MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed To Be University U/S 3 OF UGC ACT, 1956)
12, Vembuliamman Koil Street, West K.K. Nagar, Chennai – 600 078

MEENAKSHI MEDICAL COLLEGE HOSPITAL AND RESEARCH INSTITUTE,
ENATHUR, KANCHIPURAM

MD – MICROBIOLOGY

FACULTY OF MEDICINE

REGULATIONS AND SYLLABUS (REGULATIONS – 2019)

Effective from the Academic Year 2020-2021

PROFESSOR & H.O.D.,
DEPARTMENT OF MICROBIOLOGY
MEENAKSHI MEDICAL COLLEGE &
RESEARCH INSTITUTE,
ENATHUR, KANCHIPURAM-631 401

DEAN

MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

M.D MICROBIOLOGY

REGULATIONS -2019

I.VISION AND MISSION OF MAHER

VISION

To be a world-class institution, transforming society through value-based diverse programs and healthcare advancements, leading to the all-around development of human resources, knowledge, innovation, entrepreneurship, and research.

MISSION

To become an institute of eminence by developing world-class professionals in the field of healthcare, science, liberal arts, technology and research with a focus on the societal good.

To create an enabling state-of-the-art infrastructure, intellectual capital and provide best-in- class learning experience with a freedom to innovate and invent.

To foster values and ethics so as to develop students and learners into responsible citizens of the Nation and the world.

MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

M.D MICROBIOLOGY

REGULATIONS -2019

II.VISION AND MISSION OF MMCHRI

VISION

To provide global leadership in human development, excellence in education and quality health care.

MISSION

To train competent, compassionate and caring physicians through excellence in teaching, patient care and medical research

MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

M.D MICROBIOLOGY

REGULATIONS -2019

III.VISION AND MISSION – DEPARTMENT OF MICROBIOLOGY

VISION

To provide with high qualified Medical Staff capable of dealing with infectious diseases and to improve human health

MISSION

To train competent, compassionate and caring Microbiologists through excellence in teaching, patient care and medical research. To provide uniform, standard training in Microbiology to the candidates so that after 3 years of training they are able to acquire the necessary competence in the speciality to work as Senior Resident/ Junior and to progress further in their career.

MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

FACULTY OF MEDICINE

M.D MICROBIOLOGY

REGULATIONS -2019

IV.PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

- A Candidate upon successfully qualifying in M.D(Microbiology) Examination, should be able to

PEO 1. Be a competent Microbiologist

PEO 2. Conduct such clinical/experimental research as would have significant bearing on human health and patient care.

PEO 3 Interact with the Allied department by rendering services in advanced laboratory investigation

PEO 4. Acquire skills in conducting collaborative research in the field of microbiology & allied Sciences.

PEO 5. Must be able to demonstrate to the students how the knowledge of microbiology can be used in a variety of clinical settings to solve

diagnostic and therapeutic problems

V. PROGRAM OUTCOMES (PO's)

PO 1: Acquisition of knowledge: The student will learn the basic, diagnostic and applied Microbiology. The students will actively learn from various training programs like lectures along with seminars/symposia/group discussions and journal clubs. The postgraduate student should will attend a minimum of 20 ward rounds, discuss with the faculty, and maintain a log book for the same. They should be able to render consultative and investigative services in microbiology.

PO 2 Teaching and training: The student will be able to effectively teach postgraduate students in medicine so that they become competent healthcare professionals and able to contribute to training of postgraduate trainees.

PO 3 Research: The student will be able to carry out a research project (both basic and clinical) from planning to publication and be able to pursue academic interests and continue life-long learning to become more experienced in all the above areas and eventually be able to guide postgraduates in their thesis work.

PO 4 Critical thinking skill: The student will be able to evaluate and manage the difficult situational cases and become competent in early management of such cases. They will be able to co-ordinate with super-speciality consultants and follow protocols based on the cases

PO 5 Technical skill: The student will be able to assist and perform day-care, minor, major and emergency (Diagnostic & therapeutic) individually under the supervision of senior faculty.

PO 6 Professional skill: Recognize conditions that may be outside the area of his specialty/competence and refer them to the proper specialist

VI.PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO 1. Able to Demonstrate application of microbiology in a variety of clinical settings tosolve diagnostic and therapeutic problems along with preventivemeasures.

PSO 2. To play a pivotal role in hospital infection control, including formulation of antibiotic policy and management of biomedicalwaste.

PSO 3. Acquire skills in conducting collaborative research in the field of

Microbiology and alliedsciences. Able to Conduct clinical/experimental research as would have significant bearing on human health and patientcare

PS0 4. Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology andmycology.

PSO 5. To participate is various workshops/seminars/journal clubs/demonstration in the allieddepartments

MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH

MEENAKSHI MEDICAL COLLEGE HOSPITAL AND RESEARCH INSTITUTE

FACULTY OF MEDICINE

MD- MICROBIOLOGY

VII. REGULATIONS -2019

In exercise of the powers conferred by the Board of Management, Meenakshi academy of higher education and research, deemed to be University, Chennai hereby makes the following regulations:

1. SHORT TITLE

These Regulations shall be called "THE REGULATIONS FOR THE MD MICROBIOLOGYPROGRAM OF MEENAKSHI ACADEMY OF HIGHER EDUCATION AND RESEARCH" deemed to be University.

2. COMMENCEMENT

They shall come into force from the academic year 2020-2021 onwards.

The Regulations and the Syllabus are subject to modification by the Academic council and board of studies from time to time.

3. TITLE OF THE PROGRAM

It shall be called DOCTOR OF MEDICINE (MD) MICROBIOLOGY

4. SYLLABUS

The syllabus is as prescribed according to the norms given by NMC and finalised with board of studies management by the university

5. ELIGIBILITY FOR ADMISSION

1) Candidates who have obtained minimum eligibility in qualifying exam
2) The reservation of seats and relaxation in the qualifying marks for SC/ST/OBC and other categories shall be as per the rules of the Central Government/State Government, whichever is applicable.

6. CRITERIA FOR SELECTION

Students for M.D Microbiology Degree Program shall be admitted based on performance at the Competitive Examinations held by the government.

7. ADMISSION PROCEDURE

Admission shall be made as per the NMC and University norms.

8. ELIGIBILITY CERTIFICATE

No candidate shall be admitted to the MD Microbiology Program unless the candidate has obtained and produced an Eligibility Certificate issued by this University. The candidate has to make an application to the University with the Original and Xerox copies of the following documents along with the prescribed fee:

1) 10^{th} and Higher Secondary or equivalent Examination Mark Sheets.
2) Transfer Certificate
3) MBBS Under graduate degree certificate and mark sheets.
4) Candidates should obtain an Eligibility Certificate before the last date for admission as notified by the University.

9. REGISTRATION

A candidate admitted to the M.D Microbiology Program of this University shall register by remitting the prescribed fees along with the application form for registration duly filled-in and forwarded to this University through the Head of the Institution within the stipulated date.

10. DURATION OF THE PROGRAM

The programme shall be of duration of three academic years.

11. FEES

The institution shall change only such a fee as prescribed by the university

12. COMMENCEMENT OF THE PROGRAM

The program shall commence from 1stMay of the Academic year.

13. CUT-OFF DATES FOR ADMISSION TO EXAMINATION

The candidates admitted from 1st May to 30th September of the academic year will be registered to take up their Final examination in May at the completion of 3rd year.

There will not be any admission after 30th September for the academic year.

14. LEAVE DAYS IN AN ACADEMIC YEAR

There shall be maximum of 15 days in a year exclusive of the period of admission and examination

15. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATIONS

a) No candidate shall be permitted to write any one of the papers of M.D Microbiology examination unless he/ she has attended all the courses in the subject for the prescribed period and produces the necessary certificates of study and attendance from the Head of the Institution.
b) A candidate is required to put in a minimum of 80% of attendance in both theory and clinical separately in each year before admission to the examination.

c) A candidate, who has not completed the program and not submitted the dissertation signed by the Head of the Department, will not be permitted to appear for the exam.

d) Attendance earned by the student should be displayed on the Notice Board of the department every month and a copy of the same sent to the University for computerization and parents shall be informed regarding the shortage of attendance of their wards through email (if available) or by post by the Institution.

16. SUBMISSION OF LOG BOOK

a. At the time of practical examination each candidate shall submit to the Examiners his / her log book duly certified by the Head of the Department as a bonafide record of the work done by the candidate.
b. The log book shall be evaluated by the concerned member of the faculty and the external examiner (Internal and external Evaluation) the practical record marks

shall be submitted to the University prior to the commencement of the theory examinations.

17. COMMENCEMENT OF THE EXAMINATIONS

a. There shall be examinations at the end of 3rd year in the month of April/May. A candidate who does not pass the examination in any of the 4 papers shall be permitted to appear in all the final year papers in the subsequent examinations to be held in September or April/May.
b. Candidates should get enrolled/register for the first semester examination. If enrolment/registration is not possible owing to shortage of attendance beyond condition limit/rules prescribed OR belated joining OR on medical grounds, such candidates shall redo the lost academic days in the subsequent term of shall be admitted to appear for exams, if he/she has successfully kept the term in first year or the university rules are followed.

18. EVALUATION

Attendance shall be taken as a component of continuous assessment. The students should have a minimum 80% attendance in each year. In addition to the continuous evaluation component, the end of program examination, which will be a written type examination of at least 3 hours duration, would also form an integral component of the evaluation. The evaluation of practical work will be at end of the program.

19. REVALUATION OF ANSWER SCRIPTS

There shall be no revaluation of answer papers of failed candidates in the examination

However re-totalling of answer papers is allowed once upon request by the students.

20. RE-ADMISSION AFTER BREAK OF STUDY

1) The calculation of the break of study of the candidate for re-admission shall be calculated from the date of first discontinuance of the program instead of from the date of admission.
2) Candidates having break of study shall be considered for re-admission provided, they are not subjected to any disciplinary action and no charges are pending or contemplated against them.
3) All readmissions of candidates are subject to the approval of the Vice-Chancellor.
4) A candidate having a break of study of less than 6 months shall apply for re-admission for condonation to the Academic Officer of this University. The candidate

may be re-admitted in the corresponding program of study. The candidate has to fulfil the attendance requirements of the University

5) A candidate having a break of study of more than 6 months but less than 2 years shall apply for re-admission for condonation to the Academic Officer of this University. The candidate may be re- admitted to the beginning of the academic year of the program. The candidate has to fulfil the attendance requirements of the University
6) A candidate having a break of study of more than 2 years and up to 5 years shall apply for the re- admission for condonation to the Academic Officer of this University. The candidates may be re- admitted in the corresponding program of study. The candidate has to fulfil the attendancerequirements of the University and shall not be granted exemption in the subjects he has already passed.
7) Candidates having a break of study of 5 years and above from the date of discontinuance and more than two spells of break will not be considered for re-admission.

21. TRAINING PROGRAMME

Tentative Schedule for three years of MD training:

End of 1st year	End of 2nd year	End of 3rd year
GENERAL MICROBIOLOGY: 1.History and Pioneers in Microbiology 2.Microscopy 3.Nomenclature andclassification ofmicrobes 4.Morphology of bacteria and other micro-organisms 5.Growth and Nutrition of bacteria 6.Bacterial metabolism 7.Sterilizationand disinfection 8.Culture media and culture methods 9.Identification of bacteria 10. Bacterialtoxins 11. Bacterial antagonism : Bacteriocins 12. Bacterialgenetics 13. Gene cloning 14. Antibacterial substances used in the treatment of infections and drug resistance in bacteria 15. Bacterialecology - Normal flora of human body, Hospital environment, Air, Water and Milk 16. Host-parasite relationship	**IMMUNOLOGY :Clinical** 1. Hypersensitivity 2. Immunodeficiency 3. Auto-immunity 4. Immune tolerance 5. Transplantationimmunity 6. Tumourimmunity 7. Immunoprophylaxisand immunotherapy 8. Measurement ofimmunity	**GENERAL MICROBIOLOGY & IMMUNOLOGY:** **All**

IMMUNOLOGY : 1. Innate and acquired immunity 2. Antigens 3. Immunoglobulins 4. Antigen and antibody Reactions 5. Complement System 6. The normal immune system: structure and function 7. Immune Response	**SYSTEMATIC BACTERIOLOGY** *1. Streptococcus and Lactobacillus* *2. Staphylococcus and Micrococcus* *3. Pseudomonas* *4. The Enterobacteriaceae* *5. Mycobacteria* *6. Corynebacterium* andother Coryneformbacteria *7. Vibrios, Aeromonas, Plesiomonas, Campylobacter & Spirillum* *8. Neisseria, Branhamella& Moraxella* *9. Haemophilus and Bordetella* *10. Bacillus:* the aerobic spore-bearing bacilli *11.* Clostridium: the spore-bearing anaerobic bacilli *12.* Non-sporing anaerobe *13.* The Spirochaetes	**SYSTEMATIC BACTERIOLOGY (2nd year) :** **plus** *1. Actinomycetes, Nocardia and Actinobacillus* *2. Erysipelothrixand Listeria* *3.* The *Bacteroidaceae*: *Bacteroides, Fusobacterium andLeptotrichia* *4. Chromobacterium, flavobacterium, Acinetobacter and* Alkaligenes *5.* Pasteurella, Francisell *6.* Brucella *7.* Chlamydia *8.* Rickettsiae *9.* Mycoplasmatales: Mycoplasma, Ureaplasma and Acholeplasma *10.* Miscellaneous bacteri

MICROBIOLOGY APPLIED TO TROPICAL MEDICINE AND RECENT ADVANCES 1.Normal Microbial flora 2.Epidemiology of infectious diseases 3.Hospital acquired infections & Hospital waste disposal 4.Bacteriology of water milk and air	**VIROLOGY:** 1.The nature of viruses 2.Classification of viruses 3.Morphology: virus structure 4.Virus replication 5.The genetics of viruses 6.The pathogenicity & lab diagnosis of viruses 7.Epidemiology of viral infections 8.Anti-viral drugs 9.Bacteriophages 10. Herpes viruses 11. Paramyxoviruses 12. Influenza virus 13. Hepatitis viruses 14. Rabies virus 15. Human immunodeficiency viruses	**VIROLOGY (2nd year): plus** 1. Vaccines 2. Pox viruses 3. Vesicular viruses 4. Toga viruses 5. Bunya viruses 6. Arena viruses 7. Marburg and Ebola viruses 8. Rubella virus 9. Orbi viruses 10. Respiratory diseases : Rhinoviruses, adenoviruses and corona viruses 11. Enteroviruses; Polio, Echo, and Coxsackie viruses 12. Other enteric viruses 13. Slow viruses 14. Oncogenic viruses 15. Teratogenic viruses
	PARASITOLOGY: 1.General Parasitology 2.**Protozoan parasites of medical importance:** Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium	**PARASITOLOGY (2nd year): plus** 1. **Protozoan parasites of medical importance:** Toxoplasma, Sarcocystis, Cryptosporidium, Babesia, Balantidium etc. 2. **Helminthology:** All thos medically important helminthes belonging to Cestoda, Trematoda and Nematoda. 3. **Cestodes:**Diphyllobothri m, Taenia, Echinococcus, Hymenolepis, Dipyllidium,

		Multiceps etc. **4. Trematodes:** Schistosomes, Fasciola, Gastrodiscoides, Paragonimus, Clonorchis Opisthorchis etc. **5. Nematodes:** Trichuris Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius, Filarial worms, Dracunculus, etc. **6. Ecto-parasites:** Common arthropods and other vectors viz., Mosquito, Sand fly, Ticks, Mite, Cyclops
	MYCOLOGY 1.The morphology and reproduction in fungi 2.Classification of fungi 3.Dermatophytes 4.Candida 5.Aspergillus	**MYCOLOGY (2nd year): plus** 1. Contaminant and opportunistic fungi 2. Fungi causing superficial mycoses 3. Fungi causing subcutaneous mycoses 4. Fungi causing systemic infections 5. Anti-mycotic agents

		MICROBIOLOGY APPLIED TO TROPICAL MEDICINE AND RECENT ADVANCES 1. Infections of various organs and systems of human body 2. Molecular genetics as applicable to microbiology 3. Vaccinology: principle, methods of preparation, administration of vaccines. 4. Bio-terrorism
		ALLIED BASIC SCIENCES **(a) Biochemistry:** Basic understanding of biochemistry as applied to immunological/ molecular methods for study of microbial diseases and pathogenesis of infections 1. Protein purification and estimation 2. Protein estimation 3. Nucleic acid

		purification and characterization 4. Agarose and polyacrylamide gel electrophoresis - principles 5. Ultracentrifugatio n – principles 6. Column chromatography – principles **(b) Molecular biology:** Basic knowledge as applicable to molecular diagnostics and molecular epidemiology. 1. Recombinant DNA technology 2. Southern, northern and western blotting 3. DNA amplification techniques 4. Diagnostic PCR, different methods of PCR product detection (liquid hybridization, ELISA). **5.** Genotyping of microbes and viruses **(c) Pathology: (as applied to Microbiology) Basic knowledge of** 1. Inflammation and repair 2. Intercellular substances and reaction 3. Pathological changes in the body in bacterial,

		viral, mycotic and parasiti infections 4. Demonstration c pathogen in tissue section

SKILLS:

1st yearresidency-skillslist					
Area	Sr. no.	Procedure	Observedno.	Assistedno./practiceondummy	Performedindependentlyno.(undersupervision)
Generalmicrobiology	1.	Microscopyforunstained preparations/wetmount	5	5	10
	2.	Microscopyforstained preparation	5	5	10
	3.	Preparationofdirectsmearsfromclinicalspecimens	5	5	10
	4.	Hangingdroppreparation	5	5	10
	5.	Washing,sterilizationand packingofglassware	10sessions	-	-
	6.	Infectioncontrolactivities-environmentalsampling	10	10	-
	7	IdentificationofHAI	5	5	--
	8	CalculationofHAI qualityindicators	5	5	--
	9	Bacteriologyofwater	5	5	-
	10	Bacteriologyofair	5	5	-
	11	Antibioticdiscpreparation	-	-	-
	12	Handlingoflaboratoryanimal	-	-	-

	13	Methods for preservation ofbacteria	10	-	-
	14	Maintenanceofstockcultures	10	-	-
Staining	1	Gramstaining	10	20	30
	2	Acidfaststaining(Ziehl-Neelsenmethod)	10	20	30
	3	Albert staining	5	10	10
	4	Modified ZN staining for *M.leprae*	5	5	5
	5	ModifiedZNstainingfor *Nocardia*	5	5	5
	6	IQC-staining	5	5	5
Mediapre paration	1	Preparationofstains	4	4	4
	2	Preparationofreagents	10	10	10
	3	Preparation,plugging,pouring	20	20	30
		& Quality Control (QC) of culture media			
	4	Operation & maintenance of autoclave	10	10	20
Bacteriology	1	Specimen collection for Blood Culture	5	5	5
	2	Inoculation of liquid & solid media	20	20	30
	3	Identification test	20	20	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	10	20	30
	5	IQC- Antibiotic disc potency	5	5	-
	6	Operation of BacT/ALERT	5	10	20
	7	Operation of Vitek 2 compact	5	10	20
	8	Petroff's concentration technique	10	10	20
	9	AFB culture & sensitivity	5	10	20
Mycology	1	KOH Wet mount	5	10	20
	2	Germ tube test	5	10	20
	3	Slide culture	5	10	20

	4	Negative staining for fungus	5	5	5
	5	LPCB mount	10	10	10
Parasitology	1	Giemsa staining for thick & thin peripheral blood smear	5	-	-
	2	Stool wet mount for R/M	10	20	30
	3	Stool concentration techniques	5	10	5
	4	Modified ZN staining for C. parvum	2	2	2
Serology/ Immunology	1	Phlebotomy & separation of serum	10	10	5
	2	Operation & maintenance of mini-VIDAS	5	10	20
	3	Operation & maintenance of ELISA reader & washer	5	10	--
		Performance of serological tests			
	1	Latex agglutination test(RA, ASO)	10	20	30
	2	RPR card test	10	20	30
	3	Tube agglutination test	10	20	30
	4	Gold conjugate Rapid card test	10	20	30
	5	ANA by IF	5	5	--
	6	ANA by Immunoblot	5	5	--
	7	IQC-serology	5	5	5

2nd year residency-skill list					
Area	Sr. no.	Procedure	Observedno.	Assisted no./practice on dummy	Performedindependentlyno. (undersupervision)
General microbio	1.	Microscopy for unstained preparations/wet mount	---	--	--

logy					
	2.	Microscopy for stained preparation	--	--	--
	3.	Preparation of direct smears From clinical specimens	--	--	--
	4.	Preparation of slit skin smear For lepra bacilli	5	5	5
	5.	Hanging drop preparation	--	--	10
	6.	Washing, sterilization and Packing of glassware	05sessions	-	-
	7	Infection control activities-Environmental sampling	--	10	10
	8	Identification of HAI	--	5	5
	9	Calculation of HAI quality indicators	--	5	5
	10	Bacteriology of water	--	5	5
	11	Bacteriology of air	--	5	5
	12	Antibiotic disc preparation	05lots	-	-
	13	Handling of laboratory animal	-	-	-
	14	Methods for preservation of bacteria	--	05	10
	15	Maintenance of stock cultures	--	05	10
Staining	1	Gram staining	--	--	30
	2	Acid fast staining(Ziehl-Neelsen method)	--	--	30
	3	Albert staining	--	--	05
	4	ModifiedZNstainingfor *M. leprae*	--	--	5
	5	ModifiedZNstainingfor *Nocardia*	--	--	5
	6	IQC-staining	--	--	5
Media preparation	1	Preparationofstains	--	--	5
	2	Preparationofreagents	--	--	15
	3	Preparation,plugging,pouring &QualityControl (QC)ofculturemedia	--	--	50
	4	Operation&maintenance of autoclave	--	--	20
Bacteriology	1	Specimencollectionfor BloodCulture	--	--	5
	2	Inoculationofliquid&solid media	--	--	30
	3	Identificationtest	--	--	30

	4	Antimicrobialsensitivity testing-modifiedKirby-bauertechnique	--	--	30
	5	IQC-Antibioticdiscpotency	--	5	5
	6	OperationofBacT/ALERT	--	--	20
	7	OperationofVitek2 compact	--	--	20
	8	Petroff'sconcentration technique	--	--	20
	9	AFB culture&sensitivity	--	--	20
Mycology	1	KOH Wet mount	--	--	20
	2	Germ tube test	--	--	20
	3	Slide culture	--	--	20
	4	Negative staining for fungus	--	--	5
	5	LPCB mount	--	--	10
Parasitology	1	Giemsa staining for thick & thin peripheral blood smear	-	10	-
	2	Stool wet mount for R/M	--	--	30
	3	Stool concentration techniques	--	--	5
	4	Modified ZN staining for C. parvum	--	--	2
Serology / Immunology	1	Phlebotomy & separation of serum	--	--	5
	2	Operation & maintenance of mini-VIDAS	--	--	20
	3	Operation & maintenance of ELISA reader & washer	--	--	20
		Performance of serological tests			
	1	Latex agglutination test(RA, ASO, CRP)	--	--	30
	2	RPR card test	--	--	30
	3	Tube agglutination test	--	--	30
	4	Gold conjugate rapid card test	--	--	30
	5	ANA by IF	--	--	10
	6	ANA by Immunoblot	--	--	10
	7	IQC-serology	--	--	5

3rd yearresidency-skilllist

Area	Sr.no.	Procedure	Observedno.	Assisted no./practice ondummy	Performedindependentlyno. (undersupervision)
Generalmicrobiology	1.	Microscopy for unstained preparations/wetmount	---	--	--
	2.	Microscopy for stained preparation	--	--	--
	3.	Preparation of slitskinsmearforleprabacilli	--	--	--
	4.	Hangingdroppreparation	--	--	--
	5.	Washing,sterilizationand packingofglassware	05 sessions	-	-
	6.	Infectioncontrolactivities-environmentalsampling	--	--	10
	7	IdentificationofHAI	--	--	5
	8	CalculationofHAI qualityindicators	--	--	5
	9	Bacteriologyofwater	-	-	5
	10	Bacteriologyofair	-	-	5
	11	Antibioticdiscpreparation	-	5lots	2lots
	12	Handling of laboratoryanimal	-	-	10
	13	Methods for preservation ofbacteria	-	-	10
	14	Maintenance of stockcultures	-	--	10
Staining	1	Gramstaining	--	--	30

	2	Acidfaststaining(Ziehl-Neelsenmethod)	--	--	30
	3	Albert staining	--	--	05
	4	Modified ZN staining for *M.leprae*	--	--	5
	5	ModifiedZNstainingfor *Nocardia*	--	--	5
	6	IQC-staining	--	--	5
Mediapreparation	1	Preparationofstains	--	--	10
	2	Preparationofreagents	--	--	15
	3	Preparation, pouring &Quality Control (QC) ofculture media	--	--	50
	4	Operation & maintenance ofautoclave	--	--	20
Bacteriology	1	Specimen collection forBloodCulture	--	--	5
	2	Inoculationofliquid&solidmedia	--	--	30
	3	Identificationtest	--	--	30
	4	Antimicrobial sensitivitytesting- modified Kirby-bauertechnique	--	--	30
	5	IQC-Antibioticdiscpotency	--	--	5
	6	OperationofBacT/ALERT	--	--	20
	7	Operation of Vitek 2compact	--	--	20
	8	Petroff's concentrationtechnique	--	--	20
	9	AFBculture&sensitivity	--	--	20
Mycology	1	KOHWetmount	--	--	20
	2	Germtubetest	--	--	20
	3	Slideculture	--	--	2

			-	-	0
	4	Negativestainingforfungus	--	- -	5
	5	LPCBmount	--	- -	1 0
Parasitology	1	Giemsa staining for thick &thinperipheralbloodsmear	--	- -	-
	2	Stoolwetmountfor R/M	--	- -	3 0
	3	Stool concentrationtechniqu es	--	- -	5
	4	Modified ZN staining for *C.parvum*	--	- -	2
Serology/Immunolo gy	1	Phlebotomy & separation ofserum	--	- -	5
	2	Operation & maintenance ofmini-VIDAS	--	- -	2 0
	3	Operation & maintenance of ELISA reader & washer	--	- -	2 0
		Performance of serological tests			
	1	Latex agglutination test(RA, ASO, CRP)	--	- -	3 0
	2	RPR card test	--	- -	3 0
	3	Tube agglutination test	--	- -	3 0
	4	Gold conjugate rapid card test	--	- -	3 0
	5	ANA by IF	--	- -	1 0
	6	ANA by Immunoblot	--	- -	1 0
	7	IQC-serology	--	- -	5

Teaching activities

One teaching activity each day

1. **Journal based / recent advanceslearning**
2. **Subject seminar presentation**

3. **Slide seminars**
4. **Patient based /Laboratory or Skill based learning**
5. **Self directed learning andteaching**
6. **Departmental and interdepartmental learningactivity**
7. **External and Outreach Activities /CMEs**

22. MINIMUM PASSING STANDARD

The minimum passing standard for final Examinations shall be 50% i.e., each in theory and practical courses.

Four theory papers:

Paper I: General Microbiology and Immunology – 100 Marks

Paper II: Systematic Bacteriology – 100 Marks

PaperIII: Virology Parasitology and Mycology – 100 Marks

PaperIV: Applied Microbiology and Recent advances – 100 Marks

PRACTICALEXAMINATION

Reframed practical scheme for 2 days duration **Marks:300**

S.No	Division	Exercises	Marks
1.	**Bacteriology**	**Pure culture** Preliminary sample processing & report	15
		Clinical Sample processing (Simulated Sample with Case scenario)	35
		Bacterial Techniques - Pure Culture Identification & Antimicrobial Susceptibility testing	30
		Total	**80**
2.	**Mycology**	One slant *I* slide culture (Contaminant , Pathogenic fungi)	20
3.	**Virology**	PCR / CPE I Western Blot I EUSA	20

4.	**Immunoserology**	Bacteriology (Wide! I VDRL *I* Weil-felix*I* SAT for Brucellosis *I* ASO I CRP *I* RA. etc) rapid test for Viral infections - Point of care tests	20
5.	**Parasitology**	laboratory diagnosis of parasitic infections in stool/ blood *I* sputum- Concentration Techniques	20
6.	**OSPE Exercises**	Including Case scenario - discussion (2X10)	20
7.	Microscopy Including histopathology Slides - Discussion		20
8.	Pedagogy		40
9.	Viva voce including Competency Assessment		60
		TOTAL	**300**

23. GRADE OF MARKS:

>/= 50% of total marks	Pass
>75% of total marks	Distinction
>90 % of total marks	Honours

24.AWARD OF DEGREE

The degree shall be awarded by the university only after the completion of thesis approval and of all four final year theory exams papers and practical examination.

VIII. Program level CO/PO and PSO matrix:

S. No	Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PS O1	PS O2	PS O3	PS O4	PSO 5
1.	1181	General Microbiology and Immunology	3	2.8	2.8	2.9	3	2.6	3	2.4	2.5	2.5	2.8
2.	1182	Systemic Bacteriology	3	2.6	2.5	3	2.6	2.8	2.4	2.6	2.7	2.8	2.6
3.	1183	Virology and parasitology	3	2.9	2.7	2.8	3	2.4	3	2.8	2.8	2.7	2.5
4.	1184	Mycology,Applied Microbiology and Recent advances	3	2.7	2.5	2.8	3	2.6	3	2.4	2.5	2.5	2.4

1-low, 2-medium, 3-high

IX. PROGRAM AND COURSE DETAILS

PROGRAM SPECIFIC COMPETENCIES:

By the end of the program, the student should have acquired knowledge (cognitive domain), professionalism (affective domain) and skills (psychomotor domain) as given below:

A) Cognitive Domain:

At the end of the course, the student should have acquired knowledge in the following theoretical competencies:

Course Code 1181 General Microbiology and immunology

1. Important historical events and developments in microbiology
2. Basic as well as advanced knowledge in various microscopes and microscopic techniques used in diagnostic microbiology
3. Various bio-safety issues including physical and biological containment, universal containment, personal protective equipment for biological agents
4. Various isolation precautions including standard and transmission based precautions
5. In-depth knowledge about various method of Sterilization,disinfection and lyophilization
6. Nomenclature, classification and morphology of bacteria as well as other microorganisms
7. Various types and significance of normal flora of human body in health and disease states.
8. Requirements for growth and nutrition of bacteria along with bacterial metabolism
9. Various types and role of bacterial toxins and bacteriocins
10. Microbiology of air, milk, water as well as hospital environment
11. Various types of host-parasite relationship and their significance
12. Various antimicrobial agents and mechanisms drug resistance
13. Bacterial genetics, bacteriophages and molecular genetics relevant for medical microbiology

14. Applications of quality assurance, quality control in microbiology and accreditation of laboratories

Immunology

1. Components of immune system, typesof immunity (Innate, acquired, mucosal, humoral and cell mediated immunity) and immune response
2. Describes and identifies uses of various antigens, immunoglobulins (antibodies) and antigen and antibody reactions
3. Complement system and Cytokines
4. Various disorders like hypersensitivity, immunodeficiency and auto-immunity involving immunesystem
5. MHC complex, Immune tolerance,Transplantation and Tumorimmunity
6. Various types, techniques, advances, and applications of vaccines and immunotherapy
7. Measurement of immunological parameters
8. Immunological techniques and their applications in diagnostic microbiology as well asresearch
9. Mechanisms and significance of immune-potentiation andimmune-modulation

Course 2 (1182)Systemic bacteriology

1. Demonstrate knowledge and skills in various techniques for isolation and identification ofbacteria
2. Demonstrate knowledge about epidemiology, morphology, biochemical properties, antigenic nature, pathogenesis, complications, laboratory diagnosis treatment and prevention of major bacterial pathogens of medical importance givenbelow-
    a. Gram positive cocci including *Staphylococcus, Micrococcus, Streptococcus*, anaerobic coccietc.
    b. Gram negative cocci including *Neisseria, Branhamella, Moraxella*etc.
    c. Gram positive bacilli including *Lactobacillus, Coryneform*bacteria, *Bacillus* and aerobic bacilli, *Actinomyces, Nocardia, Actinobacillus and other actinomycetales, Erysipelothrix, Listeria, Clostridium* and other spore bearing anaerobic bacillietc.
    d. Gram negative bacilli including *Vibrios, Aeromonas, Plesiomonas, Haemophilus, Bordetella, Brucella, Gardnerella, Pseudomonas* and other

non-fermenters, *Pasteurella, Francisella, Bacteroides, Fusobacterium, Leptotrichia*and other anaerobic gram negative bacillietc.

e.Helicobacter, Campylobacter, Calymmatobacterium,Streptobacillus,

Spirillum and miscellaneous bacteria

f. Enterobacteriaceae

g.Mycobacteria

h.Spirochaetes

i. Chlamydia

*j. Mycoplasmatales; Mycoplasma, Ureaplasma, Acholeplasma*andother *Mycoplasmas.*

*k.Rickettsiae, Coxiella, Bartonella*etc.

Course code (1183) Virology and Parasitology

1. Demonstrates knowledge about general properties, classification, morphology, virus replication and genetics ofviruses
2. Explain pathogenesis of viralinfections
3. Demonstrates knowledge about isolation and identification ofviruses
4. Demonstrate knowledge about epidemiology, morphology, genetics, antigenic nature, pathogenesis, complications, laboratory diagnosis, treatment and prevention of major DNA viruses of medical importance including *Pox viruses, Herpes viruses, Adeno viruses, Hepadna virus, Papova viruses* and *Parvo viruses* etc.
5. Demonstrate knowledge about epidemiology, morphology, genetics, antigenic nature, pathogenesis, complications, laboratory diagnosis, treatment and prevention of major RNA viruses of medical importance including *Entero viruses, Toga viruses, Flavi viruses, Orthomyxo viruses, Paramyxo viruses, Reo viruses, Rhabdo viruses, Arena viruses, Bunya viruses, Retro viruses, Filo viruses, Human Immunodeficiency Virus, Arbo viruses, Corona viruses, Calci viruses* etc.
6. Demonstrate knowledge about epidemiology, morphology, genetics, antigenic nature, pathogenesis, complications, laboratory diagnosis, treatment and prevention of major *Hepatitisviruses*
7. Demonstrate knowledge about epidemiology, morphology, genetics, antigenic nature, pathogenesis, complications, laboratory diagnosis, treatment and prevention

of unclassified viruses and slow viruses includingprions

8. Demonstrate knowledge about viral vaccines and anti-viraldrugs.

Parasitology

1. Demonstrate knowledge about general characters, classification and methods of identification ofparasites.
2. Demonstrate knowledge about epidemiology, morphology, antigenic nature, life cycle, pathogenesis, complications, laboratory diagnosis, treatment and prevention of Protozoan parasites of medical importance including *Entamoeba, Free living amoebae, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Sarcocystis, Cryptosporidium, Microsporidium, CyclosporaIsospora, Babesia, Balantidium,*etc.
3. Demonstrate knowledge about epidemiology, morphology, antigenic nature, life cycle, pathogenesis, complications, laboratory diagnosis, treatment and prevention of helminthes of medical importance including those belonging to Cestoda (*Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipyllidium, Multiceps*etc.), Trematoda (*Schistosomes, Fasciola, Fasciolopsis, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis* etc.) and Nematoda (*Trichiuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius, Filarial worms, Dracunculus*etc.)
4. Demonstrate knowledge about common arthropods and other vectors viz. mosquito, sand fly, ticks, mite, cyclops, louse, myasis of medicalimportance.
5. Demonstrate knowledge about anti-parasitic vaccine anddrugs.

Course code 1184 **Mycology,Applied Microbiology and Recent advances**

1. Explain general characteristics including morphology, reproduction and classification offungi
2. Demonstrate knowledge and skills for isolation and identification offungi
3. Explain tissue reactions tofungi
4. Demonstrate knowledge about epidemiology, morphology, biochemical properties, antigenic nature, pathogenesis, complications, laboratory diagnosis treatment and prevention of major fungal pathogens of medical importance givenbelow-
    a. Yeasts and yeast like fungi including *Candida, Cryptococcus, Malassezia, Trichosporon, Geotrichum, Saccharomyces*etc.

b. Mycelial fungi including *Aspergillus, Zygomycetes, Pseudallescheria, Fusarium, Piedra*, other dematiaceous hyphomycetes and other hyalohyphomycetesetc.

c. Dimorphic fungi including *Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix, Penicilliummarneffei*etc.

d. Dermatophytes

e. Fungi causing Mycetoma, Chromoblatomycosis, Occulomycosis and Otomycosis.

f. *Pneumocystis jirovecii*infection

g. *Rhinosporidiumseeberi*and *Lacazialoboi*(formerly named *Loboaloboi)*

h. *Pythium insidiosum*

i. *Prototheca*

5. Able to identify laboratory contaminantfungi
6. Explain Mycetism and mycotoxicosis along with agentsinvolved

   Demonstrates knowledge about antifungal agents and perform *invitro* antifungal susceptibility tests.

Applied Microbiology

1. Demonstrate knowledge about epidemiology of infectiousdiseases
2. Demonstrate knowledge about antimicrobial prophylaxis andtherapy
3. Demonstrate knowledge about hospital acquiredinfections
4. Demonstrate knowledge about management of biomedicalwaste
5. Effectively investigate an infectious outbreak in hospital andcommunity
6. Demonstrate knowledge about infections of various organs and systems of human body viz. respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive tract infections, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear and nose, septicaemia, endocarditis, haemorrhagic feveretc.
7. Demonstrate knowledge about opportunisticinfections
8. Demonstrate knowledge about various sexually transmitteddiseases
9. Demonstrate knowledge about principles, methods of preparation, administration and types ofvaccines
10. Effectively use information technology (Computers) inmicrobiology

11. Demonstrate knowledge and applications of Automation inMicrobiology
12. Demonstrate knowledge and applications about molecular techniques in the laboratory diagnosis of infectiousdiseases
13. Demonstrate knowledge in statistical analysis of microbiological data and researchmethodology
14. Demonstrate knowledge in animal and human ethics involved inmicrobiology
15. Demonstrate knowledge in safety in laboratory and Laboratory management

B) Affective Domain:

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopts ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and students for effective teaching.

C) Psychomotor domain:

1. Collection/transportation of specimens for microbiological investigations
2. Preparation, examination and interpretation of direct smears from clinical specimens
3. Plating of clinical specimens on media for isolation, purification, identification and quantification purposes.
4. Preparation of stains viz. Gram, Albert's, ZiehlNeelsen (ZN), Silver impregnation stain and special stains for capsule and sporeetc.
5. Preparation and pouring of media like Nutrient agar, Blood Agar, Mac-Conkey agar, Sugars, Kligler iron agar/Triple sugar iron agar (TSI), Robertson's cooked meat broth, Lowenstein Jensensmedium, Sabouraud's dextrose agaretc.
6. Preparation of reagents-oxidase, Kovacetc.
7. Quality control of media, reagents etc.
8. Operation of autoclave, hot air oven, filters like Seitz and membrane filters etc

9. Care and operation of microscopes
10. Washing and sterilization of glassware (including plugging and packing)
11. Care, maintenance and use of common laboratory equipments like autoclave, hot air oven, water bath, centrifuge, refrigerators, incubators etc.
12. Aseptic practices in laboratory and safety precautions. Selection of Personal Protective Equipment according to task and donning (gloves, mask, eye protection, gown etc).
13. Sterility tests
14. Identification of bacteria of medical importance up to species level (except anaerobes which could be up to generic level).
15. Techniques of anaerobiosis
16. Tests for Motility: hanging drop, Cragie's tube, dark ground microscopy for *spirochaetes*
17. Routine and Special tests - Catalase test, Oxidase test, slide and tube coagulase tests, niacin and catalase tests for *Mycobacterium*, bile solubility, chick cell agglutination, sheep cell haemolysis, satellitism, CAMP test, and other biochemical tests.
18. Preparation of antibiotic discs; performance of antimicrobial susceptibility testing eg. Kirby-Bauer, Stoke's method, Estimation of Minimal Inhibitory/Bactericidal concentrations by tube/plate dilution methods.
19. Tests for ß-lactamase production.
20. Screening of gram negative isolates for ESBL and MBL
21. Screening of *Staphylococci* for Methicillin Resistance.
22. Screening of *Enterococci* for Vancomycin resistance.
23. Testing of disinfectants.
24. Quantitative analysis of urine by pour plate method and semi qantitative analysis by standard loop tests for finding significant bacteriuria
25. Disposal of contaminated materials like cultures
26. Disposal of infectious waste
27. Bacteriological tests for water, air and milk
28. Maintenance and preservation of bacterial cultures

COURSE 1 (1181) – GENERAL MICROBIOLOGY AND IMMUNOLOGY

COURSE SPECIFIC OBJECTIVES:

1. Critically evaluate, initiate investigation and clinically manage cases in Microbiology, Virology and Mycology and Parasitology with the help of relevant investigations.
2. Capable of offering high quality diagnostic opinion in given clinical situation with an appropriate and relevant sample for the purpose of diagnosis
3. Student should have acquired practical and procedural skills related to the course
4. Student should learn the basic methodology of teaching and develop competence in teaching medical/paramedical students.
5. Should have acquired Problem Solving skills

COURSE CONTENT:

PaperI: GeneralMicrobiology

1. Historyofmicrobiology
2. Microscopy
3. Biosafety including universal containment, personal protective equipment for biological agents
4. Physicalandbiologicalcontainment
5. Isolationprecautionsincludingstandardprecautionsandtransmissionbasedprecautions
6. Sterilization,disinfectionandlyophilization
7. Morphologyofbacteriaandothermicroorganisms
8. Nomenclatureandclassificationofmicroorganisms
9. Normalfloraofhumanbody
10. Growthand nutritionofbacteria
11. Bacterialmetabolism
12. Bacterialtoxins
13. Bacteriocins
14. Microbiologyofhospitalenvironment
15. Microbiologyofair,milk and water

16. Host-parasiterelationship
17. Antimicrobialagentsandmechanismsdrugresistance
18. Bacterialgeneticsandbacteriophages
19. Moleculargeneticsrelevantformedicalmicrobiology
20. Qualityassurance and qualitycontrolin microbiology
21. Accreditationoflaboratories

Immunology

1. Componentsofimmunesystem
2. Innateandacquiredimmunity
3. Cellsinvolvedinimmuneresponse
4. Antigens
5. Immunoglobulins
6. Mucosalimmunity
7. Complement
8. Antigenand antibodyreactions
9. Hypersensitivity
10. Cellmediatedimmunity
11. Cytokines
12. Immunodeficiency
13. Auto-immunity
14. Immunetolerance
15. MHCcomplex
16. Transplantationimmunity
17. Tumorimmunity
18. Vaccinesandimmunotherapy
19. Measurementofimmunologicalparameters
20. Immunologicaltechniques
21. Immunopotentiationand immunomodulation

COURSE OUTCOMES

CO1 Describe the history & development of microbiology , microscopy,staining and sterilization techniques and different methods of microbial characterization

CO2 To know general bacteriology and microbial techniques for isolation of pure culture of bacteria.

CO3 To Master aspetic techniques and able to perform routine culture handling tasks safely and effectively

CO4 To demonstrate an understanding of concepts of immunology to make them understand salient features of antigen antibody and its uses in diagnosis and

CO5

To be able to interpret results of various serological diagnostic tests.

COURSE OUTCOME (CO) / PROGRAM OUTCOME(PO) AND PROGRAM SPECIFIC OUTCOME (PSO) MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3	2	3	2	2	3	3
CO2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	2	3	3	3	2	3	2	3	3	3
CO4	3	2	2	2	3	2	1	2	2	1	1
CO5	3	3	2	2	3	3	2	1	2	1	3
AVERAGE	3	2.4	2.4	2.6	3	2.2	2.4	2	2.4	2.2	2.6

COURSE 2 (1182) – Systemic Bacteriology:

COURSE SPECIFIC OBJECTIVES:

1. Demonstrateknowledgeandskillsinvarioustechniquesf orisolationandidentificationofbacteria.
2. Demonstrateknowledgeaboutepidemiology,morphology,biochemicalpr operties,antigenicnature,pathogenesis,complications,laboratory diagnosistreatmentand prevention of majorbacterial pathogens of medical importance

COURSE CONTENTS:

1. Isolationandidentificationofbacteria
2. Grampositivecocciofmedicalimportanceincl udingStaphylococcus,Micrococcus,Streptoc occus,anaerobiccocci*etc.
3. Gram negative cocci of medical importance *including Neisseria, Branhamella,Moraxella*etc.
4. Gram positive bacilli of medical importance including *Lactobacillus, Coryneformorganisms, Bacillus and aerobic bacilli, Actinomyces, Nocardia,Actinobacillusand other actinomycetales, Erysipelothrix, Listeria, Clostridium* and otherspore bearinganaerobicbacillietc.
5. Gramnegativebacilliofmedicalimportancein cluding*Vibrios,Aeromonas,Plesiomonas, Haemophilus, Bordetella, Brucella, Gardnerella, Pseudomonas andothernon-fermenters,Pasteurella,Francisella,Bacteroi des,Fusobacterium,Leptotrichiaandotheran aerobicgram negativebacilli*etc.
6. *Helicobacter,Campylobacter,Calymmatobacterium,Streptobac illus,Spirillum*

   andmiscellaneousbacteria
7. *Enterobacteriaceae*

8.Mycobacteria

9.Spirochaetes

10.Chlamydia

11.Mycoplasmatales; Mycoplasma, *Ureaplasma*, *Acholeplasma and c Mycoplasmas.*

12.*Rickettsiae,Coxiella,Bartonella*etc.

COURSE OUTCOMES:

CO1 Describe conceptual basis for understanding pathogenic microorganisms and their disease mechanism.

CO2 Describe basic principles of infectious disease.

CO3 Provides insight on how to diagnosis and identify the disease causing bacteria and interpretation of laboratory tests in diagnosis of infectious diseases

CO4 To understand the importance of pathogenic bacteria in human disease with respect to infection of Respiratory tract,gastrointestinal tract,urinary tract and skin and soft tissue.

CO5 Should be able to interpret antimicrobial sensitivity testing for effective handling of infectious diseases.

COURSE OUTCOME (CO) / PROGRAM OUTCOME(PO) AND PROGRAM SPECIFIC OUTCOME (PSO) MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	1	3	3	1	3	3	2	3
CO2	3	3	3	2	3	3	2	3	3	3	3
CO3	3	3	3	2	3	3	2	3	3	3	3
CO4	3	2	2	3	3	3	3	2	3	2	3
CO5	3	3	2	2	3	3	2	2	3	3	3
AV ERA GE	3	2.6	2.6	2.2	3	3	2	2.6	3	2.6	3

COURSE-3(1183)Virology and parasitology

COUSRE SPECIFIC OBJECTIVES

1. Demonstrates knowledge about general properties, classification, morphology, virus replication and genetics ofviruses
2. Explain pathogenesis of viralinfections
3. Demonstrates knowledge about isolation and identification ofviruses
4. Demonstrate knowledge about epidemiology, morphology, genetics, antigenic nature, pathogenesis, complications, laboratory diagnosis, treatment and prevention of major DNA and RNA viruses of medical importance and unclassified viruses and slow viruses includingprions

5. Demonstrate knowledge about viral vaccines and anti-viraldrugs.

1. Demonstrate knowledge about general characters, classification and methods of identification ofparasites.

2.Demonstrate knowledge about epidemiology, morphology, antigenic nature, life cycle, pathogenesis, complications, laboratory diagnosis, treatment and prevention of Protozoan parasites,Helminths,Cestodes,trematodes,Nematodes of medical importance

3.Demonstrate knowledge about common arthropods and other vectors viz. mosquito, sand fly, ticks, mite, cyclops, louse, myasis of medicalimportance.

4.Demonstrate knowledge about anti-parasitic vaccine anddrugs.

COURSE CONTENTS

Virology: General properties ofviruses, Classification ofviruses, Morphology: Virusstructure, Virusreplication, Isolation and identification ofviruses, Pathogenesis of viral infections, Genetics ofviruses, DNA viruses of medical importance, RNA viruses of medical importance, Slow viruses includingprions, Unclassifiedviruses, Hepatitisviruses, Viriods,prions, Vaccines and anti-viraldrugs.

Parasitology:-General characters and classification ofparasites, Methods of identification ofparasites, Protozoan parasites of medical importance, Helminthology of medical importance, Nematoda (etc.), Entomology: common arthropods and other vectors viz. mosquito, sand fly, ticks, mite, cyclops, louse,myasis., Anti-parasitic agents.

COURSE OUTCOMES:

CO1 Describe about general properties, classification, morphology, virus replication and genetics ofviruses.

CO2 Explain the pathogenesis of Viral infections

CO3 Describe etiology, pathophysiology, replication, principles of diagnosis and management of Viral infections caused by DNA and RNA viruses.

CO4 Demonstrates knowledge about isolation and identification ofviruses

CO5 Demonstrate knowledge about viral vaccines and anti-viraldrugs.

CO1 Describe about about general characters, classification and methods of identification ofparasites,

CO2 Explain the Life cycle of the various parasites and the Host involved.

CO3	Describe about epidemiology, morphology, antigenic nature, life cycle, pathogenesis, complications, laboratory diagnosis, treatment and prevention of Protozoan parasites, Helminths, Cestodes, trematodes, Nematodes of medical importance
CO4	To have knowledge about common arthropods and other vectors viz. mosquito, sand fly, ticks, mite, cyclops, louse, myasis of medicalimportance.
CO5	Demonstrate knowledge about anti-parasitic vaccine anddrugs.

COURSE OUTCOME (CO) / PROGRAM OUTCOME(PO) AND PROGRAM SPECIFIC OUTCOME (PSO) MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3	2	3	2	2	3	3
CO2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	2	3	3	3	2	3	2	3	3	3
CO4	3	2	2	1	3	2	1	2	2	1	1
CO5	3	2	2	3	2	2	3	2	2	3	3
CO1	3	3	2	2	3	3	3	2	3	3	3
CO2	3	2	3	3	3	2	3	3	3	2	2
CO3	3	3	1	1	2	1	2	3	2	3	3
CO4	3	2	3	2	2	2	3	3	2	2	3
CO5	3	3	2	3	1	3	2	3	3	3	2
AVERAGE	3	2.4	2.3	2.4	2.5	2.1	2.6	2.5	2.5	2.6	2.6

COURSE 4 (1184)-MYCOLOGY,APPLIED MICROBIOLOGY and RECENT ADVANCES

COURSE SPECIFIC OBJECTIVES

1. Explain general characteristics including morphology, reproduction and classification offungi

2.Demonstrate knowledge and skills for isolation and identification offungi

3.Demonstrate knowledge about epidemiology, morphology, biochemical properties, antigenic nature, pathogenesis, complications, laboratory diagnosis treatment and prevention of major fungal pathogens of medical importance

4. Able to identify laboratory contaminantfungi

5.ExplainMycetism and mycotoxicosis along with agentsinvolved

6. Demonstrates knowledge about antifungal agents and perform *invitro* antifungal susceptibility tests.

Applied Microbiology

1. Demonstrate knowledge about epidemiology of infectiousdiseases,antimicrobial prophylaxis and therapy,Demonstrate knowledge about hospital acquiredinfections,

2.Must be able to Effectively investigate an infectious outbreak in hospital andcommunity

3. Demonstrate knowledge about principles, methods of preparation, administration and types ofvaccines

4.Should have knowledge about management of biomedicalwaste

5.To Have knowledge and applications of Automation inMicrobiology

6.Demonstrate knowledge and applications about molecular techniques in the laboratory diagnosis of infectiousdiseases

COURSE CONTENTS:

Mycology:-General characteristics and classification offungi, Morphology and reproduction offungi, Isolation and identification offungi, Tissue reactions to fungi, Yeasts and yeast like fungi of medical importance, Mycelial fungi of medical importance ,Laboratory contaminantfungi, Antifungal agents and *in vitro* antifungal susceptibilitytests.

Applied Microbiology:- Epidemiology of infectiousdiseases, Antimicrobial prophylaxis andtherapy, Hospital acquiredinfections, Management of biomedicalwaste, Investigation of an infectious outbreak in hospital andcommunity, Infections of various organs and systems of human body viz. respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive tract infections, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear and nose, septicaemia, endocarditis, haemorrhagic feveretc., Opportunisticinfections, Sexually transmitteddiseases, Vaccinology: principles, methods of preparation, administration of vaccines, types ofvaccines, Information technology (Computers) inmicrobiology, Automation inMicrobiology, Molecular techniques in the laboratory diagnosis of infectious diseases, Statistical analysis of microbiological data and researchmethodology, Animal and human ethics involved in microbiologicalwork, Safety in laboratory and Laboratorymanagement.,

COURSE OUTCOMES

CO1	Ability toIsolate and Identify the fungi
CO2	Acquire knowledge epidemiology, morphology, biochemical properties, antigenic nature, pathogenesis, complications, laboratory diagnosis treatment and prevention of major fungal pathogens of medical importance
CO3	Able to identify laboratory contaminantfungi
CO4	Acquire knowledge about Mycetism and mycotoxicosis along with agentsinvolved
CO5	Acquire knowledge about knowledge about antifungal agents and perform *invitro* antifungal susceptibility tests.
CO1	Acquire knowledge about epidemiology of infectiousdiseases, antimicrobial prophylaxis and therapy, Demonstrate knowledge about hospital acquiredinfections.
CO2	able to Effectively investigate an infectious outbreak in hospital andcommunity
CO3	Acquire knowledge about principles, methods of preparation, administration and types ofvaccines
CO4	Should have knowledge about management of biomedicalwaste
CO5	Acquire knowledge and applications of Automation inMicrobiology
CO6	To perform and acquire knowledge and applications about molecular techniques in the laboratory diagnosis of infectiousdiseases

COURSE OUTCOME (CO) / PROGRAM OUTCOME(PO) AND PROGRAM SPECIFIC OUTCOME (PSO) MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	2	3	3	2	3	2	2	3	3
CO2	3	3	3	3	3	2	3	3	3	3	3
CO3	3	2	3	3	3	2	3	2	3	3	3
CO4	3	2	2	1	3	2	1	2	2	1	1
CO5	3	2	2	3	2	2	3	2	2	3	3
CO1	3	3	3	3	2	2	1	2	3	3	3
CO2	3	2	2	3	3	2	3	2	2	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3
CO4	3	2	3	3	3	2	3	2	3	3	3
CO5	3	2	2	1	3	2	1	2	2	1	1
CO6	3	2	2	3	2	2	3	2	2	3	3
AVERAGE	3	2.3	2.5	2.6	2.7	2	2.5	2.2	2.5	2.6	2.6