COURSE SPECIFICATION

(Postgraduate MD degree of Medical Microbiology and Immunology)

Faculty of Medicine– Mansoura University

(A) Administrative information

(1) Programme offering the course:	Programme for Postgraduate MD 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:** MIC 607
(8) Credit hours	23 credit hours lectures– 14 credit hours practical – 1 hour field
(9) Total teaching hours:	345 hours lectures - 420 hours practical 60 hours field study

(B) Professional information

(1) Course Aims:

The broad aims of the course are to provide the candidate with

1- comprehensive understanding of 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.

2- in depth basic elements of immune response and the pathological immune response and the pathological immune reactions towards infections and tumours.

3- classical and modern approaches to the development of therapeutic agents and vaccines for the prevention of human microbial diseases

4- the advances in microbial genetics and how to do genetic research in practice

5- the candidate about 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.

6- efficiently all available techniques for diagnosis of microbial infections.

7- the skill of practicing the available immunological techniques.

8- a 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

9- the skill of carrying out a scientific research.

10- the skill of making an effective presentation.

11- 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 Know the mechanism of DNA replication.

A 3 identify the process of transcription and translation of DNA.

A 4 Recognize DNA repair mechanisms.

A 5 Recognize the methods of gene transfer among bacteria.

A 6 Recognize the basics of the different molecular biology techniques.

A 7 Realize the items of infection control program

A 8 Identify the infection control measures of air, food and water in hospitals

A 9 Know the investigations of outbreaks

A 10 Recognize different infection control policies

A 11 Recognize infection rates

A 12 Identify infection control measures for specific infections and in special units

A 13 Recognize the normal immune system.

A 14 Describe the mechanisms of innate immunity.

A 15 Recognize the Complement and kinin systems

A 16 Recognize antigens, Immunoglobulins and understand antigen – antibody reactions.

A 17 realize antigen presentation and the major histocompatibility complex.

A 18 realize inflammation and the inflammatory response.

A 19 Recognize the humoral and cell mediated immune response

A20 Describe the hypersensitivity reactions.

A21 List the Immunodeficiency diseases.

A22 Recognize Immune tolerance and principles of autoimmunity.

A23 Describe the basics of Transplantation immunity

A24 Recognize the basics of tumour immunity

A25 Describe the general microscopic morphology of bacteria

A 26 Outline the nomenclature and classification of microbes

A 27 Recognize the antigenic structure of bacteria, their virulence factors and pathogenesis.

A 28 Recognize the physiology of bacteria and bacterial metabolism

A 29 Mention the principles and the different methods of sterilization and disinfection
A 30 Describe the host parasite relationship
A 31 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 32 Understand 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 Elicit 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 Outline 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

2- Intellectual activities (I)

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 Assess 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 Detect the proper typing method that can be used for investigation of outbreaks.
B 5 Assess infection risk and develop infection prevention and control strategies
B 6 Recommend infection control (IC) policies and procedures.
B 7 Assess the educational needs of health care workers regarding IC.
B 8 Evaluate control measures for outbreaks.
B 9 Interpret the results of immunofluorescence test and ELISA
B 10 Interpret results of HLA typing
B11 Interpret the results of immunological and serological tests.
B 12 Recognize the antibiotic of choice for treatment of each type of bacterial infection.
B 13 Design a scheme for classification of microbes.
B 14 Explain the mechanism of resistance of bacteria to antibiotics.
B 15 Explain the pathogenic mechanisms of different pathogenic bacteria.
B16 Choose the appropriate antibiotic discs to use for antibiotic sensitivity testing of bacteria
B17 Interpret the results of antibiotic sensitivity testing
B 18 Differentiate between infection, colonization and contamination.
B19 Advice for further tests necessary for full identification of pathogens
B20 Adhere to and comply with laboratory health and safety practice
B21 Formulate a policy on the use of sterilization and disinfection in the laboratory
B22 Assimilate clinical, laboratory and epidemiological information and use it to differentiate between infections and other conditions
B 23 Interpret CPE in tissue cultures.
B 24 Explain the clinical features, etiology, pathogenesis of a viral disease.
B 25 Interpret the results of plaque assay.
B 26 Formulate a policy on the use of sterilisation and disinfection in the laboratory
B 27 Develop, under supervision, core reporting skills
B 28 Explain the clinical features, etiology, pathogenesis of mycotic diseases
B 29 Plan 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 Competently proceed in plasmid extraction, and curing.
C 4 Competently accomplish bacterial transformation and conjugation.
C5 perform examine and interpret RFLP technique
C 6 exercise tests required for air examination in hospitals.

C 7 Perform tests required for water examination in hospitals.

C 8 carry out quality tests for water to ensure being safe for use.

C 9 accomplish tests required for food examination in hospitals.

C 10 proceed in microbiological examinations of food handlers to ensure being free of infections

C 11 exercise tests required for disinfectant examination.

C 12 Plan infection control policy of TB cases

C 13 design a policy for safe disposal of hospital wastes

C 14 schedule isolations policies for infectious diseases

C 15 arrange a policy for management of needle sticks and blood and body fluid exposure for health care workers.

C 16 Formulate infection control policy in special hospital units as hemodialysis units, ICU, OR and NICU.

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, transformation and culture techniques
C 25 perform measurement of complement components and counting of immune cells
C 26 exercise neurtophil function, trypan blue and immunodiffusion tests
C27 accomplish detection of tumour markers detection of phagocytosis.
C 28 implement identification of different bacterial species in the lab by
Prepare and examine stained smears and interpreting biochemical reactions.
C29 Competently perform Techniques of anaerobiosis e.g Gaspack system

C30 carry out antimicrobial susceptibility testing by Kirby-Bauer disk diffusion method or by estimation of Minimum inhibitory /Bactericidal concentrations by tube/plate dilution methods
C31 Collect specimens for Microbiological investigations such as blood, urine, throat swab, rectal swab, stool, pus
C32 Quantitative analysis of urine by pour plate method and semiquantitative analysis by standard loop test for significant bacteriuria
C 33 process different samples properly in lab
C 34Prepare glassware for tissue culture (washing, sterilization)
C35 Prepare of clinical specimens for isolation of viruses
C36 Prepare primary cell lines and preserve cell cultures.
C 37 Inoculation of tissue cultures and examination of cytopathic effects
C 38 exercise phage typing technique.
C39 Perform ELISA and immunofluorescence for identification of viruses
C 40 Collection of specimens for mycological diagnosis
C 41 Direct examination of specimens by KOH, Gram, Kinyoun's, Giemsa, Lactophenol cotton for yeast identification
C 42 Examination of histopathology slides for fungal infections.
C 42 carry out Antifungal susceptibility testing
C43 proceed in diagnosis of different fungi and mycosis by staining, culture, biochemical reactions and specific tests.

D- Communication & Transferable skills

D 1 Effectively utilize 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 Provide education to physicians and other hospital staff about infectious diseases in seminars, lectures and ward rounds.
D 4 Search midline data base
D 5 Work in a team in the laboratory.
D 6 Utilize problem solving skills in practical situations.
D 7 Report the facts using printable sheets in the field of microbiology
D 8 Supervise collection, safe handling and processing of all routine specimens received in the laboratory
D9Develop a sense of the continuity of identification of specimens from collection, through culture and further testing to the issuing of a final report
D10Conduct infection control educational and training programs for healthcare workers and non medical care givers
D11 Recommend level of work restriction for health care workers with communicable diseases
D12 Advise on appropriate patient placement
D13 Collaborate with appropriate persons to establish the existence of an outbreak.
D14Use different media for teaching that are appropriate to the teaching setting
D15 Communicate effectively with learners
D16 Communicate with other members of the multidisciplinary team
D17 Show leadership and safe supervision.
D18 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 Participate in multidisciplinary quality/performance improvement strategies.
D20 Participate in research activities.
D21 Follow the ethical regulations of sample collection and delivery of results, showing respect to the patient's privacy.

(3) Course content:

Module (1): genetics and Nosocomial

Subjects	Lectures
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.	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
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	2 hours
Antibiotic policy	2 hours
Sterilization and disinfection policy	2 hours
I.C measures for T.B	2 hours
Waste disposal policy	2 hours
Isolation policies	2 hours
Needle stick policy	2 hours
I.C in ICUs and ORs	2 hours
I.C in Haemodialysis unit	2 hours

Practical

Subjects	Laboratory	Field	Total Teaching Hours
DNA extraction	6 hours		6 hours
PCR.	6 hours		6 hours
Agarose gel electrophoresis	6 hours		6 hours
Plasmid extraction	6 hours		6 hours
Plasmid curing	6 hours		6 hours
Bacterial Transformation	6 hours		6 hours
Bacterial conjugation	6 hours		6 hours
RFLP	6 hours		6 hours
IC of Hospital environment (Air)		6 hour	6 hours
IC of Hospital environment (water)		6 hour	6 hours
IC of Hospital environment (Food)		6 hours	6 hours
Sterilization and disinfection		6 hours	6 hours

policy			
I.C measures for T.B		6 hours	6 hours
Waste disposal policy		6 hours	6 hours
Isolation policies		6 hours	6 hours
Needle stick policy		6 hours	6 hours
I.C in Haemodialysis		6 hours	6 hours
I.C in Ors		6 hours	6 hours
I.C in ICUs		6 hours	6 hours
I.C in NICUs		6 hours	6 hours

Module (2): immunology

Subjects	Lectures
-Introduction to immunology: • General properties of immune response • Innate and adaptive immunity • Cells of innate & adaptive immunity	2 hours
-The concept of self and self/nonself recognition	2 hours
-The immune system: • Lymphoid tissues & their function • Cells of the immune system • Lymphocyte recirculation and homing	2 hours
- Antigen recognition & receptors • Maturation of B & T lymphocytes	2 hours
-Antigens	2 hours
-Immunoglobulins (Antibodies)	2 hours
-Complement system	2 hours
-Major histocompatibility complex	2 hours
-Antigen processing & presentation to T Lymphocytes	2 hours
-B cell activation	2 hours

-T cell activation & costimulators	2 hours
-Cytokines	2 hours
-Effector mechanisms of humoral & cell-mediated immunity	2 hours
-Immunity to microbes	2 hours
-Apoptosis	2 hours
-Vaccines	2 hours
-Stem cell therapy	2 hours
-Transplantation immunology	2 Hours
- Autoimmune diseases	2 hours
Immunological tolerance	2 hours
-Immunodeficiency diseases	2 hours
-Tumor immunology	2 hours
-Hypersensitivity reactions	2 hours
-Immunotherapy	2 hours
Measurement of immune function	2 hours

Practical

Subjects	Laboratory
-HLA typing	6 hours
Detection of apoptosis by - Giemsa stain - Propidium iodide - DNA fragmentation	6 hours
Monoclonal antibodies	6 hours
Hypersensitivity testing	6 hours
Tumor markers detection by ELISA	6 hours
ELISA techniques	6 hours
Immunoflourescence technique	6 hours
Autoantibodies detection	6 hours
Lymphocyte separation	6 hours
Lymphocyte culture	6 hours
Measurement of complement	6 hours
Neutrophil function tests	6 hours
Immunodiffusion test	6 hours
Lymphocyte transformation test	6 hours
Detection of tumor markers by ELISA and immunoflourescence	6 hours
Detection of phagocytosis	6 hours
Counting of immune cells	6 hours
Trypan blue test	6 hours

Module(3) bacteriology

Subjects	Lectures
Bacterial morphology & structure.	2 hours
Nomenclature & classification of microbes.	2 hours
Growth & nutrition of bacteria.	2 hours
Bacterial metabolism.	2 hours
Sterilization, disinfection & antiseptics.	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
Microscopes.	2 hours
Staining.	2 hours
Culture media.	2 hours
Laboratory diagnosis of infections.	2 hours
Staphylococci & Micrococci	3 hours
Streptococcus.	3 hours
Neisseria, Branhamnella & Moraxella.	3 hours
Corynebacterium.	3 hours
Bacillus.	3 hours
Clostridium.	3 hours
Non sporing anaerobes.	3 hours
The enterobacteriaceae.	6 hours
Vibrios, aeromonas & Plasiomonas.	2 hours
Campylobacter, spirillum & helicobacter pylori.	2 hours
Erysipelothrix & listeria.	2 hours

Pasteurella, francisella.	2 hours
Haemophilus & Bordetella.	2 hours
Brucella.	2 hours
Mycobacteria.	4 hours
Biochemical reactions.	2 hours
Methods of anaerobiosis.	2 hours
Antibiotic sensitivity testing.	2 hours
Collection of samples for bacteriological diagnosis.	2 hours
Laboratory processing of urine samples.	2 hours
Laboratory processing of blood samples.	2 hours
Laboratory processing of wound samples.	2 hours
Laboratory processing of respiratory samples.	2 hours
Laboratory processing of GIT samples.	2 hours
Laboratory processing of genital samples.	2 hours
Clinical microbiology.	2 hours
Opportunistic infections.	2 hours
Occupational diseases.	2 hours
Fever with jaundice.	2 hours
Pyrexia of unknown origin.	2 hours

Practical

Subjects	Laboratory
Identification of Staphylococci & Micrococci	6 hours
Identification of Streptococcus.	6 hours
Identification of Neisseria, Branhamnella & Moraxella.	6 hours
Identification of Corynebacterium.	6 hours
Identification of Bacillus.	6 hours
Identification of Clostridium.	6 hours
Identification of enterobacteriaceae.	6 hours
Identification of Mycobacteria	6 hours
Identification of Biochemical reactions.	6 hours
Methods of anaerobiosis.	6 hours
Antibiotic sensitivity testing.	6 hours
Collection of samples for bacteriological diagnosis.	6 hours
Laboratory processing of urine samples.	6 hours
Laboratory processing of blood samples.	6 hours
Laboratory processing of wound samples.	6 hours
Laboratory processing of respiratory samples.	6 hours
Laboratory processing of GIT samples.	6 hours
Laboratory processing of genital samples.	6 hours

Module (4) virology and mycology

Subjects	Lectures
General properties of viruses	2 hours
Pathogenesis & control of viral diseases	2 hours
Parvo-adenovirus- Pox	2 hours
Herpes virus	6 hours
Hepatitis viruses	5 hours
Picornaviruses	4 hours
Reoviruses, Rotaviruses, Caliciviruses.	2 hours
Arthropod borne & rodent viral diseases.	2 hours
Orthomyxoviruses.	2 hours
Paramyxoviruses.	2 hours
Coronaviruses.	2 hours
Rabies, slow virus infection.	4 hours
Bacteriophages.	2 hours
Oncogenic viruses.	2 hours
AIDS & Lentiviruses.	2 hours
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.	4 hours
Laboratory & molecular diagnosis of mycosis.	4 hours
Antifungal therapy: • Principle. • Resistance.	2 hours

• Susceptibility testing. • Types of therapies.	
Dermatomycotic molds.	4 hours
Superficial mycosis.	4 hours
Hyalohyphomycosis.	2 hours
Cutaneous mycosis.	4 hours
Invasive fungal infections.	4 hours
Sub-cutaneous mycosis.	4 hours
Fungal like infections.	2 hours
Systemic mycosis: • Endemic. • Opportunistic.	8 hours
Fungal infections in pediatrics.	2 hours
Oral fungal infections.	2 hours
Phaehyphomycosis.	2 hours
Fungal infections in bone & joint.	2 hours
Zygomycosis.	2 hours
Hematogenous disseminated fungal infections.	2 hours
Mycotoxicosis.	2 hours
Fungal infections in HIV patients.	2 hours
Fungal infections in cancer patients.	2 hours
Fungal infections in genitourinary.	2 hours
Fungal infections in respiratory tract.	3 hours
Ocular fungal infections.	3 hours
Occupational fungal infections.	3 hours
Indoor mycotic infections.	2 hours

Practical

Subjects	Laboratory
General properties of viruses	6 hours
Tissue culture technique	6 hours
Study of cytopathic effect	6 hours
Phage typing technique	6 hours
Diagnosis of Hepatitis viruses	6 hours
Diagnosis of HIV	6 hours
Diagnosis of influenza viruses	6 hours
Diagnosis of Herpes viruses	6 hours
Diagnosis of paramyxo viruses	6 hours
Antifungal susceptibility testing	6 hours
Approaches for yeast identification.	6 hours
Identification of Systemic mycosis: • Endemic. • Opportunistic.	6 hours
Hyalohyphomycosis.	6 hours
Diagnosis of Dermatophytes	6 hours
Diagnosis of subcutaneous mycosis	6 hours
Diagnosis of superficial mycosis	6 hours
Approaches for molds identification.	6 hours
Laboratory & molecular diagnosis of mycosis.	6 hours
Diagnosis of invasive fungal infections	6 hours

(4) 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

(5) Assessment methods:

5.1:Written exam for assessment of ILOs number; A 1-49, B 1-29

5.2: Structured Oral exam for assessment of ILOs number; A 1-49, B 1-29, D1-21

5.3: OSPE exam for assessment of ILOs number; C 1-24, A 1-43, B 1-28, D1-21

Assessment schedule:

Assessment 1: Final MD exam(written, oral and practical) : 6 semesters from the time of MD registration

MCQ at the end of each semester

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

Written exam: 160 marks, that is 40 % of the total marks

OSPE: 100 marks , that's is 25 % of the total marks

Structural Oral exam 100 marks , that's is 25% of the total marks

MCQ: 40 marks, that's is 10% of the total marks

Other types of assessment: None

Other assessment without marks:

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

a. Attendance Criteria: Minimum acceptance attendance is 75%

(6) 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. Ghada Maghawry

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

Date: