

PART-2

(SEMESTER SCHEME)

Inforce from June-2011

Teaching & Examination Scheme for Semester-3

Paper	Teaching Schedule Hrs / Wk	University Exam Theory / Practical		Internal Exam Theory / Practical	Total Theory / Practical
		Duration	Marks		
THEORY					
MLT 301: Instrumentation & Biostatistics	3	3	70	30	100
MLT 302: Clinical including Systemic Bacteriology/ MLT 305: Biochemistry -1 (Metabolism)	3	3	70	30	100
MLT 303: Clinical including Systemic Virology/ MLT 306: Biochemistry -2 (Molecular Biology)	3	3	70	30	100
MLT 304: Clinical Microbiology/ MLT 307: Biochemistry -3 (Clinical Biochemistry)	3	3	70	30	100
PRACTICAL					
MLT 308: Practical – 1: Instrumentation & Biostatistics MLT 309: Practical – 2: Clinical Microbiology including Systemic Bacteriology MLT 310: Practical – 2: Clinical Biochemistry	12	21	140	60	200
TOTAL	24		420	180	600

Teaching and Examination for Semester-4

Paper	Teaching Schedule Hrs / Wk	University Exam Theory / Practical		Internal Exam Theory / Practical	Total Theory / Practical
		Duration	Marks		
MLT 401: Project work	42		420	180	600

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(SEMESTER SCHEME)

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Teaching & Examination Scheme for Semester-3

(PART 2: SEMESTER-3)

MLT 301 MICROBIOLOGY

(Instruments and Biostatistics)

Total Marks: 100 (External 70 + Internal 30)

Total Hours: 45

INSTRUMENTS (MICROBIOLOGY)

UNIT-1

1. Hot air oven, Incinerator
2. Water Bath, Pasteurizer, Serum-bath, Inspissator, Arnold Steam Sterilizer, Autoclave
3. Filters: Candle filters, Asbestos filters, Sintered glass filters, Membrane filters
4. Radiation: Ultra Violet (infrared), X-rays, Gamma sterilizer, Ultrasonic / Sonic vibrators
5. Syringe needle destroyer
6. Bio-safety Cabinets (Class I, II & III), Laminar Air Flow Cabinet
7. Fumigator, Fogger, ozoniser for air sterilization
8. Air samplers

UNIT-2

1. Microscopes (Bright Field, Dark ground, Phase contrast & Fluorescent)
2. Microphotograph & Microscope with Colour Coupling Device (CCD) Camera.
3. Electron Microscope (Transmitted, Scanning etc)
4. Micro-meter: Eyepiece & Slide
5. Centrifuge (Different rotor heads, Bio-safety & Refrigerated centrifuges)
6. pH Meter
7. McIntosh Fildes Jar, Anaerobic Jar, Candle Jar
8. Incubator, Co2 Incubator
9. Automated: Culture System
10. Automated: Identification (ID) & Antibiotic Sensitivity Testing (AST) Machine
11. Lyophilizer
12. PCR System: Thermal Cycler, UV Transilluminator, Electrophoresis, Gel Doc system etc.
13. ELISA Reader & Washer (Semi automatic & Fully automatic)
14. VDRL Shaker
15. Micro pipettes, Dispensers

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Teaching & Examination Scheme for Semester-3

(PART 2: SEMESTER-3)

MLT 301 MICROBIOLOGY

(Instruments and Biostatistics)

Total Marks: 100 (External 70 + Internal 30)

Total Hours: 45

BIOSTATISTICS

UNIT-3

1. Introduction to Biostatistics
2. Definition, role of statistics in health science and health care delivery system
3. Sampling Population, sample, sampling, reasons for sampling, probability and non-probability sampling
4. Methods of probability sampling-simple random, stratified, systematic procedure, merits and demerits. Use of random number table.
5. Organization of data
6. Frequency table, histogram, frequency polygon, frequency curve, bar diagram, pie chart.
7. Measures of location arithmetic mean, median, mode, quartiles and percentiles – definition, computation (for raw data), merits, demerits and applications.
8. Measures of variation: Range, inter-quartile range, variance, standard deviation, coefficient of variation – definition, computation (for raw data), merits, demerits and applications. Skewness and kurtosis.
9. Basic probability distributions.
10. Concept of probability distribution. Normal, Poisson and binomial distributions, and application. Concept of sampling distributions. Standard error and confidence intervals.

UNIT-4

1. Tests of significance:
2. Basic of testing of hypothesis – Null and alternate hypothesis, type I and type II errors, level of significance and power of the test, p value.
3. Tests of significance (parametric) – t – test (paired and unpaired), Chi square test and test of proportion.
4. Correlation and Regression:
5. Scatter diagram, concept and properties of correlation coefficient, examples (No computation Simple correlation) Pearson's and spearman's, testing the significance of correlation coefficient. Linear and multiple regression.

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Teaching & Examination Scheme for Semester-3

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MLT 302 MICROBIOLOGY

(Clinical Microbiology including Systemic Bacteriology)

Total Marks: 100 (External 70 + Internal 30)

Total Hours: 45

UNIT-1

1. Staphylococcus
2. Streptococcus
3. Pneumococcus
4. Neisseria

UNIT-2

1. Corynebacterium
2. Bacillus
3. Clostridium
4. Non-sporing anaerobes

UNIT-3

1. Enterobacteriaceae-1
2. Enterobacteriaceae-2: Shigella
3. Enterobacteriaceae-3: Salmonella
4. Vibrio
5. Pseudomonas
6. Yersinia, Pasteurella, Francisella.
7. Hemophilus
8. Bordetella
9. Brucella

UNIT-4

1. Mycobacterium-1: Tuberculosis
2. Mycobacterium-2: Non-tuberculous Mycobacteria
3. Mycobacterium-3: M. leprae
4. Spirochetes
5. Mycoplasma
6. Actinomycetes
7. Miscellaneous bacteria: Rickettsiaceae & Chlamydiae

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(PART 2: SEMESTER-3)

MLT 303 MICROBIOLOGY

(Clinical Microbiology including Systemic Virology)

Total Marks: 100 (External 70 + Internal 30)

Total Hours: 45

UNIT-I

1. General properties of viruses
2. Virus-Host interactions: Viral infections
3. Bacteriophages
4. Poxviruses (Variola, Vaccinia, Small Pox, Others)

UNIT-2

1. Herpes viruses (Herpes Simplex, Varicella Zoster, Herpes Zoster, Epstein Barr Virus, Cytomegalovirus, Human Herpes Virus-6, 8)
2. Adenoviruses
3. Picornaviruses (Enterovirus, Poliovirus, Coxsackievirus, Echovirus, Rhinovirus)
4. Orthomyxoviruse (Influenzavirus)

UNIT-3

1. Paramyxoviruses (Parainfluenzavirus, Rubulavirus, Genus Pneumovirus, Genus Morbillivirus)
2. Arboviruses (Togaviruses, Flaviviruses, Bunyaviruses, Rhabdoviridae, Reoviridae)
3. Rhabdoviruses (Rabies, Rabies related viruses)
4. Hepatitis viruses (Type A Hepatitis, Type B Hepatitis, Type C Hepatitis, Type D Hepatitis, Type E Hepatitis, Type G Hepatitis)

UNIT-4

1. Miscellaneous viruses (Papovaviruses, Rubella Virus, Coronaviruses, SARS, Rotaviruses,)
2. Oncogenic viruses (Oncogenic DNA viruses, Oncogenic RNA Viruses, Oncogenes)
3. Human Immunodeficiency Viruses: AIDS

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MLT 304 MICROBIOLOGY

(Clinical Microbiology)

Total Marks: 100 (External 70 + Internal 30)

Total Hours: 45

CLINICAL MICROBIOLOGY

UNIT-1

1. Bacteremia, Septicemia, Endocarditis
2. Pyrexia of Unknown Origin
3. Upper & Lower Respiratory tract Infections
4. CNS Infections:- Meningitis, Encephalitis.

UNIT-2

1. Diarrheal Diseases (E. coli, Salmonella, Cholera, Shigella etc.) & Food poisoning (Staphylococcus aureus, Salmonella, Bacillus)
2. Urinary Tract Infections
3. Sexually Transmitted Disease

UNIT-3

1. Zoonotic Disease
2. Bioterrorism
3. Biomedical Waste Disposals
4. Laboratory Control Of Antimicrobial Therapy
5. Immunoprophylaxis
6. Hospital Acquired Infections
7. Emerging & Reemerging Infectious Diseases.

RECENT ADVANCES

UNIT-4

1. Gene Extraction Techniques
2. Genetic Amplification Technique (PCR, LCR, TMA, RFLP etc.)
3. Errors in Gene Amplification Technique
4. Gel Documentation System
5. Electrophoresis (Western Blot, Eastern Blot, Southern blot, etc.)
6. Dot Blot technique, Slot Blot Technique
7. Application of Genetics in Microbiology

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Teaching & Examination Scheme for Semester-3

(PART 2: SEMESTER-3)

MLT 308 PRACTICAL - 1: Instrumentation & Biostatistics

Instrumentation: Principles, Operation, Uses, Care and Maintenance

1. Microscopes (Bright Field, Dark ground, Phase contrast & Fluorescent)
2. Microphotograph & Microscope with Colour Coupling Device (CCD) Camera.
3. Micro-meter: Eyepiece & Slide
4. Hot air oven, Incinerator
5. Water Bath, Pasteurizer, Serum-bath, Inspissator, Arnold Steam Sterilizer, Autoclave
6. Filters: Candle filters, Asbestos filters, Sintered glass filters, Membrane filters
7. Radiation: Ultra Violet (infrared), X-rays, Gamma sterilizer, Ultrasonic / Sonic vibrators
8. Fumigator & Fogger for air sterilization
9. Air samplers
10. Centrifuge (Different rotor heads, Bio-safety & Refrigerated centrifuges)
11. pH Meter
12. McIntosh Fildes Jar, Anaerobic Jar, Candle Jar
13. Incubator, Co2 Incubator
14. Automated: Culture System
15. Automated: Identification (ID) & Antibiotic Sensitivity Testing (AST) Machine
16. Lyophilizer
17. PCR System: Thermal Cycler, UV Transilluminator, Electrophoresis, Gel Doc system etc.
18. ELISA Reader & Washer (Semi automatic & Fully automatic)

Biostatistics:

19. Collection and tabulation of data
20. Graphical representation of data
21. Correlation and regression analysis
22. Student's 't' test
23. Chi-square test
24. ANOVA

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Teaching & Examination Scheme for Semester-3

(PART 2: SEMESTER-3)

MLT 309 PRACTICAL – 2

(Clinical Microbiology including Systemic Bacteriology)

Systemic Bacteriology :

1. Cocci: Staphylococcus, Streptococcus, Pneumococcus & Neisseria
2. Corynebacterium
3. Clostridium
4. Bacillus & Non-sporing anaerobes
5. Enterobacteriaceae-1
6. Enterobacteriaceae-2: Shigella
7. Enterobacteriaceae-3: Salmonella
8. Vibrio & Pseudomonas
9. Yersinia, Pasteurella, Francisella.
10. Hemophilus, Bordetella & Brucella
11. Mycobacterium-1: Tuberculosis
12. Mycobacterium-2: Non-tuberculous Mycobacteria

Clinical Microbiology:

13. Preparation and pouring of media – Nutrient agar, Blood agar, MacConkey agar, Sugars, Serum sugars, Kligler iron Agar, Robertson Cooked Meat Medium, Lowenstein Jensen, Sabourad Dextrose Agar etc.
14. Washing and Sterilization of glasswares (plugging and packing)
15. Preparation of Reagents: Oxidase, Kovaks, KOH, etc.
16. Preparation, examination & interpretation of direct smear examinations.
17. Tests for motility: hanging drop craige's tube, dark ground examination for spirochetes.
18. Special biochemical identification tests: Bile solubility, catalase test, CAMP test, Slide agglutination tests etc.
19. Plating of clinical specimens on media with different techniques and isolation, purification & quantification of bacteria.
20. Identification of organisms from different specimens (Blood, Swab, Sputum, Urine, CSF, Body fluids, etc.)
21. Quantitative analysis of Urine by pour plate method and semi quantitative by standard loop test for finding significant bacteria.
22. Performance of Antimicrobial susceptibility testing (Kirby Bauer Estimation of MIC / Disk diffusion method, E-test, etc)
23. Methods for preservation of bacteria, Maintenance of stock cultures.
24. Extraction DNA / RNA from different specimens.
25. Amplification of DNA by thermal cycler.
26. Gel documentation method.

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REFERENCE BOOKS:

1. Dr Praful B. Godkar, Text Book of Medical Laboratory Technology
2. Dr Mukherjee, Medical Laboratory Technology, Vol I, II & III
3. Samuel Baron, Medical Microbiolog, Churchill Livingstone Inc.
4. John G Holt et al, Begley's Manual of Determinative Bacteriology, Maryland, Williams & Wilkins.
5. Albert Blows, Manual of Clinical Microbiology, Washington DC, Americal Society for Microbiology.
6. Ellen Jo Baron et al: Bailey & Scott's Diagnostic Microbiology, Missouri, Mosby.
7. Bob A Freeman, Burrows Textbook of Microbiology, WB Saunders.
8. Elmer W Koneman et al, Introduction to Dagnostic Microbiology, Philadelphia, J B Lippincott Company.
9. Danial Greenwood et al, medical Microbiology, A guide to Microbial Infections, Pathogenesis, Immunity, Laboratory Diagnosis and control, London, Churchill Livingstone
10. JG College et al, Mackie & Mc Cartney Practical Medical Microbiology, London, Churchill Livingstone.
11. Medical Microbiology, by Mims, Publisher: Mosby.
12. Human Virology, Collier Publisher: Oxford.
13. Text Book of Microbiology by Ananthnarayan, Publisher: University Press.
14. Microbiology in clinical practice, D C Shanson,
15. Field's Virology (Vol – I & II), by Fields.
16. Biochemical Test for Identification of Medical Bacteria, by McFADDIN F JEAN, Publisher: Lippincott Willians & Wilkins.
17. Fundamental Principles of Bacteriology by A.J. Salle, Publisher: Tata McGrew Hill Publishing Co. Ltd., New Delhi.

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MLT 401: PROJECT WORK

Marks: 600 (Ext. Marks 420 + Int. Marks 180)

During this semester, the student will carry out project work. The students will be assigned project by qualified teachers. They can do evaluation of techniques or can take up project, which has importance in recent time. The students will prepare dissertation which should contain the following;

- a. Introduction to the subjects
- b. Objective
- c. Review of Literature
- d. Methods & Material
- e. Result & Discussion
- f. Conclusion
- g. Bibliography

Besides project work, the students will give seminars regularly during semester on project work and they will be given research articles for study, summary and critical review. Both seminar and review of articles (Journal club) will be assessed continuously by faculty internally.

Micro-teaching session will be arranged. Students will have to present the allotted topics and students will be assessed, internally based on the performance.

In final examination, students will be given topic of microteaching and they have to carry out teaching session, before the panel of examiners and invitees.

The report of project work will be submitted well in time before the semester ends.

The dissertation will be evaluated by one internal and one external examiner. The candidates will prepare report of project in printed and bound form. The candidate will present his / their project report before the panel of examiners, face viva to be conducted by the same panel of examiners.

The breakup of marks will be as under:

No	Subject	External	Internal	Total
1	Dissertation Evaluation	240	-	240
2	Presentation of Project	70	-	70
3	Viva	50	-	50
4	Micro-Teaching	60	60	120
5	Seminar during semester	-	60	60
6	Review of Research Article (Journal Club)	-	60	60
TOTAL		420	180	600