Doctor of Philosophy in Medical Microbiology
Program code: 052070

INTRODUCTION

The Department of Microbiology (Faculty of Medicine) offers a Ph.D. program in **Medical Microbiology**. A graduate successfully completing this program will be expected to have an in-depth knowledge in specific areas of Medical Microbiology. In addition, he/she should become an independent thinker, planner and executor of specific ideas relevant to Medical Microbiology. A major part of the program is the dissertation, which requires high quality research in a specific area of Medical Microbiology.

PROGRAM REQUIREMENTS

33 TOTAL COURSE CREDITS

9-15 Course credits in the major specialization (Medical Microbiology)

0520-601	Molecular Techniques and Instrumentation	(3)
0520-602	Molecular Virology	(3)
0520-603	Advanced Medical Mycology	(3)
0520-604	Advanced Immunology	(3)
0520-605	Clinical Immunology	(3)
0520-606	Advanced Bacteriology	(3)
0520-607	Advanced Parasitology	(3)
0520-608	Current Topics in Microbiology I	(3)
0520-609	Seminar-I	(1)
0520-610	Seminar-II	(1)
0520-611	Seminar-III	(1)
0520-612	Gene Cloning and Expression	(3)
0520-613	Current topics in Microbiology II	(3)

0-6 Courses outside the major specialization*

0510-601	Bio-statistical Methods in Medical Research	(3)
0510-602	Epidemiology of Infectious Diseases	(3)
2000-501	Scientific Writing and Communication Skills	(3)
2000-503	Ethics and Professionalism	(2)

*****Students may study other appropriate Graduate level Courses outside the Department of Microbiology, with the approval of the Program Director.

18 COMPULSORY COURSES

0520-697 Dissertation (9)
0520-698 Dissertation (9)

COURSE DESCRIPTION

0520-601: MOLECULAR TECHNIQUES AND INSTRUMENTATION
CR: 3 PR:0520-519 or its equivalent

Polymerase chain reaction (PCR), RT-PCR, In-situ PCR, PCR-SSCP, ligase chain reaction, strand displacement assay, cloning and expression of foreign DNA, site directed mutagenesis, restriction fragment length polymorphism, use of isotopes and autoradiography, nucleic acid and antibody probes, electroporation, chromatography, electrophoresis, blotting and hybridization techniques, electrophoresis, ultracentrifugtion, DNA and protein sequencing, image analysis, DNA and peptide synthesis, construction and screening of DNA and genomic DNA libraries in lambda gt 11.

0520-602: MOLECULAR VIROLOGY
CR: 3 PR: 0520-505 or its equivalent

Modern approaches to the finding of new medically important viruses, their identification, molecular characterization and the development of diagnostic tests. The content of the course will include the following molecular approaches: expression libraries, representational difference analysis, DNA/RNA amplification techniques, DNA sequencing, DNA/protein sequence analysis, development of antibody/ antigen and viral DNA/RNA detection tests in the absence of complete virus isolates.

0520-603: ADVANCED MEDICAL MYCOLOGY
CR: 3 PR:0520-510 or its equivalent

Biology of pathogenic fungi, molecular epidemiology of fungal diseases, recent advances in diagnosis of fungal diseases, molecular techniques in diagnostic mycology, defense against fungal infections, virulence factors in pathogenic fungi, immune response in mycoses, cytokines and mycoses, heat shock proteins in fungi, emerging fungal pathogens, recent advances in antifungal therapy, drug resistance in pathogenic fungi, fungal vaccines.

0520-604: ADVANCED IMMUNOLOGY
CR: 3 PR:0520-504 or its equivalent

Antigens and haptens (Immunogenicity of antigens, epitopes, mitogens and Haptens), antigen receptors (structure, function, generation of diversity, immunoglobulin superfamily), major histocompatibility complex (organization and inheritance, structure, polymorphism), antigen processing and presentation (role of antigen processing cells, MHC-restriction, regulation of processing), complement (steps in complement activation, receptors, biological function, regulation), generation of the humoral immune response (kinetics, steps in B cell activation, proliferation and differentiation), cell-mediated immunity (cell activation, cytotoxic responses mediated by CD8 and CD4 T cells) cytokines (general properties, secretion and function of cytokines, cytokines receptors, role of cytokines in inflammation and disease), hybridomas and monoclonal antibodies (formation and selection of hybrid cells, production and function of monoclonal antibodies, T cell hybirdomas).

0520-605: CLINICAL IMMUNOLOGY
CR:3 PR: 0520-504 or its equivalent

Transplantation (immunogenicity of various organs, HLA matching, immunosuppressive regimen, rejection), immunity to infection (immunity to viral, bacterial and parasitic infections), autoimmunity (proposed mechanisms, rheumatoid arthritis, connective tissue disorders), immunohematology, hypersensitivity, neoplasia (malignant transformation of cells, oncogenes, tumor antigens, immune response), immunodeficiency and infection (primary and secondary immunodeficiencies), immune intervention (vaccines, immunosuppression, immunopotentiation, plasmapheresis).

0520-606: ADVANCED BACTERIOLOGY
CR:3 PR: 0520-506 or its equivalent

An advanced course in bacteriology including mycobacteriology, anaerobic bacteriology,

enterobacteriacae, microbial genetics, gram-positive aerobic bacteria, unconventional bacteria e.g chlamydia, mycoplasma and rickettsia and antimicrobial agents with varying degree of emphasis on techniques and methodologies.

0520-607: ADVANCED PARASITOLOGY
CR: 3 PR: 0520-509 or its equivalent.

The course covers recent knowledge on important aspects of selected parasitic diseases with emphasis on the biology and transmission of the parasites, the immune host response, modern aspects of laboratory diagnosis, current problems in therapy, drug resistance and vaccine development. Principles and application of serodiagnostic procedures in parasitic infections will be discussed. Arthropods as a cause of disease and those involved in transmission of parasites will be reviewed. Relevant clinical cases also be highlighted especially, zoonoses and emerging parasitic infections and problems in diagnosis.
Practical sessions will involve benchwork to review the role of classical microscopical methods in the diagnosis of parasitic infections such as procedures for the examination of stool, urine, blood, sputum, aspirates and biopsy material for diagnosis of parasitic infections. The ongoing research techniques and experimental protocols for parasite culture, antigen preparation and animal inoculation will be demonstrated. The currently available immunodiagnostic tests, new techniques, use of isoenzymes in parasite identification, DNA probes (selection, construction and use in diagnosis) and PCR as a tool for diagnosis will be reviewed and demonstrated. Journal articles, practicals, slides sessions, seminars /discussion sessions will involve the active participation of students to instill an awareness of complexities involved.

0520-608: CURRENT TOPICS IN MICROBIOLOGY I
CR: 3 PR: 0520-501 or its equivalent

In this course, students will be required to critically analyze and present the topics of current interest in Medical Microbiology for discussion to their peers and the Faculty. They will also be required to write term papers on selected topics in the sub-specialties of Medical Microbiology.

0520-609: SEMINAR I
CR: 1

The candidate will be assigned a topic relevant to his/her area of specialization in Medical Microbiology. He/She will be asked to critically review the literature and present it in the Department.

0520-610: SEMINAR II
CR: 1

The candidate will be assigned a topic relevant to his/her area of specialization in Medical Microbiology. He/She will be asked to critically review the literature and present it in the Department.

0520-611: SEMINAR III
CR: 1

The candidate will be assigned a topic relevant to his/her area of specialization in Medical Microbiology. He/She will be asked to critically review the literature and present it in the Department.

0520-612: GENE CLONING AND EXPRESSION
CR: 3 PR: 0520-519 or its equivalent

Basic techniques in molecular biology, isolation and analysis of genomic DNA, extraction and analysis of eukaryotic mRNA, nucleic acid labelling and detection, plasmid cloning vehicles, phage and cosmid vectors, construction of genomic DNA libraries, construction of cDNA libraries, screening of libraries for recombinants, subcloning and DNA sequencing, how to obtain a clone for a specific gene, cloning in yeast, mammalian cells and insect vectors, gene amplification, targeted mutagenesis of cloned DNA, expression and analysis of cloned genes in Escherichia coli, detection and analysis of expressed proteins, mapping transcribed DNA sequences.

0520-613: CURRENT TOPICS IN MICROBIOLOGY II
CR: 3 PR: 0520-501 or its equivalent.

In this course, students will be required to critically analyze and present the topics of current interest in Medical Microbiology for discussion to their peers and the Faculty. They will also be required to write term papers on selected topics in the sub-specialization of Medical Microbiology.

0520-697: DISSERTATION
CR: 9

0520-698: DISSERTATION
CR: 9