviewed journals
- successfully find employment or postdoctoral training in an area related to their field of study.

PhD graduates can expect to be employed by pharmaceutical, biochemical, or biotechnology firms, government agencies or continue their academic training as postdoctoral fellows. Many University of Mississippi Microbiology and Immunology graduates are faculty members at colleges and universities throughout the United States.

CURRICULUM

Core component
- MICRO 701 Medical Microbiology (12 hrs)
- BIOCH 710 Biochemistry (10 hrs)
- MICRO 707 Microbiology Laboratory Rotation (3 hrs)
- ID 709 Responsible Conduct of Research (1 hr)
- MICRO 733 Experimental Immunology (3 hrs)
- MICRO 702 Molecular and Cellular Virology (3 hrs)
- MICRO 725 Bacterial Structure and Function (3 hrs)
- MICRO 708 Preparation for Instruction in Microbiology (3 hrs)
- MICRO 750 Research Proposal (3 hrs)
- MICRO 703 Seminar in Microbiology (2 - 3 hrs)
- ID 714 Professional Skills (3 hrs)

Elective component
- ID 710 Research Tools in Molecular Biology (3 hrs)
- ID 740 Statistical Methods in Research I (3 hrs)
- ID 741 Statistical Methods in Research II (3 hrs)
- ID 721 Molecular Oncology (4 hrs)
MICRO 715 Special Topics in Microbiology (1-9 hrs)
ID 713 Bioinformatics & Genomics (3 hrs)
ID 715 Teaching in Higher Education (3 hrs)

Dissertation
MICRO 798 Dissertation and dissertation research

Plan of Study
In order to maintain full-time status, a student must register for 9 credit hours per semester, except for the summer term when 1 credit hour is sufficient. The table below represents the basic courses taken by the graduate students in the Department of Microbiology and Immunology. Note that students entering in an odd year will take the graduate Immunology course (Micro 733) in the spring of their first year, and the graduate Virology (Micro 702) and Bacteriology (Micro 725) courses in the spring of their second year. Students entering in even years take these courses in reverse order. By following this curriculum will have completed the bulk of their academic requirements and be eligible to take their qualifying examination during the summer of their second year/fall of their third year.

Suggested Pre-Candidacy Plan of Study

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<th>Yr</th>
<th>Semester</th>
<th>Course</th>
<th>Description</th>
<th>Hours</th>
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<td>Micro 733</td>
<td>Experimental Immunochemistry and Immunobiology a</td>
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<td>Responsible Conduct of Research</td>
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<td>Micro 703</td>
<td>Seminar</td>
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<td>Micro 703</td>
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**Subtotal: 30**

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<th>Course</th>
<th>Description</th>
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<tr>
<td>2</td>
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<td>Micro 708</td>
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<td>ID 740</td>
<td>Statistical Methods in Research I (optional)</td>
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<td>Micro 702</td>
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<td></td>
<td>Micro 725</td>
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<td></td>
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<td>Micro 704</td>
<td>Research in Microbiology</td>
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</table>
### Summer/ Fall Qualifying Examination

**Note:**
- a The course is offered in even years.
- b The course is offered in odd years.

#### Post-Candidacy Plan of Study

After the student has passed the qualifying exam and been admitted to candidacy, the studies are focused on research. The plan of studies will be tailored to fit the individual student’s needs and interests. A PhD candidate needs only to enroll in 1 credit hour/semester (MICRO 798 Dissertation and Dissertation Research). However, in addition to this course, students may enroll in an Advanced Course or Special Topics Course in their area of emphasis (bacteriology, immunology, virology) or in other elective courses offered within the Department of Microbiology and Immunology or another department. All senior students are also required to take ID714 Professional Skills for Graduate Students and Postdoctoral Fellows during their third year. By the end of the third year or beginning of the fourth, students are required to take Micro 750 (Research Proposal in Microbiology, 3 credit hours). This course requires the student to write and defend a research proposal before their committee. The time from admission to candidacy (i.e., passing the qualifying examination) to graduation with a PhD degree varies from student to student, but generally requires 3 - 4 years of intense research efforts. A typical registration schedule for a PhD candidate is shown on the next page:

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<th>Yr</th>
<th>Semester</th>
<th>Course</th>
<th>Description</th>
<th>Hours</th>
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<td>Spring</td>
<td>ID 714 Micro 703</td>
<td>Professional Skills for Graduate Students and Postdoctoral Fellows, Seminar in Microbiology</td>
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<tr>
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<td>Summer</td>
<td>Micro 798</td>
<td>Dissertation and Dissertation Research</td>
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<td>4</td>
<td>Fall</td>
<td>Micro 750</td>
<td>Research Proposal in Microbiology</td>
<td>3</td>
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<tr>
<td></td>
<td>Spring</td>
<td>ID XXX Micro 703</td>
<td>Elective (optional), Seminar in Microbiology</td>
<td>3</td>
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<tr>
<td></td>
<td>Summer</td>
<td>Micro 798</td>
<td>Dissertation and Dissertation Research</td>
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### General Requirements

**Attendance requirements:** As preparation for a career in microbiology, graduate students are expected to attend all classes and seminars. When not in class or seminars, graduate students are expected to be at the department engaged in academic work or laboratory research. Students are expected to perform research activities at a level defined by their mentor and advisory committee.

**Academic performance:** Students can be dismissed from the program for cause (e.g., plagiarism, cheating, harassment, etc.) or for poor academic performance. This includes:

- **A)** Failure to achieve a grade of >80% in the Medical Microbiology Course (MICRO 701).
- **B)** Failure to maintain an overall GPA of >80% for two consecutive semesters.
- **C)** Scoring less than 80% in two of the three graduate microbiology courses (i.e., Bacterial Structure and Function (MICRO 725), Experimental Immunochemistry and Immunobiology, (MICRO 733), and Viruses (MICRO 702). Students who score <80% in two of these courses will be limited to a MS degree.

**Professional conduct:** It is both expected and mandatory that all students adhere to the highest levels of honesty and research integrity. Misconduct such as academic dishonesty (cheating), fabrication of data, falsification or misreporting research findings, plagiarizing the words or ideas of others undermines scientific integrity. Communicating with other students during examination is an unacceptable behavior. Students engaging in these practices will be disciplined and, if the offense warrants, dismissed from the Microbiology and Immunology Graduate Program entirely upon majority vote of the faculty.

All PhD graduate students will be evaluated on eleven professionalism performance standards across domains of integrity, communication, demeanor and respect using the Professionalism Assessment Tool (PAT) developed for the QEP at UMMC. The initial assessment will be at the time of the qualifying exam by the qualifying exam committee members. Subsequently, the student’s research advisory committee will evaluate the student once per year following one of the semi-annual committee meetings.
Requirements for a Doctor of Philosophy Degree

The PhD Program at the University of Mississippi Medical Center requires successful completion of a minimum of 60 semester hours. For students entering with an MS degree or prior graduate work, course requirements and transfer of graduate level courses from another institution will be determined on an individual basis by the Director of the Graduate Program in Microbiology and Immunology. However, courses to be transferred must be appropriate to the student’s course of study and must be limited to less than half of the hours required for graduation. Students must apply for transferring credits using forms available on the graduate school website. http://graduateschool.umc.edu All transfer of credits must be approved by the Dean of the graduate school.

Mentor selection. During the first year of graduate study, the student will be “hosted” by one or more laboratories, and participate in formal research rotations in at least two research laboratories. These activities will help the student learn about the various projects in the department. Near the end of their first year of graduate study, students will be required to submit a list of three preferred mentors, in the order of preference, to the Chairman. The Chairman, with the student’s preferences in mind, will make the final decision on mentor selection following input from the Executive Committee and the Director of the Graduate Program. The decision of assigning a mentor to a student will be based on several factors including the financial ability of the laboratory to support the student's stipend, research and travel, the availability of space, the mentor's time, the quality of the proposed project, and the mentor's track record with previous students.

Qualifying Examination

In the beginning of the student’s third year of graduate study, the student must pass a qualifying examination for admission to candidacy for the PhD degree. The qualifying exam consists of two parts, a written and an oral exam. The written exam consists of questions from each of the following areas: 1) bacteriology, 2) immunology, 3) virology and 4) medical microbiology. Students need to score 75% on the written exam to pass. Only students who successfully pass the written exam are allowed to take the oral exam. The oral examination will be given by a standing qualifying examination committee. The committee will examine the student and also consider a report from the mentor relative to the student’s progress in research. Students, who fail the written qualifying examination, are allowed to retake the written exam once. However, if the student fails the written exam a second time, the committee will recommend to the faculty that the student not be admitted to the PhD program. Note: If the student has successfully completed requirements for a MS in Biomedical Science, the student may receive the MS as a terminal degree. In case of an unsatisfactory performance on the oral qualifying examination, the qualifying examination committee may allow the student to repeat the exam; the ability to repeat the oral exam will be determined by a majority vote of the exam committee. Satisfactory performance on the qualifying examination (written and oral) will result in a recommendation for admission to candidacy. The examination committee will discuss and determine by a majority vote if any deficiencies are noted and remedial work is required.

After successfully completion of the qualifying exam, the student must complete the Application for Admission to Candidacy for the Degree of Doctor of Philosophy form and the Qualifying Examination Form (to be signed by all members of the
examination committee) and submit these, along with a copy of his/her transcript, to the Graduate Office. Copies of these forms can be found on the School of Graduate Studies in the Health Sciences web site. Upon successful entry into candidacy, the student must complete his/her PhD requirements within five years.

Advisory Committee: The student in consultation with his/her mentor will nominate an Advisory Committee. The committee will consist of at least five members of the graduate faculty, at least three from within the Department of Microbiology and Immunology and at least one from outside the department. Once the faculty for the committee are determined, the Nomination of Advisory Committee Form should be submitted to the Director of the Graduate Program in Microbiology and Immunology who will submit this form to the Graduate Office for approval. The student is required to meet with the advisory committee twice a year to present his/her ongoing research and progress.

Research proposal: Within one year of being admitted to candidacy for the PhD the student will prepare and submit a written research proposal to each member of the Advisory Committee. The proposal should outline the research planned for the completion of the PhD. The research proposal will be presented in oral form to the advisory committee and they will evaluate the feasibility and appropriateness of the proposal and advise the student accordingly. Each committee member will grade the proposal based on an agreed upon rubric and the majority vote will determine if the proposal has been approved. The student is expected to present his/her research findings and an outline of their proposed research to the entire department after the advisory committee has approved the proposal. Students should not register for Micro 750 Proposal unless they are ready to defend their proposal in that semester.

Dissertation, final oral examination and publication requirement: Requirements for successful completion of the PhD are three-fold: (1) a written dissertation describing the student’s original research submitted to each member of the a student’s Advisory Committee who in private deliberation will determine the adequacy of the dissertation and the defense, (2) a public oral presentation of the dissertation research, and (3) at least one peer-reviewed, first author publication describing original research done by the student in a major scientific journal. Submission of the dissertation to the Advisory Committee and defense of dissertation may not take place until the student has a paper published or “in press” (accepted for publication). The paper must describe the original research done by the student and list the student as first author. Publication must be in a peer-reviewed journal; review papers or book chapters do not fulfill the publication requirement. The dissertation should be submitted to the committee two weeks prior to the committee meeting at which it will be determined whether or not the dissertation is defensible. At this meeting the closed oral examination and thesis defense will take place. If the dissertation is deemed acceptable the student shall submit a letter to the director of the graduate program and the chairman of the department providing the title of the dissertation, the expected date of the public dissertation defense, and a list of publications. If the student’s paper is not yet published, a letter of acceptance from the journal’s editorial office must be included with the letter. On receipt of that letter, the director of the graduate program will schedule the student’s public defense and notify the School of Graduate Studies in the Health Sciences.
The Application for Diploma form and if applicable the Cap and Gown Order form should be returned to the Registrar at the beginning of the semester in which the student expects to graduate. Consult the Bulletin to determine the last date on which all forms and requirements must be completed for participation in graduation, and the School of Graduate Studies in the Health Sciences Student Handbook for additional graduation/dissertation requirements.

Requirements for a M.D./Ph.D degree

For students pursuing an M.D./Ph.D degree the general requirements outlined in the University bulletin apply. Credit earned in medical school courses will count toward graduate school requirements. In addition, the combined degree candidate must take additional 10 semester hours of courses within the Department of Microbiology and Immunology, outside of the medical curriculum. Since the proposed time allotted for the PhD portion of the combined degree is short (3 years) and since research should be a major component of the program, it is advisable that the student completes the bulk of his/her course requirements within the first year of graduate school. The courses required during this year will be determined based on the recommendations of the student’s advisory committee. Whereas individual plans may vary, for a student working in the area of bacteriology, for example, the required courses may include the following:

- MICRO 725 Bacterial Structure and Function (3 hrs)
- MICRO 750 Research Proposal (3 hrs)
- MICRO 703 Seminar in Microbiology (2 - 3 hrs)
- MICRO 707 Microbiology Laboratory Rotation (3 hrs)
- ID 709 Responsible Conduct of Research (1 hr)
- ID 714 Professional Skills (3 hrs)

Descriptions of Graduate Courses in Microbiology and Immunology

MICRO 701. MEDICAL MICROBIOLOGY. The fundamentals of microbial physiology, genetics and immunology are presented with important bacterial, viral, parasitic and mycotic infections discussed from the standpoint of etiology, epidemiology, pathogenesis and laboratory diagnosis. Participation in laboratory exercises and small group sessions is required. (12 semester hours; 6-6)

MICRO 702. MOLECULAR AND CELLULAR VIROLOGY. The students will learn fundamentals of viral replication and pathogenesis with emphasis on pertinent aspects of molecular biology. Prerequisites: Microbiology 701 and Biochemistry 710. (3 semester hours)

MICRO 703. SEMINAR IN MICROBIOLOGY. (1 semester hour)

MICRO 704. RESEARCH IN MICROBIOLOGY. (1-9 semester hours)

MICRO 707. MICROBIOLOGY LABORATORY ROTATION. This course is designed to acquaint the student with ongoing research and research methodologies within the
To accomplish this, the student will actively take part in ongoing research projects in two or three laboratories during the semester. (3 semester hours)

**MICRO 708. PREPARATION FOR INSTRUCTION IN MICROBIOLOGY.** The student will participate in the preparation of microbiological cultures and assist faculty in the teaching of the medical microbiology laboratory course. Prerequisite: MICRO 701. (3 semester hours.)

**MICRO 715. SPECIAL TOPICS IN MICROBIOLOGY.** The course is designed to meet the special needs of individual students. Students who wish to learn more about a particular topic can arrange this course by discussing their needs with their mentor. (1 - 9 semester hours)

**MICRO 725. BACTERIAL STRUCTURE AND FUNCTION.** A study of bacterial physiology, anatomy and regulatory mechanisms. Prerequisite: Microbiology 701 and Biochemistry 710. (3 semester hours.)

**MICRO 733. EXPERIMENTAL IMMUNOCHEMISTRY AND IMMUNOBIOLOGY.** Theoretical and experimental applications of immunochemistry and immunobiology with major emphasis on *in vivo* and *in vitro* techniques used in investigating various aspects of humoral and cell-mediated immune responses. Prerequisite: Microbiology 701 or equivalent. (3 semester hours.)

**MICRO 750. RESEARCH PROPOSAL IN MICROBIOLOGY.** An advanced course in which doctoral students prepare and defend a research grant proposal focused on their dissertation research. (3 semester hours.)

**MICRO 798. DISSERTATION AND DISSERTATION RESEARCH.** (1-9 semester hours)