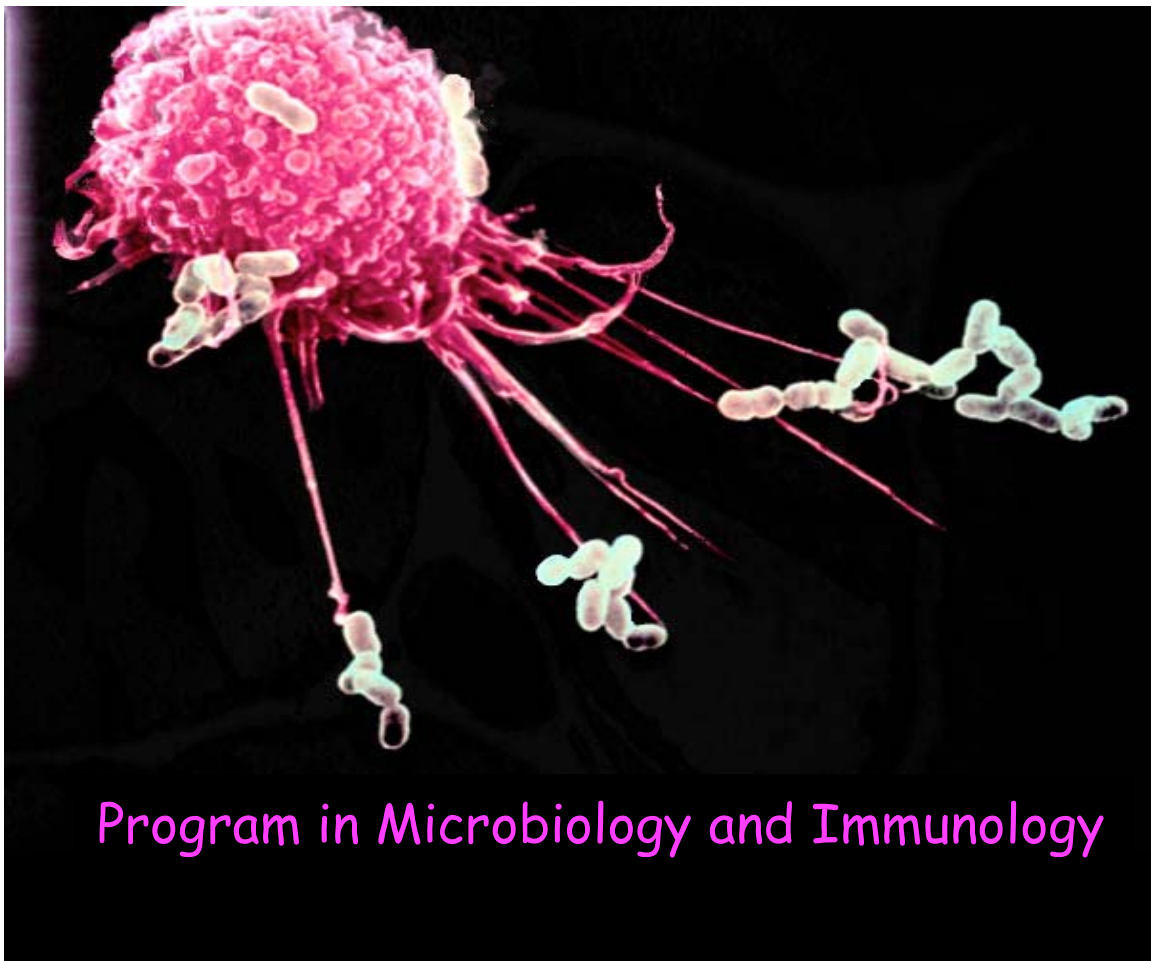

MUSC

MEDICAL UNIVERSITY
OF SOUTH CAROLINA

College of Graduate Studies



Updated August 1, 2007

Microbiology and Immunology Graduate Program

Program of Study:

The Microbiology and Immunology Graduate Program is the largest discipline-based graduate program at the Medical University of South Carolina. The Microbiology and Immunology Graduate Program is an interdepartmental program administered by a Program Committee, which is responsible for monitoring individual student progress from the time of admission to the program at the beginning of the second year to the time of selection of the student's Advisory Committee. The Microbiology and Immunology Graduate Program leads to either the M.S. or Ph.D. degree.

All matriculating Ph.D. students participate in the first year common curriculum of the College of Graduate Studies. Students interested in Microbiology and Immunology are encouraged to select their research rotations with faculty members associated with the Microbiology and Immunology Graduate Faculty. Students are also encouraged to speak to the Microbiology and Immunology Graduate Program Coordinator to assist in their selection of rotations. In the second year of study, Ph.D. students undertake advanced and elective courses in Microbiology and Immunology. The program of study for each student is planned jointly by the student and his or her advisory committee and is highly individualized according to the needs and goals of the student. In addition, all students must complete an original investigation indicating knowledge of research methods and demonstrating an ability to conduct scientific research on an independent basis. Candidates are required to submit and successfully defend a dissertation (Ph.D. students). All requirements for the Ph.D. degree are discussed in detail below. Master's degree students complete all course requirements during their first year of study. The program of study for each student is highly individualized according to the needs and goals of the student. Master's candidates are required to submit and successfully defend a thesis. All requirements for the Master's degree are discussed in detail below.

The Microbiology and Immunology Faculty have active research programs in three broad areas, which include Gene and Immunotherapy, Environmental Microbiology and Microbial Physiology, and Immunopathogenesis. Current specific areas of research interest include molecular studies of lymphocyte activation and signal transduction; immunology of CNS diseases; regulation of immune mechanisms; immune mechanisms involved in atherosclerosis; autoimmunity; immunoglobulin structure and genetics; genetic control of immune response; transplantation immunobiology; complement chemistry; recombinant DNA vaccines; tumor immunology; oncogenes; lipid metabolism; microbial physiology; retrovirology, including HIV; pathogenic microbiology; immunology of enteric diseases; gene therapy of genetic diseases and cancer including vector development, molecular biology of bacteriophages, and yeast molecular genetics. Faculty members in the program who have M.D.s also have appointments in various clinical departments, thus permitting direct access to patients of interest. Departmental graduates have a strong record of publication and successful careers in the biomedical disciplines.

Program Requirements for Ph.D.

Requirements for admission to candidacy for the degree include:

1. Satisfactory completion of all required course work.
2. Satisfactory performance in the Qualifying Examination.
3. Selection of a Dissertation Advisor and Advisory Committee
4. Submission and oral defense of the Dissertation Proposal (Plan of Research)

Each of these requirements, detailed below, must be completed within a specified time frame. All requirements must be completed at least one year prior to the student's Final Dissertation/Thesis defense. Exceptions to this rule will be considered only if student illness or other extenuating circumstances exist, or if unsatisfactory performance mandates re-examination (discussed below). Admission to Candidacy should be accomplished by the beginning of the third year.

1. Required Courses:

The program of study for each student is planned jointly by the student and his or her advisory committee and is highly individualized according to the needs and goals of the student. All matriculating Ph.D. students participate in the first year curriculum of the College of Graduate Studies. In the second year of study Ph.D. students undertake advanced and elective courses in Microbiology and Immunology. A total of **12 credit hours** of advanced coursework are required. At **least six credit hours** of advanced course work must be completed in the second year prior to sitting for the qualifying exam. Course work can be in either Microbiology or Immunology or both. Students in the DMSTP or MSTP program design an individualized course of study under the guidance of the Microbiology and Immunology Graduate Coordinator. In addition, all students are required to attend and present yearly at the Microbiology and Immunology departmental seminar series.

First Year: Common Core Curriculum

Second Year:

Fall and/or Spring

Semester:

Elective #1 (3+ credit hrs)*

Elective #2 (3+ credit hrs)*

Biomedical Research (MBIM 970)

Seminar (MBIM 770) 1 credit hr

Once after 1st year: Biostatistics (BMTRY 723) or proof of proficiency (required in all CGS programs)

Each Semester: Biomedical Research (MBIM 970)
Seminar (MBIM 770) 1 credit hr

*A list of Microbiology and Immunology advanced courses and electives follows this section. In coordination with the M & I Graduate Program Coordinator, a program of study will be devised

for each student. In addition, specific electives offered through another department are also acceptable after obtaining permission of the Graduate Coordinator. Elective courses may be taken anytime after completion of the first year core curriculum. At least 6 credit hours **MUST** be taken in the second year of study. These may be in either or both Immunology and Microbiology. Additional specialized courses in Microbiology and Immunology as well as courses in English, Biochemistry, Statistics, Computer literacy, and Grants and Manuscript Writing, may be required at the discretion of the Advisory Committee. Courses offered by other graduate programs are also acceptable with permission from the graduate coordinator.

Students must maintain a minimum grade of 3.0 in all advanced courses, which satisfy the advanced graduate 12 credit hours. If this requirement is not met, the student may retake a specific course once or may take additional courses to satisfy the 12 credit hours at the discretion of the Course Director and the Program Committee. Failure to achieve the required grade upon subsequent examination will usually result in dismissal from the program, as will a grade of less than 2.0 in any course. Extenuating circumstances will be considered by the Program Committee.

2. Qualifying Exam:

The qualifying exam is a written examination taken at the end of the **second year** of study following completion of at **least 6 approved advanced credit hours**. The format of the Microbiology & Immunology Written Qualifying Examination is determined on an ongoing basis each academic year and is comprised of a number of questions in the area of microbiology and immunology. The examining committee expects you to formulate well-structured, complete, and properly proof-read answers to each of your questions. A passing grade (70% or above) must be obtained in order to pass the exam. The portion of total points allotted to each section of the exam will be indicated. Questions are approved by the Program Committee, and grades will be awarded by at least two faculty members. If a passing grade is not achieved, the student will be re-examined at the next yearly cycle. Failure at this time will result in dismissal from the program.

The purpose of the qualifying exam is to determine one's maturity and preparation for completing the Ph.D. degree. The exam is designed to determine the following: 1) your ability to read and understand primary scientific literature, 2) your ability to summarize detailed information on subjects of which you do not have direct knowledge without consulting the scientific literature, 3) your ability to develop hypotheses about the information you read, 4) your ability to propose experiments to test such hypotheses and 5) your ability to communicate this information in writing. All of these are essential to one's future success in a career in science and will be considered in grading the exam.

3. Dissertation Advisor and Advisory Committee

Students are encouraged to select an Advisor and members of the Advisory Committee as early as is feasible, but no later than the beginning of the third year. In exceptional circumstances, approved by the Program Committee, this may be extended six months. During this time, the Program Committee will act as the Student Advisory Committee.

The Advisory Committee will consist of at least five members including the student's Advisor. At least three members of the Advisory Committee must be Microbiology and Immunology

Program Faculty, and at least four members must be faculty of the MUSC College of Graduate Studies. One member of the committee may be from outside the College of Graduate Studies or a member of the faculty at another university. The Program Director must approve and recommend the Advisory Committee in writing to the Dean of the College of Graduate Studies. The approved Advisory Committee assumes primary responsibility for the Dissertation Research and general progress of the student.

The student will meet at least yearly with his/her Advisory Committee, and will provide a **concise written summary** of his/her research progress to the Committee prior to the annual meeting. This annual meeting usually coincides with the student's annual seminar. A copy of the approved annual report will be forwarded to the Dean of the College of Graduate studies.

4. Dissertation Proposal and Dissertation Defense

A written plan of research must be prepared by the student in consultation with the Advisory Committee, in the **format of a research grant application in accordance with the current National Institutes of Health Guidelines**. The proposal must contain clearly stated and original hypotheses to be tested and preliminary data that support the objectives. The student must defend the proposal **orally** before the Advisory Committee and the Program faculty. This presentation usually takes place during the regular Microbiology and Immunology Seminar Series and will fulfill the seminar requirement for the year. The written dissertation proposal must be submitted and defended no later than **six months** after passing the qualifying examination. The date of the proposal defense must be agreed upon by the Program Committee Chairman. Prior to the proposal defense, the student will distribute a summary (abstract) of the proposal to all M & I Program Faculty. The written proposal **MUST** be given to the student's advisory committee at least one week prior to the oral presentation. The written proposal must be approved by the Advisory Committee.

The approved Dissertation proposal should generally be submitted to the graduate office before the beginning of the third academic year. It must be submitted at least one year prior to the date of the final Dissertation defense. The College of Graduate Studies recognizes that the student's research may deviate from that originally proposed. The student should be encouraged to pursue promising leads; however, substantial or long-term changes in the direction of the student's research should be made only with the approval of the Advisory Committee.

Program Requirements for M.S.

The M.S. program is expected to last two fall semesters, two spring semesters and one summer, so that a degree can be obtained 19 - 24 months after the start of the program. Requirements for admission to candidacy for the degree include:

1. Satisfactory completion of all required course work.
2. Selection of a Thesis Advisor and Advisory Committee
3. Submission and oral defense of the Thesis Proposal (Plan of Research)

Each of these requirements, detailed below, must be completed within a specified time frame. All requirements must be completed at least six months prior to the student's Final Thesis defense. Exceptions to this rule will be considered only if student illness or other extenuating

circumstances exist, or if unsatisfactory performance mandates re-examination (discussed below). Admission to Candidacy should be accomplished by the beginning of the second year.

1. Required Courses for the Masters Degree:

The program of study for each student is planned jointly by the student and his or her advisory committee and is highly individualized according to the needs and goals of the student. In consultation with the program advisory committee, Master's students may complete the first year core curriculum as their course requirement or an individual plan of course work will be developed. A list of Microbiology and Immunology electives follows this section as well as examples of programs of study. In addition, specific electives offered through other departments are also acceptable after obtaining permission of the Graduate Coordinator. Additional specialized courses in Microbiology and Immunology as well as courses in English, Biochemistry, Statistics, Computer literacy, and Grants and Manuscript Writing, may be required at the discretion of the Advisory Committee. In addition, all Master's students are required to attend and present yearly at the Microbiology and Immunology Departmental Seminar Series.

Students must maintain a **minimum grade of 3.0 in all courses**, in order to satisfy the required graduate credit hours. If this requirement is not met, the student may retake a specific course once or may take additional courses to satisfy the required credit hours at the discretion of the Course Director and the Program Committee. Failure to achieve the required grade upon subsequent examination will usually result in dismissal from the program, as will a grade of less than 2.0 in any course. Extenuating circumstances will be considered by the Program Committee.

An M.S. program is also currently offered in conjunction with the Department of Periodontics in the School of Dental Medicine. Students admitted to this program must hold a D.M.D./D.D.S. degree, and be acceptable to the Department of Periodontics for Graduate Training in that specialty of clinical dentistry.

2. Thesis Advisor and Advisory Committee

The student is encouraged to select an Advisor and Advisory Committee during the second semester of the program, so that he/she may start work on a thesis at the beginning of the summer semester. In exceptional circumstances, approved by the M & I Program Committee, this may be extended six months. During this time, the M & I Program Committee will act as the Student Advisory Committee.

The Advisory Committee will consist of at least five members, three of whom must be Program Faculty. The Program Director must approve and recommend the Advisory Committee in writing to the Dean of the College of Graduate Studies. The approved Advisory Committee assumes primary responsibility for the Thesis Research and general progress of the student.

The student will meet at **least yearly** with his/her Advisory Committee, and will provide a concise written summary of his/her research progress to the Committee prior to the meeting. This meeting usually coincides with the student's annual seminar. A copy of the approved annual report will be forwarded to the Dean of the College of Graduate studies.

3. Thesis Proposal and Proposal Defense

A written plan of research must be prepared by the student in consultation with the Advisory Committee, in the format of a research grant application in accordance with the current National

Institutes of Health Guidelines. The proposal must contain clearly stated and original hypotheses to be tested and preliminary data that support the objectives. The student must defend the proposal orally before the Advisory Committee and the Program faculty. This presentation usually takes place during the regular Microbiology and Immunology Seminar Series and will fulfill the seminar requirement for the year. The written thesis proposal is usually presented after the first year of study. The date of the proposal defense must be agreed upon by the Program Committee Chairman. The written proposal **MUST** be given to the student's advisory committee at least one week prior to the oral presentation. Prior to the proposal defense, the student will distribute a summary (abstract) of the proposal to all Program Faculty. The written proposal must be approved by the Advisory Committee.

The approved Thesis proposal should generally be submitted to the graduate office before the beginning of the second academic year. It must be submitted at least six months prior to the date of the final Thesis defense. The College of Graduate Studies recognizes that the student's research may deviate from that originally proposed. The student should be encouraged to pursue promising leads; however, substantial or long-term changes in the direction of the student's research should be made only with the approval of the Advisory Committee.

Admission to Candidacy:

MASTER'S and Ph.D. DEGREE REQUIREMENTS

All students in the Master's degree program must be admitted to candidacy at least six months prior to submission and defense of the Thesis. All students in the Ph.D. degree program must be admitted to candidacy at least one year prior to submission and defense of the Dissertation.

- i. **Seminars:*** Students must prepare a seminar every academic year that should be related to the student's research. The topic will be chosen by the student in consultation with a faculty member who will assist the student in organizing the seminar. A date will be assigned to the student two months before the scheduled presentation. This seminar usually coincides with the Microbiology and Immunology seminar series. Attendance of students at departmental seminars is **compulsory**.
- ii. **Thesis/Dissertation:*** The dissertation/thesis must be based upon original investigation, give evidence of mature scholarship and critical judgement, indicate knowledge of research methods and techniques and demonstrate ability to carry on independent investigation. Preparation of the dissertation/thesis must comply with the regulations contained in "A Guide to the Preparation of Thesis and Dissertations" which is available in the College of Graduate Studies Office. **Three weeks prior** to the date of the student's thesis/dissertation defense, the "thesis/dissertation defense notice" must be completed and signed by your thesis/dissertation committee, the graduate coordinator, and department chair. A completed copy of your thesis/dissertation must then be given to the graduate coordinator and it will be placed in the Microbiology and Immunology conference room for review by the faculty. However, the thesis/dissertation committee should be given an **additional two weeks** to review the thesis/dissertation before they are asked to sign the "thesis/dissertation defense notice." **Therefore, the thesis/dissertation should be in a complete form five weeks prior to the intended defense date.** Following approval of the dissertation by the Advisory Committee, the typewritten original and two copies of

the dissertation and abstract must be submitted to the Graduate Office **not less than three weeks** before a date is set for the student's final examination.

- iii. Thesis/Dissertation Seminar:** Student candidates for the M.S. and Ph.D. degree are required to present completed research results in a formal seminar prior to their final examination. The date of the Thesis/Dissertation Seminar must be agreed upon by the Chairman of the Program Committee.
- iv. Final Examination (Oral Defense of Thesis/Dissertation):** Each candidate is required to pass a general oral examination directed primarily to the defense of the thesis/dissertation. This will follow the Thesis/Dissertation Seminar. The examination is conducted by the Advisory Committee, with the Chairman of the Department or the Chairman of the Program Committee presiding. (The Chairmen may appoint another faculty member, who is not a member of the student's Advisory Committee, to preside at this meeting.) The M & I Program Faculty, other Graduate Faculty and General Faculty are invited to be present and participate. The review of the thesis/dissertation by an external reviewer (a person outside of the University that is an expert in the field) can be extremely helpful and is suggested. Approval by the Advisory Committee is a requirement for awarding of the degree. In the event of disapproval, the candidate may, at the discretion of the Advisory Committee, be permitted to retake the examination in no less than six months and not more than two years from the time this decision was made. Only one opportunity for re-examination is given. Any candidate who is granted this privilege shall retain the status and obligations of a graduate student until the time of such re-examination.

The Advisory Committee has the authority for final approval of the candidate for the awarding of the degree, and their recommendation is forwarded to the Dean of the College of Graduate Studies. Diplomas are awarded twice a year, in December and May. Official Graduation Ceremonies are held in May.

NOTE:
IT IS THE STUDENT'S RESPONSIBILITY TO MEET THE REQUIREMENTS SET FORTH IN THIS HANDBOOK.

Microbiology and Immunology Course Selections

Courses available for advanced credit in Microbiology and Immunology:

MBIM 613G Infection(7 cr hrs) and MBIM 614G Immunity (4 cr hrs): 11 hr. Fall (*Virella*)

This course introduces the basic concepts of molecular and medical microbiology and the major concepts in modern basic immunology and exemplifies the application of those concepts to the understanding of human diseases. The course emphasizes the importance of basic science information in understanding the mechanism of disease. Students may elect to participate in both Infection and Immunity or may elect to participate in either "Infection" or "Immunity."

MBIM-623G. Microbiology for Dental Students: 4 hr. Spring. (*Faculty*)

Microbiology is a core course in the dental curriculum that is intended to foster a knowledge base and understanding of the fundamentals of bacterial physiology and genetics; clinical bacteriology, virology, parasitology and mycology; antimicrobial therapy; asepsis in dentistry; and infection control. The primary goals of the course are to explore the relationship between the physiology of medically important microbes to the pathobiological sequelae of human-microbial interactions, with particular reference to the role of oral microbes in human disease. Emphasis is placed on the study of oral ecology, dental caries, periodontal disease, hepatitis and AIDS. Laboratory instruction includes problem based, small group exercises in microbiology, with specific sections on oral flora and aseptic techniques.

MBIM 702 Oral ImmunoBiology: 3.5 hr Spring. (*Boackle*). Oral Immunology-Oral Biology.

Basic and clinical aspects of immunology are oriented toward oral biology with emphasis placed on salivary secre-tions, dental plaque, dental caries, the mucosal immune response, gingival crevicular fluid, periodontal disease and the acquired immuno-deficiency syndrome (AIDS). Laboratory demonstrations include a variety of immunological techniques used in research and diagnostic laboratories. Students are required to report on several manuscripts, which they choose from the recent dental literature in the area of oral biology and oral immunology. In addition, students share this information in small group discussions.

MBIM-716 Development of Molecular Cancer Therapies: From Bench to Bedside: 2 hr.

Fall (*Norris and Tew*) This lecture course will cover the topics of the molecular basis of cancer causation, molecular and proteomic methods for cancer detection and diagnosis, the physics of cancer imaging, cancer immunology, current cancer therapy approaches and challenges including gene therapy, and cancer epidemiology. In addition, students will be exposed to actual patient care situations by surgical and medical practitioners, observe translational cancer therapy in a clinical setting, and observe practical demonstrations of cancer detection and diagnosis.

MBIM-725 Virology: Spring 2 hr. (*Faculty*). This course will introduce principles of

virology to advanced microbiology students. The key areas to be covered include the unique features of replication of RNA and DNA viruses, the uses of viruses as vectors,

and elements of viral pathogenicity. The material will be presented in a number of formats including lectures by faculty, written papers, oral presentations by students, and discussion of current and seminal literature. Minimum enrolment, 4.

MBIM-731 Advanced Topics in Immunology: 4 hr. Spring. (*Tomlinson*). This course represents an intensive and in-depth study of the areas of cellular immunology, immunogenetics, clinical immunology, and the immunobiology of tumor development. Each area will be presented with the intent of developing a sound understanding of experimental and theoretical observations. Emphasis will be placed on the most current research involving sophisticated methodology. Minimum enrollment, 4.

MBIM-742 Advanced Microbiology: 4 hr. Fall (*May and Schmidt*). The course will present in depth perspectives on the agents responsible for the major bacterial, viral and parasitic-induced diseases. Emphasis will be placed on current research and new insights gained into the biochemistry, molecular biology and immunology of these organisms. Minimum enrollment, 4.

MBIM-779 Immunogenetics: 2 hr. Spring (*Pandey*). Initial lectures will review the fundamental principles of genetics. The principal focus of the course will be the genetics of human MHC and immunoglobulin allotypes. Major blood group genes will also be discussed. Statistical methods employed in delineating the genetic contribution to human diseases will be reviewed. Minimum enrollment, 4.

MBIM-772 Environmental Microbiology: Spring 3 hr (*May*). This course emphasizes fundamental microbiological principles as they apply to the environment. Its main goal to introduce the student to the concepts of microbial diversity and evolution, microbial metabolism and catalysis in the biodegradation and synthesis of natural and man-made compounds, the microbial role in biogeochemical cycling, and the interactions of microbes with the physical environment and with other organisms related to the application of microbiological approaches to problems which exist in today's environment. This course also emphasizes real world pollution problems that can be addressed biologically. Biochemical and genetic mechanisms of biodegradation of aromatic and aliphatic compounds, chlorinated compounds, nitroaromatics, and hydrocarbons will be explored. In addition the microbiology of activated sludge, anaerobic digestion, composting, and other liquid, air, and solid phase waste treatment processes will be developed in this course. The course should prepare the student interested in environmental problems and issues with the necessary practical information to make sound judgments in assessing meaningful solutions and the role microorganisms play in those processes. Minimum enrollment, 4.

MBIM-775 Special Topics in Microbiology and Immunology: Fall/Spring. (*Faculty*). This elective course will provide continuous update in immunology to those students who have completed Basic and Advanced Immunology and taken their qualifying examination. It will be seminar course during which the students will meet with the instructor for two hours a week over a semester to discuss the most recent publications

and the new insights they give. To ensure a broad coverage, any faculty in Immunology and Microbiology may suggest a topic to be discussed.

MBIM-775A Bioentrepreneurship: Spring 1 hr (*Faculty*). The course in Bioentrepreneurship is offered in the Spring in alternative years. The course, with support from the MUSC Foundation for Research, will include lectures and corporate case histories by MUSC faculty and outside speakers who have experience in technology transfer, starting new companies or as corporate scientists. The purpose of the course will be to give the student insight into what it takes to transfer research in the lab to a product or service useful to the public. Topics will include discussions of Intellectual Property, Patents, Licensing, Personnel Requirements, Incorporation, Business Plans, Confidentiality Agreements, Venture Capital, Joint Ventures and Partnering, and Regulatory Requirements (e.g. FDA, USDA).

MBIM 905 Translational Genomics: Gene Therapy in the 21st Century: Spring 1 hr. (*Norris*). This elective course is open to all Graduate students, and fourth year Medical and Dental Students. Its goals are to help the student dissect the complex issues associated with gene therapy given the explosion of information made possible as a result of the sequencing of the human genome and advances in gene therapy. It is anticipated that at the completion of this course the student will have developed an understanding of the fundamental genetics, biochemistry, virology, immunology and ethical and legal considerations associated with the development and use of gene therapy.

MBIM-701 Spring Selective: Emerging Infectious Diseases: Spring 3 hr. (*Kasman*). This elective course will teach basic immunological and microbiological concepts through in-depth study of six microorganisms responsible for emerging or epidemic infectious diseases. Each week will focus on the biology, natural history, pathology and immunology associated with one pathogen. Pathogens covered will include avian influenza, tuberculosis, Ebola/Marburg virus, methicillin resistant *Staph. aureus*, SARS, and anthrax. Classes will include lecture, primary literature reading and analysis, and some in-class small group work.