

2nd Semester

BIOMEDICAL TECHNIQUE AND LABORATORY MANAGEMENT

Subject Code:MMLSS2-201

60 Hours

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BIOMEDICAL TECHNIQUES

Unit I:

15 Hours

Methods of qualitative analysis of biomolecules: Principles, experimental procedures and application of chromatography – paper, thin-layer, ion exchange, affinity, gel filtration, gas-liquid and HPLC. Principles, procedures and application of Electrophoresis- paper, polyacrylamide gel, agarose gel, capillary and cellulose acetate.

Unit II:

15 Hours

Centrifugation Techniques – Principle and technique of preparative and analytical centrifugation, differential centrifugation, density gradient centrifugation, ultracentrifuge and its application. Quantitative methods: Principles and applications of Photometry, Spectrophotometry, flame photometry, flow cytometry ELISA, RIA Western Blotting, FACS, Immuno electrophoresis

LABORATORY MANAGEMENT

Unit III:

15 Hours

Preparation of operating budgets; general aspects of financial management of laboratories
Cost-analysis (tests and instruments); justification of providing new services or rejecting existing ones; lease and purchase decision analysis; delegation of budget responsibilities, work load statistics.
Laboratory safety: Fire, chemical, radiation and infection control (body substance precautions), hazardous waste and transport of hazardous materials.
Maintenance of records: Procedure manuals, ward manuals, quality control programs, patient data retrieval.

Unit IV:

15 Hours

Personnel management: Personnel policy manual; job descriptions; labor, supervision relations; conducting job interviews; motivation, recognizing job distress syndrome; delegation to a laboratory manager.
Hospital organization; interactions between the laboratory service and the rest of the hospital.
Professional ethics.
Quality assurance; total quality management; development and monitoring of performance indicators.

CLINICAL MICROBIOLOGY

Subject Code:MMLSS2-202

60 Hours

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Course Syllabus:

Unit I:

15 Hours

Hospital infections Quality control in microbiology Laboratory control of antimicrobial therapy
Collection of specimens for bacteriological investigations

Unit II:

15 Hours

Methods of culture, techniques and organisms encountered in: CSF, blood culture, sputum, pus,
urine, stool, UTI, endocarditis, Bone and joint infections

Unit III:

15 Hours

Bacteriological investigation in: PUO, Tuberculosis, Leprosy, Meningitis, Eye infections
Causative agents and investigations in cases of: Food poisoning, gastroenteritis, diarrhea,
Respiratory tract infections, Sexually transmitted diseases, Dental infections

Unit IV:

15 Hours

Blood transfusion and associated infections Immunoprophylaxis against diseases Rapid
diagnostic methods in microbiology

Reference Books:

- Murray PR, Baron EJ, Pfaller MA, Tenoer PC and Tenover RH (Eds): Manual of Clinical Microbiology 6 th Ed. American Society for Microbiology, Washington, DC 2005.
- Woods GL, Washington JA: The Clinician and the Microbiology Laboratory, Mandell
- GL, Bennett JE, Dolin R (Eds): Principles and Practice of Infectious Disease 4th Ed. Churchill Livingstone, New York, 2002.
- E. Joan Stokes, M.W.D. Wren, G.L.Ridgway, Clinical Microbiology 7th Ed. Hodder Arnold Publishers 7 th Edition.
- Ananthanarayan & Paniker's Textbook of Microbiology, 8th Ed., Orient Longman, India; 2009.
- Bailey and Scott's Diagnostic Microbiology 9th Ed. C V Mosby, St. Louis, 2003.
- Brooks, Geo F Jawetz Medical Microbiology 22nd Ed. Mc Graw Hill 2001.
- Collier, Leslie Topley and Wilson's Microbiology and microbial infections Vol 1, 2, 3, 4, 5, 6, 7: 9th Ed.

**MRSPTU M.SC. MLS (CLINICAL MICROBIOLOGY) SYLLABUS
BATCH 2021 ONWARDS (2 YEARS COURSE)**

SYSTEMIC BATERIOLOGY

Subject Code:MMLSS2-203

60 Hours

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Course Syllabus:

Study of -

Unit I:

15 Hours

Staphylococcus, Streptococcus, Pneumococcus.

Unit II:

15 Hours

Neisseira gonorrhoea, Neisseira meningitis, Corynebacterium diptheriae

Unit III:

15 Hours

Mycobacterium, Clostridium, E.coli, H. pylori

Unit IV:

15 Hours

Klebsiella, Salmonella, Proteus, Pseudomonas, Vibrio & Spirochaetes

With reference to their: Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis.

IMMUNOPATHOLOGY

Subject Code:MMLSS2-204

60 Hours

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Course Syllabus:

Unit I:

15 Hours

Mechanism of Ab-mediated inactivation: direct and indirect. Eg. Diabetes mellitus, thyroid diseases, pernicious anemia, infertility, haemophilia, myasthenia gravis.

Unit II:

15 Hours

Immune deficiency disorders. Immunohaematologic diseases: transfusion reactions, erythroblastosis foetalis, agranulocytosis, thrombocytopenic purpura. Immune complex reactions: arthus reaction, serum sickness. Connective tissue disease: Arteritis, SLE, rheumatic fever, rheumatoid arthritis.

Unit III:

15 Hours

Atopic anaphylactic reactions: reaginic antibody, anaphylaxis, atopic allergy – factors involved, asthma, hay fever, food allergy, insect allergy, atopic eczema, delayed hypersensitivity reactions, contact dermatitis, Autoallergic diseases: encephalomyelitis, multiple sclerosis, orchitis, thyroiditis, sjogren's syndrome. Granulomatous reactions: Infectious diseases like tuberculosis, leprosy.

Unit IV:

15 Hours

Autoimmune diseases-organ specific and systemic. Clinical transplantation-Kidney, Bone marrow, Heart. Immunology of AIDS, Tumor and Tumor markers.

Immunohaematology- Compatibility testing. Different types of Ag-Ab reactions, Principle and Application

MOLECULAR DIAGNOSTIC

Subject Code:MMLSS2-205

45 Hours

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Course Syllabus:

UNIT I:

10 Hours

Introduction to Molecular Diagnostics: Reverse transcriptase PCR, Quantitative real time PCR, the basic concept and threshold cycle, fluorescent dyes used in real time PCR, Taqman™ specimen collection and transportation, nucleic acids extraction, PCR optimization and inhibitors, handling contamination, applications of real time PCR as diagnostic tool.

UNIT II:

10 Hours

Signal Amplification Methods: Concept of molecular diagnostic techniques – identification, characterization and quantization of specific nucleic acids sequences, branched DNA amplification and its application in quantization of HCV and HIV, hybrid capture assay and its application in detection of HPV, invader technology.

UNIT III:

15 Hours

Chip Based Diagnostics: DNA sequence analysis, gene expression profiling, biomarker detection, their role in detection of diseases or their susceptibility, applications of chips, on-chip blood cells separation, on-chip extraction of cell contents such as DNA and proteins, on-chip approach for genetic analysis using miniaturized PCR, SNP detection by probe ligation and amplification (MLPA), next generation sequencing in molecular diagnostics.

UNIT IV:

10 Hours

Molecular Diagnostics of Infectious Diseases: Molecular diagnostics of infectious diseases such as, Leishmania, detection of large DNA viruses. Molecular diagnostics of non-infectious diseases such as cystic fibrosis, X-linked mental retardation disorder, Huntington disease, molecular markers for early detection of cancer.

Recommended Books

- R.M. Nakamra, F.L. Kiechle, W.W. Grody and C. Strom, 'Molecular Diagnostics Techniques and Applications for the Clinical Laboratory', Academic Press.
- L. Buckingham, 'Molecular Diagnostics – Fundamentals, Methods and Clinical Applications', F.A. Davis Company.

**MRSPTU M.SC. MLS (CLINICAL MICROBIOLOGY) SYLLABUS
BATCH 2021 ONWARDS (2 YEARS COURSE)**

CLINICAL MICROBIOLOGY LABORATORY

Subject Code:MMLSS2-206

4 Hours/Week

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Course Syllabus:

- Aseptic practice in Lab and safety precautions
- Washing and Sterilization of glasswares
- Care and operation of microscopes viz. Dark ground, Phase contrast and Fluorescent microscope,(Electron microscope).
- Operation and maintenance of Autoclave, Hot air oven, Distillation plants, Filters like Sietz and Membrane and sterility test and Testing of disinfectant-Phenol coefficient test and its uses.
- Care and maintenance of common laboratory equipments
- Collection of specimens for Microbiological investigations
- Preparations of stains viz. Grams, Alberts, Capsules, Spores, Ziehl Neelsons,etc and performing of staining
- Preparation and pouring of media- Nutrient agar, Blood agar, Mac Conkey agar, Sugars, Kligler iron agar, Robertson's cooked meat, Lowenstein Jensen, Sabouraud's
- Preparation of reagents-Oxidase, Kovac, etc
- Identification of bacteria of medical importance upto species level(except Anaerobes which could be upto generic level)
- Preparation of antibiotics discs: performance of Kirby Bauer, Stokes, etc
- Disposal of contaminated materials
- Quality control of media, reagents, etc.

SYSTEMATIC BACTERIOLOGY LABORATORY

Subject Code:MMLSS2-207

4 Hours/Week

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Course Syllabus:

- Sterilization techniques.
- Staining techniques-Gram stain, Acid fast stain, Albert stain.
- Study of motility of bacteria, Hanging drop preparation.
- Preparation of different culture media and Biochemical media.
- Culture techniques
- Isolation of bacteria on Nutrient agar, Blood Agar, Maconky agar
- Biochemical reactions-Sugar fermentation test, Oxidation-Fermentation test, Urease test, Citrate test, TSI, M.R., V.P.
- Antibiotic sensitivity test-MIC, MBC, Agar dilution, Broth dilution, Disc diffusion etc
- Anaerobic culture methods.

IMMUNOPATHOLOGY LABORATORY

Subject Code:MMLSS2-208

2 Hours/Week

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Course Syllabus:

- Serological tests [Screening &diagnostic] used in different pathological conditions.
- Blood grouping &cross matching.
- Coomb's Test - Direct & Indirect.

3rd Semester

MEDICAL VIROLOGY

Subject Code:MMLSS2-301

60 Hours

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Course Syllabus:

Systematic study of the following viruses: Their biological properties, Pathogenicity, Epidemiology, isolation & Identification from Clinical Specimens, Lab diagnosis, Treatment and Immunoprophylaxis:

Unit I:

15 Hours

Systematic study of the following viruses: Their biological properties, Pathogenicity, Epidemiology, isolation & Identification from Clinical Specimens, Lab diagnosis, Treatment and Immunoprophylaxis of Parvo viruses, Adenoviruses, Herpes viruses,

Unit II:

15 Hours

Systematic study of the following viruses: Their biological properties, Pathogenicity, Epidemiology, isolation & Identification from Clinical Specimens, Lab diagnosis, Treatment and Immunoprophylaxis of Pox viruses, Hepatitis viruses, Picorna viruses,

Unit III:

15 Hours

Systematic study of the following viruses: Their biological properties, Pathogenicity, Epidemiology, isolation & Identification from Clinical Specimens, Lab diagnosis, Treatment and Immunoprophylaxis of Rota viruses, Ortho-myxo viruses, Paramyxoviruses,

Unit IV:

15 Hours

Systematic study of the following viruses: Their biological properties, Pathogenicity, Epidemiology, isolation & Identification from Clinical Specimens, Lab diagnosis, Treatment and Immunoprophylaxis of Rubella viruses, Rabies viruses, Arbo viruses, Papoa viruses,

Systematic study of the following viruses: Their biological properties, Pathogenicity, Epidemiology, isolation & Identification from Clinical Specimens, Lab diagnosis, Treatment and Immunoprophylaxis of HIV, Oncogenic viruses

MEDICAL PARASITOLOGY

Subject Code:MMLSS2-302

60 Hours

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Course Syllabus:

Unit I:

15 Hours

Introduction to parasitology, classification of parasitic infections, parasitic infections in humans. Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Entamoeba, Naegleria, Giardia, Trichomonas,

**MRSPTU M.SC. MLS (CLINICAL MICROBIOLOGY) SYLLABUS
BATCH 2021 ONWARDS (2 YEARS COURSE)**

Unit II: 15 Hours

Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Balantidium, Isospora, Cryptosporidium,

Unit III: 15 Hours

Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Malarial Parasites, Trypanosoma, Leishmania, Toxoplasma,

Unit IV: 15 Hours

Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Pneumocystis carinii, Schistosoma, Paragonimus, Diphyllbothrium,

Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Taenia, Ascaris, Enterobius, Ancylostoma, Trichuris trichra, Wucherera, Dracunculus, Trichinella spiralis.

MEDICAL MYCOLOGY

Subject Code: MMLSS2-303

60 Hours

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Course Syllabus:

Unit I: 15 Hours

Introduction to mycology, classification of fungal infections, fungal infections in humans. Laboratory diagnosis of fungal infections-Specimens collection, transport of specimens, Different methods employed-direct microscopic Examination, Slide culture technique, fungal culture, serology and animal inoculation.

Unit II: 15 Hours

Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Superficial Cutaneous Mycoses- Malassezia infections, Taenia nigra, Piedra, Dermatophytosis. Subcutaneous mycosis - Mycetoma, Sporotrichosis, Chromoblastomycosis, Phaeohyphomycosis, Rhinosporidiosis and Lobomycosis

Unit III: 15 Hours

Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Systemic mycoses-Histoplasmosis, Blastomycosis, Coccidioidomycosis and Paracoccidioidomycosis.

Unit IV: 15 Hours

Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Opportunistic mycoses - Candidiasis, Cryptococcosis, Penicilliosis, Aspergillosis, Zygomycosis.

Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment & prevention of Occulomycosis, Otomycosis, Mycotic poisoning

BIOSAFETY & BIOETHICS

Subject Code:MMLSS2-304

45 Hours

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Course Syllabus:

Unit I:

10 Hours

Introduction to Intellectual Property: Types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Protection of GMOs IP as a factor in R&D; IPs of relevance to Biotechnology and few Case Studies. Agreements and Treaties: History of GATT & TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; Budapest Treaty; PCT; Indian Patent Act 1970 & recent amendments

Unit II:

15 Hours

Basics of Patents and Concept of Prior Art: Introduction to Patents; Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; Specifications: Provisional and complete; Forms and fees Invention in context of “prior art”; Patent databases; Searching International Databases; Country-wise patent searches (USPTO, esp@cenet(EPO), PATENT Scope(WIPO), IPO, etc.)

Patent filing procedures: National & PCT filing procedure; Time frame and cost; Status of the patent applications filed; Precautions while patenting–disclosure/non-disclosure; financial assistance for patenting-introduction to existing schemes, patent licensing and agreement patent. Infringement- meaning, scope, litigation, case studies

Unit III:

15 Hours

Biosafety: Introduction; Historical Background; Introduction to Biological Safety Cabinets; Primary Containment for Biohazards; Biosafety Levels; Biosafety Levels of Specific Microorganisms; Recommended Biosafety Levels for Infectious Agents and Infected Animals; Biosafety guidelines: Government of India; Definition of GMOs & LMOs; Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO applications in food and agriculture; Environmental release of GMOs; Risk Analysis; Risk Assessment; Risk management and communication; Overview of National Regulations and relevant International Agreements including; Cartagena Protocol.

Unit IV:

5 Hours

Bioethics: Ethical implications of biotechnological products and techniques. Social and ethical implications of biological weapons.

References:

1. BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2007
2. Kankanala C., Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd., 2007

MEDICAL VIROLOGY LABORATORY

Subject Code:MMLSS2-305

4 Hours/Week

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Course Syllabus:

- Culture Media used for fungus
- Fungal culture
- Methods of lab diagnosis of viruses.
- Preparation of glassware for tissue culture(washing, sterilization)
- Preparation of media like Hanks, MEM.
- Preparation of clinical specimens for isolation of viruses.
- Serological tests-ELISA and rapid tests for HIV, RPHA for HbsAg, Haemagglutination inhibition for influenza, AGD and couter immune electrophoresis for detection of viral antigens or antiviral antibodies.
- Handling of mice, rats, guinea pigs, rabbits for collection of blood, pathogenicity test etc.

MEDICAL PARASITOLOGY LABORATORY

Subject Code:MMLSS2-306

4 Hours/Week

L	T	P	C
0	0	4	2

Course Syllabus:

- Diagnostic tests for the detection of parasitic infections
- Methods for demonstration of parasites in clinical specimens.
- Collection, preservation and transportation of fecal material for examination of parasites.
- Concentration techniques of stool for ova and cyst.
- Wet preparation of fecal sample for ova and cyst.
- Identification of ova and cyst in stool sample.

MEDICAL MYCOLOGY LABORATORY

Subject Code:MMLSS2-307

4 Hours/Week

L	T	P	C
0	0	4	2

Course Syllabus:

- Collection, Transport and Processing of specimens.
- Fungal stains, Preparation of stains & Staining Techniques, Special stains.
- Preparation of various fungal culture medias & Sterilization.
- Fungal culture, Slide culture technique & Inoculation techniques.
- Morphologic study of fungi of medically fungi – LPCB mounts, KOH preparation, India ink preparation.
- Study of colony morphology of different fungus, isolation of medically important fungi, biochemical tests, Special tests - Germ tube test, Hair perforation test,
- Chlamydospore production test, Phenol oxidase test.

4th Semester

INTERNSHIP AND PROJECT REPORT

Subject Code:MMLSS2-401

40 Hours/Week

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Course Objectives: This subject will lead to practical understanding of the procedures. Project report making lead to a introduction on research investigations.

Course details:

Students have to carry out a research project (on any topic related to radiology) under the supervision of a faculty/hospital administration. The project report has to be prepared on the basis of the research work carried out. The assessment is done on the basis of the work done and the presentation and viva.