

SUMANDEEP VIDYAPEETH

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

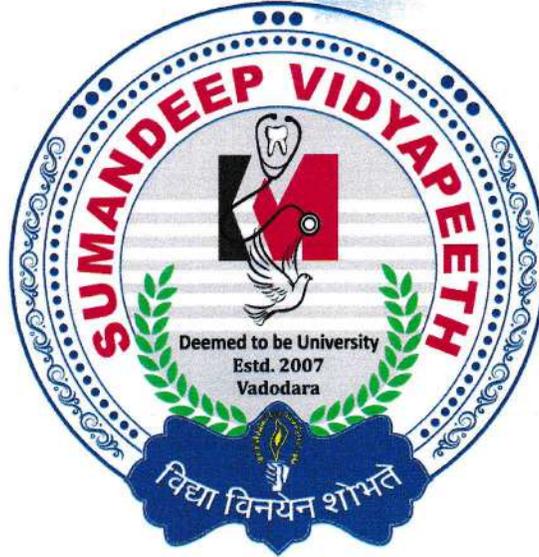
Accredited by NAAC with a CGPA of 3.53 out of four-point scale at 'A' Grade

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

At & Post Piparia, Tal: Waghodia 391760 (Gujarat) India.

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CURRICULUM

Doctor of Medicine (M.D.) MICROBIOLOGY

Attested CTC

Charaney
15/2/2021

Vice-Chancellor

Sumandeep Vidyapeeth

An Institution Deemed to be University

Vill. Piparia, Taluka: Waghodia.

Dist. Vadodara-391 760. (Gujarat)

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AMENDED UP TO DECEMBER -2020

Programme outcome : MD

The purpose of MD education is to create specialists who would provide high quality health care and advance the cause of science through research & training. The goal of postgraduate medical education shall be to produce competent specialists and/or Medical teachers.

Programme specific outcome : MD

POS 1. Scholars shall recognize the health needs of the community, and carry out professional obligations ethically and in keeping with the objectives of the national health policy.

POS 2. Scholars shall have acquired the basic skills in teaching of the medical and paramedical professionals.

POS 3. Practice the specialty concerned ethically and in step with the principles of primary health care.

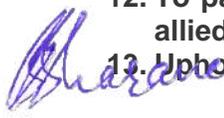
POS 4. Demonstrate sufficient knowledge of the basic sciences relevant to the concerned specialty.

POS 5. Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students, general physicians and paramedical health workers.

COURSE OUTCOME (CO): A post graduate student upon successfully qualifying in the MD (Microbiology) examination shall achieved expertise 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 and acquire knowledge about 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
8. Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology and mycology.
9. Plan, execute and evaluate teaching assignments in Medical Microbiology.
10. Plan, execute, analyze and present the research work in medical microbiology.
11. To acquire various skills for collaborative research.
12. To participate in various workshops/seminars/journal clubs/demonstration in the allied departments
13. Uphold the prestige of the discipline amongst the fraternity of doctors.

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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 Mycobacteriology, 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.

They will also be trained in teaching methods. They will be trained in **Evidence Based Education System** and will learn to apply it in undergraduate teaching. They will be trained in searching evidence for a problem, critically appraise and apply it to the day-to-day practice.

Goal:

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

- Who shall recognize the health needs of the community and carry out Professional obligations ethically in keeping with the objectives of the national health policy;
- Who shall have mastered most of the competencies, pertaining to Medical and Diagnostic Microbiology that are required to be practiced at the secondary and the tertiary levels of the health care delivery system;
- Who shall be aware of the contemporary advances and developments in the field of Medical and Diagnostic Microbiology and will be able to search for evidence and be abreast with the advances and incorporate into practice
- Who shall have acquired the spirit of scientific inquiry and is trained to use the principles of research methodology and epidemiology
- Who shall have acquired the basic skills of teaching of the medical and paramedical professionals in EBES format

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- **Educational objectives:**

- A. Knowledge:**

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 fundamental or applied research in different branches of medicine involving microbiological work.
8. Develop specialization in any such subspecialty.
9. Demonstrate competence in basic concepts of research methodology, epidemiology
10. 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 according to EBES format
11. Develops skills of presenting research work in the form of seminars, symposia and Journal Clubs in professional forums supported with best, critically appraised evidence.
12. Develop skills required for evidence based research publications.

- B. Skills:**

At the end of the course the student shall be able to:

1. Plan the laboratory investigations for diagnosis of infectious diseases
2. Perform routine & advanced laboratory procedures to arrive at the etiological diagnosis of diseases caused by bacteria, fungi, viruses and parasites.
3. Perform and interpret immunological and serological tests
4. Operate routine and sophisticated instruments in the laboratory.

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C. Integration:

All the post graduates after enrollment will be exposed to:

1. EBES Training:
 - a) Undergo EBES training, workshops etc. from time to time
 - b) Conduct UG teaching in EBES format
 - c) Assist in Problem Based evidence searching exercise for UG students
 2. Post Graduate Programme: Seminar
 - a. PG student is required to present atleast one seminar per month on relevant topic approved by the PG teachers
 - b. Incorporate well searched and critically appraised evidence in standard format and at the end of the seminar all the references will be listed
 - c. Seminar will be assessed by the facilitator
 3. Post Graduate Programme: Journal Club/Case Presentation
 - a. PG student is required to present atleast one journal article or an interesting case study from indexed journal
 - b. Critically appraise the article in the relevant format
 - c. A designated teacher/facilitator will assess every post graduate student for each Journal Club presentation
 4. Short Projects for PGs:
 - a. PG students are required to undertake short projects during the course of 3 years
 - b. Search evidence, critically appraise and use it
 - c. To make 1 poster presentation and 1 oral paper/publication during the course of 3 years
- *To introduce Basic life support (BLS) and Advanced Cardiac Life Support (ACLS) training for all the First year Postgraduate Resident Doctors from academic year 2017-18. (Board of Studies letter no.: SBKSMIRC/Dean/1777(A)/2017, dated 28/11/2017 and Vide Notification of Board of Management Resolution Ref: No.: SV/8813/2017-18, dated 06/04/2018)*

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PG SYLLABUS & EXAM PATTERN:

BROAD AREAS OF STUDY

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

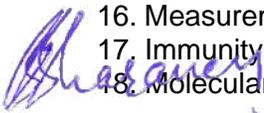
GENERAL MICROBIOLOGY

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

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

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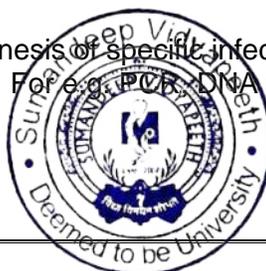
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SYSTEMATIC BACTERIOLOGY

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, Branhamella 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.

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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
32. Emerging viral infections

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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: Diphyllbothrium, Taenia, Echinococcus, Hymenolepis, Dypylidium, 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, Mite, 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, care of animals and animal ethics

PRACTICALS (SKILLS)

In addition to the skills mentioned below in the various areas of clinical Microbiology:

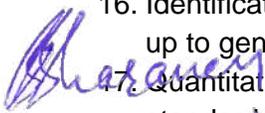
1. In the practical skills every PG student will be exposed to at least one encounter of role modeling in which a consultant after raising a relevant query will search for its evidence and demonstrate evidence searching methodologies, its importance and utility to the student.
2. PGs shall acquire the skill to Search for the evidence for any advances in the field of Medical Microbiology, critically appraise it and implement it in the day-to-day working in the laboratory wherever possible.
3. PGs shall acquire the skill to keep abreast with the changing recent guidelines in various areas of Clinical Microbiology from time-to-time like CLSI guidelines, guidelines pertaining to biomedical waste disposal and other infectious diseases

BACTERIOLOGY

Must acquire:

4. Care and operation of Microscopes viz. Light, Dark ground, Phase contrast, Inverted, Fluorescent microscopes.
5. Preparation of stains viz. Gram's, Albert's, Ziehl- Neelsen and other special stains - performing of staining and interpretation of stained smears.
6. Washing and sterilization of glassware including plugging and packing.
7. Operation of incubator, autoclave, hot air oven, inspissator, distillation plant, filters like Seitz and membrane, other laboratory instruments, and sterility tests.
8. Care and maintenance of common laboratory equipments.
9. 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.
10. Preparation of reagents and their procurement.
11. Tests for beta-lactamases including ESBLs and MBL.
12. Collection of specimens for Microbiological investigations such as blood, urine, throat swab, rectal swab, stool, pus,
13. Surveillance specimens.
14. 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.
15. Techniques of anaerobiosis – Gas-pak system, anaerobic jars-evacuation & filling with H₂, CO₂
16. Identification of bacteria of medical importance upto species level (except anaerobes – up to generic level)
17. Quantitative analysis of urine by pour plate method and semi quantitative analysis by standard loop test for significant bacterium.

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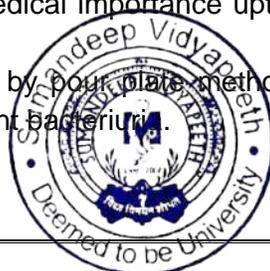


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18. Plating of clinical specimens on media for isolation, purification, identification and quantitation.
19. Tests for motility: hanging drop, Craigie's tube, dark ground microscopy for Spirochaetes – Treponema & Leptospira.
20. In-vitro toxigenicity tests – Elek test, Nagler's reaction
21. 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
22. 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
23. Skin tests like Mantoux, Lepromin etc.
24. Testing of disinfectants- Phenol coefficient and 'in use' tests.
25. Quality control of media reagents etc. and validation of sterilization procedures.
26. Aseptic practices in laboratory and safety precautions.
27. Disposal of contaminated material like cultures.
28. Bacteriology of food, water, milk, air
29. Maintenance of stock cultures.

Desirable to acquire:

1. 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. Performance of autopsy on animals.
6. Isolation of plasmids and Conjugation experiments for transfer of drug resistance
7. Serum antibiotic assays eg. Gentamicin
8. Phage typing for Staphylococci, S.typhi etc.
9. Bacteriocin typing eg. Pyocin, Proteocin etc.
10. Enterotoxigenicity tests like rabbit ileal loop, intragastric inoculation of mouse, Sereny's test.
11. Mouse foot pad test for M.leprae

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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. Preparation of adjuvants like Freund's adjuvant.
4. Raising of antisera in laboratory animals.
5. Performance of serological tests viz. Widal, Brucella tube agglutination, indirect haemagglutination, VDRL, Paul-Bunnell, Rose-Waaler, IFA.
6. Immunodiffusion in gels, counter immunoelectrophoresis- visualization and interpretation of bands.
7. Performance and interpretation of Enzyme linked immune sorbent assay & Western blot.
8. Latex and staphylococcal co-agglutination tests.

Desirable to acquire:

1. Leucocyte migration inhibition test.
2. T-cell rosetting.
3. Flow Cytometry
4. Radial immunodiffusion.
5. Immunoelectrophoresis.
6. Neutrophil phagocytosis.

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.
7. Animal pathogenicity tests viz. Intracerebral and intraperitoneal inoculation of mice for Cryptococcus.

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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, 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

Desirable to acquire:

1. In-vitro culture of parasites like Entamoeba, Leishmania, P.falciparum.
2. Maintenance of Toxoplasma gondii in mice.
3. Preparation of media – NIH, NNN etc.
4. Copro-culture for larva of hook worms.
5. Antigen preparation viz. Entamoeba , Filarial , Hydatid for serological tests like IHA and skin test like Casoni's .
6. Permanent staining techniques like iron haematoxylin

VIROLOGY

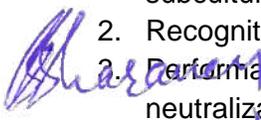
Must acquire:

1. Preparation of glassware for tissue culture(washing, sterilization)
2. Preparation of media like Hanks, MEM.
3. Preparation of clinical specimens for isolation of viruses.
4. 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.
5. Chick embryo techniques- inoculation and harvesting.
6. Handling of mice, rats, guinea pigs, rabbits for collection of blood, pathogenicity test etc.

Desirable to acquire:

1. Preparation of Monkey Kidney Cells (Primary) maintenance of continuous cell lines by subcultures. Preservation of cell cultures.
2. Recognition of CPE in tissue cultures.
3. Performance of haemadsorption, haemagglutination, immunofluorescence and neutralization tests for identification of viruses.

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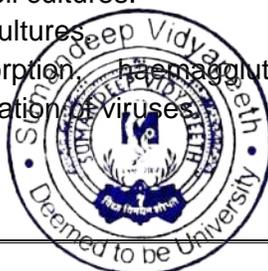
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Exam Pattern for P.G. Courses
MD Microbiology
Degree Courses

Theory	4 Papers	4x100 Total	400 Marks
Practicals	3 days	Total	<u>600 Marks</u>
		Grand Total	1000 Marks

Theory 4 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 MD Degree 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.

University shall separately appoint one/two external examiners (depending on the number of PG students) for examining dissertations. One copy of dissertation shall be sent by university to the examiner. The external examiner should confidentially return the copy and his/her report to the university within one month of receipt of the dissertation copy. The completion of this process with favourable report from the external examiner is one of the eligibility criteria for the PG student to appear in the university examination.

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

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Scheme of Examination (MD Course)

Theory Examination: (400 Marks)

Paper number	Topics	Marks	Time
I	General Bacteriology, Immunology, Applied Microbiology	100	3 Hours
II	Systematic Bacteriology	100	3 Hours
III	Virology, Parasitology, Mycology	100	3 Hours
IV	Recent advances in Medical Microbiology	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 Examination: (450 Marks + 150 marks viva voce) = 600 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.	225	Total 3 days exercise	All Four examiners
2	a. Short case (Pure Bacterial culture identification) b. Serology Exercise c. Parasitology d. Virology e. Mycology f. Slides identification g. Lab animals / Egg inoculation h. Pedagogy (Optional)	50 50 25 20 25 25 25 05	1 day First or second day First or second day	All Four examiners
3	Viva voce	150	45 minutes On day three.	All Four examiners

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