



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Programme Structure and Course Details

Of

MD Microbiology 2022 onwards


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M.S. Ramaiah University of Applied Sciences
Bangalore - 560 054

M.S. Ramaiah University of Applied Sciences

Ramaiah Medical College



Principal and Dean
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M.S. Ramaiah University of Applied Sciences
Bangalore-560054


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Approved by the Academic Council meeting held on 27th September 2022



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Programme Specifications

MD Microbiology Programme 2022 onwards

Programme Code: MD132

M.S. Ramaiah University of Applied Sciences



Ramaiah Medical College

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University's Vision, Mission and Objectives

The M. S. Ramaiah University of Applied Sciences (MSRUAS) will focus on student-centric professional education and motivates its staff and students to contribute significantly to the growth of technology, science, economy and society through their imaginative, creative and innovative pursuits. Hence, the University has articulated the following vision and objectives.

Vision

MSRUAS aspires to be the premier university of choice in Asia for student centric professional education and services with a strong focus on applied research whilst maintaining the highest academic and ethical standards in a creative and innovative environment

Mission

Our purpose is the creation and dissemination of knowledge. We are committed to creativity, innovation and excellence in our teaching and research. We value integrity, quality and teamwork in all our endeavors. We inspire critical thinking, personal development and a passion for lifelong learning. We serve the technical, scientific and economic needs of our Society.

Objectives

1. To disseminate knowledge and skills through instructions, teaching, training, seminars, workshops and symposia in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to equip students and scholars to meet the needs of industries, business and society
2. To generate knowledge through research in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to meet the challenges that arise in industry, business and society
3. To promote health, human well-being and provide holistic healthcare
4. To provide technical and scientific solutions to real life problems posed by industry, business and society in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences
5. To instill the spirit of entrepreneurship in our youth to help create more career opportunities in the society by incubating and nurturing technology product ideas and supporting technology backed business
6. To identify and nurture leadership skills in students and help in the development of our future leaders to enrich the society we live in
7. To develop partnership with universities, industries, businesses, research establishments, NGOs, international organizations, governmental organizations in India and abroad to enrich the experiences of faculties and students through research and developmental programme



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Programme Specifications: MD Microbiology

Faculty	Ramaiah Medical College
Department	Microbiology
Programme	MD –Microbiology
Programme Code	MD132
Dean of Faculty	Dr Shalini C Nooyi
Head of the Department	Dr. Banashankari G S

1. **Title of the Award:** MD in Microbiology
2. **Mode of Study:** Full-Time
3. **Awarding Institution /Body:** Ramaiah University of Applied Sciences, Bengaluru
4. **Joint Award:** Not Applicable
5. **Teaching Institution:** Ramaiah Medical College
6. **Date of Programme Specifications:** September 2022
7. **Programme Approval by the Academic Council of MSRUAS:** 27th September 2022
8. **Programme Approving Regulating Body and Date of Approval:** National Medical Council of India
9. **Rationale for the Programme**

The purpose of PG education is to create specialists who would provide high quality healthcare and advance the cause of science of oncology through research & training. Oncology is a highly specialized and technical discipline in clinical medicine comprising treatment with ionizing radiations and cytotoxic agents as major arms in non-surgical management and treatment of cancer. With a view to update, by inclusion of newer topics, and to provide a uniform syllabus and course contents in Indian universities and teaching medical institutions, the proposed guidelines provide course outlines based on recent developments in clinical medicine and other disciplines related to oncology.



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Programme objectives (PO) for MD Microbiology Postgraduate students

- PO1.** Develop the knowledge, skills and attitude to be a competent Microbiologist (C, P, A).
- PO2.** Acquire and develop the knowledge, skills and attitude required to be a competent and ethical researcher and teacher. (C, P, A)
- PO3.** Be able to independently perform Diagnostic procedures with a reasonable degree of professionalism and competence. (C, P, A)
- PO4.** To be competent to play a pivotal role in hospital infection control. (C, P, A)
- PO5.** Demonstrate a commitment to excellence and continuous professional development with integrity, compassion and sensitivity to patient care. (A)

Programme specific outcome (PSO) for MD Microbiology Postgraduate students

- PSO1.** Demonstrate the application of microbiology with an effective communication skill in a variety of clinical settings to solve diagnostic and therapeutic problems along with preventive measures.(A)
- PSO2.** Advise on the selection of appropriate samples and tests necessary to arrive at a diagnosis & interpret the results obtained with reasonable accuracy(C, A)
- PSO3.** Establish good Clinical Microbiological services in a hospital and in the community in the fields of Bacteriology, Virology, Parasitology, Immunology and Mycology.(C,P,A)
- PSO4.** Acquire various skills for Intramural & Extramural collaborative research (C, P, A)
- PSO5.** Participate in various workshops/seminars/journal clubs(C,P,A)
- PSO6.** Plan, execute, analyze and present the research work in various workshops(C,P,A)
- PSO7.** Participate in various quality system procedures and quality assurance and accreditation process (C,P,A)
- PSO8.** Play a pivotal role in hospital infection control, including formulation of antibiotic policy and management of biomedical waste. (C,P,A)
- PSO9.** Demonstrate effective communication skills required for the practice of Clinical microbiology and while teaching undergraduate students. (A)

Note: A- Affective Domain, C- Cognitive Domain & P- Psychomotor Domain



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Course- PO-PSO Mapping

Course Code and name	Program Outcomes POs					Program Specific Outcomes PSOs								
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
MDC521A General Microbiology & Immunology	3	3	3	3	2	1	1	3	3	2	3	3	3	3
MDC522A Clinical and Systemic Microbiology 1	2	3	3		2	3	3	3	3	3	2	3	3	3
MDC523A Clinical and Systemic Microbiology 2	3	3	2	2	1	3	3	3	3	3	2	3	3	3
MDC524A Recent advances & applied Microbiology	3	3	3	3	3	2	3	3	3	3	2	3	3	3
MDP506A Thesis – Microbiology	3	3	3	3	3	3	3	3	2	1	2	3	3	3



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10. Regulations:**(A) Attendance, Progress and Conduct**

1. A candidate pursuing degree course should work in the concerned department of the institution for the full period as a full time student. No candidate is permitted to run or work in clinic/laboratory/nursing home while studying postgraduate course. No candidate shall join any other course of study or appear for any other examination conducted by this university or any other university in India or abroad during the period of study.
2. Each term shall be taken as a unit for the purpose of calculating attendance. Attendance of 80% every term is mandatory for appearing in the final university examination.
3. Every student shall attend symposia, seminars, conferences, journal review meetings, grand rounds, CPC, case presentation, clinics and lectures during each year as prescribed by the department and not absent himself / herself from work without valid reasons.
4. Every candidate is required to attend a minimum of 80% of the training during each academic term of the post graduate course. Provided further, leave of any kind shall not be counted as part of academic term without prejudice to minimum 80% attendance of training period every term.
5. Any student who fails to complete the course in the manner stated above shall not be permitted to appear for the University Examinations.

(B) Monitoring of progress of Studies

1. Work diary / Log Book - Every candidate shall maintain a work diary and record of his/her participation in the training programmes conducted by the department such as journal reviews, seminars, etc. as per the model checklists and logbook specimen copy.
2. Special mention may be made of the presentations by the candidate as well as details of procedures, if any conducted by the candidate. The work diary shall be scrutinized and certified by the Head of the Department and Head of the Institution, and presented in the university practical/clinical examination.
3. Procedure for defaulters: There will be a committee constituted by all teachers to review such situations. The defaulting candidate is counselled by the guide and head of the department. In extreme cases of default, the departmental committee may recommend that defaulting candidate will be withheld from appearing the examination, if she/he fails to fulfil the requirements in spite of being given adequate chances to set himself or herself right.
4. Each student has to complete DRP postings for 3 months as per NMC.



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11. Teaching Learning Methods:

The training programme should be designed to enable the student to acquire a capacity to learn and investigate, to synthesize and integrate a set of facts and develop a faculty to reason. The curricular programme and scheduling of postings must provide the student with opportunities to achieve the above broad objectives. Much of the learning is to be accomplished by the student himself. Interactive discussions are to be preferred over didactic sessions. The student must blend as an integral part of the activities of an academic department that usually revolves around three equally important basic functions of teaching, research and service. As mentioned earlier, the emphasis recommended under a residency programme is of learning while serving/working.

Post Graduate Training programme**Teaching****methodology**

Based on the available facilities, the 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 (at least 20 per year), along with seminars, symposia, group-discussions and Journal clubs. The post graduate students should regularly do the ward rounds of various clinical departments and learn cases of interest for discussion with the clinical faculty. Each college should have a Medical Education Unit to generate teaching resource material for undergraduates and evolving of problem solving modules.

Rotation:**Postings to laboratories/assignments**

The three-year training programme for the MD degree may be arranged in the form of postings to different assignments/laboratories for specified periods as outlined below. The period of such assignments/postings is recommended for 35 months. Posting schedules may be modified depending on needs, feasibility and exigencies. For facilities not available in the parent institution as well as for additional knowledge and skill, extramural postings may be undertaken.



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Suggested schedule of rotation:**Within Department**

1. Bacteriology
2. Mycobacteriology
3. Serology/Immunology
4. Mycology
5. Virology
6. Parasitology
7. **Media** preparation

Other Departments

1. Clinical Pathology
2. Clinical Biochemistry
3. Skin & VD
4. ICTC & RNTCP

Practical training

Practical training should be imparted by posting the students in various sub-specialties (sections) as detailed in the intrinsic and extrinsic rotation. The student should be actively involved in day to day working of all the sections. He/she should be trained under the guidance of teachers in all the aspects of Clinical Microbiology and applied aspects of laboratory medicine including collection and transport of specimens, receiving of samples, preparation of requisite reagents, chemicals, media and glassware, processing of specimens, performing required antimicrobial susceptibility testing and reporting on the specimens, interpretation of results, sterilization procedures, bio-safety precautions, infection control practices, maintenance of equipments, record keeping and quality control in Microbiology.

Skills & performance

The student should be given graded responsibility to enable learning by apprenticeship. The faculty throughout the year should assess performance of the student in skills. Area of improvement/remarks should be mentioned for the skill and student should be re-assessed for the skills which are not acquired.

To go to the next level, it should be mandatory for the student to acquire lower level skills satisfactorily, i.e only on satisfactory completion of assisted/performed with assistance skills should the student be permitted to

perform the skill independently.

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Emergency duty

The student should be posted for managing emergency laboratory services in Microbiology. He/she should deal with all the emergency investigations in Microbiology.

Training in research methodology

Training in research methodology should be imparted by planning of a research project by the student under the guidance of a recognized guide to be executed and submitted in the form of a thesis.

The thesis is aimed at training the post graduate student in research methods and techniques. It should include identification of a research question, formulation of a hypothesis, search and review of relevant literature, getting acquainted with recent advances, designing of research study, collection of data, critical analysis of the results and drawing conclusions. The thesis should be completed and submitted by the student six months before appearing for the final university examination.

Communication and attitudinal skills

Post-graduate student is expected to imbibe professional attributes of honesty, integrity, accountability, honour, humanism and excellence and demonstrate the same in the day- by-day conduct and dealings with the teacher, peers, the nursing and paramedical staff and most-importantly patients. To ensure that student is able to acquire these attributes, their personal conduct should be keenly observed by the teachers and student should be counselled as and when required. Personal attributes of the student should be regularly assessed by peers, senior, and junior students and Head of the Unit/ In charge.

The following is a rough guideline to various teaching/learning activities that may be employed.

1. Collection of specimens, smear examination, culture and sensitivity analysis
2. Discussion during routine activities such as during signing out of cases.
3. Presentation and work-up of cases including the identification of special stains and ancillary procedures needed.
4. Clinico-microbiological conferences, active



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- involvement with hospital infection control committee
5. Intradepartmental and interdepartmental conferences related to case discussions.
 6. Conferences, Seminars, Continuing Medical Education (CME) Programme.
 7. Journal Club.
 8. Research Presentation and review of research work.
 9. A postgraduate student of a postgraduate degree course in broad specialties/super specialties 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.
 10. Participation in workshops, conferences and presentation of papers etc.
 11. Laboratory work.
 12. Use and maintenance of equipment.
 13. Maintenance of records. **Log books** should be maintained to record the work done which shall be checked and assessed periodically by the faculty members imparting the training.
 14. Postgraduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
 15. Department should encourage e-learning activities.
 16. During the training programme, patient safety is of paramount importance, therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently; for this purpose, provision of skills laboratories in medical colleges is mandatory.



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14. Assessment:

FORMATIVE ASSESSMENT, i.e., assessment during the training

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and practical/clinical examination.

Once in Six Months

Quarterly assessment during the MD programme should be based on:

1. Journal based / recent advances learning
2. Patient based /Laboratory or Skill based learning
3. Self directed learning and teaching
4. Departmental and interdepartmental learning activity
5. External and Outreach Activities / CMEs

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

SUMMATIVE ASSESSMENT, i.e., assessment at the end of training

The summative examination would be carried out as per the Rules given in POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.

The post-graduate examinations should be in three parts:

Thesis.

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognized Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.



Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. 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 examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

1. Theory Examination

The examinations shall be organized on the basis of 'Grading' or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

There should be four theory papers:

Name of the Course	Course Code	Topics	Marks
General Microbiology and Immunology	MDC521A	General Microbiology and Immunology History and Pioneers in Microbiology Microscopy Nomenclature and classification of microbes Morphology of bacteria and other micro-organisms Growth and Nutrition of bacteria Bacterial metabolism Sterilization and disinfection Culture media and culture methods Identification of bacteria Bacterial toxins Bacterial antagonism : Bacteriocins Bacterial genetics Gene cloning Antibacterial substances used in the treatment of infections and drug resistance in bacteria Bacterial ecology - Normal flora of human body, Hospital environment, Air, Water and Milk Host-parasite relationship. Innate and acquired immunity Antigens Immunoglobulins 100 Antigen and antibody Reactions Complement System The normal immune system: structure and function, Immune Response. Hypersensitivity Immunodeficiency Auto-immunity Immune tolerance Transplantation immunity Tumour immunity Immunoprophylaxis and immunotherapy. Measurement of immunity	100

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Clinical Systematic Microbiology 1	and MDC522A	Streptococcus and Lactobacillus Staphylococcus and Micrococcus Pseudomonas The Enterobacteriaceae Mycobacteria. Corynebacterium and other Coryneform bacteria. Vibrios, Aeromonas, Plesiomonas, Campylobacter & Spirillum Neisseria, Branhamella & Moraxella Haemophilus and Bordetella. Bacillus: the aerobic spore bearing bacilli Clostridium: the spore-bearing anaerobic bacilli Non-sporing anaerobe The Spirochaetes Actinomycetes, Nocardia and Actinobacillus Erysipelothrix and Listeria The Bacteroidaceae: Bacteroides, Fusobacterium and Leptotrichia Chromobacterium, flavobacterium, Acinetobacter and Alkaligenes Pasteurella, Francisella Brucella Chlamydia Rickettsiae Mycoplasmatales: Mycoplasma, Ureaplasma and Acholeplasma Miscellaneous bacteri	100
Clinical Systematic Microbiology 2	and MDC523A	<p>VIROLOGY & MYCOLOGY The nature of viruses Classification of viruses Morphology: virus structure Virus replication The genetics of viruses The pathogenicity & lab diagnosis of viruses Epidemiology of viral infections Anti-viral drugs Bacteriophages Herpes viruses Paramyxoviruses Influenza virus Hepatitis viruses Rabies virus Human immunodeficiency viruses Vaccines Pox viruses 100</p> <p>Vesicular viruses Toga viruses Bunya viruses Arena viruses Marburg and Ebola viruses Rubella virus Orbi viruses Respiratory diseases : Rhinoviruses, adenoviruses and corona viruses Enteroviruses; Polio, Echo, and Coxsackie viruses. Other enteric viruses The morphology and reproduction in fungi Classification of fungi Dermatophytes Candida Aspergillus Contaminant and opportunistic fungi Fungi causing superficial mycoses Fungi causing subcutaneous mycoses Fungi causing systemic infections Anti-mycotic agents</p>	100



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Recent advances and applied Microbiology	MDC524A	<p>VIROLOGY & MYCOLOGY The nature of viruses Classification of viruses Morphology: virus structure Virus replication The genetics of viruses The pathogenicity & lab diagnosis of viruses: Epidemiology of viral infections Anti-viral drugs Bacteriophages Herpes viruses Paramyxoviruses Influenza virus Hepatitis viruses Rabies virus Human immunodeficiency viruses Vaccines Pox viruses 100</p> <p>Vesicular viruses Toga viruses Bunya viruses Arena viruses Marburg and Ebola viruses Rubella virus Orbi viruses Respiratory diseases : Rhinoviruses, adenoviruses and corona viruses Enteroviruses; Polio, Echo, and Coxsackie viruses. Other enteric viruses The morphology and reproduction in fungi Classification of fungi Dermatophytes Candida Aspergillus Contaminant and opportunistic fungi Fungi causing superficial mycoses Fungi causing subcutaneous mycoses Fungi causing systemic infections Anti-mycotic agents</p>	100
Thesis Microbiology	MDP506A	Approval 6 months before final examination.	

2. Practical and Oral/viva voce Examination

Practical should be spread over **two** days and include the following components:

- **Bacteriology + Clinical : 60 Marks**
 1. Identification of a pure culture.
 2. Isolation and Identification of Bacteria from Clinical Samples
- **Serology: 35 Marks**

Common Serological Tests like ELISA/VDRL/Widal/Brucella Agglutination test etc.

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- **Virology+ Clinical : 40 Marks**
 1. Preparation of tissue cultures
 2. Virus Titration
 3. Haemagglutination and its inhibition test
 4. Virus Neutralization Test
 5. Other rapid tests for diagnosis of viral infections

- **Mycology + Clinical – 25 Marks**
 1. Identification of fungal cultures
 2. Slide culture techniques
 3. Examination of histopathology slides for fungi

- **Parasitology - 40 Marks**
 1. Processing and Identification of ova and cysts in stool samples
 2. Amoebic Serology
 3. Microscopic Slides
 4. Examination of histopathology slides for parasites
 5. Spots: 10 spots

Oral/Viva-Voce Examination:

This must include a component of teaching session of not more than 15 minutes duration. – 100 Marks

Pedagogy – 20 Marks

Dissertation – 10 Marks

Viva - 70 Marks

A. Total Marks Distribution:

Maximum marks for M.D degree course	Theory	Practical	Viva	Grand Total
	400	200	100	700



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AnnexuresCompetency list and Course plan: Annexure - I

End of 1 st year	End of 2 nd year	End of 3 rd year
GENERAL MICROBIOLOGY: <ol style="list-style-type: none"> History and Pioneers in Microbiology Microscopy Nomenclature and classification of microbes Morphology of bacteria and other micro-organisms Growth and Nutrition of bacteria Bacterial metabolism Sterilization and disinfection Culture media and culture methods Identification of bacteria Bacterial toxins Bacterial antagonism : Bacteriocins Bacterial genetics Gene cloning Antibacterial substances used in the treatment of infections and drug resistance in bacteria Bacterial ecology - Normal flora of human body, Hospital environment, Air, Water and Milk Host-parasite relationship 	IMMUNOLOGY : Clinical <ol style="list-style-type: none"> Hypersensitivity Immunodeficiency Auto-immunity Immune tolerance Transplantation immunity Tumour immunity Immuno prophylaxis and immunotherapy Measurement of immunity 	GENERAL MICROBIOLOGY & IMMUNOLOGY: All
IMMUNOLOGY : <ol style="list-style-type: none"> Innate and acquired immunity Antigens Immunoglobulins Antigen and antibody Reactions Complement System The normal immune system: structure and function Immune Response 	SYSTEMATIC BACTERIOLOGY <ol style="list-style-type: none"> Streptococcus and Lactobacillus Staphylococcus and Micrococcus Pseudomonas The Enterobacteriaceae Mycobacteria Corynebacterium and other Coryneform bacteria Vibrios, Aeromonas, 	SYSTEMATIC BACTERIOLOGY (2nd year) : plus <ol style="list-style-type: none"> Actinomycetes, Nocardia and Actinobacillus Erysipelothrix and Listeria The Bacteroidaceae: Bacteroides, Fusobacterium and Leptotrichia Chromobacterium, flavobacterium, Acinetobacter and Alkaligenes Pasteurella, Francisella Brucella

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	<p>Plesiomonas, Campylobacter & Spirillum</p> <p>8. Neisseria, Branhamella & Moraxella</p> <p>9. Haemophilus and Bordetella.</p> <p>10. Bacillus: the aerobic spore bearing bacilli</p> <p>11. Clostridium: the spore-bearing anaerobic bacilli</p> <p>12. Non-sporing anaerobe</p> <p>13. The Spirochaetes</p>	<p>7. Chlamydia</p> <p>8. Rickettsiae</p> <p>9. Mycoplasmatales: Mycoplasma, Ureaplasma and Acholeplasma</p> <p>10. Miscellaneous bacteria</p>
<p>MICROBIOLOGY APPLIED TOTROPICAL MEDICINE AND RECENT ADVANCES</p> <p>1. Normal Microbial flora</p> <p>2. Epidemiology of infectious diseases</p> <p>3. Hospital acquired infections & Hospital waste disposal</p> <p>4. Bacteriology of water, milk and air</p>	<p>VIROLOGY:</p> <p>1. The nature of viruses</p> <p>2. Classification of viruses</p> <p>3. Morphology: virus structure</p> <p>4. Virus replication</p> <p>5. The genetics of viruses</p> <p>6. The pathogenicity & lab diagnosis of viruses</p> <p>7. Epidemiology of viral infections</p> <p>8. Anti-viral drugs</p> <p>9. Bacteriophages</p> <p>10. Herpes viruses</p> <p>11. Paramyxoviruses</p> <p>12. Influenza virus</p> <p>13. Hepatitis viruses</p> <p>14. Rabies virus</p> <p>15. Human immunodeficiency viruses</p>	<p>VIROLOGY (2nd year): plus</p> <p>1. Vaccines</p> <p>2. Pox viruses</p> <p>3. Vesicular viruses</p> <p>4. Toga viruses</p> <p>5. Bunya viruses</p> <p>6. Arena viruses</p> <p>7. Marburg and Ebola viruses</p> <p>8. Rubella virus</p> <p>9. Orbivirus</p> <p>10. Respiratory diseases : Rhinoviruses, adenoviruses and corona viruses</p> <p>11. Enteroviruses; Polio, Echo, and Coxsackie viruses</p> <p>12. Other enteric viruses</p> <p>13. Slow viruses</p> <p>14. Oncogenic viruses</p> <p>15. Teratogenic viruses</p>
	<p>PARASITOLOGY:</p> <p>1. General Parasitology</p>	<p>PARASITOLOGY (2nd year): plus</p> <p>1. Protozoan parasites</p>



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	<p>2. Protozoan parasites of medical importance: <i>Entamoeba, Giardia, Trichomonas, Leishmania, Trypanosoma, Plasmodium</i></p>	<p>of medical importance: <i>Toxoplasma, Sarcocystis, Cryptosporidium, Babesia, Balantidium</i> etc.</p> <p>2. Helminthology: All those medically important helminthes belonging to Cestoda, Trematoda and Nematoda.</p> <p>3. Cestodes: <i>Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipylidium Multiceps</i> etc.</p> <p>4. Trematodes: <i>Schistosomes, Fasciola, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis</i> etc.</p> <p>5. Nematodes: <i>Trichuris, Trichinella, Strongyloides, Ancylostoma, Necator, Ascaris, Toxocara, Enterobius, Filarial worms, Dracunculus,</i> etc.</p> <p>6. Ecto-parasites: Common arthropods and other vectors viz., Mosquito, Sand fly, Ticks, Mite,</p> <p>7. Cyclops</p>
<p>Shalini</p>  <p>Principal and Dean M.S. Ramaiah Medical College and Hospital M.S. Ramaiah University of Applied Sciences Bangalore - 560054</p>	<p>MYCOLOGY</p> <ol style="list-style-type: none"> The morphology Classification of fungi <i>Dermatophytes</i> <i>Candida</i> <i>Aspergillus</i> 	<p>MYCOLOGY (2nd year): plus</p> <ol style="list-style-type: none"> Contaminant and opportunistic fungi Fungi causing superficial mycoses Fungi causing subcutaneous mycoses

		<ol style="list-style-type: none"> 4. Fungi causing systemic infections 5. Anti-mycotic agents
<p>Shalini</p>	 <p>Dean - Academics M.S. Ramaiah University of Applied Sciences Bangalore - 560054</p> <p>H. L. G. Rao</p>	<p>MICROBIOLOGY APPLIED TO TROPICAL MEDICINE AND RECENT ADVANCES</p> <ol style="list-style-type: none"> 1. Infections of various organs and systems of human body 2. Molecular genetics as applicable to microbiology 3. Vaccinology: principle, methods of preparation, administration of vaccines. 4. Bio-terrorism <p>ALLIED BASIC SCIENCES</p> <p>(a) Biochemistry: Basic understanding of biochemistry as applied to immunological/ molecular methods for study of microbial diseases and pathogenesis of infections.</p> <ol style="list-style-type: none"> 1. Protein purification and estimation 2. Protein estimation 3. Nucleic acid purification and characterization 4. Agarose and polyacrylamide gel electrophoresis - principles 5. Ultracentrifugation - principles 6. Column chromatography - principles

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		<p>(b) Molecular biology: Basic knowledge as applicable to molecular diagnostics and molecular epidemiology.</p> <ol style="list-style-type: none"> 1. Recombinant DNA technology 2. Southern, northern and western blotting 3. DNA amplification techniques 4. Diagnostic PCR, different methods of PCR product detection (liquid hybridization, ELISA). 5. Genotyping of microbes and viruses <p>(c) Pathology: (as applied to Microbiology) Basic knowledge of</p> <ol style="list-style-type: none"> 1. Inflammation and repair 2. Intercellular substances and reaction 3. Pathological changes in the body in bacterial, viral, mycotic and parasitic infections 4. Demonstration of pathogen in tissue section
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Skills:**1st year residency-skills list**

Area	Sr. no.	Procedure	Observed no.	Assisted no./ practice on dummy	Performed independently no.(under supervision)
General microbiology	1.	Microscopy for unstained preparations/ wet mount	5	5	10
	2.	Microscopy for stained preparation	5	5	10
	3.	Preparation of direct smears from clinical specimens	5	5	10
	4.	Hanging drop preparation	5	5	10
	5.	Washing, sterilization and packing of glassware	10 sessions	-	-
	6.	Infection control activities- environmental sampling	10	10	-
	7.	Identification of HAI	5	5	--
	8.	Calculation of HAI quality indicators	5	5	--
	9.	Bacteriology of water	5	5	-
	10.	Bacteriology of air	5	5	-
	11.	Antibiotic disc preparation	-	-	-
	12.	Handling of laboratory animal	-	-	-
	13.	Methods for preservation of bacteria	10	-	-
	14.	Maintenance of stock cultures	10	-	-
Staining	1	Gram staining	10	20	30
	2	Acid fast staining (Ziehl-Neelsen method)	10	20	30
	3	Albert staining	5	10	10
	4	Modified ZN staining for <i>M. leprae</i>	5	5	5
	5	Modified ZN staining for <i>Nocardia</i>	5	5	5
	6	IQC-staining	5	5	5
Media preparation	1	Preparation of stains	4	4	4
	2	Preparation of reagents	10	10	10
	3	Preparation, plugging, pouring & Quality Control (QC) of culture	20	20	30



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		media			
	4	Operation & maintenance of autoclave	10	10	20
Bacteriology	1	Specimen collection for Blood Culture	5	5	5
	2	Inoculation of liquid & solid media	20	20	30
	3	Identification test	20	20	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	10	20	30
	5	IQC- Antibiotic disc potency	5	5	-
	6	Operation of BacT/ALERT	5	10	20
	7	Operation of Vitek 2 compact	5	10	20
	8	Petroff's concentration technique	10	10	20
	9	AFB culture & sensitivity	5	10	20
Mycology	1	KOH Wet mount	5	10	20
	2	Germ tube test	5	10	20
	3	Slide culture	5	10	20
	4	Negative staining for fungus	5	5	5
	5	LPCB mount	10	10	10
Parasitology	1	Giemsa staining for thick & thin peripheral blood smear	5	-	-
	2	Stool wet mount for R/M	10	20	30
	3	Stool concentration techniques	5	10	5
	4	Modified ZN staining for <i>C. parvum</i>	2	2	2
Serology/ Immunology	1	Phlebotomy & separation of serum	10	10	5
	2	Operation & maintenance of mini-VIDAS	5	10	20
	3	Operation & maintenance of ELISA reader & washer	5	10	
		Performance of serological tests			
	1	Latex agglutination test(RA, ASO)	10	20	30
	2	RPR card test	10	20	30
	3	Tube agglutination test	10	20	30



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	4	Gold conjugate Rapid card test	10	20	30
	5	ANA by IF	5	5	--
	6	ANA by Immunoblot	5	5	--
	7	IQC-serology	5	5	5

2nd year residency-skill list

Area	Sr. no.	Procedure	Observed no.	Assisted no./ practice on dummy	Performed independently no. (under supervision)
General microbiology	1.	Microscopy for unstained preparations/ wet mount	--	--	--
	2.	Microscopy for stained preparation	--	--	--
	3.	Preparation of direct smears from clinical specimens	--	--	--
	4.	Preparation of slit skin smear for lepra bacilli	5	5	5
	5.	Hanging drop preparation	--	--	10
	6.	Washing, sterilization and packing of glassware	05 sessions	-	-
	7.	Infection control activities- environmental sampling	--	10	10
	8.	Identification of HAI	--	5	5
	9.	Calculation of HAI quality indicators	--	5	5
	10.	Bacteriology of water	--	5	5
	11.	Bacteriology of air	--	5	5
	12.	Antibiotic disc preparation	05 lots	-	-
	13.	Handling of laboratory animal	-	-	-
	14.	Methods for preservation of bacteria	--	05	10
	15.	Maintenance of stock cultures	--	05	10
Staining	1	Gram staining	--	--	30
	2	Acid fast staining (Ziehl-Neelsen method)	--	--	30
	3	Albert staining	--	--	05
	4	Modified ZN staining for <i>M. leprae</i>	--	--	5
	5	Modified ZN staining for <i>Nocardia</i>	--	--	5
	6	IQC-staining	--	--	5
Media preparation	1	Preparation of stains	--	--	5
	2	Preparation of reagents	--	--	15
	3	Preparation, plugging, pouring & Quality Control (QC) of culture media	--	--	50



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	4	Operation & maintenance of autoclave	--	--	20
Bacteriology	1	Specimen collection for Blood Culture	--	--	5
	2	Inoculation of liquid & solid media	--	--	30
	3	Identification test	--	--	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	--	--	30
	5	IQC- Antibiotic disc potency	--	5	5
	6	Operation of BacT/ALERT	--	--	20
	7	Operation of Vitek 2 compact	--	--	20
	8	Petroff's concentration technique	--	--	20
	9	AFB culture & sensitivity	--	--	20
Mycology	1	KOH Wet mount	--	--	20



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

3rd year residency-skill list

Area	Sr. no.	Procedure	Observed no.	Assisted no./practice on dummy	Performed independently no.(under supervision)
General microbiology	1	Microscopy for unstained preparations/ wet mount	---	--	--
	2	Microscopy for stained preparation	--	--	--
	3	Preparation of slit skinsmear for lepra bacilli	--	--	--
	4	Hanging drop preparation	--	--	--
	5	Washing, sterilization and packing of glassware	05 sessions	--	-
	6.	Infection control activities-environmental	--	--	10

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		sampling			
	7	Identification of HAI	--	--	5
	8	Calculation of HAI quality indicators	--	--	5
	9	Bacteriology of water	-	-	5
	10	Bacteriology of air	-	-	5
	11	Antibiotic disc preparation	-	5 lots	2 lots
	12	Handling of laboratory animal	-	-	10
	13	Methods for preservation of bacteria	-	-	10

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	14	Maintenance of stock cultures	-	-	10
Staining	1	Gram staining	--	--	30
	2	Acid fast staining (Ziehl-Neelsen method)	--	--	30
	3	Albert staining	--	--	05
	4	Modified ZN staining for <i>M. leprae</i>	--	--	5
	5	Modified ZN staining for <i>Nocardia</i>	--	--	5
	6	IQC-staining	--	--	5
Media preparation	1	Preparation of stains	--	--	10
	2	Preparation of reagents	--	--	15
	3	Preparation, pouring & Quality Control (QC) of culture media	--	--	50
	4	Operation & maintenance of autoclave	--	--	20
Bacteriology	1	Specimen collection for Blood Culture	--	--	5
	2	Inoculation of liquid & solid media	--	--	30
	3	Identification test	--	--	30
	4	Antimicrobial sensitivity testing- modified Kirby-bauer technique	--	--	30
	5	IQC- Antibiotic disc potency	--	--	5
	6	Operation of BacT/ALERT	--	--	20
	7	Operation of Vitek 2 compact	--	--	20
	8	Petroff's concentration technique	--	--	20
	9	AFB culture & sensitivity	--	--	20



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

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Annexure -02
Department of Microbiology
POST GRADUATE TEACHING PROGRAMME

DAY	TOPIC	POST GRADUATE	MODERATOR
Saturday	Pure Culture – (Last Month Backlog)		
Wednesday	Cleaning & Sterilization of glassware's		
Wednesday	Pure Culture		
Saturday	Journal Club		
Wednesday	Microbiological evaluation of disinfectants		
Wednesday	Modifications of gram stain (To perform)		
Saturday	Topic : Slow Viral Infections		

Annexure -03**Suggested schedule of rotation:****Within Department**

1. Bacteriology
2. Mycobacteriology
3. Serology/Immunology
4. Mycology
5. Virology
6. Parasitology
7. Media preparation

Other Departments

5. Clinical Pathology
6. Clinical Biochemistry
7. Skin & VD
8. ICTC & RNTCP
9. District Residency Programme

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10. NIMHANS (Virology)

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Annexure -04
Logbook entry

Date	
Setting/method	
Presented/attended	
Summary in brief	
Reflection	
Teachers comments	

Student's signature

Guide's Signature



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Annexure -05

Postgraduate Students Appraisal Form Pre / Para / Clinical Disciplines

Name of the Department/Unit :

Name of the PG Student

:

Period of Training: FROM.....TO.....

Sr. No.	PARTICULARS	Not Satisfactory			Satisfactory			More Than Satisfactory			Remarks
		1	2	3	4	5	6	7	8	9	
1.	Journal based / recent advances learning										
2.	Patient based /Laboratory or Skill based learning										
3.	Self directed learning and teaching										
4.	Departmental and interdepartmental learning activity										
5.	External and Outreach Activities / CMEs										
6.	Thesis / Research work										
7.	Log Book Maintenance										

Publications Yes/ No

Remarks



*REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned.

For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

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SIGNATURE OF ASSESSEE

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SIGNATURE OF CONSULTANT

SIGNATURE OF HOD

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Course Specifications

MD Microbiology 2022 onwards

Course Code: MDC521A



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Course Specifications

Course Title	General Microbiology and Immunology
Course Code	MDC521A
Department	Microbiology
Faculty	Ramaiah Medical College

Course summary:

This course is designed in such a way that the student will master the basics in general microbiology and immunology.

Course Outcomes:

CO 1: Acquire knowledge about: Important historical events and developments in Microbiology. Basic as well as advanced knowledge regarding various types of microscopes, Biosafety cabinets and other equipments used in Diagnostic Microbiology. Different methods of Sterilization, disinfection and various isolation precautions including standard and transmission based precautions. Nomenclature, classification, morphology, growth requirements of microorganisms, Host Parasite relationship and the significance of Normal flora in health and disease. Various antimicrobial agents and mechanisms of drug resistance. Bacterial and Molecular genetics relevant for Medical Microbiology. Applications of quality assurance, quality control in microbiology and accreditation of laboratories

CO 2: Components of immune system, types of immunity and Immune response. Various disorders involving the immune system. Various types, techniques, advances, and applications of vaccines and immunotherapy. Immunological techniques and their applications in diagnostic microbiology as well as research

Course Content:**General Microbiology**

1. History of microbiology
2. Microscopy
3. Bio-safety including universal containment, personal protective equipment for biological agents
4. Physical and biological containment
5. Isolation precautions including standard precautions and transmission based precautions
6. Sterilization, disinfection and lyophilization
7. Morphology of bacteria and other microorganisms
8. Nomenclature and classification of microorganisms
9. Normal flora of human body



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10. Growth and nutrition of bacteria
11. Bacterial metabolism
12. Bacterial toxins
13. Bacteriocins
14. Microbiology of hospital environment
15. Microbiology of air, milk and water
16. Host-parasite relationship
17. Antimicrobial agents and mechanisms drug resistance
18. Bacterial genetics and bacteriophages
19. Molecular genetics relevant for medical microbiology
20. Quality assurance and quality control in microbiology
21. 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 and antibody reactions
9. Hypersensitivity
10. Cell mediated immunity
11. Cytokines
12. Auto-immunity
13. Immune tolerance
14. MHC complex
15. Transplantation immunity
16. Tumor immunity
17. Vaccines and immunotherapy
18. Measurement of immunological parameters
19. Immunological techniques
20. Immunopotentialiation and immunomodulation



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes POs					Program Specific Outcomes PSOs								
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
MDC521A General Microbiology & Immunology	CO 1	3	3	3	3	2	1	1	3	3	2	3	3	3	3
	CO 2	3	3	2	2	2	3	2	3	2	3	2	3	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															

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Course Specifications

MD Microbiology 2022 onwards

Course Code: MDC522A



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Course Specifications

Course Title	Clinical & Systemic Microbiology – 1
Course Code	MDCS22A
Department	Microbiology
Faculty	Ramaiah Medical College

Course Summary:

This course is designed in such a way that the student will master the evidence based Systematic Bacteriology & Mycology.

Course Outcomes:

CO 1: - Demonstrate knowledge and skills in various techniques for isolation and identification of bacteria, Demonstrate knowledge about epidemiology, morphology, biochemical properties, antigenic nature, pathogenesis, complications, laboratory diagnosis, treatment and prevention of major bacterial pathogens of medical importance.

CO 2: Explain general characteristics including morphology & reproduction of fungi
Demonstrate knowledge about classification and skills for isolation and identification of fungi
Demonstrate knowledge about epidemiology, morphology, biochemical properties, antigenic nature, pathogenesis, complications, laboratory diagnosis treatment and prevention of major fungal pathogens of medical importance.

Course Content:

Systematic bacteriology

1. Isolation and 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 and 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 and other non-fermenters, Pasteurella, Francisella, Bacteroides, Fusobacterium, Leptotrichia and other anaerobic gram negative bacilli etc.



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6. Helicobacter, Campylobacter, Calymmatobacterium, Streptobacillus, Spirillum and miscellaneous bacteria
7. Enterobacteriaceae
8. Mycobacteria
9. Spirochaetes
10. Chlamydia
11. Mycoplasmatales; Mycoplasma, Ureaplasma, Acholeplasma and other Mycoplasmas
12. Rickettsiae, Coxiella, Bartonella etc.

Mycology

1. General characteristics and classification of fungi
2. Morphology and reproduction of fungi
3. Isolation and identification of fungi
4. Tissue reactions to fungi
5. Mycelial fungi of medical importance including Aspergillus, Zygomycetes, Pseudallescheria, Fusarium, Piedra, other dematiaceous hyphomycetes and other hyalohyphomycetes etc.
6. Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix, Penicillium marneffeii etc.
7. Dermatophytes
8. Fungi causing Mycetoma, Chromoblatomycosis, Occulomycosis and Otomycosis.
9. Pythium insidiosum
10. Prototheca
11. Pneumocystis jirovecii infection
12. Rhinosporidium seeberi and Lacazia loboi (Loboa lobo)
13. Laboratory contaminant fungi
14. Mycetism and mycotoxicosis
15. Antifungal agents and in vitro antifungal susceptibility tests.



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Course Mapping (CO, PO & PSO mapping)

Course Code and name	Course Outcome	Program Outcomes POs					Program Specific Outcomes PSOs								
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
MDC522A Clinical & Systemic Microbiology - 1	CO1	2	3	3	---	2	3	3	3	3	3	2	3	3	3
	CO2	3	2	2	1	1	3	3	3	3	3	2	3	3	3

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution



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Course Specifications

MD Microbiology 2022 onwards

Course Code: MDC523A



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Course Specifications

Course Title	Clinical & Systemic Microbiology – 2
Course Code	MDC523A
Department	Microbiology
Faculty	Ramaiah Medical College

Course Summary:

This course is designed in such a way that the student will master the evidence based Virology & Parasitology

Course Outcomes:

CO 1: - Demonstrates knowledge about general properties, classification, morphology, virus replication & genetics of viruses. Demonstrates knowledge about isolation, identification of viruses and pathogenesis, laboratory diagnosis & treatment of viral infections. Demonstrate knowledge about viral vaccines and anti-viral drugs.

CO 2: Demonstrate knowledge about general characters, classification and methods of identification of parasites.

Demonstrate knowledge about epidemiology, morphology, antigenic nature, life cycle, pathogenesis, complications, laboratory diagnosis, treatment and prevention of Protozoan & Helminthic parasites of medical importance.

Course Content:**Virology**

1. General properties of viruses
2. Classification of viruses
3. Morphology: Virus structure
4. Virus replication
5. Isolation and identification of viruses
6. Pathogenesis of viral infections
7. Genetics of viruses
8. DNA viruses of medical importance including Pox viruses, Herpes viruses, Adenoviruses, Hepadna virus, Papova and Parvo viruses etc.
9. RNA viruses of medical importance including Enteroviruses, Toga viruses, Flaviviruses, Orthomyxo viruses, Paramyxo viruses, Reo



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viruses, Rhabdo viruses, Arena viruses,
Bunya viruses, Retro viruses, Filo
viruses, Human immunodeficiency virus,
Arbo viruses, Corona viruses, Calci viruses etc.

10. Slow viruses including prions
11. Unclassified viruses
12. Hepatitis viruses
13. Virioids, prions
14. Vaccines and anti-viral drugs.

Parasitology

1. General characters and classification of parasites.
2. Methods of identification of parasites
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. Helminthology of medical importance including those belonging to Cestoda (Diphyllobothrium, Taenia, Echinococcus, Hymenolepis, Dipylidium, Multiceps etc.), Trematoda (Schistosomes, Fasciola, Fasciolopsis, Gastrodiscoides, Paragonimus, Clonorchis, Opisthorchis etc.) and Nematoda (etc.)
5. Entomology: common arthropods and other vectors viz. mosquito, sand fly, ticks, mite, cyclops, louse, myiasis.
6. Anti-parasitic agents.

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Course Mapping (CO, PO & PSO mapping)

Course Code and name	Course Outcome	Program Outcomes POs					Program Specific Outcomes PSOs								
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
MDC523A Clinical & Systemic Microbiology - 2	CO 1	3	3	2	2	1	3	3	3	3	3	2	3	3	3
	CO 2	3	3	2	2	2	2	3	3	3	3	2	3	3	3
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution															



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Course Specifications

MD Microbiology 2022 onwards

Course Code: MDC524A



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Course Specifications

Course Title	Recent Advances & Applied Microbiology.
Course Code	MDC524A
Department	Microbiology
Faculty	Ramaiah Medical College

Course Summary:

This course is designed in such a way that the student will master the evidence based Recent advances & Applied microbiology.

Course Outcomes:

CO 1: - Demonstrate knowledge about epidemiology of infectious diseases. Demonstrate knowledge about antimicrobial prophylaxis and therapy. Demonstrate knowledge about hospital acquired infections. Demonstrate knowledge about management of biomedical waste

CO 2: Demonstrate knowledge about infections of various organs and systems of human body viz. respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive tract infections, STI, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear and nose, septicaemia, endocarditis, haemorrhagic fever etc.

CO 3: Demonstrate knowledge and applications of Automation in Microbiology. Demonstrate knowledge and applications about molecular techniques in the laboratory diagnosis of infectious diseases.

CO 4: Demonstrate knowledge about principles, methods of preparation, administration and types of vaccines.

CO 5: Demonstrate knowledge in animal and human ethics involved in microbiology.

Course Content:

Applied Microbiology

1. Epidemiology of infectious diseases
2. Antimicrobial prophylaxis and therapy
3. Hospital acquired infections
4. Management of biomedical waste
5. Investigation of an infectious outbreak in hospital and community
6. Infections of various organs and systems of human body viz. respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive



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- tract infections, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear and nose, septicaemia, endocarditis, haemorrhagic fever etc.
7. Opportunistic infections
 8. Sexually transmitted diseases
 9. Vaccinology: principles, methods of preparation, administration of vaccines, types of vaccines
 10. Information technology (Computers) in microbiology
 11. Automation in Microbiology
 12. Molecular techniques in the laboratory diagnosis of infectious diseases
 13. Statistical analysis of microbiological data and research methodology
 14. Animal and human ethics involved in microbiological work.
 15. Safety in laboratory and Laboratory management



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Course Mapping (CO, PO & PSO mapping)

Course Code and name	Course Outcome	Program Outcomes POs					Program Specific Outcomes PSOs								
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
MDC524A Recent advances & applied Microbiology	CO 1	3	3	3	3	3	2	3	3	3	3	2	3	3	3
	CO 2	3	3	3	3	2	2	3	3	3	3	2	3	3	3
	CO 3	3	3	3	2	3	2	3	3	3	3	2	3	3	3
	CO 4	3	3	3	2	2	2	2	2	2	2	2	2	2	2
	CO 5	3	3	3	2	2	2	2	2	2	2	2	2	1	2

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution



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Course Specifications

MD Microbiology 2022 onwards

Course Code: MDP506A



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Course Specifications

Course Title	Thesis – Microbiology
Course Code	MDP506A
Department	Microbiology
Faculty	Ramaiah Medical College

Course Summary:

The course is designed in such a way that the student will master the science of research in terms of designing, conducting and interpreting the results.

Course Outcome:

CO 1: Should be introduced to basic research methodology so that he/she can independently conduct fundamental and applied research and he/she should independently write the thesis in accordance with the prescribed instructions as expected of international standards(C,P).

CO 2: Demonstrate knowledge in statistical analysis of microbiological data and research methodology

CO 3: The student should demonstrate integrity, accountability, respect, compassion and dedicated patient care and a commitment to excellence, continuous professional development and ethical principles relating to research conduct and research publication as applicable to all the specific courses.

Course details:

Every candidate pursuing MD Medicine degree course is required to carry out work on a selected research project under the guidance of a recognised post graduate teacher. The results of such a work shall be submitted in the form of a dissertation. The dissertation is aimed to train a post graduate student in research methods and techniques. It includes identification of a problem, formulation of a hypothesis, search and review of literature, getting acquainted with recent advances, designing of a research study, collection of data, critical analysis, comparison of results and drawing conclusions.

Every candidate shall submit to the Registrar (Academic) of the University in the prescribed proforma, a synopsis containing particulars of proposed dissertation work within six months from the date of commencement of the course on or before the dates notified by the University. The synopsis shall be sent through the proper channel.

Such synopsis will be reviewed and the dissertation topic will be registered by the University. No change in the dissertation topic or guide shall be made without prior approval of the University.

The dissertation should be written under the following headings:

1. Introduction
2. Aims or Objectives of study
3. Review of Literature
4. Material and Methods
5. Results
6. Discussion
7. Conclusion
8. Summary
9. References (Vancouver style)
10. Tables
11. Annexures

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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes POs					Program Specific Outcomes PSOs								
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
		MDP506A Thesis – Microbiology	CO 1	3	3	3	3	3	3	3	3	2	1	2	3
	CO 2	3	3	3	3	3	3	3	3	2	1	2	3	3	3
	CO 3	3	3	3	3	3	3	3	3	2	1	2	3	3	3

3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution



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