# DPU

## Dr. D. Y. PATIL VIDYAPEETH, PUNE
(Deemed to be University)

# Syllabus for
# II – MBBS
# (Para - Clinical Subjects)

**2014 - 15**
**(Amended / Revised upto July 2019)**

DPU

**Dr. D.Y. PATIL VIDYAPEETH, PUNE**
(Deemed to be University)
(Re-accredited by NAAC with a CGPA of 3.62 on a four point scale at 'A' Grade)
(An ISO 9001 : 2015 Certified University)

**Dr. A. N. Suryakar**
Registrar

Ref. No. : DPU/875-VII/2019
Date : 11/09/2019

## NOTIFICATION

Whereas in pursuance of the following decisions taken by the Board of Management, it is hereby notified to all concerned that the **"Syllabus for II-M.B.B.S. (Para-Clinical Subjects) – 2014-15"** is **revised upto July 2019** and hereby published.

- Updation in UG syllabus of Microbiology vide **Resolution No. BM-04(i)-15, dated 31st March, 2015.**
- Adoption of **"Double Evaluation System"** for UG Answer Papers **vide Resolution No. BM-07-15 dated 31st March, 2015.**
- Structure of Integrated Teaching for II MBBS **vide Resolution No. BM-26(iii)-15, dated 29th December, 2015.**
- Introduction of Bioethical aspects in various chapters of all subjects **vide Resolution No. BM-26(xi)-15, dated 29th December, 2015.**
- Inclusion of certain topics in the Microbiology syllabus of IInd MBBS **vide Resolution No. BM-17(iv)-16, dated 22nd September, 2016.**
- Inclusion of practical classes in Pharmacology Syllabus of IInd MBBS **vide Resolution No. BM-17(v)-16, dated 22nd September, 2016.**
- Change in existing Internship Training Programme in Community Medicine Posting **vide Resolution No. BM-05(i)-17, dated 7th April, 2017.**
- Graduate Attributes, Programme Outcomes (POs), Course Outcomes (Cos) and gap analysis for all courses of UG and PG Programmes for Para-Clinical and Surgical Subjects **vide Resolution No. BM-10(vii)-19 dated, 12th April, 2019.**
- Interdisciplinary subjects of M.B.B.S, M.D./M.S. and Super-specialty (D.M./M.Ch.) Programs under the Faculty of Medicine **vide Resolution No. BM-10(viii) dated 12th April, 2019.**

The **Syllabus for II-M.B.B.S. (Para-Clinical Subjects) – 2014-15"** is **revised upto July 2019** will be useful to all the concerned. This will come into force with immediate effect.

Dr. D.Y. PATIL VIDYAPEETH PIMPRI, PUNE-18. Deemed to be University

**(Dr. A. N. Suryakar)**
**Registrar**

**Copy to:**
1. PS to Chancellor for kind information of Hon'ble Chancellor, Dr. D. Y. Patil Vidyapeeth, Pune.
2. PS to Vice Chancellor for kind information of Hon'ble Vice Chancellor, Dr. D. Y. Patil Vidyapeeth, Pune.
3. The Dean, Dr. D. Y. Patil Medical College Hospital & Research Centre, Pimpri, Pune
4. The Controller of Examinations, Dr. D. Y. Patil Vidyapeeth, Pune.
5. Director (IQAC), Dr. D. Y. Patil Vidyapeeth, Pune.
6. Web Master for uploading on Website.

# REGULATIONS AND SYLLABUS FOR M.B.B.S. DEGREE COURSE

## 1. SHORT TITLE AND COMMENCEMENT

These regulations may be called "The Regulations for the Bachelor of Medicine and Bachelor of Surgery Degree Course of Dr. D. Y. Patil Vidyapeeth, Pune (Deemed to be University)

These regulations shall come into force from the academic year 1997 - 1998 and amendments notified by MCI from time to time.

## 2. ELIGIBILITY FOR ADMISSION TO M.B.B.S

### DEGREE COURSE QUALIFICATION FOR ADMISSION:

No candidate shall be allowed to be admitted to the first year Bachelor of Medicine and Bachelor of Surgery (MBBS) Course until:

He/She has completed the age of 17 years on or before 31st December of the year of admission to the MBBS course.

**He / She has passed qualifying examination as under** :-

(a) The higher secondary examination or the Indian School Certificate Examination which is equivalent to 10+2 Higher Secondary Examination after a period of 12 years study, the last two years of study comprising of **Physics, Chemistry, Biology / Bio-technology** and Mathematics or any other elective subjects with English at a level not less than core course of English as prescribed by the National Council of Educational Research and Training after the introduction of the 10+2+3 years educational structure as recommended by the National Committee of education;

**Note:** Where the course content is not as prescribed for 10+2 education structure of the National Committee, the candidates will have to undergo a period of one year pre-professional training before admission to the Medical colleges;
Or

(b) The intermediate examination in science of an Indian University / Board or other recognised examining body with **Physics, Chemistry and Biology / Bio-technology** which shall include a practical test in these subjects and also English as a compulsory subject;

Or

(c) The pre-professional/pre-medical examination with Physics, Chemistry and Biology/Bio-technology, after passing either the higher secondary school examination, or the pre-university or an equivalent Examination. The pre-professional/pre-medical examination shall include a practical test in **Physics, Chemistry and Biology / Bio-technology** and also English as a compulsory subject;
Or

(d) The first year of the three years degree course of a recognized university, with Physics, Chemistry and Biology including a practical test in these subjects provided the examination is a "University Examination" and candidate has passed 10+2 with English at a level not less than a core course;
Or

(e) B.Sc examination of an Indian University, provided that he/she has passed the B.Sc examination with not less than two of the following subjects Physics, Chemistry, Biology (Botany, Zoology) and further that he/she has passed the earlier qualifying examination with the following subjects - Physics, Chemistry, Biology and English.
Or

(f) Any other examination which, in scope and standard is found to be equivalent to the intermediate science examination of an Indian University/Board, taking **Physics, Chemistry and Biology/Bio-technology** including practical test in each of these subjects and English.

## 3. PROCEDURE FOR SELECTION TO MBBS COURSE

1] There shall be a uniform entrance examination to all medical educational institutions at the undergraduate level namely 'National Eligibility-cum-Entrance Test for admission to MBBS course in each academic year and shall be conducted under overall supervision of the Ministry of Health & Family Welfare, Government of India.

2] The "designated authority" to conduct the 'National Eligibility-Cum-Entrance Test' shall be the Central Board of Secondary Education or any other body/organization so designated by the Ministry of Health & Family Welfare, Government of India, in consultation with the Medical Council of India.

3] The language and manner of conducting the 'National Eligibility-Cum-Entrance Test' shall be determined by the "designated authority" in consultation with the Medical Council of India and the Ministry of Health and Family Welfare, Government of India.

4] In order to be eligible for admission to MBBS Course for a academic year, it shall be necessary for a candidate to obtain minimum of marks at 50$^{th}$ percentile in 'National Eligibility-cum-Entrance Test to MBBS course' held for the said academic year. However, in respect of candidates belonging to Scheduled Castes, Scheduled Tribes, Other Backward Classes, the minimum marks shall be at 40$^{th}$ percentile. In respect of candidates with benchmark disabilities specified under the Rights of Persons with Disabilities Act, 2016, in terms of Clause 4(3) above, the minimum marks shall be at 45th percentile. The percentile shall be determined on the basis of highest marks secured in the All-India common merit list for admission in 'National Eligibility-cum-Entrance Test for admission to MBBS course.

Provided when sufficient number of candidates in the respective categories fail to secure minimum marks as prescribed in National Eligibility-cum-Entrance Test held for any academic year for admission to MBBS Course, the Central Government in consultation with Medical Council of India may at its discretion lower the minimum marks required for admission to MBBS Course for candidates belonging to respective categories and marks so lowered by the Central Government shall be applicable for the said academic year only.

**4. REGISTRATION/ Eligibility Certificate**

A candidate admitted to the course shall register with this University by remitting the prescribed fees along with the prescribed application form for registration duly filled in, within the stipulated date.

**5. DURATION OF THECOURSE**

The period of certified study and training for the course of Degree of Bachelor of Medicine and Bachelor of Surgery shall extend over a period of four and half academic years and one year of Compulsory Rotatory Resident Internship before the award of the Degree.

**6. CURRICULUM**

The curriculum and the syllabus for the course shall be as prescribed from time to time by the appropriate bodies.

## COMMENCEMENT OF THECOURSE

The first year MBBS Course shall begin on or before 1st August of every academic year.

## 7. TRAINING PERIOD AND TIME DISTRIBUTION

(a) Every student shall undergo a period of certified study extending over four and half academic years divided into 9 semesters, (i.e. of 6 months each) from the date of commencement of study for the subjects comprising the medical curriculum to the date of completion of examination and followed by one year Compulsory Rotatory Residential Internship. Each semester will consist of approximately 120 teaching days of 8 hours duration including one hour for lunch.

(b) The period of four and half years is divided into three phases as follows:

- Phase - I (two semesters) consisting of pre-clinical subjects (Anatomy, Physiology, Biochemistry and introduction to Community Medicine including Humanities). Sixty hours are allocated for introduction to Community Medicine including Humanities, and rest of the time shall be and again divided between Anatomy and Physiology (2/3) plus Biochemistry (1/3)combined.

- Phase - II (three semesters) consisting of para-clinical / clinical subjects.

  During this phase teaching of para-clinical and clinical subjects shall be done concurrently.

  The para-clinical subjects shall consist of Pathology, Pharmacology, Microbiology, Forensic Medicine including Toxicology and part of Community Medicine.

  The clinical subjects shall consist of all those detailed below in Phase III.

  Out of the allotted time for para-clinical teaching, approximately equal time be allotted to Pathology, Pharmacology, Microbiology and Forensic Medicine, Community Medicine combined (1/3 for Forensic Medicine and 2/3 for Community Medicine).

- Phase - III (four semesters) Continuation of study of clinical subjects for seven semesters after passing Phase -I

The clinical subjects to be taught during Phase II and III are Medicine and its allied specialities, Surgery and its allied specialities, Obstetrics and Gynaecology and Community Medicine.

The Medicine and its allied specialities training will include General Medicine, Paediatrics, Tuberculosis and Chest, Skin and Sexually Transmitted Diseases, Psychiatry, Radio-diagnosis, Infectious Diseases etc. The Surgery and its allied specialities training will include General Surgery, Orthopaedic Surgery including Physiotherapy and Rehabilitation, Ophthalmology, Oto-rhino-laryngology, Anaesthesia, Dentistry, Radio-therapy etc. The Obstetrics & Gynaecology training will include family medicine, family welfare planning etc.

(c) The first 2 semesters (approximately 240 teaching days) shall be occupied in the Phase I (Pre-clinical) subjects and introduction to a broader understanding of the perspectives of medical education leading to delivery of health care. No student will be permitted to join the Phase II (Para - clinical) group of subjects until he has passed in all the PhaseI.

(d) After passing pre-clinical subjects, Phase II will be devoted to para-clinical and clinical subjects, along with clinical postings. During clinical phase (Phase III) pre-clinical and para-clinical teaching will be integrated into the teaching of clinical subjects where relevant.

(e) Supplementary examination will be conducted as follows:
Supplementary examination may be conducted within 3 months so that the students who pass can join the main batch and the failed students will have to appear in the subsequent year.

## 8. PHASE DISTRIBUTION AND TRAINING OFEXAMINATIONS:

| 6 Months | 6 Months | 6 Months | |
|---|---|---|---|
| 1 | 2 | | I[st] Professional examination (during 2[nd]semester) |
| 3 | 4 | 5 | II[nd] Professional examination (during 5[th] semester) |
| 6 | 7 | | III[rd] Professional Part I examination (during 7[th] semester) |
| 8 | 9 | | III[rd] Professional Part II (Final Professional) (during 9[th] semester) |

(a) Passing in I[st] Professional examination is compulsory before proceeding to Phase II training.

(b) A student who fails in the II[nd] Professional examination, shall not be allowed to appear for III[rd] Professional Part I examination unless he/she passes all subjects of II[nd] Professional examination.

(c) Passing in III[rd] Professional (Part I) is compulsory for being eligible for III[rd] Professional (Part II) examination.

During third to ninth semesters, clinical postings of three hours duration daily as specified is suggested for various departments, after introductory course in Clinical Methods in Medicine and Surgery of two weeks each for the whole class.

## 9. ACADEMICTERMS

First M.B.B.S
Part-I & Part II - 1[st] August to June 15[th]

## 10. CUT OFFDATES

As decided by the appropriate bodies from time to time.

**11. EXAMINATIONDATE**

There shall be two sessions of University examinations in an academic year, viz., June and December.

**12. WORKING DAYS IN AN ACADEMICYEAR**

Each academic year shall consist of not less than 240 working days.

**13. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATION**

(a) No candidate shall be permitted to any one of the parts of MBBS Examinations unless he/she attended the course in the subject for the prescribed period and produces the necessary certificate of study, attendance and progress from the Head of the Institution.

(b) A candidate is required to put in minimum 75% of attendance in a subject for appearing in the examination, inclusive of attendance in non-lectures teaching, i.e. seminars, group discussions, tutorials, demonstrations, practicals, Hospital (Tertiary, Secondary, Primary) postings and bed side clinics, etc.

(c) A candidate lacking in the prescribed attendance and progress in any one subject in theory and practical / clinical in the first appearance shall not be permitted for admission to the university examination in that subject only.

## 14. MIGRATION/TRANSFER OF CANDIDATES

The Medical Council of India Regulations relating to Migration will be followed by the University as reproduced below:

(1) Migration of students from one medical college to another medical college may be granted on any genuine ground subject to the availability of vacancy in the college where migration is sought and fulfilling the other requirements laid down in the Regulations. Migration would be restricted to 5% of the sanctioned intake of the college during the year. No migration will be permitted on any ground from one medical college to another located within the same city.

(2) Migration of students from one College to another is permissible only if both the colleges are recognized by the Central Government under section 11(2) of the Indian Medical Council Act,1956 and further subject to the condition that it shall not result in increase in the sanctioned intake capacity for the academic year concerned in respect of the receiving medical college.

(3) The applicant candidate shall be eligible to apply for migration only after qualifying in the first professional MBBS examination. Migration during clinical course of study shall not be allowed on any ground.

(4) For the purpose of migration an applicant candidate shall first obtain "No Objection Certificate" from the college where he is studying for the present and the university to which that college is affiliated and also from the college to which the migration is sought and the university to it that college is affiliated. He / She shall submit his application for migration within a period of 1 month of passing (Declaration of result of the 1st Professional MBBS examination) along with the above cited four "No Objection Certificates" to: (a) the Director of Medical Education of the State, if migration is sought from one college to another within the same State **or** (b) the Medical Council of India, if the migration is sought from one college to another located outside the State.

(5) A student who has joined another college on migration shall be eligible to appear in the IInd professional MBBS examination only after attaining the minimum attendance in that college in the subjects, lectures, seminars etc. required for appearing in the examination prescribed under Regulation 12 (1)

**Note-1:** The State Governments / Universities / Institutions may frame appropriate guidelines for grant of No Objection Certificate or migration, as the case may be, to the students subject to provisions of these regulations.

**Note-2:** Any request for migration not covered under the provisions of these Regulations shall be referred to the Medical Council of India for consideration on individual merits by the Director (Medical Education) of the State or the Head of Central Government Institution concerned. The decision taken by the Council on such requests shall be final.

**Note-3:** The College/Institutions shall send intimation to the Medical Council of India about the number of students admitted by them on migration within one month of their joining. It shall be open to the Council to undertake verification of the compliance of the provisions of the regulations governing migration by the Colleges at any point of time."

**15. SUBMISSION OF LABORATORY RECORD NOTEBOOKS**

At the time of practical/clinical examination, each candidate shall submit to the Examiners his/her laboratory notebooks duly certified by the Head of the Department as a bonafide record of work done by the candidate. The practical record shall be evaluated by the Head of the Department.

The candidate may be permitted by the Examiners to refer to the practical record book during the practical examination in the subject of Biochemistry only. No other material, handwritten, cyclostyled or printed guides is allowed for reference during the practical examinations.

In respect of failed candidates, the marks awarded for records at previous examinations will be carried over for the subsequent examination or the candidates shall have the option to improve his performance by submission of fresh records.

## 16. INTERNAL ASSESSMENT

1] A minimum of three written and practical examinations shall be conducted in each subject during an academic year and the average marks of three best performances shall be taken into consideration for the award of sessional marks.

2] Day to day records and logbook (including required skill certifications) should be given importance in internal assessment. Internal assessment should be based on skills and competencies. Students must have completed the required certifiable competencies and completed logbook appropriate for each phase of training to be eligible for appearing at the final university examination of that subject.

3] Learner must secure at least 50% marks of total marks (combined in theory / Practical, not less than 40% in theory and practical separately) assigned for internal assessment in a particular subject in order to be eligible for appearing at the final university examination of the subject. Internal assessment marks will not be added to university examination and reflected as a separate head of passing at the summative examination.

4] The results of Internal Assessment should be displayed on notice board within 1-2 weeks of the test. Formulate remedial measures for students who are either not able to score qualifying marks or have missed some assessment due to any reason by forming committee under the Chairmanship of Dean, Dr. D. Y. Patil Medical College, Hospital and Research Center, Pune and three more members.

There shall be one additional examination after third internal assessment (Prelim) examination as per recommendation by institutional grievance committee before the submission of IA marks sheet to University.

**17. CLASSIFICATION OF SUCCESSFULCANDIDATES**

A successful candidate

i. Who secures not less than 75% in the aggregate marks shall be declared to have secured, **FIRST CLASS WITH DISTINCTION'** provided he/she passes the whole examination in the FIRSTATTEMPT;

ii. Who secures not less than 65% in the aggregate marks and completes the course within the stipulated course period shall be declared to have passed the examinations in the **'FIRSTCLASS'**;

iii. Who secures above 50% marks and completes the course within the stipulated course period shall be declared to have **PASSED** the examinations

**18. EXEMPTION FROM RE-EXAMINATION IN ASUBJECT**

Where a candidate obtains pass marks in a subject (or) subjects but fails in other subject (s) he / she shall be exempted from reexamination in the subject (s) he / she has passed.

**MAPPING OF PROGRAMME OUTCOMES [POs] AND COURSE OUTCOMES [COs] OF- II - MBBS PROGRAMMES**

**PROGRAMME OUTCOMES :**

| **Programme Name: MBBS** | |
|---|---|
| **Programme Code: MB** | |
| **Sr. No.** | By the end of the programme, the MBBS Graduate will have /be: |
| PO 1 | Knowledge and Skills |
| PO 2 | Planning and problem-solving abilities |
| PO 3 | Communication |
| PO 4 | Research Aptitude |
| PO 5 | Professionalism and Ethics |
| PO 6 | Leadership |
| PO 7 | Societal Responsibilities |
| PO 8 | Environment and Sustainability |
| PO 9 | Lifelong Learner |

| **Year II** | |
|---|---|
| **Course Code** | **Course Title** |
| MB201 | Pathology |
| MB202 | Pharmacology and Therapeutics |
| MB203 | Microbiology |
| MB204 | Forensic Medicine and Toxicology |

| Microbiology: (MB203) | | |
|---|---|---|
| **CO No.** | **At the end of the course, the learner should be able to:** | **Mapped Programme Outcomes** |
| 203.1 | The student should be well equipped with the knowledge of prevalent communicable diseases of national importance and of the newer emerging pathogens. | PO1,PO2,PO3,PO5, PO6,PO7,PO8,PO9 |
| 203.2 | Know and describe the etiology and pathogenesis of diseases caused by microorganisms | PO1,PO2,PO3,PO4, PO5,PO7,PO9 |
| 203.3 | Plan and interpret laboratory investigations for diagnosis of infectious diseases and correlate the clinical manifestations with the etiological agent. | PO1,PO2,PO3,PO4, PO5,PO6,PO7,PO9 |
| 203.4 | Be conversant with proper methods of collection, storage & transport of clinical material for microbiological investigations. | PO1,PO2,PO3,PO5, PO6,PO7,PO8,PO9 |
| 203.5 | Understand the principles of immunology and it application in the diagnosis and prevention of infectious diseases including vaccinology. | PO1,PO2,PO3,PO4, PO5,PO6, PO7,PO8,PO9 |
| 203.6 | Understand methods of disinfection and sterilization and their application to control and prevent hospital and community acquired infections including universal biosafety precautions and waste disposal. | PO1,PO2,PO3,PO4, PO5,PO6, PO7,PO8,PO9 |
| 203.7 | The student will understand the use of the different antimicrobial agents including antibiotics to use judiciously and prevent misuse | PO1,PO2,PO3,PO4, PO5,PO6, PO7,PO8,PO9 |

# MICROBIOLOGY

## MICROBIOLOGY

**1. GOAL:**

The goal of teaching Microbiology is to provide understanding of the natural history of infectious diseases in order to deal with the etiology, pathogenesis, pathogenicity, laboratory diagnosis, treatment, control and prevention of these infections and infectious diseases.

**2. EDUCATIONAL OBJECTIVES:**

**A) KNOWLEDGE :**

The student at the end of one and half years should be able to: -

- State the etiology, pathogenesis and methods of laboratory diagnosis and apply that knowledge in the diagnosis, treatment, prevention and control of communicable diseases caused by microorganisms.
- Understand commensally, opportunistic and pathogenic organisms of human body and describe host parasite relationship.
- Know and describe the pathogenesis of diseases caused by microorganisms.
- State the sources and modes of transmission of pathogenic and opportunistic micro-organisms including knowledge of insect vectors & their role in transmission of infectious diseases.
- Choose appropriate laboratory investigations required for clinical diagnosis.

**B) SKILLS :**

- Plan and interpret laboratory investigations for diagnosis of infectious diseases and correlate the clinical manifestations with the etiological agent.
- Identify common infectious agents with the help of laboratory procedure, acquire knowledge of antimicrobial agents, use of antimicrobial sensitivity tests to select suitable antimicrobial agents for treatment.
- Perform simple laboratory tests, which help to arrive at rapid diagnosis.
- Be conversant with proper methods of collection, storage & transport of clinical material for microbiological investigations.

- Understand the principles of immunology and its application in the diagnosis and prevention of infectious diseases including immunization schedule, acquire knowledge of the scope of immunotherapy and different vaccines available for the prevention of communicable diseases.
- Understand methods of disinfection and sterilization and their application to control and prevent hospital and community acquired infections including universal biosafety precautions and waste disposal.
- Recommend laboratory investigations regarding bacteriological examination of food, water, milk and air.
- The student should be well equipped with the knowledge of prevalent communicable diseases of national importance and of the newer emerging pathogens.

**C) ATTITUDE:**

- The student will be regular, sincere, punctual and courteous and regular in studies.
- The student will follow all the rules laid down by the department and participate in all activities.
- The student will understand the importance of, and practice asepsis, waste segregation and appropriate disposal.
- The student will understand the importance of, and practice the best methods to prevent the development of infection in self and patient. (E.g. hand washing, using aprons for hospitals in hospitals only, regularly washing the aprons, wearing gloves (as and when required / handling specimens etc.).
- The student will understand the use of the different antimicrobial agents including antibiotics to use judiciously and prevent misuse, (prescribing attitude).
- The student will understand the significance of vaccinations and will receive appropriate vaccines (e.g. TT, Hepatitis B and any other as per needs).
- The student will wash his/her hands with soap after each practical class.

- The student will leave the area allotted for his practical neat and tidy.
- The student will discard the slides in the appropriate container provided for the same.
- The student will report any injury sustained in class, immediately.
- The student will report any breakage occurring during class times immediately.
- The student may give suggestions to improve teacher student association.

**3. INTEGRATION –**

| **INTEGRATED TEACHING PROGRAMME** | |
|---|---|
| Urinary Tract infection | Semester - I |
| Pneumonia | |
| Tuber culosis | Semester - II |
| HIV | |
| Enteric fever. | Semester - III |
| Myocardial infection | |

**Problem Based Learning –(PBL)**

- Meningitis
- Pyrexia of unknown origin
- UTI

**4. LEARNING METHODS**

Lectures, practicals Distribution of teaching hours –

| | |
|---|---|
| A) Theory: Lectures | 71 |
| Tutorials | 26 |
| **Total** | **97** |
| B) Practicals and Revision | 120 |
| C) Assessments | 33 |
| **Total** | **250** |

**SEQUENTIAL ORGANISATION OF CONTENTS**

The areas of study in Microbiology will include General Microbiology, Systemic Microbiology including Bacteriology, Immunology, Mycology, Virology, Rickettsia, Chlamydia, Parasitology and Applied microbiology in relation to infections and diseases of various systems of the body.

## SEMESTER- I

## I. GENERAL MICROBIOLOGY

**A) Introduction and historical background**.
**Definitions:** Medical Microbiology, Pathogen, commensal, symbiont etc.
**In History:** Anton van Leeuwenhoek, Pasterur, Lister, Koch, Flemming etc.

**B) Morphology of bacteria and Classification.**
Bacterial cell and its organelles, morphological classification, methods of Studying bacteria, staining methods & their principles. Grams &Ziehl Neelson staining, their Importance in presumptive diagnosis, negative staining, dark ground illumination, phase and fluorescent, microscopes, briefly about electron microscopy. Principles and applications of all microscopes.

**C) Physiology including growth requirements & metabolism.**
Nutrition, respiration (anaerobic & aerobic) and growth of bacteria, growth curve, physical Factors influencing, growth. Culture media: Definition, classification and application.

**D) Sterilization**
Definition of sterilization, disinfections, asepsis, antiseptics. Ubiquity of bacteria, modes of killing microbes and preventing them, factors determining selection of the mode, factors adversely affecting sterilization. Enumeration of physical methods of sterilization including principle & their application.
Work and efficacy testing of autoclave, inspissator and hot air oven Central Sterile supply Department (CSSD).

**E) Disinfectants**
Asepsis and antisepsis, modes of Action of chemical agents on microbes, Phenols, Halogens, Aldehydes, Acids, Alcohol, heavy metals, oxidizing agents etc. Universal bio-safety precautions.
Dyes, soaps and detergents. Concentration and contact time.

**F) Waste disposal**
Definition of waste, classification, segregation, transport and disposal.

**G) Bacterial genetics and drug resistance to antimicrobial agents.**
Introductions – codon, lac operon, mutation, transformations, transductions & conjugations, R Factor, mode of action of antimicrobials on bacteria, mechanism of drug resistance and Antimicrobial susceptibility test, steps taken to minimize emergence of resistant strains

(Antibiotic policy, formulatons) Microorganisms as modes in Molecular Biology and Genetic engineering.

**H) Host parasite relationship and bacterial infections.**

Commensal, pathogenic, and opportunistic organisms, their pathogenic factors and modes of transmission.

Microbial factors: spores, capsule, toxins, enzymes, intracellular parasitism, antigenic Variation & extrinsic factors etc. leading to establishment of infection.

Type of infection: primary, secondary, general, local, natural, nosocomial iatrogenic, zoontic.

**I) Normal flora**

Introduction – various sites, types and role

**J) Methods of identification of bacteria. Diagnosis of infections (direct and indirect)**

Principles of laboratory diagnosis of infectious diseases. General procedures for collection transport, processing of specimens for microbiological diagnosis.
PCR, RIA, DNA probes.

## II. IMMUNOLOGY

**A) Introduction**

Definition of immunity, type of immunity, factors responsible, mechanism of innate immunity. Herd immunity.

**B) Antigens, HLA**

Definition, types, antigen determinants, properties of antigen. MHC – concept, class – I, II and III functions, indications, indication of typing, MHC restriction.
Nature of determinants, e.g. of haptens, e.g. of cross-reactive antigen.

**C) Antibodies**

Definition, nature, structure of immuno- immunoglobulin classes, physical and biological properties of immunoglobins, Pepsin digestion, amino acid sequence, immunoglobin domain, abnormal immunoglobins.

**Understand isotypic, allotypic, and idiotypic markers.**

**D) Serological reactions**

Definition, characteristics, titre, sensitivity &specificity, antigen-antibody interaction-primary.

Secondary & tertiary, prozone phenomenon, principle, types and application of precipitation, agglutination, complement fixation, enzyme immunoassay, radioimmunoasay,immunofluoroscence test, neutralization and opsonisation.

Techniques of precipitation and their uses, blocking antibodies, antiglobulin reactions, co-agglutination, on vitro test, techniques of EIA, IF & electron microscopy.

**E) Immune response**

Types, developments, role of- thymus, bone marrow, lymph nodes & spleen, cell of lymphoreticuar system, morphology and role of T subsets, NK cells, B cells, plasma cells and macrophages, B & T cell activation, antigen processing and presentation, primary and secondary immune response, principle and use of monoclonal antibodies, factors affecting antibody production, CMI –definition, type, role of T cell and macrophages, definition of immune tolerance and mechanism of tolerance.

Lymphokines and their role, clonal selections, mechanism of immunoregulation, theories of antibodies formation, techniques of monoclonal antibody formation, detection of CME, types of immunotolerance.

**F) Complement**

Definition, synthesis, pathways, activations, role & biological function, components, measurement. **Complement deficiency** Regulation of complement activation,

**G) Hypersensitivity**

Definition, classification, difference between immediate and delayed reaction, mechanism of anaphylaxis, type V reaction, ADCC, schwartzman phenomenon.

**H) Autoimmunity**

Definition, mechanism, classification. Pathogenesis.

**I) Transplantation & tumor immunology**

Type of transplants, mechanism of transplant rejection, prevention of graft rejection GVH reaction, IR to tumors, tumor antigens, mechanism of IR to tumours.

Type of tumor antigens, immune surveillance

**J) Immuno- Deficiency**

Classification, examples, laboratory test for detection, manifestations.

**SEMESTER- II**

**III. SYSTEMIC BACTERIOLOGY**

**TOPIC FOR LECTURES WITH PATHOGENESIS INCLUDES:**

- Infectious agent
- Habitat
- Source / Reservoir
- Mode
- Infective dose
- Multiplication, spread
- Clinical features, pathology.
- Complications
- Virulence factors
- Immunological response

**LABORATORY DIAGNOSIS:**

- Specimen selection
- Collection
- Transport
- Primary smear, hanging drop
- Selection of media
- Pathogenicity testing
- Anti microbial drug susceptibility testing
- Serological interpretation

**TOPICS FOR LECTURES:**

1. Staphylococci : 1 hour
2. Streptococci Pneumococci : 1 hour
3. Neisseria : 1 hour
4. C.diptheriae : 1 hour
5. M .Tuberculosis : 1 hour
6. Atypical mycobacteria : 1 hour
7. M.leprae : 1 hour

8. Bacillus, methods of anaerobiosis and classification. Non sporing anaerobes. : 1 hour
9. Clostridiunwelchii, tetani, botulinum : 1 hour
10. Enterobacteriaceae : 1 hour
11. Salmonlla typhi, paratyphi : 1 hour
12. Shigella : 1 hour
13. Vibrio & Campylobacter : 1 hour
14. Pseudomonas : 1 hour
15. Other GNB Hemophilus, Brucella,Bordetella: 1 hour
16. Newer bacteria Listeria, Gardnerella : 1 hour
17. Spirochetes : 1 hour
18. Actinomycosis &Nocaria : 1 hour
19. Rickettsia : 1 hour
20. Chlamydia & Mycoplasma : 1 hour
21. Bacteriology of air, water, milkand food : 1 hour

## IV. MYCOLOGY

**A) Introduction to Mycology**

Nature of fungus(definition, differences with bacteria), characteristics of fungi,common terminologies, brief account of types of sporulation and morphological classification of fungi. Methods of identification, Infections produced, Lab Diagnosis, processing of skin, hair and nail. Growth requirements, ecological, medical and industrial importance of fungi.

**B) Agents of Superficial mycosis**

Predisposing factors, morphological features and Lab diagnosis.
**Colony Characteristics of common dermatophytes**

**C) Subcutaneous mycosis**

Predisposing factors, Mycetoma, Rhinosporidiosis, Pathogensis and Lab diagnosis

**D) Systemic mycosis opportunistic fungal infections**

Classification, predisposing factors, Candida, Cryptococcus, Histoplasma morphology pathogenesis, lab. Diagnosis Classification, predisposing factors, Mucor, Aspergillus, pneumocystis carinii Cultural characteristic.

## SEMESTER- III

## V. VIROLOGY

Morphology, pathogenesis, laboratory diagnosis, prevention and control for all viruses.

i. General Virology
Size, shape, symmetry, structure, resistance, multiplication, properties and classification of viruses, pathogenesis, bacteriphages, concept of virons

ii. Laboratory diagnosis of viral infections
Collection of samples, transport, cultivation & methods of diagnosis

iii. Viral immunity
Viral immunity, interferon, viral vaccines

iv. Pox viruses
Smallpox and Molluscum

v. DNA viruses
Papova, Adeno, Herpes viruses (Herpes simplex, Varicella zoster, CMV, EBV)

vi. Respiratory viruses
Orthomyxo&paramxoviruses, Ag shift amd driftRhinoviruses

vii. Picornaviruses
Polio, Coxsackie, Enteroviruses, Viruses causing diarrhea – Rota viruses, Immunity (polio)

viii. Hepatitis viruses
Hepatitis viruses, immunity and laboratory diagnosis

ix. Arboviruses
Dengue, KFD, Japanese Encephalitis – definition, classification, enumeration in India, Pathogenesis, laboratory diagnosis and control

x. Rhabdoviruses
Rabies

xi. Slow and Oncogenic viruses
Characteristics of slow virus infection, pathogenesis and laboratory diagnosis and viruses associated with it

xii. Retroviruses
HIV/ADIS, Immunity USP

## VI. PARASITOLOGY

- Geographical distribution
- Habitat
- Morphology (different stages) found in human beings
- Life cycle
- Pathogenesis
- Laboratory diagnosis
- Treatment
- Control
- Immuno-prophylaxis

**A)** Introduction to medical Parasitology
Parasites : their nature, classifications, and explanation ofterminologies, epidemiology, emerging parasitic infections, (pathogenicity and laboratory diagnosis)

**B)** E.histolytica
Amoebic infections

**C)** Free living amoebae and flagellates
Free living amoebae, PAME, Giardia and Trichomonas

**D)** Haemoflagellates
L. donovani: life cycle, morphology, pathogenicity, and lab. Diagnosisetc.
Brief account of trypanosomes.

**E)** Malaria
Malaria parasites: life cycle, morphology, pathogenicity, laboratory Diagnosis etc.

**F)** Misc. pathogenic protozoaToxoplasma, Cryptosporidium Isospora, B.coli, Cyclospora.

**G)** Cestodes
Taenia saginata and solium, Ecchinococcusgranulosus, life cycle, morphology, pathogenicity and laboratory diagnosis.
Brief mention of other cestodes

**H)** Trematodes
Schistosomiasis : life cycle, morphology, pathogenicity, and lab. Diagnosis
Brief account of fasciola hepatica.

**I)** Intestinal Nematodes
A. duodenale, A. lumbricoides, E. vermicularis, T. tritura, brief mention of S.stercoralis life cycle, morphology lab. Diagnosis

**J)** Tissue Nematodes
W. bancrofti, D. medinensis, in brief T. spiralis.

## VII. APPLIED CLINICAL MICROBIOLOGY

a) Urinary tract infection 1 hr
b) Respiratory tract infection 1 hr
c) Gastro-intestinal tract infection & Food poisoning 1 hr
d) Surgical site infection 1 hr
e) Septicaemia 1 hr
f) Acute meningitis 1 hr
g) Healthcare associated infection 1 hr
h) Pyrexia of unknown origin 1 hr
i) Emerging & re-emerging infection 1 hr
j) Bioterrorism 1 hr
k) Sexually transmitted infections 1 hr
*l)* ***Hand hygiene*** *1hr*

- Introduction
- Barrier to adherence with hand hygiene practices
- Hand rub and hand washing
- Various agents used ( Hand antiseptic agents including their side effects
- Recommendations for surgical hand preparation
- Evaluation of hand hygine practices

**m) BIO-ETHICS IN UNDERGRADUATE MEDICAL CURRICULUM (3+5 )**

| Sr. No. | Theory Topic | Department | Hours |
|---|---|---|---|
| 1 | Non-discrimination and Non-stigmatization | Microbiology | **1hour** |
| 2 | Sharing of benefits | Microbiology | **2hours** |

**VIII. INTEGRATED TEACHING FOR II MBBS –**

| Sr. No. | Broad topic | Department | Lecture topics | Duration |
|---|---|---|---|---|
| **1** | **PYELONEPHRITIS** | **Pathology** | Pathology of Pyelonephritis | 1 Hour |
| | | **Microbiology** | Bacteriology of Pyelonephritis | 1 Hour |
| | | **Medicine** | Clinical features | 1 Hour |
| | | **Pharmacology** | Treatment | 1 Hour |
| **2** | **PNEUMONIA** | **Microbiology** | Lab diagnosis of Pneumonia | 1 Hour |
| | | **Pathology** | Pathology of Pneumonia | 1 Hour |
| | | **Medicine** | Clinical features and Radiology | 1 Hour |
| | | **Pharmacology** | Treatment | 1 Hour |
| | | **Community Medicine** | Epidemiology and prevention | 1 Hour |
| | | **F.M.T** | Medico Legal Aspect of Pneumonia | 1 Hour |
| **3** | **TUBERCULOSIS** | **Microbiology** | Lab diagnosis of TB | 1 Hour |
| | | **Pathology** | Pathology of Pulmonary TB | 1 Hour |
| | | | Pathology of Extra Pulmonary TB | 1 Hour |
| | | **Medicine** | Clinical features and Radiology | 1 Hour |
| | | **Pharmacology** | Treatment-1 | 1 Hour |
| | | | Treatment-2 | 1 Hour |
| | | **Community Medicine** | Epidemiology Prevention, RNTCP | 1 Hour |
| | | **Pulmonary Medicine** | Management | 1 Hour |

| Sr. No. | Broad topic | Department | Lecture topics | Duration |
|---|---|---|---|---|
| **4** | **HIV** | **Microbiology** | Virology of HIV | 1 Hour |
| | | | Diagnosis of HIV | 1 Hour |
| | | **Pathology** | Pathogenesis of HIV Infection | 1 Hour |
| | | **Medicine** | Clinical features and Opportunistic infections in HIV | 1 Hour |
| | | **Pharmacology** | Treatment of HIV | 1 Hour |
| | | **Community Medicine** | Epidemiology of HIV | 1 Hour |
| | | | Prevention of HIV | 1 Hour |
| | | | NACO activities | 1 Hour |
| | | **F.M.T.** | Medico legal aspect of HIV | 1 Hour |
| **5** | **ENTERIC FEVER** | **Microbiology** | Bacteriology and of enteric fever | 1 Hour |
| | | **Pathology** | Pathology of enteric fever | 1 Hour |
| | | **Medicine** | Clinical features | 1 Hour |
| | | **Pharmacology** | Treatment | 1 Hour |
| | | **Community Medicine** | Epidemiology and prevention | 1 Hour |

**DURATION OF PARA-CLINICAL TEACHING :**

| | |
|---|---|
| Semesters | 03 |
| Teaching days | 360 |
| Teaching Hours | 250 |
| (As per MCI guidelines 1997). | |

## 5. LECTURES, TUTORIALS IN EACH SEMESTER

(Total Number, Topics)

| SEMESTER -I | |
|---|---|
| **GENERAL MICROBIOLOGY** | |
| **No.** | **Topics** |
| 1 | Introduction |
| 2 | Morphology-1 |
| 3 | Morphology-1 |
| 4 | Growth and nutrition |
| 5 | Sterilization-1 |
| 6 | Sterilization-2 |
| 7 | Genetics-1 |
| 8 | Genetics-2 |
| 9 | Host- parasite relationship-1 |
| 10 | Host- parasite relationship-2 |
| 11 | Antibiotic sensitivity and resistance |
| **IMMUNOLOGY** | |
| 12 | Introduction of immunology |
| 13 | Antigen |
| 14 | Immunoglobulins |
| 15 | Complement |
| 16 | Structure and function of Immune system-1 |
| 17 | Structure and function of Immune system-2 |
| 18 | Immune response |
| 19 | Ag- Ab reaction-1 |
| 20 | Ag- Ab reaction-2 |
| 21 | Hypersensitivity |
| 22 | Autoimmune diseases |
| 23 | Immunodeficiency diseases |
| 24 | Immunology of transplantation and malignancy |
| | Tutorial |
| | Tutorial On General Microbiology-I |
| | Tutorial On General .Microbiology-I |
| | Tutorial On Antigen & Antibody |
| | Tutorial On Immune Response & Complement |
| **SEMESTER -II** | |
| **SYSTEMIC BACTERIOLOGY** | |
| 25 | Staphylococci |
| 26 | Streptococci |
| 27 | Pneumococci |

| No. | Topics |
|---|---|
| 28 | Gram negative cocci |
| 29 | Enterobacteriacea-E.coli,Klebsiella, Proteus |
| 30 | Salmonella - I |
| 31 | Salmonella – II |
| 32 | Shigella |
| 33 | Vibrio |
| 34 | Pseudomonas |
| 35 | Corynebacterium. Diphtheriae |
| 36 | Bacillus |
| 37 | Haemophilus influenzae |
| 38 | Brucella |
| 40 | Bordetella |
| 41 | Yersinia |
| 42 | Anaerobiasis and Clostridia-1 |
| 43 | Clostridia-2 |
| 44 | Mycobacteria-1 |
| 45 | Mycobacteria-2 |
| 46 | Mycobacterium leprae |
| 47 | Non sporing anaerobes |
| 48 | Spirochaetes-1 |
| 49 | Spirochaetes-2 |
| 50 | Mycoplasma and Chlamydia |
| 51 | Rickettsiae |
| 52 | Miscellaneous bacteria |
| | Tutorial |
| | Tutorial On Gram Positive Cocci |
| | Tutorial On Gram Negative Cocci |
| | Tutorial On Gram Positive Bacilli |
| | Tutorial On Gram Negative Bacilli |
| | **MYCOLOGY** |
| 53 | Mycology-1 |
| 54 | Mycology-2 |
| 55 | Mycology-3 |
| 56 | Mycology-4 |
| | **SEMESTER -III** |
| | **VIROLOGY** |
| 57 | General properties of viruses-1 |
| 58 | General properties of viruses-2 |
| 59 | Lab diagnosis of viral infection ($2^{nd}$sem) |
| 60 | Bacteriophage |

| No. | Topics |
|---|---|
| 61 | Herpes |
| 62 | Pox and adenovirus |
| 63 | Picorna |
| 64 | Orthomyxovirus |
| 65 | Paramyxovirus |
| 66 | Retroviruses-1 |
| 67 | Retroviruses-2 |
| 68 | Arbovirus |
| 69 | Rabdovirus |
| 70 | Hepatitis- I |
| 71 | Hepatitis- II |
| 72 | Oncogenic viruses |
| 73 | Miscellaneous viruses |
| | **PARASITOLOGY** |
| 74 | Introduction and lab. Diagnosis |
| 75 | Intestinal protozoa-1 |
| 76 | Intestinal protozoa-2 |
| 77 | Leishmaniasis |
| 78 | Trypanosomes |
| 79 | Malaria-1 |
| 80 | Malaria-2 |
| 81 | Cestodes-1 |
| 82 | Cestodes-2 |
| 83 | Trematodes |
| 84 | Intestinal nematodes-1 |
| 85 | Intestinal nematodes-2 |
| 86 | Tissue Nematodes-1 |
| 87 | Tissue Nematodes-2 |
| 88 | Cryptosporidium and Toxoplasma |
| | **CLINICAL MICROBIOLOGY** |
| 89 | Lab diagnosis of PUO |
| 90 | Lab diagnosis of meningitis |
| 91 | Lab diagnosis of UTI |
| 92 | Lab diagnosis of STD |
| 93 | Lab diagnosis of GIT infections |
| 94 | Lab diagnosis of wound infection |
| 95 | Lab diagnosis of respiratory infection |
| 96 | Lab diagnosis of food poisoning |
| 97 | Microbiology of food, water and milk |
| 98 | Hospital acquired infections |

| No. | Topics |
|---|---|
| 99 | Bioterrorism |
| 100 | Emerging & re-emerging infection |
| 101 | Hand hygiene |
| | Tutorial |
| | Tutorial On Parasitology |
| | Tutorial On Virology |
| | Tutorial On Mycology |

## 6. HORIZONTAL INTEGRATED TEACHING

| Sr. No | Semester of MBBS | Topics to be covered |
|---|---|---|
| 1 | III rd Semester | • Pneumonia<br>• Enteric Fever |
| 2 | IV th Semester | • TB<br>• HIV |
| 3 | Vth Semester | • Myocardial infraction<br>• Malaria |

**7. Research methodology (10 sessions in II MBBS)**

**8. Communication skill (5 sessions in II MBBS)**

**9. Language sessions ( 5 sessions in II MBBS)**

**10. Practical classes:**

The practical classes for integrated teaching needs to be included in the syllabus as separate entities. This is also done within the limits of practical classes as laid down by MCI.

Following are the proposed list of practical classes which are to be included in the syllabus.

a) Mycobacterium tuberculosis
b) Human immunodeficiency virus
c) Salmonella typhi

| S.N. | **Practical Topics** |
|---|---|
| 1 | Microscopy |
| 2 | Morphology of Bacteria-I |
| 3 | Morphology of Bacteria-11 |
| 4. | Common Methods of Sterillisation |
| 5. | Growth Requirements of Bacteria: common Media |
| 6. | Principles and Microbiology- I Principles and Microbiology- II Methods of Diagnostic |
| 7. | Common Serological Reactions |
| 8. | Staphylococcus |
| 9. | Sterptococcus and Pneumococcus |
| 10. | Neisseria |
| 11. | Enterobacteria-I |
| 12. | Enteric fever (Salmonella typhi) |
| 13. | Vibrio and pseudomonas |
| 14. | Mycobacterium tuberculosis |
| 15. | M. leprae and Atypical Mycobacteria |
| 16. | Yersinia, Brucella, Haemophilus, Bordetella |
| 17. | Corynebacteria |
| 18. | Gram Positive Bacilli |
| 19. | Spirochaetes |
| 20. | Fungi |
| 21. | Rickettsia and Viruses |
| 22. | ***HIV (Human Immunodeficiency Virus)*** |
| 23. | Prasitology introduction |
| 24. | Intestinal Protozoa |
| 25. | Heamoflagellates |
| 26. | Plasmodia |
| 27. | Helminthology: Phylum Platyhelminthese-Cestodes |
| 28. | Phylum Platyhelminthes-Trematodes |
| 29. | Phylum Nemathlmininthes-Intestinal Nematodes |
| 30. | Phylum Nemathalminthes-Tissue Nematodes |
| 31. | Toxoplasma, Crytosporidium, Pneumocystis |
| 32. | Entomology |

## 11. EVALUATION:

### PLAN FOR INTERNAL ASSESSMENT

| Marks for Internal Assessment: |
|---|
| Theory : 15 |
| Practical : 15 |

Pattern for computation of ' Internal Assessment ' in the subject of Microbiology. (Applicable to the batch joining in June 2001)

**THEORY:**

Internal assessment shall be computed on the basis of three term ending examinations (two terminals & one preliminary examination before the university examination).

| **Examination** | **No. of Papers** | **Pattern** | **Duration of each paper** | **Total Mar** |
|---|---|---|---|---|
| 1ST TERMINAL | One -50 Marks | MCQs- 20(10 Marks)<br>SAQs- 8/9 (24 Marks)<br>LAQs- 2 (16 Marks) | 2 Hours 30 Minutes | 50 |
| 2ND TERMINAL | One - 50 marks | MCQs- 20(10 Marks)<br>SAQs- 8/9 (24 Marks)<br>LAQs- 2 (16 Marks) | 2 Hours 30 Minutes | 50 |
| PRELIMINARY (As per final University pattern) | Two - 40 marks each | Each paper-<br>Sec A<br>One line answer 8/10 (08 Marks)<br>LAQs- 2/3(14 Marks)<br>Sec B<br>SAQs- 6/8 (18 Marks)<br>(Total- 40 Marks paper) | 2 Hours As for find | 80 |
| | | | **Total** | **180** |

Final internal assessment in THEORY shall be computed on the basis of actual marks obtained out of 180+two mid-term examinations 30 (Total 80+30=210) reduced to marks out of 15.

**PRACTICAL:**

Internal assessment in PRACTICALS shall be computed on the basis of three term ending examinations and the marks allotted to practical record book.

| Examination | Pattern | Marks | Total |
|---|---|---|---|
| 1ST TERMINAL | Exercise (eg.Gram's Stain) | 10 | 40 |
| | Spotting | 10 | |
| | Viva | 20 | |
| 2ND | Exercise/Exercises (eg.Gram's & Z.N. Stain) | 10 | 40 |
| | Spotting | 10 | |
| | Viva | 20 | |
| PRILIMINARY EXAM As per University pattern | Gram's Stain | 05 | 40 |
| | Ziehl-Neelson Stain | 05 | |
| | Stool Exam. | 05 | |
| | Spotting | 10 | |
| | Viva | 15 | |
| | | **Total** | **120** |

| **THERE WILL BE 03 MID-TERM EXAMINATIONS** |
|---|
| 1st Mid - term examination MCQ type – 15 marks |
| 2nd Mid - term examination Practical/ MCQ – 15 marks |
| 3rd Mid - term examination Journal/ MCQ – 15 marks |
| Best two of three performances will be considered for internal assessment |

Actual marks obtained out of 120 shall be reduced to out of 12. Add marks obtained out of 3 for Practical Record Book. Total internal assessment marks for Practical shall be out of (12+3) 15.

| **Total Internal Assessment:** | |
|---|---|
| Theory | 15 |
| Practical | 15 |
| Total: | 30 |

**7. PATTERN OF FINAL EXAMINATION**

**METHODS :**

**THEORY, PRACTICAL & VIVA**

| No. | | Total Marks |
|---|---|---|
| 1 | Theory ( 2 papers – 40 marks each) | 80 |
| 2 | Oral (Viva) | 14 |
| 3 | Practical | 26 |
| 4 | Internal assessment (theory-15, practicals-15) | 30 |
| | **Total** | **150** |

**Passing:** A candidate must obtain 50% in aggregate with minimum 50% in Theory +orals, 50% in Practicals.

**PATTERN OF THEORY EXAMINATION:**

UNIVERSITY PATTERN OF EXAMINATION **(**Theory Examination)

**Time Allowed: -** 2.00 Hours For Each Paper

| | | | | **Marks** | **Total** |
|---|---|---|---|---|---|
| **Paper I** | SECTION **A** | Question 1 | One Sentence Answer Questions (8 Out of 10) | 8X1=08 | 22 |
| | | Question 2 | Long Answer Questions (2 Out of 3)* | 7X2=14 | |
| | SECTION **B** | Question 3 | Short Answer Questions (6 Out of 8) | 6X3=18 | 18 |
| | | | | **Total =** | **40** |
| | SECTION **A** | Question 1 | One Sentence Answer Questions (8 Out of 10) | 8X1=08 | 22 |
| | | Question 2 | Long Answer Questions (2 Out of 3)* | 7X2=14 | |
| **Paper II** | SECTION **B** | Question 3 | Short Answer Questions (6 Out of 8) | 6X3=18 | 18 |
| | | | | **Total =** | **40** |
| *** One compulsory question of 7 marks on applied Microbiology in each paper**. | | | | | |

**Paper I -**Related to General Microbiology & Systematic Bacteriology.
**Paper II -**Related to Parasitology, Mycology, Virology & Immunology.

## (a.) TOPIC DISTRIBUTION

**A) MICROBIOLOGY PAPER - I**

- General Microbiology
- Systematic bacteriology including Rickettsia, Chlamydia and Mycoplasma
- Related applied microbiology.

**B) MICROBIOLOGY PAPER II**

- Parasitology
- Mycology
- Virology
- Immunology
- Related applied Microbiology.

## (b.) MARKING SCHEME

Each paper of 40 marks as shown in the above table.

## (c.) NATURE OF PRACTICALS AND DURATION

Practical examination in MICROBIOLOGY will be of 26 marks and oral (viva) of 14 marks of THREE hours duration.

| | |
|---|---|
| Q.1: Gram staining | 6 |
| Q.2: Ziehl – Neelsen's staining | 6 |
| Q.3: Stool examination for Ova/cyst | 4 |
| Q.4: Spot identification (Ten spots)* | 10 |
| **Total** | **26** |

* Spots- Microscopic slides, Mounted specimen, Instruments used in laboratory, Serological tests, Inoculated culture medium, Sterile culture medium, Vaccines / serum), Lab Animal.

The journal should be scrutinized by the teacher concerned and presented during university examination."

## (d.) VIVA (Two Tables)

| | **Marks** |
|---|---|
| A: General & Systemic Microbiology | 7 |
| B: Mycology, Parasitology, Virology, Immunology | 7 |

## 8. BOOKS RECOMMENDED

### 8.1 Textbooks : -

1. Ananthanarayan and Paniker's textbook of Microbiology 9th edition
2. A Textbook of Microbiology – P. Chakraborty
3. Parasitology (protozoology and Helminthology) edition- 13th K.D Chattergee
4. Textbook of Medical parasitology (Panicker)

### 8.2 Reference books:-

1. Textbook of Medical Mycology (Jogdish Chander)
2. Principle and Practice of Infectious diseases-by Mandell, seventh edition.