SUMANDEEP VIDYAPEETH

(Declared as Deemed to be University under Section 3 of the UGC Act 1956)

Accredited by NAAC with a CGPA of 3.53 out of four-point scale at 'A' Grade

Category – I deemed to be university under UGC Act - 2018

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CURRICULUM
Master of Science
(M.Sc)
MEDICAL MICROBIOLOGY

Attested CTC

15/2/2021

Vice-Chancellor
Sumandeep Vidyapeeth
An Institution Deemed to be University
Vill. Piparia, Taluka: Waghodia.
Dist. Vadodara-391 760. (Gujarat)

Dean

AMENDED UP TO DECEMBER -2020

M. Sc. Medical Microbiology Part – I
Teaching Program (Curriculum)

PROGRAMME OUTCOME : M.SC. MEDICAL

The Master of Science in Medical field provides the candidate with knowledge, general competence, and analytical skills on an advanced level, needed in consultancy, education, research.

Programme specific outcome : M.SC. MEDICAL

POS 1. A post graduate student after undergoing the required training should be able to deal with the allied departments and render services in advanced laboratory investigations.

POS 2. The PG student should acquire basic skills in teaching medical/para-medical students

POS 3. The student should have knowledge about the principles of research methodology and self-directed learning for continuous professional development.

POS 4. The student should be able to carry out a research project from planning to publication and be able to pursue academic interests.

COURSE OUTCOME (CO) :A post graduate student upon successfully qualifying in the M.Sc. (Microbiology)
examination should be able to:

1. Demonstrate competence as a clinical microbiologist.
2. Interact effectively with the allied departments by rendering services in basic as well as advanced laboratory investigations
3. Demonstrate application of microbiology in a variety of clinical settings to solve diagnostic and therapeutic problems along with preventive measures.
4. Play a pivotal role in hospital infection control, including formulation of antibiotic policy and management of biomedical waste.
5. Acquire skills in conducting collaborative research in the field of Microbiology and allied sciences.
6. Conduct such clinical/experimental research as would have significant bearing on human health and patient care
7. Demonstrate effective communication skills required for the practice of clinical microbiology and while teaching undergraduate students

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Aim:- It is to impart basic knowledge of all pre-clinical & para-clinical subjects including Anatomy, Physiology, Biochemistry, Pathology, Microbiology & Pharmacology. Therefore Part-I course is common for all M. Sc. (Medical) candidates. Teaching is mainly in the form of theory lectures.

First Term:

General Microbiology & Immunology:

1. Introduction to the historical aspects of Microbiology.
2. Operating microscopes & its parts
3. Microscopy with different staining methods and study of bacteria.
4. Growth & multiplication of bacteria
5. Sterilization & disinfection
6. Different culture media
7. Different culture methods
8. Identification of bacteria with the help of various biochemical tests
9. Anti-microbial susceptibility testing
10. Microbial Pathogenicity and Infection
11. Introduction to Immunology
12. Immunity
13. Antigen
14. Antibodies or Immunoglobulins
15. Various Antigen-Antibody reactions
16. Complement system
17. Cells of Immune system, Lymphoid system –Structure & Function
18. Cytokines
19. Immune response
20. Hypersensitivity

Second Term:

Systematic Bacteriology:

1. Staphylococcus
2. Streptococcus and Pneumococcus
3. Neisseria
4. Corynebacterium
5. Bacillus
6. Clostridia
7. Esch.coli, Klebsiella and Proteus
8. Salmonella
9. Shigella
10. Pseudomonas aeruginosa
11. Vibrio cholerae
12. Yersinia pestis
13. Haemophilus influenzae
14. Brucella
15. Mycobacteria
16. Spirochaetes
17. Rickettsia

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Third Term:

Parasitology:

1. Introduction to parasitology
2. Entamoeba histolytica
3. Giardia intestinalis
4. Trichomonas vaginalis
5. Malarial parasite
6. Leishmania donovani
7. Trypanosoma
8. Toxoplasma gondii
9. Isospora

Virology:

1. General properties of viruses
2. Laboratory methods of diagnosis of viral diseases
3. Hepatitis viruses
4. Polio virus
5. Rabies virus
6. Human Immunodeficiency virus (HIV) & AIDS
7. Miscellaneous important viruses such as arboviruses, dengue fever, viral encephalitis, rotavirus, herpes viruses, rubella, cytomegalovirus & oncogenic viruses.

Scheme of examination:

Two internal assessment tests, one each at the end of First & Second term respectively.
One preliminary examination will be conducted at the end of third term, consisting of full course.

Internal credit marks: 30 Marks (Best of two internal tests + Preliminary exam)

Final University examination:

Theory paper (1)	70 Marks
Internal Credit	30 Marks
Total	100 Marks
Passing standard:	**50%**

Note: Only Theory examination. No practical examination.

To introduce 3 years duration of M.Sc Medical from academic year 2020-21 onwards. (Board of Studies letter no.: SBKSMIRC/Dean/2234, dated 23/12/2019 and Vide Notification of Board of Management Resolution Ref: No. SVDU/NOTYN/061/2019-20 dated 02/03/2020

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M. Sc. Medical Microbiology Part – II
Teaching Program (Curriculum)

The aim of this course is to train the students of medicine in the field of Medical Diagnostic Microbiology. Knowledge and practical skills shall be acquired by the candidates in the sub-specialties of Bacteriology including, Virology, Parasitology, Immunology, Serology, Mycology & Molecular Diagnostics so as to be able to deal with diagnosis and prevention of infectious diseases. They will be trained in basic research methodology so that they are able to conduct fundamental and applied research.

Goal:

The goal of the postgraduate medical education shall be to produce a competent Clinical Microbiologist:

- Who shall have mastered most of the competencies, pertaining to Medical and Diagnostic Microbiology
- Who shall be aware of the contemporary advances and developments in the field of Medical and Diagnostic Microbiology
- Who shall have acquired the spirit of scientific inquiry and is trained to use the principles of research methodology and epidemiology

- **Educational objectives:**

A. At the end of PG training in this discipline, the student shall be able to:-

1. Recognize the importance of microbiology in context to the health needs of the community so that he/she can state and explain clinical features, etiology, pathogenesis and methods of laboratory diagnosis of the infectious diseases and also can apply the knowledge to treatment, prevention and control of communicable diseases.
2. Play the role in implementation of national health programs responsibly.
3. State and explain principles of immunity and immunological phenomenon which help in diagnosis of infectious and non-infectious diseases.
4. Establish and practice laboratory medicine for diagnosis of infectious diseases in hospital and community, in bacteriology, virology, parasitology, mycology, serology and immunology as required for the clinical practice.
5. Understand and practice principles of prevention and control of infectious diseases and be able to opine and contribute towards control of hospital acquired infections (HAI) and rational antibiotic policy.
6. State and understand recent advances in the field of microbiology.
7. Carry out Quality Control & Quality Assurance in Diagnostic Microbiology
8. Practice safety in microbiology to include laboratory acquired infections & biomedical waste disposal.

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9. Carry out fundamental or applied research in different branches of medicine involving microbiological work.
10. Demonstrate competence in identifying & diagnosing Emerging & Re-emerging infectious diseases as well as Biological Warfare & Bioterrorism.
11. Develop specialization in any such subspecialty.
12. Demonstrate competence in basic concepts of research methodology, epidemiology.
13. Develop skills in using educational methods and techniques, applicable to teaching medical and paramedical students and general physicians. He should undertake teaching medical and paramedical assignments in the subject of medical microbiology.

B. Skills: At the end of the course the student shall be able to:

1. Collection, transport & storage of clinical specimens for microbiological investigations.
2. Plan the laboratory investigations for diagnosis of infectious diseases
3. Perform routine & advanced laboratory procedures to arrive at the etiological diagnosis of diseases caused by bacteria, fungi, viruses and parasites.
4. Perform and interpret immunological and serological tests
5. Operate & look after the maintenance of routine and sophisticated instruments/equipments in the laboratory.
6. Prepare stains, reagents, culture media & methods to sterilize them.

BROAD AREAS OF STUDY

General Microbiology; Systematic Bacteriology, Mycology, Virology, Parasitology; Serology, Immunology, Molecular diagnostics and Applied Clinical Microbiology including recent advances in Microbiology.

GENERAL MICROBIOLOGY

1. History and pioneers in Microbiology
2. Microscopy
3. Morphology of bacteria and other micro-organisms.
4. Nomenclature and classification of microbes.
5. Growth and nutrition of bacteria.
6. Bacterial metabolism.
7. Sterilization and disinfection.
8. Biomedical waste disposal
9. Bacterial toxins.
10. Bacterial antagonism: Bacteriocins.
11. Bacterial genetics, gene cloning.

12. Antibacterial substances used in treatment of infections and drug resistance in bacteria.
13. Bacterial ecology-normal flora of human body, hospital environment, air, water and milk
14. Host parasite relationship.
15. Quality control and Quality Assurance in Microbiology.
16. Laboratory Biosafety
17. Health care associated infections- prevention and control

IMMUNOLOGY AND APPLIED ASPECTS

1. The normal immune system.
2. Innate immunity.
3. Antigens.
4. Immunoglobulins.
5. Complement.
6. Antigen and antibody reactions.
7. Hypersensitivity.
8. Cell mediated immunity.
9. Immunodeficiency.
10. Autoimmunity.
11. Immune tolerance.
12. Transplantation immunity.
13. Tumour immunity.
14. Prophylaxis and immunotherapy
15. Measurement of immunity.
16. Immunity and immunopathogenesis of specific infectious diseases
17. Molecular Biology Techniques. For e.g. PCR, DNA probes.

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SYSTEMATIC BACTERIOLOGY

1. Isolation, description and identification of bacteria. The epidemiology, pathogenesis, antigenic characteristics and laboratory diagnosis of disease caused by them.
2. Staphylococcus and Micrococcus; Anaerobic Gram positive cocci.
3. Streptococcus and Lactobacillus.
4. Neisseria, Branhamnella and Moraxella.
5. Corynebacterium and other coryneform organisms.
6. Bacillus: the aerobic spore-bearing bacilli.
7. Clostridium: the spore-bearing anaerobic bacilli.
8. Non-sporing anaerobes
9. Mycobacteria
10. Enterobacteriaceae.
11. Vibrios, Aeromonas, Plesiomonas, Campylobacter and Spirillum, H.pylori
12. Erysipelothrix and Listeria
13. Pseudomonas
14. Chromobacterium, Flavobacterium, Acinetobacter and Alkaligens.
15. Pasteurella, Francisella.
16. Haemophilus and Bordetella.
17. Brucella.
18. Spirochaetes.
19. Actinomycetes, Nocardia and Actinobacillus.
20. Mycoplasmatales: Mycoplasma, Ureaplasma and Acholeplasma.
21. Rickettsiae.
22. Chlamydiae.
23. Emerging bacterial pathogens.

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 of viruses
7. Epidemiology of viral infections
8. Vaccines and antiviral drugs

9. Bacteriophage
10. Pox viruses
11. Herpes viruses
12. Vesicular viruses
13. Togaviridae
14. Bunyaviridae
15. Arenaviridae
16. Marburg and Ebola viruses
17. Rubella virus
18. Orbi viruses
19. Influenza virus
20. Respiratory disease: Rhinoviruses, adenoviruses, corona viruses
21. Paramyxoviridae
22. Enteroviruses : Polio, Echo, Coxsackie viruses
23. Other enteric viruses
24. Hepatitis viruses
25. Rabies virus
26. Slow viruses
27. Human immunodeficiency viruses
28. Oncogenic viruses
29. Teratogenic viruses
30. Viruses of gastroenteritis
31. Prion diseases & Emerging viral infections

PARASITOLOGY

1. Protozoan parasites of medical importance: Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Sarcocystis, Cryptosporidium, Balantidium, Isospora, Cyclospora, Microsporidium etc.

2. Helminthology: All medically important helminths belonging to Cestoda, Trematoda and Nematoda.
   Cestodes: Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dypyllidium, Multiceps etc.
   Trematodes: Schistosomes, Fasciola, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis etc.
   Nematodes: Trichuris, Trichinella, Strongyloides, Ancylostoma, Necator,

Ascaris, Toxocara, Enterobius, Filarial worms, Dracunculus, etc.

3. Ectoparasites: Common arthropods and other vectors viz., Mosquito, Sandfly, Ticks, Mites, Cyclops.

MYCOLOGY

1. The morphology and reproduction of fungi and antimycotic agents
2. Classification of fungi
3. Contaminant and opportunistic fungi
4. Fungi causing superficial mycoses
5. Fungi causing subcutaneous mycoses
6. Fungi causing systemic infections
7. Antifungal agents
8. Mycetismus (Mycotoxicosis)

APPLIED CLINICAL MICROBIOLOGY

1. Epidemiology of infectious diseases
2. Hospital acquired infections
3. Infections of various organs and systems of the human body
4. Molecular genetics as applicable to Microbiology
5. Automation in Microbiology
6. Rapid diagnostic techniques for microbial diseases.
7. Vaccinology : principle, methods of preparation, administration of vaccines
8. Outbreak investigations & disaster management
9. Biological warfare

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USE OF LABORATORY ANIMALS & CARE

Various animals used in research, procedures involved, animal house and care of animals as well as the ethical issues related to use of animals in research.

PRACTICALS (SKILLS)

BACTERIOLOGY

Must acquire:

1. Care and operation of Microscopes viz. Light, Dark ground, Phase contrast, Inverted, Fluorescent microscopes.
2. Preparation of stains viz. Gram's, Albert's, Ziehl- Neelsen and other special stains - performing of staining and interpretation of stained smears.
3. Washing and sterilization of glassware including plugging and packing.
4. Operation of incubator, autoclave, hot air oven, inspissator, distillation plant, filters like Seitz and membrane, other laboratory instruments,and sterility tests.
5. Care and maintenance of common laboratory equipments.
6. Preparation and pouring of liquid and solid media - Nutrient agar, Blood agar, Mac-Conkey agar, sugars, TSI agar, Robertson's cooked meat, Lowenstein- Jensen's, selective media etc.
7. Preparation of reagents and their procurement.
8. Tests for detection of various antibiotic resistances.
9. Collection of specimens for Microbiological investigations such as blood, urine, throat swab, rectal swab, stool, pus,
10. Surveillance specimens.
11. Preparation, examination and interpretation of direct smears from clinical specimens, viz. Pus/urine for bacteria – Gram stain, Sputum for AFB – ZN & auramine O, slit smears for *M..leprae,*-ZN stain, conjunctival smear for Chlamydiae – Giemsa/Iodine.
12. Techniques of anaerobiosis – Gas-pak system, anaerobic jars-evacuation & filling with H2, CO2
13. Identification of bacteria of medical importance upto species level (except anaerobes – up to generic level)
14. Quantitative analysis of urine by pour plate method and semi quantitative analysis by standard loop test for significant bacteriuria.
15. Plating of clinical specimens on media for isolation, purification, identification and quantitation.

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16. Tests for motility: hanging drop, Craigie's tube, dark ground microscopy for Spirochaetes – Treponema & Leptospira.
17. In-vitro toxigenicity tests – Elek test, Nagler's reaction
18. Special tests – Bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for mycobacterium, satellitism, CAMP test, catalase test and slide agglutination tests, and other as applicable to identification of bacteria up to species level
19. Preparation of antibiotic discs; performance of antimicrobial susceptibility testing by Kirby-Bauer disk diffusion method; estimation of Minimum inhibitory /Bactericidal concentrations by tube/plate dilution methods. Tests for drug susceptibility of Mycobacterium tuberculosis
20. Skin tests like Mantoux, Lepromin etc.
21. Testing of disinfectants- Phenol coefficient and 'in use' tests.
22. Quality control of media reagents etc. and validation of sterilization procedures.
23. Aseptic practices in laboratory and safety precautions.
24. Disposal of contaminated material like cultures.
25. Bacteriology of food, water, milk, air
26. Maintenance of stock cultures.

Desirable to acquire:

1. Knowledge of care and breeding of laboratory animals viz. Mice, rats, guinea pigs and rabbits.
2. Techniques of withdrawal of blood from laboratory animals including sheep.
3. Inoculation of infective material in animals by different routes.
4. Animal pathogenicity /toxigenicity tests for C.diphtheriae, Cl.tetani, S.pneumoniae, S.typhimurium, K.pneumoniae *etc.*
5. Serum antibiotic assays eg. Gentamicin

IMMUNOLOGY/ SEROLOGY

Must acquire:

1. Collection of blood by venepuncture, separation of serum and preservation of serum for short and long periods.
2. Preparation of antigens from bacteria or tissues for widal, Weil-Felix, VDRL, etc. and their standardization.
3. Performance of serological tests viz. Widal, Brucella tube agglutination, indirect haemagglutination, VDRL, Paul-Bunnel, Rose-Waaler, IFA.
4. Immunodiffusion in gels, counter immunoelectrophoresis- visualization and interpretation of bands.
5. Performance and interpretation of Enzyme linked immune sorbent assay & Western blot.
6. Latex and staphylococcal co-agglutination tests.

MYCOLOGY

Must acquire:

1. Collection of specimens for mycology.
2. Direct examination of specimens by KOH, Gram, Kinyoun's, Giemsa, Lactophenol cotton blue stains.
3. Examination of histopathology slides for fungal infections.
4. Isolation and identification of pathogenic yeasts and moulds and recognition of common laboratory contaminants.
5. Special techniques like Wood's lamp examination, hair baiting, hair perforation, paraffin baiting and slide culture.
6. Maintenance of stock cultures.

PARASITOLOGY

Must acquire:

1. Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods (salt floatation and formol ether methods) and complete examination for other cellular features.
2. Egg counting techniques for helminths.
3. Examination of blood for protozoa and helminths by wet mount, thin and thick stained smears.
4. Examination of other specimens for e.g. urine, C.S.F., bone marrow etc. for parasites.
5. Histopathology sections – examination and identification of parasites.
6. Performance of stains – Leishman, Giemsa, Modified Acid Fast, Iron haematoxylin, Toluidine Blue O.
7. Identification of common arthropods and other vectors viz. Mosquito, sand fly, ticks, mite and Cyclops.
8. Collection of specimens.
9. Preservation of parasites – mounting, fixing, staining etc.
10. To prepare smear, stain with relevant stains. Examine smear. Report and interpret results. Serology of malaria diagnosis

VIROLOGY

Must acquire:

1. Serological tests-ELISA and rapid tests for HIV, RPHA for HBsAg, Haemagglutination inhibition for influenza, AGD and Counterimmunoelectrophoresis for detection of viral antigens or antiviral antibodies.

Exam Pattern for M.Sc. (Medical Microbiology) Course

Theory	3 Papers	3×100 Total	300 Marks
Practical	3 days	Total	300 Marks
		Grand Total	600 Marks

Theory 3 Papers – 100 marks each– 3 hours each

Passing Standard – 50% in Theory in each paper.

50% in Practical

No Internal Marks

Dissertation:

At the end of six months from the commencement of M.Sc. Medical Microbiology course, the student shall finally choose a topic for dissertation with the help of guide. A small pilot work may be carried out to see the feasibility of the proposed work. Due certificate must be obtained from Institutional Ethics Committee before commencing the study by submitting a synopsis.

A short presentation regarding the study may be done in front of the teaching staff of the department by the PG student for suggestions etc.

The work must be spread over a minimum period of six months to 1 year as the case may be. After compilation of data and writing the dissertation, the dissertation must be submitted to the university in four hard bound copies dully signed by guide, Head of the department and Dean; six months prior to the expected date of university examination for the candidate.

At the time of practical exam university shall make two copies of stamped dissertation available for the examiners to go through.

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Scheme of Examination (M.Sc. Medical Microbiology Course)

Theory: **Total: 300 Marks**

The written examination consists of three papers of 100 marks each. Each paper will be of 3 hours of duration. Questions on recent advances may be asked in any or all papers.

Theory Examination: (300 Marks)

Paper number	Topics	Marks	Time
I	General Bacteriology, Immunology, Applied Microbiology	100	3 Hours
II	Systematic Bacteriology & Mycology	100	3 Hours
III	Virology & Parasitology	100	3 Hours

Note: The distribution of topics in each paper is arbitrary. There may be overlapping of relevant topics in question papers

Each Paper shall have 5 Questions, all questions compulsory & no options.

Question-1: Long Question (1 or 2 parts)	20 marks
Question-2: Long Question (1 or 2 parts)	20 marks
Question-3: Long Question (1 or 2 parts)	20 marks
Question-4: Notes— (1 or 2 parts)	20 marks (2*10 marks=20)
Question-5: Short notes – (4)	20 marks (4*5 marks=20)

Practical, Viva & Pedagogy: **Total: 300 Marks**

Practical Exercise: 200 Marks

Should be spread over 3 days and include the following components:

Bacteriology: 100

1. Identification of a pure culture
2. Isolation and identification of the organisms from the clinical samples

Serology: 25

Common Serological tests like RPR/Widal/Agglutination tests

Virology:	10
ELISA test/Rapid test	
Mycology:	20
Microscopic Identification of fungal cultures	
Parasitology:	25
Processing and identification of ova and cysts in stool samples	
Spots: 10 spots	20
Viva voce on all components of syllabus including discussion on Dissertation and Pedagogy	100 Marks
Passing standard:	**50%**

Examination	Theory	Practical	Viva voce	Total
Maximum Marks	300	200	100	600
Passing Grade	150	100	50	300

Note: No internal test examinations and therefore no internal credit marks.

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Practical Examination: (200 Marks + 100 marks viva voce) = 300 marks
Duration: Three days

Exercise Number	Description	Marks	Time	Assessment
1	Long case (Clinical History along with Bacterial mixture) – Isolate, identify the organisms & Report AST.	70	Total 3 days exercise	All 4 examiners
2	a. Short case (Pure Bacterial culture identification) b. Serology Exercise c. Parasitology d. Virology e. Mycology f. Slides identification	30 25 25 10 20 20	1 day First or second day First or second day First or second day First or second day First or second day	All 4 examiners
3	Viva voce + Pedagogy	100	50 minutes On day three.	All 4 examiners

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