

CHETTINAD ACADEMY OF RESEARCH & EDUCATION
(Deemed to be University under section 3 of the U.G.C. Act 1956)



REGULATIONS & SYLLABUS

M.D. MICROBIOLOGY

CHETTINAD ACADEMY OF RESEARCH AND EDUCATION

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CHETTINAD ACADEMY OF RESEARCH AND EDUCATION

Regulations for M.D. Pre and Para Clinical Courses

1. INTRODUCTION:

M.D. Pre and Para Clinical course is a three year post graduate program under the Faculty of Medicine for students with an Under Graduate Degree in Medicine. This program is a taught course that covers relevant topics and a research project in the area of specialization. This program shall be competence based and learning shall be essentially autonomous and self directed and supplemented with practical and laboratory work. The curriculum shall have modular approach to learning. The research component is through original exploration and experiments culminating in the research project. This program shall impart advanced theoretical and practical aspects of subjects previously studied in a more generalized manner at the undergraduate level.

These courses are aimed at imparting higher level of training to qualified under graduate medical students in various branches of M.D. Pre and Para Clinical subjects and to utilize this learning to the needs of community.

In exercise of the powers conferred under sub rule (a) and (g) of Rule 8 (b) of Memorandum of Association and Clause 2.1, Chapter III of Bye-laws of Chettinad Academy of Research and Education, the Academic Council hereby makes the following regulations:

2. SHORT TITLE AND COMMENCEMENT:

These Regulations shall be called the "Regulations for M.D. Pre and Para Clinical Courses of Chettinad Academy of Research and Education. These regulations are subject to modifications as may be approved by the Academic Council from time to time.

3. GOAL:

The goal of postgraduate medical education shall be to produce competent specialists and/or medical teachers:

- i) who 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
- ii) who shall have mastered most of the competencies, pertaining to the specialty, that are required to be practiced at the secondary and the tertiary levels of the health care delivery system.

- iii) who shall be aware of the contemporary advance and developments in the discipline concerned.
- iv) who shall have acquired a spirit of scientific inquiry and is oriented to the principals of research methodology and epidemiology and
- v) who shall have acquired the basic skills in teaching of the medical and paramedical professionals.

4. AIMS AND OBJECTIVES:

At the end of the Post Graduate training in the discipline concerned the student shall be able to:

- i) Recognize the importance of the concerned speciality in the context of the health needs of the community and the national priorities in the health sector.
- ii) Practice the speciality concerned ethically and in step to the principles of primary health care.
- iii) Demonstrate sufficient understanding of the basic sciences relevant to the concerned speciality.
- iv) Identify social, economic, environmental, biological and emotional determinants of health in a given case, and take them into account while planning therapeutic, rehabilitating, preventive and primitive measures/ strategies.
- v) Diagnose and manage majority of the conditions in the speciality concerned on the basis of clinical assessment, and appropriately selected and conducted investigations.
- vi) Plan and advise measures for the prevention and rehabilitation of patients suffering from disease and disability related to the speciality.
- vii) Demonstrate skills in documentation of individual case details as well as morbidity and mortality rate relevant to the assigned situation.
- viii) Demonstrate empathy and human approach towards patients and their families and exhibit interpersonal behavior in accordance with the societal norms and expectations.
- ix) Play the assigned role in the implementation of National Health Programme effectively and responsibly.
- x) Organize and supervise the chosen/assigned health care services demonstrating adequate managerial skills in the clinic/hospital or the field situation.
- xi) Develop skills as a self-directed learner, recognize continuing education needs: select and use appropriate learning resources.
- xii) Demonstrate competence in basic concepts of Research Methodology and epidemiology, and be able to critically analyze relevant published research literature.
- xiii) Develop skills in using educational methods and techniques as applicable to the teaching of Medical/ Nursing students, General Physicians and Paramedical Health Workers.
- xiv) Function as an effective leader of a health team engaged in health care, research or training.

5. COMPONENTS OF THE POSTGRADUATE CURRICULUM:

The major components of the Postgraduate curriculum shall be:

- Theoretical knowledge
- Practical and clinical skills
- Writing Thesis/Research articles
- Attitudes including communication skills
- Training in research methodology, Medical Ethics and Medico legal aspects.

6. NOMENCLATURE OF POSTGRADUATE COURSES:

The nomenclature of Post Graduate Degree should be as laid down in the Post Graduate Medical Education Regulations prescribed by the Medical Council of India.

7. ELIGIBILITY FOR ADMISSION:

Every student, selected for admission to a post graduate medical course in Chettinad University on acquiring M.B.B.S degree or an equivalent qualification thereto shall have obtained permanent registration with the Medical Council of India, or any of the State Medical Council(s) or shall obtain the same within a period of one month from the date of his/her admission, failing which his/her admission shall stand cancelled.

Provided that in the case of a foreign national, the Medical Council of India may, on payment of the prescribed fee for registration, grant temporary registration, for the duration of the post graduate course limited to the medical college/institution to which the candidate is admitted for the time being exclusively for pursuing post graduate studies.

Provided further the temporary registration to such foreign national shall be subject to the condition that such person is duly registered with appropriate registering authority in his own country wherefrom he has obtained his basic medical qualification and is duly recognized by the corresponding Medical Council or concerned authority.

8. RECOGNITION FEE AND ELIGIBILITY CERTIFICATE:

Candidates who have passed the M.B.B.S Degree Examination other than that conducted by Chettinad Academy of Research and Education shall obtain Eligibility Certificate from this University at the time of admission and also remit recognition fee as prescribed.

9. REGISTRATION:

A candidate admitted to the Post Graduate Course shall register with the University by submitting the prescribed application form for registration, duly filled in along with the prescribed fee, through the Head of the Institution.

10. PERIOD OF TRAINING /DURATION OF THE COURSE:

The duration of certified study and training for the M.D. Pre and Para Clinical Courses shall be three completed years including the period of examination.

Provided that in the case of students possessing a recognised two year postgraduate diploma course in the same subject, the period of training, including the period of examination, shall be two years.

11. COMMENCEMENT OF THE COURSE:

The course shall ordinarily commence from 2nd May of the Academic year.

12. CUT OFF DATES FOR ADMISSION:

Candidates admitted up to 31st May of the Academic year shall be registered for the same Academic Year and shall be eligible to take up the final examination along with others students admitted prior to their admission. There shall be no admission of students in respect of any academic session beyond 31st May for postgraduate courses under any circumstances. The University shall not register any student admitted beyond the said date.

13. SYLLABUS:

The Syllabus for the course shall be as specified in the annexure to these Regulations.

14. MEDIUM OF INSTRUCTION:

English shall be the medium of instruction for all the subjects of study and for examination.

15. WORKING DAYS / ATTENDANCE *

All the candidates joining the Post Graduate training programme shall work as "Full Time Residents" during the period of training and shall attend not less than 85% (Eighty Five percent) of the imparted training during each academic year including assignments, assessed full time responsibilities and participation in all facets of the educational process as per MCI norms. 85% attendance is compulsory for all the Post Graduate students for every academic year. The Attendance details may be submitted to the Controller of Examinations at the end of every academic year. The student should also be intimated quarterly regarding the lack of attendance.

16. CONDONATION FOR LACK OF ATTENDANCE *

The discretionary power of condonation of shortage of attendance to appear for University Examination rests with the Vice Chancellor.

Lack of attendance can be condoned up to a maximum of 5% of the minimum attendance Required in the following exceptional circumstances:

- (i) Any illness/ accident (for which Medical certificate from a registered medical practitioner must be produced)
- (ii) Any unforeseen tragedy in the family (should produce the letter from the parent/guardian)

- (iii) Participation in NCC/NSS and other co curricular activities representing the Institution / University. (Certificate from competent authority is required)

For any of the above reasons, request shall be made by the candidate with prescribed fees to the Controller of Examination through proper channel, ten days prior to the commencement of the theory examination. Based on the recommendation of the Head of the Institution, the Controller of Examination shall obtain the approval of the Vice Chancellor for admission of the candidate to the University Examination.

***Sl.No.15 & 16 Amended vide XVIII meeting of Academic Council dated 15.04.2014**

and to be replaced as detailed below; -

In the existing regulations for M.D. Pre – Para and clinical courses, it has been stipulated that 85% attendance is compulsory for all the Post graduate students for every academic year. This has been modified to 80% attendance in keeping with Statutory Body norms. There shall be no condonation for attendance. The attendance criteria will hence read as follow as in MCI regulations.

"All the candidates joining the Post Graduate training programme shall work as 'Full Time Residents' during the period of training and shall attend not less than 80% (Eighty percent) of the imparted training during each academic year including assignments, assessed full time responsibilities and participation in all facets of the educational process."

The Attendance details shall be submitted to the Controller of Examinations at the end of each academic year. The student should also be intimated quarterly regarding the lack of attendance.

16 (a) STIPEND AND GRANT OF LEAVE

The Post Graduate students undergoing Post Graduate Degree / Diploma/Super-Specialty course shall be paid stipend on par with the stipend being paid to the Post Graduate students of State Government Medical Institutions / Central Government Medical Institutions, in the State / Union Territory where the institution is located. Similarly, the matter of grant of leave to Post Graduate students shall be regulated as per the respective State Government rules.

17. MIGRATION / TRANSFER OF CANDIDATES:

Under no circumstances, Migration/transfer of student undergoing any Post Graduate degree course shall be permitted by the University/Authority

18. TRAINING PROGRAMME:

The training given with due care to the Post Graduate students in the recognised institutions for the award of various Post Graduate medical degrees shall determine the

expertise of the specialist and / or medical teachers produced as a result of the educational program during the period of stay in the institution.

Every institution undertaking Post Graduate training program shall set up an Academic cell or a curriculum committee, under the chairmanship of a senior faculty member, which shall work out the details of the training program in each speciality in consultation with other department faculty staff and also coordinate and or the implementation of these training Programs.

The training programmes shall be updated as and when required. The structured training programme shall be written up and strictly followed, to enable the examiners to determine the training undergone by the candidates and the Medical Council of India inspectors to assess the same at the time of inspection.

During the training for Post Graduates to be awarded, there shall be proper training in basic medical sciences related to the disciplines concerned; during the training for the degree to be awarded in basic medical sciences, there shall be training in applied aspects of the subject; and there shall be training in allied subjects related to the disciplines concerned. In all Post Graduate training programmes, both clinical and basic medical sciences, emphasis is to be laid on preventive and social aspects and emergency care facilities for autopsies, biopsies, cytopses, endoscopic and imaging etc. also be made available for training purposes. The Post Graduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.

Training in Medical Audit, Management, Health Economics, Health Information System, basics of statistics, exposure to human behaviour studies, knowledge of pharmaco – economics and introduction to non- liner mathematics shall be imparted to the Post Graduate students.

Implementation of the training programmes for the award of various Post Graduate Degree shall include the following: -

Basic Medical Sciences

- (i) Lectures, Seminars, Journal Clubs, Group Discussions, Participation in laboratory and experimental work, and involvement in research studies in the concerned speciality and exposure to the applied aspects of the subject relevant to clinical specialities.

(ii) Clinical disciplines

In service training, with the students being given graded responsibilities in the management and treatment of patients entrusted to their care: participation in seminars, journal clubs, group discussions, clinical Meetings, Grand rounds, and Clinico - Pathological Conferences; practical training in Diagnosis and medical and Surgical treatment; training in the Basic Medical Sciences, as well as in allied clinical specialities.

The training programme shall be on the same pattern as for M.D. / M.S. in clinical disciplines; practical training including advanced Diagnostic, Therapeutic and Laboratory techniques, relevant to the subject of specialization.

19. MAINTENANCE OF LOG BOOK

- a) Every Post Graduate student shall maintain a record (Log) book containing skills, the candidate as acquired during the training period certified by the various heads of department where the candidate as undergone training including outside the institution.
- b) The students shall maintain a Record Book (Log Book) of the work carried out by them & training program undergone during the period of training including details of procedures carried out independently or assisted by the candidate. The log book will be checked by the faculty members imparting the training.
- c) At the end of the course, the candidate should summarise the contents and get the record (Log) book certified by the Head of the Department.
- d) The record (Log) book should be submitted at the time of practical examination for the scrutiny of the Board of Examiners.

20. THESIS / DISSERTATION AND EVALUATION

- a) All Candidates admitted to undergo M.D. Pre and Para Clinical Courses shall be assigned a topic for dissertation / thesis by the Head of the concerned unit and the title of the topic assigned to the candidates be intimated to the Controller of Examination of the University by the Head of the Department through the Head of the Institution before end of the First year.
- b) The dissertation / thesis shall be a bound volume of minimum 50 pages and not exceeding 75 pages of typed matter (double line spacing and on one side only) excluding certification, acknowledgements, annexure and bibliography.
- c) Four copies of dissertation shall be submitted six months prior to the commencement of the examination on the prescribed date to the controller of examination of the University.
- d) Two copies are to be submitted as an electronic version of the entire dissertation in a standard C.D. format mentioning the details and technicalities used in the C.D. format.
- e) The concerned Professors / Readers are to supervise and to see that the dissertation is done properly utilising the clinical materials of their own department / institution. The students must learn the design and interpretation of research studies, responsible use of informed consent and research methodology and interpretation of data and statistical analysis. They should seek the help of qualified staff members in the conduct of research. They must learn to use library and the computer-based research. This training will help them to develop skills in planning, designing and conduct of research studies.
- f) All candidates on admission will be allotted one of the department faculties who have fulfilled the requirement to be guides for purposes of guiding Dissertation/thesis. The topic for dissertation shall be finalized and discussed in the departmental faculty meeting and allotted to the individual candidates before the completion of 3 months after admission. The purpose of dissertation is to develop in the candidate the ability

to perform an independent study keeping the principles and research methodology in mind. The candidate will therefore work on the prospective problem either within the department or in collaboration with other departments. There will be continuous monitoring of the dissertation work by the guides and co-guide and by the other department staff throughout the course. The candidate will present the progress of the dissertation to the faculty on the completion of 1 ½ years for monitoring and feedback. The completed dissertation should be submitted not later than 6 months before final examination.

- g) The theory examinations shall be held sufficiently earlier than the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the start of the Clinical/Practical and Oral examination.
- h) The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical. A candidate shall be allowed to appear for Theory and Practical/Clinical examination only after the acceptance of thesis by the examiners. The thesis shall be evaluated under the following heading:
 - 1) Approved
 - 2) Not approved

In all cases the approval shall be given before 3 months of the date of appearing for the examination and this will be essential before the candidate is allowed to appear for the written examination.

21.SCHEDULE OF EXAMINATIONS:

The examination for M.D. Pre and Para Clinical courses shall be held at the end of 3rd academic year. An academic term shall mean six month's training period."

22.SCHEME OF EXAMINATIONS *

Post Graduate Examinations shall consist of Dissertation/Thesis, Written Paper (Theory), Practical and Viva voce.

The examinations shall be organised on the basis of "Marking system" to evaluate and to certify candidate's level of knowledge, skill and competence at the end of the training.

- a. **Dissertation/Thesis:** Every candidate shall carry out and submit a Dissertation/Thesis as explained and approval of Dissertation/Thesis shall be a precondition for a candidate to appear for the final examination.
- b. A postgraduate student of a postgraduate degree course would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.

- c. **Theory:** A Written Examination shall consist of four theory papers each of three hours duration. Each paper carries 100 marks (Total 400 marks). Out of these one shall be of Basic Medical Sciences and one shall be of Recent advances. The theory examinations shall be held well before the Practical examination, so that the answer books can be assessed and evaluated well before the commencement of the Practical and Oral examination.
- d. **Practical Examination:** Practical Examination shall be conducted to test the knowledge and competence of the candidates for making valid and relevant observations based on the experimental / laboratory studies and ability to perform such studies as are relevant to the subject.
- e. **Oral Examination:** The Oral examination shall be thorough and shall aim at assessing the candidate's knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the speciality, which form a part of the examination.
- f. **Pedagogy:** Pedagogy to evaluate the communication and teaching skills, and subject knowledge of the student. The topic for Pedagogy will be given at the end of 1st day of the Practical Examination.

THEORY	
No. of Theory Papers	4
Marks for each Theory Paper	*100
Total marks for Theory Papers	400
Passing Minimum for Theory	200/400
Total marks for PRACTICAL	300
Passing Minimum for Practical	150/300
Viva voce	50
Pedagogy	50
Passing minimum for Practical including Viva voce / Pedagogy	200/400

- i) If any candidate fails even under one head, he/she has to re-appear for whole examination.
- ii) Theory papers consist of 2 essay questions of 25 marks each (2 X 25 = 50) & 5 short notes of 10 marks each (5 X 10 = 50). Total =100 marks each.

***SI.No.22 (ii) Amended vide XVIII meeting of Academic Council Dated**

15.04.2014 and to be replaced as detailed below:

Resolved to approve 2 Essay Questions (2 x 20 marks) and 10 short notes (10 x 6 marks) for all post graduate medical / broad and higher speciality courses which will take effect for the students appearing for first time examination from March 2015 .

Resolved to approve 2 essays (2 x 20 marks) and 6 short notes (6 x 10 marks) for theory paper in all M. D/ M.S. courses by the Academic Council in its XX meeting held on 25.03.2015.

***Resolved to approve that an examinee should obtain minimum 40% marks in each theory paper and not less than 50% marks cumulatively in all the four papers in P.G. degree examination to be cleared as passed which will be implemented prospectively. (Academic Council in its XX meeting held on 25.03.2015).**

23.EXAMINERS:

All the Post Graduate Examiners shall be recognized Post Graduate Teachers holding recognized post graduate qualification in the subject concerned. For all Post Graduate Examinations, the Minimum number of examiners shall be Four, out of which at least two (50%) shall be external examiners who shall be invited from other recognized universities from outside the state / outside university. The remaining two will be internal examiners.

The qualification and teaching experience for appointment of examiner shall be as detailed below and by the guidelines of Medical Council of India issued from time to time.

No person shall be appointed as an internal examiner in any subject unless he/she has three years experience as recognized PG teacher in the concerned subject. For external examiners, he/she should have minimum six years of experience as recognized PG teacher in the concerned subject'. "An examiner shall ordinarily be appointed for not more than two consecutive terms"

Under exceptional circumstances, examinations may be held with 3 (three) examiners provided two of them are external and Medical Council of India is intimated for the justification of such action prior to publication of result for approval. Under no circumstances, result shall be published in such cases without the approval of Medical Council of India.

24. MAXIMUM NUMBER OF CANDIDATES:

The maximum number of candidates to be examined in clinical/practical and oral on any day shall not exceed eight for M.D. Pre and Para Clinical Courses.

25.*NUMBER OF EXAMINATIONS:

The University shall conduct not more than two examinations in a year, for any subject, with an interval of not less than 4 and not more than 6 months between the two examinations. The examination shall be conducted in September and March.

***Sl. No.25 Amended in XXI meeting of Academic Council dated 22.07.2015**

Resolved to approve the commencement of M.D. /M.S. University examination in April (for Regular Batch) and October (for Supplementary Batch).

26. REVALUATION OF ANSWER PAPERS:

There shall be no revaluation of answer papers. However, re-totaling is allowed in the failed subjects with the payment of required fee fixed by the University within 15 days from the date of receipt of statement of marks.

SYLLABUS

M.D. (MICROBIOLOGY)

PREAMBLE

The main aim of this course is to train students of Medicine in the field of Medical Microbiology. Theoretical as well as practical training is imparted to the candidates in the sub-specialities viz. Bacteriology, Virology, Parasitology, Immunology and Mycology so that they can participate in good patient care and prevention of infectious diseases in the community. They are introduced to basic research methodology so that they can conduct fundamental and applied research. They are also imparted training in teaching methods in the subject which may enable them to take up teaching assignments in Medical Colleges/Institutes.

AIMS & OBJECTIVES

At the end of the course the students should be able to:

1. Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology and mycology.
2. Plan, execute and evaluate teaching assignments in medical microbiology and
3. Plan, execute, analyse and present the research work in medical microbiology

Specific Learning Objectives:

- a) Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology and mycology.
- b) Plan, execute and evaluate teaching assignments in Medical Microbiology.

- c) Plan, execute, analyse and present the research work in Medical Microbiology.
- d) Conduct such clinical and experimental research, as would have a significant bearing on human health and patient care.
- e) Encourage interaction with the allied departments by rendering services in advanced laboratory investigations and relevant expert opinion.
- f) Encourage the student to participate in various workshops / seminars / journal clubs / demonstration in the allied departments, to acquire various skills for collaborative research.
- g) Uphold the prestige of the discipline amongst the fraternity of doctors.
- h) Undergo specialization in any of the above subspecialties.

Post-Graduate Training:

Based on the available facilities, department can prepare a list of post-graduate experiments pertaining to basic and applied microbiology. Active learning should form the mainstay of post-graduate training. There should be lectures for post-graduates along with seminars, symposia, group-discussions, journal clubs. They should render special investigative services in their respective area of specialization. Each college should have a Medical Education Unit to generate teaching resource material for U.G. and evolving of problem-solving modules.

Post-Graduate Examinations:

The Post-graduate examinations should be in 3 parts:

- 1) **Thesis, to be submitted by each candidate at least 6 months before the date of commencement of the theory examination.**
- 2) **Theory: There shall be four theory papers – as given separately.**
- 3) **Practicals and Viva/Oral.**

Course Content:

General Microbiology

- 1) History of Microbiology.
- 2) Microscopy.

- 3) Biosafety including universal containment.
- 4) Physical and biological containment.
- 5) Sterilization and disinfection.
- 6) Morphology of bacteria and other microorganisms.
- 7) Nomenclature and classification of microorganisms.
- 8) Normal flora of human body.
- 9) Growth & nutrition of bacteria.
- 10) Bacterial metabolism.
- 11) Bacterial toxins.
- 12) Microbiology of hospital environment.
- 13) Microbiology of air, milk and water.
- 14) Host-parasite relationship.
- 15) Antibacterial substances and drug resistance.
- 16) Bacterial genetics & bacteriophages.
- 17) Molecular genetics relevant for medical microbiology.
- 18) Molecular techniques in diagnosis of microbial infections.
- 19) Quality assurance & quality control in microbiology.
- 20) Accreditation of laboratories.

Immunology:

- 1) Components of immune system.
- 2) Innate and acquired immunity.
- 3) Cells involved in immune response.
- 4) Antigens.
- 5) Immunoglobulins.

- 6) Mucosal immunity.
- 7) Complement.
- 8) Antigen & antibody reactions.
- 9) Hypersensitivity.
- 10) Cell mediated immunity.
- 11) Cytokines.
- 12) Immunodeficiency.
- 13) Auto-immunity.
- 14) Immune tolerance.
- 15) MHC complex.
- 16) Transplantation immunity.
- 17) Tumour immunity.
- 18) Vaccines and immunotherapy.
- 19) Measurement of immunological parameters.
- 20) Immunological techniques.
- 21) Immunopotentialiation & immunomodulation.
- 22) Immuno Haematology.

Systemic Bacteriology:

- 1) Isolation & identification of bacteria.
- 2) Gram positive cocci of medical importance including Staphylococcus, Micrococcus, Streptococcus, Anaerobic cocci, etc.
- 3) Gram negative cocci of medical importance including Neisseria, Branhamella, Moraxella, etc.

- 4) Gram positive bacilli of medical importance including Lactobacillus, Coryneform organisms, Bacillus & Aerobic bacilli, Actinomyces, Nocardia, Actinobacillus and other Actinomycetales, Erysipelothrix, Listeria, Clostridium and other spore bearing Anaerobic bacilli, etc.
- 5) Gram negative bacilli of medical importance including Vibrios, Aeromonas, Plesiomonas, Haemophilus, Bordetella, Brucella, Gardnerella, Pseudomonas & other non-fermenters, Pasturella, Francisella, Bacteriodes, Fusobacterium, Leptotrichia and other anaerobic gram negative bacilli, etc.
- 6) Helicobacter, Campylobacter & Spirillum.
- 7) Enterobacteriaceae.
- 8) Mycobacteria.
- 9) Spirochaetes.
- 10) Chlamydiae.
- 11) Mycoplasmatales; Mycoplasma, Ureaplasma, Acholeplasma and other Mycoplasmas.
- 12) Rickettsiae, Coxiella, Bartonella, etc.
- 13) Miscellaneous bacteria.

Mycology:

- 1) General characteristics & classification of fungi.
- 2) Morphology & reproduction of fungi.
- 3) Isolation and identification of fungi.
- 4) Tissue reactions to fungi.
- 5) Yeasts and yeast like fungi of medical importance including Candida, Cryptococcus, Malassezia, Trichosporon, Geotrichum, Saccharomyces, etc.
- 6) Mycelial fungi of medical importance including Aspergillus, Zygomycetes, Pseudoallescheria, Fusarium, other dematiaceous hyphomycetes and other hyalohyphomycetes, etc.
- 7) Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides,

Sporothrix, Penicillium marneffeii, etc.

8) Dermatophytes.

9) Fungi causing mycetoma, keratomycosis & otomycosis.

10) Phythium insidiosum.

11) Prototheca.

12) Pneucocystis carinii infection; Pneumocystis jeroviei.

13) Rhinosporidium seeberi & Loboia loboii.

14) Common laboratory contaminant fungi.

15) Mycetism & mycotoxicosis.

16) Antifungal agents & invitro antifungal susceptibility tests.

Virology:

1) General properties of viruses.

2) Classification of viruses.

3) Morphology: Viral structure, Bacteriophages.

4) Viral replication.

5) Isolation & identification of viruses.

6) Cultivation of viruses.

7) Epidemiology and Pathogenesis of viral infections.

8) Genetics of viruses.

9) DNA viruses of medical importance including Poxviridae, Herpesviridae, Adenoviridae, Hepadna virus, Papova and Parvo viruses, etc.

10) RNA viruses of medical importance including Enteroviruses, Togaviridae, Flaviviruses, Orthomyxoviruses, Paramyxoviruses, Reoviridae, Rhabdoviridae, Arenaviridae,

Bunyaviridae, Retroviridae, Filoviruses, Human immunodeficiency virus, Arboviruses, Coronaviridae, Calciviruses, etc.

11) Slow viruses including prions.

12) Oncogenic & Teratogenic Viruses.

13) Hepatitis viruses.

14) Virioids.

15) Unclassified viruses.

16) Vaccines, anti-viral drugs & anti-viral agents.

Parasitology:

1) General characters & classification of parasites.

2) Laboratory diagnosis of parasitic infections.

3) Protozoan parasites of medical importance including Entamoeba, Free living amoebae, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium, Toxoplasma, Sarcocystis, Cryptosporidium, Microsporidium, Cyclospora, Isospora, Babesia, Balantidium, etc.

4) Helminths of medical importance including those belonging to Cestodes (Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipylidium, Multiceps, etc.), Trematodes (Schistosomae, Fasciola, Fasciolopsis, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis, etc.) and Nematodes (Trichiuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius, Filarial worms, Dracunculus, etc.).

5) Cultivation of Parasites.

6) Entomology: common arthropods & other vectors viz., mosquito, sandfly, ticks, mite, cyclops, louse, myasis.

7) Antiparasitic agents.

Applied Microbiology:

1) Epidemiology of infectious diseases.

2) Hospital acquired infections.

- 3) Management of hospital waste.
- 4) Investigation of an infectious outbreak.
- 5) Infections of various organs and systems of human body viz., respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive tract infections, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear & nose, septicaemia, endocarditis, haemorrhagic fever, etc.
- 6) Opportunistic infections.
- 7) Sexually transmitted diseases.
- 8) Vaccinology: principle, methods of preparation, administration of vaccines.
- 9) Information technology (Computers) in microbiology.
- 10) Automation in Microbiology.
- 11) Statistical analysis of microbiological data and research methodology.
- 12) Animal and human ethics involved in microbiological work.

Practical Training :

General Bacteriology, Systemic Bacteriology and Applied Microbiology –

- 1) Collection / transport of specimens for microbiological investigations.
- 2) Preparation, examination & interpretation of direct smears from clinical specimens.
- 3) Plating of clinical specimens on media for isolation, purification, identification and quantification purposes.
- 4) Preparation of stains viz., Gram, Albert's, capsules, spores, Ziehl Neelsen (ZN) Silver impregnation stain and special stains, etc.
- 5) Preparation and pouring of media like Nutrient agar, Blood agar, Mac-conkey agar, Sugars, Serum sugars, triple sugar iron agar, Robertson's cooked meat broth, Lowenstein Jensens medium, Sabouraud's dextrose agar, etc.
- 6) Preparation of reagents – oxidase, Kovac etc.
- 7) Quality control of media, reagents, etc.

- 8) Operation of autoclave, hot air oven, distillation plant, filters like sietz and membrane filters.
- 9) Care and operation of microscopes.
- 10) Washing and sterilization of glassware (plugging and packing).
- 11) Care and maintenance of common laboratory equipments like water bath, centrifuge, refrigerators, incubators, etc.
- 12) Aseptic practices in laboratory and safety precautions.
- 13) Sterility tests.
- 14) Identification of bacteria of medical importance upto species level (except anaerobes which could be upto generic level).
- 15) Techniques of anaerobiosis.
- 16) Tests for Motility: hanging drop, Cragie's tube, dark ground microscopy for spirochaetes.
- 17) In-vitro toxigenicity tests – Elek test, Naegler's reaction.
- 18) Special tests – Bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for Mycobacterium, Satellitism, CAMP test, catalase, slide & tube Coagulase test.
- 19) Preparation of antibiotic discs; performance of antimicrobial susceptibility testing eg., Kirby- Bauer, Stoke's method, Estimation of Minimal Inhibitory / Bactericidal concentrations by tube /plate dilution methods.
- 20) Test for Beta-lactamase production.
- 21) Inoculation of infective material by different routes in animals.
- 22) Bleeding techniques of animals including sheep.
- 23) Performance of autopsy on animals & disposal of animals.
- 24) Animal pathogenicity / toxigenicity tests for C.tetani, S.pneumoniae, K.pneumoniae, etc.
- 25) Care and breeding of laboratory animals viz,. mice, rats, guinea pigs, rabbits, etc.
- 26) Testing of disinfectants – Phenol coefficient and "in use" tests.
- 27) Quantitative analysis of urine by pour plate method and semi quantitative analysis by standard loop tests for finding significant bacteriuria.

- 28) Disposal of contaminated materials like cultures.
- 29) Disposal of infectious waste.
- 30) Bacteriological tests for water, air and milk.
- 31) Maintenance & preservation of bacterial cultures.
- 32) Intradermal test like mantoux.

Practical Training in Immunology:

- 1) Collection of blood by venepuncture, separation of serum and preservation of serum for short and long periods.
- 2) Preparation of antigens and their standardization.
- 3) Preparation of antiserum in laboratory animals.
- 4) Performance of serological tests viz., widal, Brucella agglutination, Weil Felix, cold agglutination, VDRL, Paul Bunnel, Rose Waaler, IFA.
- 5) ELISA.
- 6) Latex and staphylococcal co-agglutination test separation of lymphocyte.
- 7) Separation of Lymphocyte and T cell rosette.
- 8) Immuno-electrophoresis.

Practical Training in Virology:

- 1) Preparation of glassware for tissue cultures (washing, sterilization).
- 2) Preparation of media like Hanks, MEM.
- 3) Preparation of clinical specimens for isolation of viruses.
- 4) Preparation of monkey kidney cells (Primary) and maintenance of continuous cell lines by subcultures. Preservation in -70°C and liquid nitrogen.
- 5) Recognition of CPE producing viruses.

- 6) Performance of haemadsorption for Parainfluenza Haemagglutination for influenzas, Immunofluorescence, neutralization for Enteroviruses and Respiratory viruses identification tests on tissue cultures and supernatants etc.
- 7) Serological tests – Elisa for HIV, HBsAg, Haemagglutination inhibition and Haemadsorption for influenza virus.
- 8) Chick embryo techniques – Inoculation and harvesting.
- 9) Handling of Mice, rat, guinea pigs for collection of blood / pathogenicity tests etc.,

Mycology – (Practical Training) :-

- 1) Collection of Specimen.
- 2) Direct Examination of Specimen.
- 3) Examination of Histopathology slides.
- 4) Isolation and identification of fungi & slide culture
- 5) Special techniques.
- 6) Maintenance of stock cultures.
- 7) Animal Pathogenicity

Parasitology – (Practical Training):

- 1) Collection of Specimen.
- 2) Examination of faeces for parasitic ova and cyst by direct and concentration method.
- 3) Egg counting techniques for helminths.
- 4) Examination of blood smears for protozoa.
- 5) Histopathology sections – Examination and identification of parasites.
- 6) Leishman and Giemsa staining.
- 7) Identification of common arthropods and vectors.
- 8) Preservation of parasites – mounting fixing & staining.

Details of Training M.D. (MICROBIOLOGY) – theory and practical for 3 years

- 1) Collection of Clinical samples in the Central Laboratory : 1 month.
- 2) Sterilisation of Laboratory material : 1 month.
- 3) Media preparation : 1 month.
- 4) Bacteriological techniques : 2 months.
- 5) Reporting culture : 4 months.
- 6) Serology : 2 months.
- 7) Preparation for Dissertation Protocol submission : 2 months.
- 8) Special Microscopy and Staining : 1 month.
- 9) Bacterial culture and antibiogram : 4 months.
- 10) Mycobacteriology (Tuberculosis research institute – 1 week): 1 month
- 11) Anaerobic culture : 15 days.
- 12) Mycology : 1 month.
- 13) Parasitology : 1 month.
- 14) Dissertation work : 3 months.
- 15) Virology - (Kings institute -2 weeks) : 2 months
- 16) Immunology : 2 months.
- 17) Animal Experiment : 15 days.
- 18) Vaccine & Biological control : 1 month.
- 19) Molecular Biology & Biotechnology : 15 days.
- 20) Medical Statistics : 1 week.
- 21) Bacterial Genetics : 1 week.
- 22) Epidemiology – posting in Community medicine

- dept : 1 week.
- 23) STD and skin : 1 week.
- 24) Pathology : 1 week.

- *The P.Gs. will participate in Seminars, Symposiums, Journal Clubs and Tutorials and Clinical Meetings.*
- *They should organise and conduct Practicals for U.Gs. and paramedical students.*
- *The services from the Institutions having the facilities for the technique can be sought for the above training.*

PATTERN OF EXAMINATIONS

FOUR PAPERS - 100 Marks each 3 Hours Duration

Theory	Title	Duration	Marks
Paper – I	General Microbiology and Immunology	3 Hours	100
Paper – II	Systemic Bacteriology	3 Hours	100
Paper – III	Virology & Parasitology	3 Hours	100
Paper – IV	Mycology, Applied Microbiology and Recent Advances.	3 Hours	100

Total 400

Practical (3 days) :

Practical Time

- Day 1** Practical 1 – Clinical Bacteriology 10.00 to 11.30 a.m.
 2 – Bacteriological Techniques 11.30 to 1.00 p.m.
 3 – Immuno Serology 2.00 to 3.30 p.m.
 4 – Animal Experiments 3.30 to 5.00 p.m.

- Day 2** Continuation of Clinical Bacteriology 11.00 to 11.30 a.m.
 5 – Virology 11.30 to 1.00 p.m.
 6 – Mycology 2.00 to 3.30 p.m.
 7 – Parasitology 3.30 to 5.00 p.m.

Day 3 Clinical Bacteriology

(Final Report) 10.00 to 11.30 a.m.

Histopathology 11.30 to 12.30 p.m.

Oral and Pedagogy

NOTE : No. of candidates to be examined 6. Per day for Practical/Viva

-----**Post-graduate Examination:**

Practicals –

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

(Total Marks – 300).

Bacteriology – Marks

- 1) Identification of a pure culture. 50
- 2) Isolation and identification of bacteria from clinical samples. 80
- 3) Bacteriological techniques: 20
 - (a) Special Staining.
 - (b) PH Adjustment.
 - (c) Media Preparation.
 - (d) Anaerobic Culture.
 - (e) Antimicrobial Susceptibility Testing. M.I.C., M.B.C.

Immuno serology - 40

Serological Tests:-

- 1) Conventional Serological Test.
ELISA, VDRL, WIDAL, Agglutination Tests, IFA.
- 2) Rapid Tests.

(One conventional and one rapid test to be performed for the practical examination).

Virology - 25

- 1) Haemagglutination, Haemagglutination inhibition.
- 2) ELISA – HIV / HBSAG.
- 3) Interpretation of Tissue Culture slides with CPE.

Mycology -25

- 1) Identification of fungal cultures.

Parasitology - 20

- 1) Processing and identification of ova and cysts in stool samples.
Saline / Iodine / Concentration technique.
- 2) Blood smear examination for malarial parasite, microfilaria & special staining techniques for stool examination.

Animal Experiments – 20

- 1) Bleeding Techniques of animals.
- 2) Inoculation of infective material, by different routes in animals.

Histopathology Slides – 20

- a) Stained Smear
- b) Tissue Sections Applied to microbial infections. _____

Total 300

Pedagogy and Oral (50 + 50)- 100 marks.

Pedagogy

The teaching skills of the candidate will be assessed. The candidate will be given a topic by the 4 examiners at the end of the first day of practical examination for a lecture presentation. The examiners shall evaluate the candidate's ability.

DISSERTATION: APPROVED / NOT APPROVED

(No Marks)

List of Books : (Current edition)

- 1) Medical Microbiology – Greenwood Vol. I and II.
 - 2) Zinsser’s Microbiology.
 - 3) Review of Medical Microbiology – Jawaetz et al.
 - 4) Topley and Wilson’s textbook of Bacteriology, Virology and Immunology – 6 volumes.
 - 5) Essential Immunology – Ivan Roitt.
 - 6) Basic and Clinical Immunology – Danial P. stites et al.
 - 7) Immunology by Joseph A. Bellanti.
 - 8) Diagnostic Microbiology – By Finegold.
 - 9) Cumitech series 1-25 (By American Society for Microbiologists).
 - 10) Medical Virology By Fenner.
 - 11) Medical Parasitology – By Chatterjee.
 - 12) Textbook of Medical Parasitology By Jayaram Panicker.
 - 13) Textbook of Microbiology – By Jayaram Panicker.
 - 14) Medical Mycology – Conant and Smith.
 - 15) Mycology – Emmons.
 - 16) Mycology – Rippon.
 - 17) Diagnostic Bacteriology – Joan Stoke.
 - 18) Mycology – By Jagadeesh Chander.
 - 19) Parasitology – By Parija.
 - 20) Immunology by Kuby
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LIST OF JOURNALS RECOMMENDED FOR REFERENCE

I. INDIAN JOURNALS:

- 1) Indian Journal of Medical Research.
- 2) Indian Journal of Microbiology.
- 3) Indian Journal of Pathology and Bacteriology.
- 4) Indian Journal of Public Health.

II. FOREIGN JOURNALS :

- 1) WHO Bulletin.
- 2) WHO Technical Report Series.
- 3) WHO Chronicle.
- 4) Bacteriological Review.
- 5) Journal of Medical Microbiology.
- 6) Immunological Techniques.
- 7) Journal of Infection and Immunity.
- 8) Journal of Infectious Diseases.
- 9) Acta Pathol, Microbiol Scand.
- 10) Journal of Hygiene.
- 11) American Journal of Tropical Medicine and Hygiene.
- 12) Journal of Clinical Pathology.
- 13) Journal of Laboratory Sciences.
- 14) New England Journal of Medicine.
- 15) Virus News.
- 16) Science.
- 17) Lancet.
- 18) Scientific American.

- 19) JAMA.
 - 20) Parasitology.
 - 21) Clinical Epidemiology.
 - 22) Practitioner.
 - 23) Nature.
 - 24) Journal of Leprosy.
 - 25) Sabouraudia.
 - 26) Journal of Experimental Immunology.
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LOG BOOK RECOMMENDATIONS:

- 1) Structural Log Book is needed.
- 2) Must carry updated information of the department.