COURSE SPECIFICATION

Medical Microbiology and Immunology

Faculty of Medicine– Mansoura University

(A) Administrative information

(1) Programme offering the course:	Programme for Postgraduate master degree of Medical Microbiology and Immunology
(2) Department offering the programme:	Medical Microbiology and Immunology department
(3) Department responsible for teaching the course:	Medical Microbiology and Immunology department
(4) Date of approval by the Department`s council	7/8/2016
(5) Date of last approval of programme specification by Faculty council	9/8/2016
(6) Course title:	Medical Microbiology and Immunology
(7) Course code:	- **Code:** MIC507
(8) Credit hours:	14 credit hours lectures practical: 7 credit hours field: 3credit hour
(9) Teaching hours	Lectures: 210 hours Practical: 210 hours Field:180 hours

(B) Professional information

(1) Course Aims:

The broad aims of the course are as follows:

To educate the candidate all about

- commonly known pathogenic organisms (Bacteria, Fungi, Viruses) through study the microbial characters including morphology, Cultural characters, biochemical activities, antigenic and virulence properties, pathogenicity, Laboratory diagnosis, prophylaxis and treatment with focusing on different mechanisms of antimicrobial resistance.
- The basic elements of immune response and the pathological immune response and the pathological immune reactions towards infections and tumours.
- Classical and modern approaches to the development of therapeutic agents and vaccines for the prevention of human microbial diseases
- The advances in microbial genetics and how to do genetic research in practice
- Fungi causing different types of mycoses, mycotoxins and to provide the candidate with updated knowledge about antifungal agents and how to perform antifungal susceptibility with emphasis on the different mechanisms of antifungal drug resistance.
- All available techniques for diagnosis of microbial infections.
- The skill of practicing the available immunological techniques.
- Specified knowledge about hospital acquired infections, how to prevent and how to carry out surveillance system in the hospital and to prepare him to lead infection prevention and control services and develop, implement, supervise and audit a comprehensive infection prevention and control program
- The skill of carrying out a scientific research.
- The skill of making an effective presentation.
- The skill of supervising all steps of laboratory diagnosis.

(2) Intended Learning Outcomes (ILOs):

Intended learning outcomes (ILOs); Are four main categories: knowledge & understanding to be gained, intellectual qualities, professional/practical and transferable skills.
On successful completion of the course, the candidate will be able to:

A- Knowledge and Understanding

A 1 Recognize the basic structure of nucleic acids.
A 2 Identify the mechanism of DNA replication.
A 3 Recognize the process of transcription and translation of DNA.
A 4 List DNA repair mechanisms.
A 5 Recognize the methods of gene transfer among bacteria.
A 6 Recognize the basics of the different molecular biology techniques.
A7 Describe the general microscopic morphology of bacteria
A 8 List the nomenclature and classification of microbes
A 9 Recognize the antigenic structure of bacteria, their virulence factors and pathogenesis.
A 10 Recognize the physiology of bacteria and bacterial metabolism
A 11 List the principles and the different methods of sterilization and disinfection
A 12 Describe the host parasite relationship
A 13 List the antibacterial agents used in treatment of infections, their mechanisms of action, and spectra of activity and the different mechanisms of antimicrobial drug resistance
A 14 Realize the items of infection control program
A 15 Identify the infection control measures of air, food and water in hospitals
A 16 Know the investigations of outbreaks
A 17 Recognize different infection control policies
A 18 Recognize infection rates
A 19 Identify infection control measures for specific infections and in special units
A 20 Recognize the normal immune system.
A 21 Describe the mechanisms of innate immunity.
A 22 Describe the Complement and kinin systems
A 23 Recognize antigens, Immunoglobulins and understand antigen – antibody reactions.
A 24 Describe antigen presentation and the major histocompatibility complex.
A 25 Describe inflammation and the inflammatory response.

A 26 Recognize the humoral and cell mediated immune response
A27 Describe the hypersensitivity reactions.
A28 List the Immunodeficiency diseases.
A29 Recognize Immune tolerance and principles of autoimmunity.
A30 Describe the basics of Transplantation immunity
A31 Recognize the basics of tumour immunity
A 32 Discuss the epidemiology, pathogenesis, antigenic characteristics of bacteria,
A 33 Describe the laboratory diagnosis of infectious diseases
A 34 Recognize the treatment of infectious diseases caused by bacteria.
A 35 List the bacterial infections of various organs and systems of the human body.
A 36 Recognize the modes of transmission, pathogenesis and control of viral diseases.
A 37 List the antiviral agents, their mechanisms of action, and the different mechanisms of antiviral drug resistance
A 38 Recognize the modes of cultivation and assay of viruses.
A39 Describe the structure, pathogenesis, mode of transmission of DNA viruses with emphasis on the clinical picture and laboratory diagnosis of diseases caused by each.
A40 Describe the structure, pathogenesis, mode of transmission of RNA viruses with emphasis on the clinical picture and laboratory diagnosis of diseases caused by each.
A41 List arthropod born viral diseases.
A42 List rodent born viral diseases.
A 43 Describe the general properties and classification of fungi
A44 Describe the morphology and reproduction of fungi
A45 List opportunistic fungi of medical importance.
A46 Recognize Fungi causing superficial mycoses.
A47 Recognize Fungi causing subcutaneous mycoses.
A48 Recognize Fungi causing cutaneous mycoses
A49 Recognize Fungi causing endemic mycoses

B- Intellectual skills

The Postgraduate Degree provides opportunities for candidates to achieve and demonstrate the following intellectual qualities:

B1 Interpret the results of molecular diagnostic techniques.
B 2 Analyze the advantages of individual methods of molecular diagnosis for diagnosis of infections.
B 3 Analyze and explain the pitfalls encountered in PCR results
B 4 Differentiate between infection, colonization and contamination.
B 5 Distinguish the antibiotic of choice for treatment of each type of bacterial infection.
B 6 Interpret the classification of microbes.
B 7 Illustrate the mechanism of resistance of bacteria to antibiotics.
B 8 Illustrate the pathogenic mechanisms of different pathogenic bacteria.
B 9 Test the appropriate antibiotic discs to use for antibiotic sensitivity of bacteria
B10 Interpret the results of antibiotic sensitivity testing
B11 Apply further tests necessary for full identification of pathogens
B12 Applying of laboratory health and safety practice
B13 Interpret a policy on using of sterilization and disinfection in the laboratory
B14 Differentiate between infections and other conditions by clinical, laboratory and epidemiological information.
B15 Apply infection prevention and control strategies after assessing infection risk
B 16 Demonstrate infection control (IC) policies and procedures.
B 17 Interpret the educational needs of health care workers regarding IC.
B 18 Apply control measures for outbreaks.
B 19 Interpret a policy on the use of sterilization and disinfection in the laboratory
B 20 Analyse the proper typing method that can be used for investigation of outbreaks.
B 21 Interpret the results of serological and immunological tests.
B 22 Interpret the results of immunofluorescence test and ELISA
B 23 interpret results of apoptosis assay.
B 24 Interpret CPE in tissue cultures.
B 25 Illustrate the clinical features, etiology, pathogenesis of a viral disease.
B 26 Interpret the results of plaque assay.
B 27 Develop, under supervision, core reporting skills
B 28 Demonstrate the clinical features, etiology, pathogenesis of mycotic diseases
B 29 Analyze the laboratory investigations for the diagnosis of mycotic diseases

C- Professional/practical skills

C 1 Competently perform DNA extraction and PCR technique.
C 2 Competently carry out gel electrophoresis.
C 3 carry out and interpret Gram staining technique.
C 4 Practice culture techniques and examine resulting growth
C5 carry out antimicrobial susceptibility testing by Kirby-Bauer disk diffusion method or by estimation of Minimum inhibitory /Bactericidal concentrations by tube/plate dilution methods
C 6 implement identification of different bacterial species in the lab by
Prepare and examine stained smears and interpreting biochemical reactions.
C 7 Competently perform Techniques of anaerobiosis e.g Gaspack system
C 8 Collect specimens for Microbiological investigations such as blood, urine, throat swab, rectal swab, stool, pus
C 9 Quantitative analysis of urine by pour plate method and semiquantitative analysis by standard loop test for significant bacteriuria
C 10 process different samples properly in lab
C 11 design a policy for sterilization and disinfection in hospitals
C 12 exercise tests required for disinfectant examination.
C 13 schedule isolations policies for infectious diseases
C 14 arrange a policy for management of needle sticks and blood and body fluid exposure for health care workers.
C 15 Formulate infection control policy in special hospital units as hemodialysis units, ICU, and OR.
C 16 design a policy for safe disposal of hospital wastes
C 17 perform and interpret HLA typing technique.
C 18 carry out different methods for detection of apoptosis as by Giemsa stain, propidium iodide and DNA ladder.
C 19 accomplish monoclonal antibody production technique.
C 20 practice hypersensitivity testing
C 21 exercise ELISA technique and use it for detection of tumor markers.
C 22 Proceed in immunoflourescence technique
C 23 practice detection of autoantibodies
C 24 carry out lymphocyte separation, and culture techniques
C 25 perform measurement of complement components and counting of immune cells
C 26 exercise neurtophil function tests.
C 27 Prepare glassware for tissue culture (washing, sterilization)
C28 Prepare primary cell lines and preserve cell cultures.

C 29 Examine cytopathic effect by inverted microscope

C 30 carry out Antifungal susceptibility testing

C31 proceed in diagnosis of different fungi and mycosis by staining, culture, biochemical reactions and specific tests.

C 32 Direct examination of specimens by KOH, Gram, Kinyoun's, Giemsa, Lactophenol cotton for yeast identification

D- Communication & Transferable skills

D 1 Develop skills of utilizing the library to access and search for information.

D 2 Develop effective teaching skills by teaching junior colleagues and students as well as through conference presentations.

D 3 Communicate with the physicians and other hospital staff in seminars, lectures and ward rounds disscussing infectious diseases.

D 4 Search midline data base

D 5 Work in a team in the laboratory.

D 6 Develop skills of problem solving in practical situations.

D 7 Use printable sheets in the field of microbiology to report the facts

D 8 Learn and teach of safe handling and processing of all routine specimens received in the laboratory

D9 Develop a sense of the continuity of identification of specimens from collection, through culture and further testing to the issuing of a final report

D10 Learn skills for Conducting infection control educational and training programs for healthcare workers and non medical care givers

D11 Present information about level of work restriction for health care workers with communicable diseases

D12 Present information of appropriate patient placement

D13 Communicate with appropriate persons to establish the existence of an outbreak.

D14Use different media for teaching that are appropriate to the teaching setting improvement strategies.

D15 Communicate effectively with learners

D16 Communicate with other members of the multidisciplinary team

D17 Show leadership and safe supervision.

D18 Learn how to audit the infection control practice in hospitals through evaluating the structure, processes and outcomes against the standards according to evidence based IC guide-lines.

D19 Learn how to participate in multidisciplinary quality/performance

D20 Learn how to participate in research activities.

D21 Learn how to Follow the ethical regulations of sample collection and delivery of results, showing respect to the patient's privacy.

(2) Course content:

Module 1

Subjects	Lectures
Microbial genetics	
Basic Genetics: • Nucleosides and Nucleotides. • DNA and RNA. • Superhelicity & forms of DNA. • DNA analogues.	2 hours
DNA Replication.	2 hours
Gene expression in prokaryotes.	2 hours
Mutation.	2 hours
Recombination.	2 hours
DNA repair.	2 hours
Gene transfer.	2 hours
Plasmids.	2 hours
Transposons.	2 hours
Molecular cloning.	2 hours
PCR varieties.	2 hours
DNA probe and hybridization.	2 hours
DNA sequencing.	2 hours
DNA mapping.	2 hours
Epigenetics.	2 hours
Viral genetics.	2 hours
Fungal genetics in prokaryotes & eukaryotes.	2 hours
Medical bacteriology	
Bacterial morphology & structure.	2 hours
Nomenclature & classification of microbes.	2 hours

Growth & nutrition of bacteria.	2 hours
Bacterial metabolism.	2 hours
Bacterial toxins & virulence.	2 hours
Host parasite relationship.	2 hours
Bacterial ecology-normal flora of human body.	2 hours
Bacterial typing.	2 hours
Antimicrobial agent.	2 hours
Antibiotic resistance.	2 hours
Staphylococci & Micrococci	2 hours
Streptococcus.	2 hours
Neisseria, Branhamnella & Moraxella.	2 hours
Corynebacterium.	1 hour
Bacillus.	1 hour
Clostridium.	1 hour
Non sporing anaerobes.	1 hour
The enterobacteriaceae.	3 hours
Vibrios, aeromonas & Plasiomonas.	1 hour
Campylobacter, spirillum & helicobacter pylori.	1 hour
Erysipelothrix & listeria.	1 hour
Pasteurella, francisella.	1 hour
Haemophilus & Bordetella.	1 hour
Brucella.	1 hour
Mycobacteria.	1 hour
Clinical microbiology.	3 hours
Opportunistic infections.	1 hour
Occupational diseases.	1 hour
Fever with jaundice.	1 hour
Pyrexia of unknown origin.	3 hours

Nosocomial infections	
Items of infection control program	2 hours
IC of Hospital environment (Air)	2 hours
IC of Hospital environment (water)	2 hours
IC of Hospital environment (Food)	2 hours
Investigation of outbreak	2 hours
Notification policy	2 hours
Infection control rate	1 hour
Antibiotic policy	1 hour
Sterilization and disinfection policy	1 hour
I.C measures for T.B	1 hour
Waste disposal policy	1 hour
Isolation policies	2 hours
Needle stick policy	1 hour
I.C in (ICUs) (Ors)	1 hour
I.C in (Haemodialysis)	1 hour
Total	105 hours

Practical and field study:

Subjects	practical	Field	Total Teaching Hours
Microbial genetics			
DNA extraction	6 hours		6 hours
PCR	12 hours		12 hours
Agarose gel electrophoresis	6 hours		6 hours
Medical bacteriology			
Gram staining techniques	6 hours		6 hours
Culture techniques	6 hours		6 hours
Antibiotic susceptibility testing.	12 hours		12 hours

Identification of Staphylococci & Micrococci	6 hours		6 hours
Identification of Streptococcus.	6 hours		6 hours
Identification of Enterobacteriaceae.	6 hours		6 hours
Identification of Mycobacteria.	6 hours		6 hours
Methods of anaerobiosis.	6 hours		6 hour
Collection of samples for bacteriological diagnosis.	6 hours		6 hours
Laboratory processing of urine samples.	6 hours		6 hours
Laboratory processing of blood samples.	6 hours		6 hours
Laboratory processing of wound samples.	6 hours		6 hours
Laboratory processing of respiratory samples.	6 hours		6 hours
Laboratory processing of GIT samples.	6 hours		6 hours
Laboratory processing of genital samples.	6 hours		6 hours
Nosocomial infections			
Sterilization and disinfection policy		10 hours	10 hours
Isolation policies		10 hours	10 hours
Needle stick policy		5 hours	5 hours
I.C in ICUs		10 hours	10 hours
I.C in Haemodialysis		10 hours	10 hours
I.C in Ors		10 hours	10 hours

Waste disposal policy		5 hours	5 hours
Total	120 hours	60 hours	180

Module 2

Subjects	Lectures
Medical immunology	
-Introduction to immunology: • General properties of immune response • Innate and adaptive immunity • Cells of innate & adaptive immunity	1 hour
-The concept of self and self/nonself recognition	1 hour
-The immune system: • Lymphoid tissues & their function • Cells of the immune system • Lymphocyte recirculation and homing	4 hours
- Antigen recognition & receptors • Maturation of B & T lymphocytes	1 hour
-Antigens	1 hour
-Immunoglobulins (Antibodies)	1 hour
-Complement system	1 hour
-Major histocompatibility complex	1 hour
-Antigen processing & presentation to T Lymphocytes	1 hour
-B cell activation	1 hour
-T cell activation & costimulators	1 hour
-Cytokines	1 hour
-Effector mechanisms of humoral & cell-mediated immunity	1 hour
-Immunity to microbes	1 hour
-Apoptosis	1 hour

-Vaccines	1 hour
-Stem cell therapy	1 hour
-Transplantation immunology	1 hour
- Autoimmune diseases • Immunological tolerance	1 hour
-Immunodeficiency diseases	1 hour
-Tumor immunology	1 hour
-Hypersensitivity reactions	1 hour
-Immunotherapy -Measurement of immune function	1 hour
Medical virology	
General properties of viruses	1 hour
Pathogenesis & control of viral diseases	1 hour
Parvo-adenovirus- Pox	1 hour
Herpes virus	1 hour
Hepatitis viruses	6 hours
Picornaviruses	2 hours
Reoviruses, Rotaviruses, Caliciviruses.	2 hours
Orthomyxoviruses.	2 hours
Rodent viral diseases	2 hours
Paramyxoviruses.	2 hours
Coronaviruses.	2 hours
Rabies, slow virus infection.	2 hours
Bacteriophages.	2 hours
Oncogenic viruses.	2 hours
AIDS & Lentiviruses.	2 hours
Medical mycology	
Fungal taxonomy.	2 hours
Fungal structure & morphology.	2 hours

Epidemiology of mycosis.	2 hours
Immunology to fungal infection & mycoserology	2 hours
Fungal metabolism & physiology.	2 hours
Approaches for yeast identification.	2 hours
Fungal pathogenesis and virulence.	2 hours
Approaches for molds identification.	2 hours
Laboratory & molecular diagnosis of mycosis.	2 hours
Antifungal therapy: • Principle. • Resistance. • Susceptibility testing. • Types of therapies.	2 hours
Dermatomycotic molds.	2 hours
Superficial mycosis.	2 hours
Hyalohyphomycosis.	2 hours
Cutaneous mycosis.	2 hours
Invasive fungal infections.	2 hours
Sub-cutaneous mycosis.	2 hours
Fungal like infections.	2 hours
Systemic mycosis: • Endemic. • Opportunistic.	1 hour
Fungal infections in pediatrics.	1 hour
Oral fungal infections.	1 hour
Phaehyphomycosis.	1 hour
Fungal infections in bone & joint.	1 hour
Zygomycosis.	1 hour
Hematogenous disseminated fungal infections.	1 hour
Mycotoxicosis.	1 hour

Fungal infections in HIV patients.	1 hour
Fungal infections in cancer patients.	1 hour
Fungal infections in genitourinary.	1 hour
Fungal infections in respiratory tract.	1 hour
Ocular fungal infections.	1 hour
Occupational fungal infections.	1 hour
Indoor mycotic infections.	1 hour
Total	105 hours

Practical and field study :

Subjects	laboratory
Medical immunology	
-HLA typing	10 hours
Detection of apoptosis by - Giemsa stain - Propidium iodide - DNA fragmentation	10 hours
Monoclonal antibodies pr	10 hours
Hypersensitivity testing	10 hours
Tumor markers detection by ELISA	10 hours
ELISA techniques	10 hours
Immunoflourescence technique	10 hours
Autoantibodies detection	10 hours
Lymphocyte separation	10 hours
Lymphocyte culture	10 hours
Measurement of complement	10 hours
Neutrophil function tests	10 hours
Medical virology	
Tissue culture technique	6 hours
Study of cytopathic effect	6 hours
Medical mycology	
Antifungal susceptibility testing	6 hours
Approaches for yeast identification.	6 hours
Identification of Systemic mycosis: • Endemic. • Opportunistic.	6 hours
Total	150 hours

(3) Teaching methods:

4.1: Lectures

4.2: Seminars

4.3: Laboratory classes.

4.4: Attending workshops

4.5 Observation of, assisting and discussion with senior medical staff

(4) Assessment methods:

5.1:Written exam for assessment of knowledge and intellectual ILOS

5.2: Structured Oral exam for assessment of knowledge, intellectual and transferable ILOS

5.3: OSPE Practical exam for assessment of knowledge , Practical, intellectual and transferable ILOS

5.4 MCQ continuous assessment for assessment of knowledge and intellectual ILOS

Assessment schedule:

Assessment 1: Final written, oral and ospe after 30 months of MS registration or 36 months of admission to the job

MCQ continuous assessment: at the end of each semester

Percentage of each Assessment to the total mark (total microbiology course assessment):

Written exam:… 240 marks

OSPE Practical exam:… 150 marks

Oral exam ….150 marks

MCQ:…60 marks

Other types of assessment:……None……. .%::……

Other assessment without marks:

1-Candidate Logbook which should be fulfilled and signed by Head of the department.

1- Attendance Criteria: Minimum acceptance attendance is 75%

(5) References of the course:

6.1: Hand books: Department theoretical books

6.2: Text books:…

1. Topley and Wilson's Microbiology and Microbial infections. Volume 8, 2005,10th edition
2. Zinsser Microbiology-2001.
3- Fundamental Bacterial Genetics : Nancy Trun and Janin Trempy -2004

6.3: Journals:

1. Clinical Microbiology Reviews
2. Journal of Clinical Microbiology
3. Journal of Medical Microbiology
4. Journal of Microbiological Methods
5. Journal of Applied Genetics.

6.1: Websites: Nature Reviews:

http://www.nature.com/nrg/focus/microgen/index.html

1. **Facilities and resources mandatory for course completion:**
   1. Lecture halls.
   2. Data shows and computer assistance.
   3. Molecular biology laboratory.
   4. Thermal cycler device.
   5. UV elluminator.
   6. Tray for gel electrophoresis.
   7. Chemicals for genetic techniques.

Course coordinator: Dr. Hany Lotfy

Head of the department: Prof. Dr. Mohammad Abou El ela

Date: