

**ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
(Affiliated to Thiruvalluvar University, Vellore)
CUDDALORE-1**



**PG & RESEARCH DEPARTMENT OF MICROBIOLOGY
ACADEMIC YEAR (2016 – 2017)**

**CURRICULUM TEMPLATE, SYLLABUS AND
QUESTION PAPER PATTERN**

B.Sc. MICROBIOLOGY

B. Sc. Microbiology – Course of study and Scheme of Examinations
(With effect from 2015-16)

SEME-STER	SUBJECT	SUBJECT CODE	PAPER	HOURS/CREDITS	EXAM HOURS	MAX. MARKS
I	Language - I	LF101	French-I	4/ 3	3	100
		LH101S	Hindi-I			
		LT101T	Tamil-I			
	English – I	LE101T	English – I	4 / 3	3	100
	Core - I	MB101S	Fundamentals of Microbiology	7 / 4	3	100
	Core	MBP201S	Practical - I	4 / -	-	
	Allied - I (Compulsory)	ABC101	Basic Biochemistry	5 / 4	3	100
	Allied	ABCP201S	Practical - I	3 / -		
	Value Education	VE101T		3 / 3		
	Total for Semester I			30 / 17		
II	Language - II	LF202	French-II	4 / 3	3	100
		LH202S	Hindi-II			
		LT202T	Tamil-II			
	English – II	LE202T	English – II	4 / 3	3	100
	Core - II	MB202S	Microbial Physiology	7 / 4	3	100
	Core	MBP201S	Practical – I (Contd.)	4 / 3	3 Hrs / day for 2 days	100
	Allied – II (Compulsory)	ABC202	Advanced Biochemistry	5 / 4	3	100
	Allied	ABCP201S	Practical – I (Contd.)	3 / 2		
	Personality Development	EPD201T		3 / 3		
	Total for Semester II			30 / 22		

III	Language – III	LF303	French-III	4 / 3	3	100
		LH303S	Hindi-III			
		LT303T	Tamil-III			
	English – III	LE303T	English – III	4 / 3	3	100
	Core – III	MB303S	Immunology	7 / 4	3	100
	Core	MBP402	Practical - II	4 / -	-	
	Allied – III (Optional)	AZCMB301	Classical Genetics & Biostatistics	8 / 5	3	100
	Bioinstrumentation	AOBI301	- Offered by other Departments --	3 / 4		
	Total for Semester III			30 / 19		
IV	Language – IV	LF404	French-IV	4 / 3	3	100
		LH404S	Hindi-IV			
		LT404T	Tamil-IV			
	English – IV	LE404T	English – IV	4 / 3	3	100
	Core – IV	MB404S	Microbial Genetics	7 / 4	3	100
	Core	MBP402	Practical – II (Contd.)	4 / 3	3 Hrs / day for 2 days	100
	Allied – IV	AZMB402	Solid Waste Management	8 / 5	3	100
	Environmental Science	EVS401S		3 / 4		
	Total for Semester IV			30 / 22		
V	Core – V	MB505S	Food & Industrial Microbiology	5 / 5	3	100
	Core – VI	MB507S	Medical Bacteriology	5 / 5	3	100
	Core – VII	MB508S	Medical Parasitology	5 / 5	3	100
	Elective – I A	EMB509S	Environmental Microbiology	5 / 5	3	100
	Elective – I B		Molecular Taxonomy and Phylogeny	5 / 5	3	100
	Elective – II A	EMB510S	Applied Microbiology	4 / 5	3	100
	Elective – II B		Dairy Microbiology	4 / 5	3	100
	Core	MBP603S	Practical - III	3 / -	-	
	Core	MBP604S	Practical - IV	3 / -	-	
	Total for Semester V			30 / 25		

VI	Core – VIII	MB611S	Soil and Agricultural Microbiology	5 / 5	3	100
	Core – IX	MB612S	Biotechnology	5 / 5	3	100
	Core – X	MB613S	Medical Mycology & Virology	5 / 5	3	100
	Elective – III A	MB615S	Computer Applications in Biology	4 / 5	3	100
	Elective – III B		General hygienic and Sanitary Practices	5 / 5	3	100
	Elective – IV A	EMB616S	Clinical Microbiology	5 / 5	3	100
	Elective – IV B		Veterinary Microbiology	4 / 5	3	100
	Core	MBP603S	Practical – III (Contd.)	3 / 4	3 Hrs / day for 2 days	100
	Core	MBP604S	Practical – IV (Contd.)	3 / 4	3 Hrs / day for 2 days	100
	Extension Activities			-/ 2		
	Total for Semester VI			30 / 35		

YEAR – I	FUNDAMENTALS OF MICROBIOLOGY (For those students who are admitted in the year 2015 – 2016 onwards)	MB101S
SEMESTER – I		HRS/WK - 7
CORE - 1		CREDIT - 3

Objective:

- To make the students understand the basic principles in Microbiology
- To enable the student to appreciate the diversity of microorganisms

Unit – 1 **(21 Hrs)**

Introduction - History and Scope of Microbiology – Shape, size, arrangement of Bacteria
- Structure of bacterial cell - Structure and functions of cell organelles (Cell wall, structures found outside the cell wall and within the cell wall) -Structure of Endospore.

Unit – 2 **(21 Hrs)**

Microscopy - Simple, Compound, Dark-field, Phase-contrast, Fluorescent, Electron Microscopes - Stains and dyes – staining methods.

Unit – 3 **(21 Hrs)**

Classification - Haeckel’s, Whitaker’s - Prokaryotes and eukaryotes - Evolution of microorganisms - Taxonomical ranks, Binomial Nomenclature - Characteristics used in Taxonomy – Outline of bacterial classification according to Bergey’s manual – Brief account of important groups of bacteria - Archaeobacteria, Spirochetes, Mycoplasma, Actinomycetes, Photosynthetic bacteria, Cyanobacteria, Methanogenic bacteria, Sulfate utilizing bacteria.

Unit – 4 **(21 Hrs)**

Fungi – characteristics, morphology, reproduction, physiology, classification – Fungi of special interest - Mucor, Rhizopus, Penicillium, Neurospora, Agaricus, Saccharomyces, Candida, Lichens, mycorrhiza – Algae - occurrence, importance, characteristics, classification – Algae of special interest – Chlamydomonas, Euglena, Volvox, diatoms – Protozoa - occurrence, free-living, symbiotic, morphology, reproduction, classification – Protozoa of special interest – Amoeba, Paramecium – Viruses - general characteristics, morphology, classification – viruses of bacteria, plants, animals, human beings – T4 phage, TMV, rabies, HIV as examples.

Unit – 5 **(21 Hrs)**

Sterilization - Physical agents - High temperature, Low temperature, Desiccation, Osmotic pressure, Radiation, Filtration - Chemical agents - Phenols and phenolic compounds, Alcohols, Halogens, Heavy metals and their compounds, Dyes, Synthetic detergents, Quaternary ammonium compounds, Aldehydes, Gaseous agents - Antibiotics - Classification, Mode of action – Antifungal and antiviral agents.

Text Books

Prescott, L. M., J. P. Harely and D. A. Klain, Microbiology, 2003 (5th Edition) McGraw Hill, New York.

Reference Books

- Michael J. Pelzar. Jr., E.C.S. Chan, Noel R. Krieg, Microbiology, 1993 (Fifth edition), Tata McCraw Hill, New Delhi. Talaro K. P. and A. Talaro, Foundations in Microbiology, 1999, (3rd Edition), WCB McGraw Hill.
- Atlas R. A. Principles of Microbiology (2nd Edition), 1997. Wm. C. Brown Publishers, Iowa.
- Salle A. J., Fundamental Principles of Bacteriology, 1974 (TMH Edition), Tata McGraw Hill Publishing Company, New Delhi.
- Roger Y. Stanier, John L. Ingraham, Mark L. Wheelis, Page R. Painter, Microbiology 1987 (5th Edition), Macmillan.

YEAR – I	MICROBIAL PHYSIOLOGY (For those students who are admitted in the year 2015 – 2016 onwards)	MB202S
SEMESTER - II		HRS/WK - 7
CORE - 2		CREDIT - 3

Objective:

To make the students understand the basic principles of Microbial Physiology

Unit – 1 **(21 Hrs)**

Nutrient requirements of microorganisms - Growth factors - Nutritional types -Culture media - Pure culture – Maintenance and preservation of cultures - Environmental factors affecting growth

Unit – 2 **(21 Hrs)**

Microbial growth – exponential growth - Growth curve - Measurement of microbial growth – Batch and Continuous culture - Synchronous growth - Sporulation - Bacterial reproduction

Unit – 3 **(21 Hrs)**

Motility of bacteria – Flagellar and gliding – Chemo-, photo-, Aero-, Magneto- taxis - Uptake of nutrients – Simple, Passive, Facilitated diffusion, Active transport, Group translocation

Unit – 4 **(21 Hrs)**

Principles of energetics – oxidation-reduction reactions – respiratory chain – Energy production by anaerobic process (Glycolysis, Pentose phosphate pathway, ED Pathway, Fermentation)

Unit – 5 **(21 Hrs)**

Energy production by aerobic process (TCA, catabolism of lipids, catabolism of proteins, respiration without oxygen, heterotrophic CO₂ fixation, glyoxylate cycle) Energy production by photosynthesis (cyclic, non-cyclic), Mechanism of ATP synthesis - Bioluminescence

Text Books

Schlegel, H.G., 1993. General Microbiology, (7th Edition), Press Syndicate of the University of Cambridge.

Reference Books

- Roger Y. Stanier, John L. Ingraham, Mark L. Wheelis, and Page R. Painter, Microbiology, (5th edition), Macmillan.
- Moat, A.G. and J. W. Foster, 1995. Microbial Physiology, (3rd Ed.). Wiley - LISS, A John Wiley & sons. Inc. Publications.
- Caldwell, D.R., 1995. Microbial Physiology & metabolism, USA.Wm.C. Brown Communications, Inc.
- Dawes, I. W. and Sutherland L.W. 1992. Microbial Physiology, (2nd Edition), Oxford Blackwell Scientific Publications.

I B.Sc. Microbiology	MICROBIOLOGY PRACTICAL For the students admitted from the year 2008	MBP201S
SEMESTER – I&II		HRS/WK - 4
CORE PRACTICAL – 1		CREDIT – 2+2

Objective:

To enable the students to learn the basic procedures in microbiology

Experiments list

Microscopy

1. Gram staining – gram positive cocci
2. Gram staining – gram negative bacilli
3. Spore staining
4. Acid – fast staining
5. Motility – hanging drop method

Biochemical tests

6. Catalase test
7. Oxidase test
8. Indole test
9. Methyl red test
10. Voges – Proskauer test
11. Citrate utilization test
12. Triple sugar iron agar test
13. Urease test

Pure culture technique

14. Media preparation
15. Pour plate method
16. Spread plate method
17. Quadrant streaking

List of Spotters

1. Inoculation loop
2. Inoculation needle
3. L – rod
4. Robertson cooked meat medium
5. Macconkey agar
6. EMB agar
7. Na slant with liquid paraffin
8. Na stab with liquid paraffin

9. Dark field microscopy
10. Stage micrometer
11. Ocular micrometer
12. Chlamydomonas
13. Spirochetes
14. Laminar air flow chamber
15. Incubator
16. Autoclave
17. Hot air oven
18. Inoculation hood
19. Colorimeter
20. pH meter
21. Anaerobic jar
22. Volvox
23. Gram positive cocci
24. Gram negative bacilli
25. Spore staining
26. Acid fast bacilli
27. Indole test
28. Methyl red test
29. Voges – Proskauer test
30. Citrate utilization test
31. Triple sugar iron agar test
32. Urease test
33. Na slant with Pseudomonas
34. Membrane filter
35. Meta chromatic granules

YEAR – II	IMMUNOLOGY For the students admitted in the year 2015 - 2016 onwards	MB303S
SEMESTER – III		HRS/WK - 7
CORE – 3		CREDIT - 6

Objective:

To make the students understand the basic concepts of Immunology and immune system.

Unit 1: (21hrs)

Infection - Classification of infections, Source of infection, Methods of transmission of infection, Factors predisposing to microbial pathogenicity, Types of infectious diseases – **Immunity** - Innate or native immunity, Factors affecting innate immunity, Mechanisms of innate immunity, Acquired or adaptive immunity, Active immunity, Passive immunity, Local immunity, Herd immunity - **Antigens** - Types of antigens, Determinants of antigenicity, Biological classes of antigens, Determinants recognized by the innate immune system.

Unit 2: (21hrs)

Antibodies – Immunoglobulins - Antibody Structure, Enzyme digestion, Immunoglobulin chains, Immunoglobulin domains, Hyper variable and framework regions, Constant region domains, Hinge region, Immunoglobulin classes, Abnormal Immunoglobulins, Immunoglobulin specificities, Antibody diversity, Class switching- **Antigen – Antibody Reactions** - Serological reactions, Precipitation reaction, Mechanism of precipitation, Applications, Agglutination reaction, Complement fixation test (CFT), Neutralization tests, Opsonisation, Radioimmunoassay (RIA), Enzyme immunoassay (EIA), Enzyme linked immunosorbent assay (ELISA), Chemiluminescence immunoassay (CLIA), Immunoelectroblot / Western blot techniques, Immunochromatographic tests, Immunoelectron microscopic tests, Immunofluorescence.

Unit 3: (21hrs)

Complement System - General properties, Components, Complement activation, Classical complement pathway, Alternative complement pathway, Lectin complement pathway, Regulation of complement activation, Biological effects of complement, Quantitation of complement and its components, Biosynthesis of complement, Deficiencies of the complement system - **Structure and Functions of Immune Cells & Organs** - The lymphoid system, Central (primary) lymphoid organs, Thymus, Bone marrow, Peripheral (secondary) lymphoid organs, Lymph nodes, Spleen, Cells of the lympho reticular system, Lymphocytes, T – Cell maturation, T cell receptors, Types of T cells, B – Cell maturation, Null cells, Phagocytic cells, Abnormalities of immune cells, Major histocompatibility complex (MHC), Classes of proteins, HLA complex, HLA typing, MHC restriction.

Unit 4:**(21hrs)**

Immune Response - Humoral Immune Response (Antibody Mediated), Primary and secondary responses, Fate of antigen in tissues, Production of antibodies, Monoclonal antibodies, Factor influencing antibody production, Cellular Immune Response, Scope of cell – mediated immunity (CMI), Induction of cell – mediated immunity (CMI), Cytokines, Detection of cell mediated immunity (CMI), Transfer Factor, Immunological Tolerance, Theories of Immune Response - **Hypersensitivity** - Classification of hypersensitivity reactions, Type I Reactions (IgE dependent), Anaphylaxis, Atopy, Type II reactions: cytolytic and cytotoxic, Type III reactions: immune complex diseases, Arthus reaction, Serum sickness, Type IV reactions: Delayed Hypersensitivity, Tuberculin (Infection) type, Cutaneous basophil hypersensitivity, Contact dermatitis type, Type v reactions (stimulatory hypersensitivity), Shwartzman reaction - **Immunodeficiency Diseases** - Primary immunodeficiencies, Disorders of specific immunity, Humoral immunodeficiencies, Cellular immunodeficiencies, Combined immunodeficiencies, Disorders of complement, Disorders of phagocytosis, Secondary immunodeficiencies.

Unit 5:**(21hrs)**

Autoimmunity - Mechanisms of autoimmunity, Classification of autoimmune diseases, Hemocytolytic autoimmune diseases, Localised (organ – specific) autoimmune diseases, Systemic (non – organ specific) autoimmune diseases, Pathogenesis of autoimmune disease - **Immunology of transplantation and malignancy** - Immunology of transplantation, Classification of transplants, Types of grafts, allograft reaction, Histocompatibility antigens, Histocompatibility testing, Immunology of malignancy, Clinical evidence of immune response in malignancy, Tumour antigens, Immune response of malignancy, Immunological surveillance, Immunotherapy of cancer - **Immunohematology** - ABO blood group system, Rh blood group system, Other blood group system, Medical applications of blood groups, Blood transfusion, Hemolytic disease of the newborn, Detection of Rh antibodies, Identification of Rh incompatibility, ABO hemolytic disease.

Text Books

Ananthanarayanan, R and Paniker C.K. Text Book of Microbiology, 2009, (8th Edition), Universities Press (India) Private Ltd., Himayatnagar, Hyderabad – 500029 (A. P.), India.

Reference Books

- Tizard, I. R. Immunology. 1995 (4th Edition), Saunders College Publishing.
- Weir, D.M. and J. Stewart, Immunology, 1997 (8th Edition), Churchill Livingstone, New York.
- Mark Peakman and Diego Vergani. 1st magazine, 1997, Basic and Clinical Immunology. Churchill Livingstone, New York.

YEAR - II	MICROBIAL GENETICS For the students admitted in the year 2015 - 2016 onwards	MB404S
SEMESTER – IV		HRS/WK - 7
CORE - 4		CREDIT - 6

Objective:

To make the students understand the basic principles in microbial genetics.

Unit- 1 **(21 Hrs)**

Central dogma of Molecular biology - Structure of DNA - Forms of DNA -DNA as the genetic material - Griffith experiment, Hershey & Chase - Denaturation and renaturation of DNA - Structure of RNA –Types - RNA as the genetic material

Unit – 2 **(21 Hrs)**

Organization of prokaryotic genetic material - Plasmids - Organization of eukaryotic genetic material - Chromosome – Transposons – Concept of gene – genetic code

Unit – 3 **(21 Hrs)**

Replication of DNA - Enzymology of replication – Mutation types – Mutagenic agents - carcinogenicity testing- DNA damage and repair

Unit – 4 **(21 Hrs)**

Gene expression – Detailed account of Transcription and Translation – Post- transcriptional modifications in prokaryotes and eukaryotes - Regulation of transcription - lac operon - trp operon

Unit – 5 **(21 Hrs)**

Genetics of bacteriophages - Lytic and Lysogenic cycles - Gene transfer mechanisms - Transformation, Conjugation, Transduction (Generalised and Specialised)

Text Books

- Freifelder, D., Microbial Genetics. 1987, Narosa Publishing House, New Delhi.
- Turner P. C., Mc Lennan A. G., Bates A. D and White M. R. H. Instant Notes in Molecular Biology, 2001, (2nd Edition) Published by arrangement with Bios Scientific Publishers Ltd., Oxford.

Reference Books

- Streips, U. N. and R. E. Yasbin, Modern Microbial Genetics, 2002 (2nd Edition), Wiley- Liss, Inc., New York.
- Benjamin Lewin, Gene VII, 7th Edition, Oxford University Press.
- Twyman, R M., Advanced Molecular Biology - A concise Reference, 1998, Viva Books Private Ltd., New Delhi.

II B.Sc. Microbiology	MICROBIOLOGY PRACTICAL For the students admitted from the year 2015-16	MBP402
SEMESTER – III & I		HRS/WK - 4
CORE PRACTICAL - 2		CREDIT – 2+2

Objective:

To enable the students, learn the basic procedures in Immunology

1. Separation of serum
2. Separation of plasma
3. Blood grouping – Forward
4. Widal – Slide test
5. ASO test
6. RPR test
7. RA test
8. VDRL test
9. Study of blood smear for cell morphology
10. Differential Count
11. WBC & RBC Count
12. Bacterial agglutination

LIST OF SPOTTERS

1. Centrifuged blood showing serum & blood clot
2. Eosinophil
3. Monocyte
4. Lymphocytes
5. Neutrophils
6. Widal test
7. Single Radial Immuno diffusion
8. Immuno electrophoresis test
9. Latex agglutination test
10. Counter Immuno electrophoresis
11. ASO antigen
12. RPR antigen
13. Haemocytometer
14. ELISA plate
15. Normal saline
16. Widal O, H antigen
17. Anti A, B and D reagent
18. Electrophoresis Horizontal tank
19. EDTA
20. Leishman stain
21. Pasteur pipette
22. Micro pipette
23. Water bath

24. Trisodium Citrate
25. Rocket Immuno Electrophoresis
26. Ouchterlony method
27. Electrophoresis power pack
28. Gel puncture
29. RBC pipette
30. WBC pipette
31. ABO blood grouping
32. Centrifuge
33. VDRL shaker

YEAR – III	FOOD AND INDUSTRIAL MICROBIOLOGY For the students admitted in the year 2015 onwards	MB505S
SEMESTER - V		HRS/WK - 5
CORE- 5		CREDIT - 3

Objective:

To make the students understand the importance of microbes in food industry.

Unit – 1 (15 Hrs)

Food as a substrate for microorganisms - Principles of food preservation - asepsis - removal of microorganisms - high temperature - low temperature- drying- food additives - radiation - General principles of Contamination, spoilage and preservation - canned food. - Food-borne infections and intoxications - Food borne disease outbreaks - laboratory testing - preventing measures - Food sanitation – Plant sanitation - quality control - HACCP

Unit – 2 (15 Hrs)

Food fermentations – bread, malted beverages, idly, fermented vegetables, pickles, Oriental fermented foods - Milk and milk products - fermented dairy products - butter, cheese, yogurt, acidophilus milk - Spoilage and defects of fermented dairy products - Milk-borne diseases.

Unit – 3 (15 Hrs)

General concepts - screening and strain development strategies - raw materials used in media production media optimization – foaming - fermentation equipment and its uses – types of fermenters - Types of fermentation - batch, continuous, dual or multiple, surface, submerged, aerobic, anaerobic

Unit – 4 (15 Hrs)

Downstream process – recovery and purification of products – sterilization – development of inoculum - scale up processes - Production of alcohol and beverages – Ethanol, beer and wine, vinegar - Organic acids - lactic acid, citric acid

Unit – 5 (15 Hrs)

Industrial production of enzymes - amylase, proteinase, - Amino acid production - glutamic acid and lysine - Production of antibiotics - penicillin, streptomycin – Role of precursors - Production of Vitamins - riboflavin, cyanocobalamin

Text Books

- Frazier W. C. and D.C, Westhoff, Food Microbiology, 1988 (4th Edition), Tata McGraw Hill Publishing Company Ltd., New Delhi.
- Casida, L.E. *Industrial Microbiology*. 1968, New Age International (P) Ltd., Publishers, New Delhi.
- Patel, A.H., *Industrial Microbiology*, 1985, Macmillan India Ltd., New Delhi.

Reference Books

- Doyle, M. P., L. R. Beuchat and T. J. Montville, *Food Microbiology -Fundamentals and Frontiers*, 2001 (2nd Edition), ASM Press. Washington, D.C.
- Jay, J. M., *Modern Food Microbiology*. (4th Edition), 1996, CBS Publishers and Distributors.
- Crueger W. and A Crueger, *Biotechnology*, 2000 (2nd Edition), Panima Publishing Corporation, New Delhi.
- Reed, G, *Prescott & Dunn's Industrial Microbiology*, 1982 (4th Edition), CBS Publishers Distributors, Delhi.

YEAR – III	MEDICAL BACTERIOLOGY For the students admitted in the year 2015 onwards	MB507S
SEMESTER - V		HRS/WK - 5
CORE- 6		CREDIT - 3

Objective:

To make the students understand the medical importance of bacteria.

Unit – 1 (15 Hrs)

General attributes and virulence factors of bacteria causing infections - Morphology, classification, cultural characteristics, pathogenicity, laboratory diagnosis and prevention of infections caused by the following organisms - Staphylococci, Streptococci, Pneumococci, *Neisseria meningitides* and *N. gonorrhoea*, Corynebacteria

Unit – 2 (15 Hrs)

Escherichia coli, *Klebsiella*, *Salmonella typhi*, *S. Paratyphi A* and *S. Paratyphi B*, *Shigella*, *Proteus*, *Vibrio cholerae*, *Pseudomonas*

Unit - 3 (15 Hrs)

Bacillus anthracis, *Clostridium perfringenes*, *Cl. Tetani*, *Cl. botulinum*, *Mycobacterium tuberculosis*, *M. leprae*, Atypical Mycobacteria

Unit - 4 (15 Hrs)

Yersinia, *Haemophilus*, *Helicobacter*, *Francisella*, *Brucella*, *Bordetella*, *Legionella*, *Listeria*

Unit - 5 (15 Hrs)

Rickettsiae, *Chlamydia*, Spirochaetes, *Mycoplasma*, Actinomycetes

Text Books

- Ananthanarayanan, R and C.K.J. Panicker. *Text Book of Microbiology*, 2000 (6th Edition), Orient Longman Private Ltd., Chennai.
- Greenwood, D., R.C.B. Slack, and J.F. Peutherer, *Medical Microbiology* 1997 (15th Edition), Churchill Livingstone. New York.

Reference Books

- Brooks, G.F., Janet S. Butel, Stephen A, Jawwetz, Melnick & Adlerberg's *Medical Microbiology*, 21st Edition, Prentice Hall International Inc. 1998,
- Murray. P.R., G.S, Kobayashi, M. A. Pfaller and K. S. Rosenthal, *Medical Microbiology*, 1993, (2nd Edition), Mosby St. Louis.

YEAR – III	MEDICAL PARASITOLOGY For the students admitted in the year 2015 onwards	MB508S
SEMESTER - V		HRS/WK - 5
CORE- 7		CREDIT - 3

Objective:

To make the students understand the medical importance of parasites.

Unit - 1

(15 Hrs)

Introduction – Definition – Host parasite relationship – Transmission of parasites – Pathogenesis – Clinical diagnosis – Laboratory diagnosis – Treatment.

Unit - 2

(15 Hrs)

Entamoeba histolytica, Entamoeba coli, Giardia intestinalis, Trichomonas vaginalis, Leishmania donovani, Trypanosoma cruzi

Unit - 3

(15 Hrs)

Plasmodium falciparum, Plasmodium vivax, Cryptosporidium, Balantidium coli, Pneumocystis carinii.

Unit - 4

(15 Hrs)

Taenia saginata, Taenia solium, Schistoma haematobium, Fasciola hepatica, Trichuris trichura.

Unit - 5

(15 Hrs)

Ancylostoma duodenale, Enterobium vermicularis, Ascaris lumbricoides, Wuchereria bancrofti, Brugia malayi.

Text Books

- Parija, S. C, *Text Book of Medical Parasitology*. 1996, A l l India Publishers and Distributers Regd., Chennai.
- Ananthanarayan. R. and C.K.J. Panicker, *Text Book of Microbiology*, 2000 (6th Edition), Orient Longman Private Ltd., Chennai.

Reference Books

- Franklin A. Neva and Harold W. Brown, *Basic and Clinical Parasitology*, 1994, VI Edition, Appleton & Lange, Norwalk, Connecticut.
- Ichhpujani, R.L. and R. Bhatia. *Medical Parasitology* 3rd Edition, 2002, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi.

YEAR – III	ENVIRONMENTAL MICROBIOLOGY For the students admitted in the year 2015 onwards	EMB509S
SEMESTER - V		HRS/WK - 5
ELECTIVE – 1 A		CREDIT - 3

Objective:

To make the students understand the role of microbes in ecology.

Unit – 1 **(15 Hrs)**

Microbiology of air - droplet nuclei, aerosols - enumeration of microorganisms in air- air sanitation - Laboratory hazards - airborne diseases

Unit - 2 **(15 Hrs)**

Aquatic microflora - lakes, ponds, rivers, ocean, estuary, ground water -significance – study of aquatic microflora - Waterborne diseases - Eutrophication

Unit - 3 **(15 Hrs)**

Waste water treatment - primary, secondary (anaerobic and aerobic - trickling, activated sludge, oxidation pond) - Sludge digestion - Disposal - Drinking water treatment - chlorination - Microbiological standards of water

Unit - 4 **(15 Hrs)**

Water pollution – indicators water pollution - BOD - COD – techniques for the study of water pollution - Composting

Unit - 5 **(15 Hrs)**

Interaction among microbial populations (Neutralism, commensalisms, parasitism, antagonism) – bioleaching – Symbiotic relationship with animals

Textbooks

- Atlas & Bartha, *Microbial Ecology - Fundamental and Applications*, 1998, Benjamin/ Cummings Publishing Company, Inc., California
- Joseph C. Daniel. *Environmental Aspects of Microbiology*, 1996, Brightsun Publications, Chennai.

Reference Books

- Mitchell, R (ed) *Environmental Microbiologv*. 1992, John Wiley, New York.
- Grant W. D. and Long P.E., *Environmental Microbiology*, 1981 Blackie and Son Ltd., Glasgow

YEAR – III	MOLECULAR TAXONOMY AND PHYLOGENY For the students admitted in the year 2015 onwards	HRS/WK - 5
SEMESTER - V		CREDIT - 3
ELECTIVE – 1 B		

Objective:

To make the students understand the importance of molecular taxonomy and phylogeny

Unit - 1 **(15Hrs)**

Microbial Taxonomy: Introduction of microbial taxonomy- morphological taxonomy- biochemical taxonomy- molecular taxonomy -Numerical taxonomy- Morphological phylogeny.

Unit - 2 **(15Hrs)**

Biochemical and Molecular taxonomy: Chemotaxonomy-Fatty acid, Protein finger printing- Isozyme typing-Molecular taxonomy- G+C content-DNA-DNA hybridization.Plasmid profiles, RFLP, RAPD, STRR & LTRR-r RNA based finger printing methods.

Unit - 3 **(15Hrs)**

16S r RNA based finger printing: Types of r RNA-23S r RNA, 16S r RNA and 5S r RNA- Importance of 16S r RNA in microbial identification and taxonomy-Methods of 16S r RNA/r DNA fingerprinting - amplification of 16S r DNA using PCR-Plasmid isolation- Dot blot/ Southern blot hybridization using specific probes-sequencing of 16S r DNA using chain termination method.

Unit - 4 **(15Hrs)**

Sequence analysis: Submission of r DNA sequences in Gen Bank-Bankit & sequin guidelines- NCBI-EMBL –DDBJ-Retrieving sequences-Designing primers and probes- Sequence comparison- Alignment and data base searching- ClastalW-FASTA-BLAST-DNA barcoding.

Unit-5 **(15Hrs)**

Molecular Phylogeny: Introduction to molecular phylogeny-tree terminology-software programs for making phylogenetic trees-MEGA-PHYLIP-Cladogram –additive trees, ultrametric trees, rooted trees, unrooted trees and tree shapes.

Text books:

- Roderic D.M.Page, Edward C.Holmes (1998) Molecular Evolution: A Phylogenetic Approach .Blackwell publishing, USA
- Sandy B Primrose Richard m.Twynam, (2005) Principles of Genome analysis and Genomics, Blackwell Publishing, USA

Reference Books:

- Brendan Wren, Nick Dorrel 2002 Functional microbial genomics (vol 33) (Methods in Microbiology), Academic press, UK.
- S.B.Primrose. Principles of Genome analysis: A guide to mapping and sequencing DNA from different organisms(paper back Jan 1998.

YEAR – III	APPLIED MICROBIOLOGY For the students admitted in the year 2015 onwards	EMB510S
SEMESTER - V		HRS/WK - 4
ELECTIVE – II A		CREDIT - 3

Objective:

To make the students familiar with application of microbes in agriculture and bioremediation.

Unit - 1 **(12Hrs)**

Algal technology - Spirulina cultivation - Factors affecting Biomass production - Requirements for growth of Spirulina - Algal tanks - Avoiding contamination - Mass cultivation of Spirulina - Semi - Natural Lake system, Artificial built cultivation system - clean water system - Harvesting the Biomass & Product recovery - Benefits from Spirulina.

Unit - 2 **(12Hrs)**

Mushroom production - Mushroom biology - classification and types -Edible and poisonous mushrooms - Spawn and spawning - culture media - Preservation and storage of cultures - Crop management after spawning - casing, fruiting, harvesting - Processing - Mushroom recipes

Unit - 3 **(12Hrs)**

Biofertilizers - Bacteria – Bacterization - Mass cultivation of *Rhizobium* -*Azotobacter*-*Azospirillum* and phosphate solubilizers - Blue green algae- Algalization, Mass cultivation of Blue green algae. *Azolla* as Biofertilizer, Mycorrhizae as biofertiliser.

Unit - 4 **(12Hrs)**

Biogas production – Introduction – interaction between various microbial groups – factors affecting production – design of digester – distribution of anaerobic organisms – methanogens and methanogenesis – alternate feed stock and other wastes – kinetics of fermentation – use of spent slurry.

Unit – 5 **(12Hrs)**

Bioremediation – Clean-up Biotechnology – Microbial removal of metal ions – Soil Bioremediation – Removal of oil spill – Biodegradation of hydrocarbons – Genetically modified organisms.

Text Books

- Pathak, V.N., N.Yadav and M.Gaur, *Mushroom – Production and processing technology*, 2000, Agrobios, Jodhpur.
- SubbhaRao, N S. *Biofertilizers in Agriculture and Forestry*, 1995 (3rd Edition), Oxford & IBH Publishing Co,Pvt.Ltd.New Delhi.

Reference Books

- Sharma, A.K., *Biofertilizers for Sustainable Agriculture*, 2002, Agro bios India.
- Singh, H., *Mushrooms - The Art of Cultivation*,1991, Sterling Publishers Pvt. Ltd. New Delhi.

YEAR – III	DAIRY MICROBIOLOGY For the students admitted in the year 2015 onwards	
SEMESTER - V		HRS/WK-4
ELECTIVE–II B		CREDIT - 3

Objective: To study about the microorganisms associated with milk, dairy products and to learn about fermented dairy products.

Unit-1 **(12Hrs)**
Microorganisms of milk and milk products - Factors affecting the growth of microorganisms - Types of microorganism in milk and dairy products like butter, cheese, ice cream, yoghurt, whey - Examination or assessing microbial load of milk and milk products-Quantitative and Qualitative test

Unit-2 **(12Hrs)**
Preservation of milk and milk products – Pasteurization - Sterilization- Radiation- Ionizing Radiation- Chemicals.

Unit-3 **(12Hrs)**
Types of Microbial spoilage of milk and milk products - spoilage of milk, butter, cheese, yoghurt, raw milk-dry milk, ice cream, whey.

Unit-4 **(12Hrs)**
Fermentation of milk and milk products - Fermentation of milk, kefir, koumiss, yoghurt –Fermentation of whey in industrial uses - Lactic acid production - Alcoholic fermentation of whey and yeast delactosed whey - Synthesis of vitamins - Diseases spread by microorganisms through milk.

Unit-5 **(12Hrs)**
Milk and milk product processing - Milk sanitation - Cleaning and sanitization of milking utensils - Microbiological standards and guidelines - Quality control - Dairy plant waste disposal – treatment - preventing dairy wastes.

Text books:

- William C. Frazier and Dennis C. Westhoff. Food Microbiology. Mc Graw Hill Education.
- N. Ramanathan. A text Book on Food Microbiology. Omsakthi Pathipagam.

Reference books:

- Robinson, R. 1990. Dairy microbiology. 2nd Edition. Elsevier Applied Science Pub.
- Yadav, J.S., Sunitha, G and V.K. Batish. 1993. Comprehensive Dairy Microbiology. Metropolitan Book Co., New Delhi .

YEAR – III	SOIL AND AGRICULTURAL MICROBIOLOGY For the students admitted in the year 2015 onwards	MB611
SEMESTER- VI		HRS/WK - 5
CORE- 8		CREDIT - 3

Objective:

To make the students understand the importance of microbes in soil fertility and plant diseases.

Unit - 1 (15 Hrs)

Soil – physical and chemical properties - Introduction to soil microorganisms - bacteria, algae, fungi, actinomycetes, protozoans, nematodes and viruses - Role of microbes in soil fertility - Winogradsky column.

Unit - 2 (15 Hrs)

Microbial interactions with plants - Mycorrhizae, Rhizosphere, Phyllosphere - Plant growth promoting bacteria - Organic matter decomposition - humus formation - Biodegradation of pesticides and pollutants in soil

Unit - 3 (15 Hrs)

Biogeochemical cycles - carbon, phosphorus, sulphur and nitrogen cycles - Nitrogen fixation – symbiotic and free living - Biofertilizers (Examples and advantages) - Biopesticides (Examples and advantages)

Unit – 4 (15 Hrs)

Plant pathogenic microorganisms - Disease symptoms, mode of entry, control measures - Diseases caused by bacteria – bacterial Wilt of potato- Citrus canker, leaf blight of paddy as examples - Diseases caused by fungi - False smut of paddy, Leaf smut of rice, Red rot of sugarcane and Tikka disease of groundnut as examples

Unit - 5 (15 Hrs)

Diseases caused by viruses - Tungro virus, Virus diseases of papaya and sugarcane – Bunchy disease of banana – Leaf curl of tomato as example - Diseases caused by Mycoplasma - Little leaf of brinjal as example – Diseases due to nematodes – Root knot of vegetables as example – Seed borne diseases.

Text Books

- G. Rangaswami, A. Mahadevan. *Diseases of crop plants in India* 4th Edition. 1999, Prentice - Hall of India Private Ltd., New Delhi.
- G. Rangaswami, D. J Bagyaraj, *Agricultural Microbiology* 2nd Edition, 1998, Prentice - Hall of India Private Ltd., New Dethi.

Reference Books

- Atlas & Bartha, *Microbiology - Fundamentals and Applications* 1998, Benjamin/Cummings Publishing Company, Inc., California.
- Alcxander.M. 1961. *Introduction to Soil Microbiology*, John Wiley A Sons, Inc. New York&.London.

YEAR – III	BIOTECHNOLOGY For the students admitted in the year 2015 onwards	MB612S
SEMESTER - VI		HRS/WK - 5
CORE- 9		CREDIT - 3

Objective:

To make the students understand the basic principles and techniques involved in gene technology.

Unit - 1 (15 Hrs)

Definition and history - Recombinant DNA technology - Enzymes involved - Restriction endonucleases, RNases, Ligases, Polymerases - Cloning vectors – Types and examples - pBR 322, lambda phage vectors - DNA ligation

Unit – 2 (15 Hrs)

Chemical synthesis of DNA - DNA sequencing - cDNA - Hybridisation techniques - PCR - Genomic library

Unit - 3 (15 Hrs)

Enzyme technology - Enzyme immobilisation, Products, Applications - Biotechnological potentials of Seaweeds, Microalgae –Biofuel - Hydrogen gas as fuel from Microorganisms

Unit - 4 (15 Hrs)

Genetic engineering of plants - Electroporation - Gene gun - Particle bombardment - Ti plasmid vectors - Applications - Transgenic plants - Insect resistant, Stress tolerant, Virus resistant plants, genetically modified foods

Unit - 5 (15 Hrs)

Transgenic animals - Retroviral vector method, DNA micro injection method – Applications of rDNA technology – Recombinant products – insulin, tPA, vaccines - Gene therapy - Patents - IPR

Text Books

- Gupta, P.K., Elements of Biotechnology, 1996, Rastogi and company, Meerut.
- Ratledge C. and B. Kristiansen, Basic Biotechnology, 2001 (2nd Edition), Cambridge University Press, United Kingdom.

Reference Books

- Old, R.W. and S.B. Primrose, Principles of Gene manipulation, V. Edition, 1994, Blackwell Science, Oxford.
- Glick, B.R. and J.J. Pasternack, Molecular Biotechnology, Panima Publishing Corporation, New Delhi, Bangalore, Indian Edition.

YEAR – III	MEDICAL MYCOLOGY AND VIROLOGY For the students admitted in the year 2015 onwards	MB613S
SEMESTER – VI		HRS/WK - 5
CORE- 10		CREDIT - 3

Objective:

To make the students understand the medical importance of viruses.

Unit – 1 (15 Hrs)

Introduction – Characteristics of fungi - Morphology - Dimorphic yeasts - Classification of medically important fungi - Laboratory diagnosis of fungal infections - Antifungal agents - Superficial cutaneous mycosis – *Malssezia* infections, Tinea nigra, Piedra, dermatophytoses

Unit – 2 (15 Hrs)

Subcutaneous mycoses - Mycotic mycetoma, - Systemic mycoses – Histoplasmosis, Blastomycosis, Coccidioidomycosis, Paraccoccidioidosis - Opportunistic systemic mycoses - Aspergillosis, Penicilliosis - Yeasts of medical importance- *Candida*, *Cryptococcus* - Mycotoxicoses

Unit - 3 (15 Hrs)

General properties of viruses - Outline of animal tissue culture - Virus-Host interactions – Classification - Prions - antiviral agents - Morphology, pathogenesis, laboratory diagnosis and control of the following viruses - Pox viruses - Herpes viruses, Adeno viruses, Picorna viruses

Unit - 4 (15 Hrs)

Orthomyxo viruses, Paramyxo viruses - Arboviruses, Rhabdo viruses. Hepatitis viruses

Unit – 5 (15 Hrs)

Rubella virus, Rota virus, Oncogenic viruses, Retro viruses

Text Books

- Jagadish Chander, *Text Book of Medical Mycology*, 2002 (2nd Edition), Mehta Publishers, New Delhi.
- Timhury, M.C.. *Notes on Medical Virology*, 1997, Pearson Professional Limited, London.

Reference Books

- Ananthanarayan. R. and C.K.J. Panicker, *Text Book of Microbiology*, 2000 (6th Edition), Orient Longman Private Ltd., Chennai.
- Brooks, G. F., Janet S. Butel, Stephen A, Jawetz, Melnick fe Adlerberg's *Medical Microbiology*. 21st Edition. Prentice Hall International Inc. 1998
- L Collier and J. Oxford, *Human Virology*, 2000, 2nd Edition, Oxford University Press, Oxford

YEAR – III	COMPUTER APPLICATIONS IN BIOLOGY For the students admitted in the year 2015 onwards	EMB615S
SEMESTER - VI		HRS/WK - 4
ELECTIVE – III A		CREDIT - 3

Objective:

To make the students understand the application of computers in biology.

Unit – 1 (15 Hrs)

Introduction to computers – Types of computers – Generation – Applications of computers – Input and Output devices – ROM, RAM- Internet

Unit– 2 (15 Hrs)

Introduction to Bioinformatics – Definition – History – Biological databases (generalized and specialized) – Nucleic acid sequence databases (EMBL, NCBI, DDBJ) – sequence format (types, FASTA format) – Protein sequence databases (SWISS – PROT, PIR) – Structure databases (PDB)

Unit – 3 (15 Hrs)

Sequence homology – Alignment – Global vs. local alignment – Dot-matrix representation – BLAST – multiple sequence alignment (CLUSTAL W)

Unit – 4 (15 Hrs)

Phylogenetic analysis (phylogenetic tree, softwares) – Gene finding (methods and tools) – Protein prediction – Molecular visualization (tools, RasMol) – Automated DNA Sequencing – Human Genome Project

Unit - 5 (15 Hrs)

Concept of Genomics and Proteomics – Comparative genomics – Functional genomics – DNA micro arrays – DNA chips – Protein array

Text Books

- Alexis Leon and Mathews Leon, *Fundamentals of information Technology*, Leon Tech World.
- Mani, K. and N. Vijayaraj. *Bioinformatics for beginners*, 2002, Kalaikathir Achagam, Coimbatore.

Reference Books

- Sawyer S.C., B.K. Williams and S.E. Hutchinson, *Using Information Technology - A Practical Introduction to Computers and Communications*. 1999, (3rd Edition), McGraw-Hill International Editions.
- Brown. S M., *Bioinformatics: A Biologist's Guide to Biocomputing and the Internet*. 2000, Ealton Publishing, Natick.

YEAR – III	GENERAL HYGIENIC AND SANITARY PRACTICES For the students admitted in the year 2015 onwards	
SEMESTER - VI		HRS/WK - 5
ELECTIVE – III A		CREDIT - 3

Objective: To make the students understand the importance of hygiene and sanitary practices

Unit - 1: (15Hrs)

Introduction – Distribution of microbes in nature – Common disease caused by microbes – Control of disease-causing microbes.

Unit - 2: (15Hrs)

Water Quality and control – Water pollution – Criteria for drinking water – sanitary surveys – Bacteriological evidence for pollution – Water borne diseases – Control methods.

Unit - 3: (15Hrs)

Hygienic practices in Industries – Factory and hospital hygiene – Sterilization control.

Unit -4: (15Hrs)

Microflora of fresh food – Spoilage of food – preservation – Microbiological safety – HACCP system.

Unit - 5: (15Hrs)

Immunization – Schedule – routine – individual immunization.

Text books:

- Purohit SS, AK Salvja, HN Kakarni (2004) – Pharmaceutical Microbiology, 1st edition, Agrobios (India).
- Joseph.C.Daniel. Environmental Aspects in Microbiology. Bright Sun Publications.

Reference books:

- Pelczar JR, Chan ECS & Kreig NR (2006) – Microbiology 5th edition – Tara Mc Graw Hill, New Delhi.
- Frazier, Food microbiology, 4th edition, Tata Mc Grow hill, New Delhi.

YEAR – III	CLINICAL MICROBIOLOGY For the students admitted in the year 2015 onwards	EMB616S
SEMESTER - VI		HRS/WK - 5
ELECTIVE – IV A		CREDIT - 3

Objective:

To make the students familiar with clinical diagnosis of various microbial diseases.

Unit - 1 **(12 Hrs)**

Organization of the Clinical Bacteriology lab - Quality assurance - Safety in Microbiology laboratory – Safety levels – Good Laboratory Practices

Unit - 2 **(12 Hrs)**

General approach to clinical specimens for microbiologic examination -Collection and transport of specimens (urine, pus, CSF, sputum, body fluids) - culture containers - Antimicrobial sensitivity testing

Unit - 3 **(12Hrs)**

General principles, media and isolation techniques involved for anaerobic bacteria - serological techniques in Diagnostic Microbiology - Hospital acquired infections - infection committee - Hospital waste disposal

Unit –4 **(12 Hrs)**

Vector borne diseases – Zoonotic diseases – Sexually transmitted diseases

Unit - 5 **(12 Hrs)**

Laboratory animal management – Animal house – Rabbit, guinea pig, mice - Ethical committee

Text Books

- Finegold, S.M. & Ellen Jo Baron, *Bailey and Scott's Diagnostic Microbiology*, 1986 (7th Edition), C, V. Mosby Company, USA.
- Colliee, J. G., A.G. Fraser, B.P, Marmion and A. Simmons. Mackie & Mc Cartney *Practical Medical Microbiology*, 1996 (14th Edition), Churchill Livingstone, USA.

Reference Books

- Mims, C.A. *Mims' Pathogenesis of Infectious diseases*, 1995 (4th Edition), Academic Press, London
- Koneman. E. W. S D.Allen., V. R Do well and H.M. Sommers (eds) 1990. *Color Alias and Textbook of diagnostic Microbiology*, J.B.Lippincott Co., Philadelphia.

YEAR – III	VETERINARY MICROBIOLOGY For the students admitted in the year 2015 onwards	
SEMESTER - VI		HRS/WK - 4
ELECTIVE – IV B		CREDIT - 3

Objective:

To learn about the different diseases caused in animals by various animal pathogens, treatment and its control measures.

Unit-1 **(12Hrs)**

General characteristics of bacteria causing animal disease - Pathogenic bacteria - Defense mechanism of the host – Actinobacillosis – Anthrax – Tuberculosis - Bovine mastitis - symptoms, diagnosis, treatment and control - Hemorrhagic septicemia.

Unit-2 **(12Hrs)**

Pathogenic fungi - Characteristics epidemiology of fungal diseases - Types of fungal diseases, symptoms, diagnosis, treatment and control of Mycotic diseases of animals.

Unit-3 **(12Hrs)**

Definition - Parasites, host, vector, parasitism, effect of parasitism on the host - protozoan parasites - Trypanosomes, Leishmania, Plasmodium - diagnosis, treatment and control. Miscellaneous protozoan parasites - Amoebae, Ciliates.

Unit-4 **(12Hrs)**

General properties of virus, purification of virus particles and reaction of viruses to physical and chemical agents Classification, cultivation and replication of viruses. Viral genetics and interaction. Viral haemagglutination, interference and inclusion bodies. Oncogenic and latent viruses.

Unit-5 **(12Hrs)**

Picornavirus group - Foot and Mouth disease virus - Enveloped viruses of animals - Reovirus group - African horse sickness virus - Blue tongue virus. Toga virus group - Swine fever viruses - Mucosal disease virus - Paramyxovirus group, Pseudo virus group, Bovine Rhinotracheitis virus

Text books:

- Prof.S.N .Sharma . Dr. S.C. Adlakha . Text book of Veterinary Microbiology. Vikas publishing house. Pvt.ltd.
- D.scott Mc Vey. Melissa Kennedy .M.Chengappa .Veterinary Microbiology . Wiley-Blackwell publishers. 3rd edition.

Reference books:

- P.J.Quinn. B.K. Markey. F.C. Leonard . Veterinary Microbiology and Microbial Disease. Wiley-Blackwell publishers. 2nd edition.
- Dwight.C.Hirsh, N.James MacLachlan. Richard .L. Walker Veterinary Microbiology. Wiley-Blackwell publishers. 2nd edition.

CLASS: III – B. Sc., MICROBIOLOGY (Revised in June 2017)

Sub: Code: MBP604S

Subject: Medical Microbiology

1. Type Study of the following bacteria
 - (i) *Staphylococcus aureus*
 - (ii). *Streptococcus pyogenes*
 - (iii) *E. coli*
 - (iv) *Klebsiella pneumoniae*
 - (v). *Proteus vulgaris*
 - (vi). *P. mirabilis*
 - (vii). *Salmonella typhi*
 - (viii). *S. paratyphi A*
 - (ix). *S. paratyphi B*
 - (x). *Shigella dysenteriae*
 - (xi). *Pseudomonas aeruginosa*
2. Enrichment culture technique (i).
Salmonella from feces
(ii). *Shigella* from feces
3. Throat Swab
4. Urine Culture
5. Antimicrobial Sensitivity test - Kirby Bauer method
6. Germ tube test for *Candida albicans*
7. Wet mount examinations of stool sample for parasites (*E. histolytica* and *Giardia*)
8. Lactophenol cotton blue mounting of *Aspergillus* and *Penicillium*

MEDICAL MICROBIOLOGY SPOTTERS (Revised in June 2017)

1. Trophozoite of *E. histolytica*
2. Cyst of *E. histolytica*
3. Trophozoite of *G. lamblia*
4. Cyst of *G. lamblia*
5. Tapeworm
6. Roundworm
7. Lab animals – Guinea pig, Mouse, Rabbit
9. Embryonated egg method
10. Robertsons cooked meat medium
11. Stormy fermentation
12. Negri bodies
13. Mosquito (Vector borne diseases)
14. Acid Fast Bacilli
15. Germ tube test
16. Pox virus
17. Rabies virus
18. LJ medium

19. *Aspergillus* mount
20. *Pencillium* mount
21. Growth of *E. coli* / *Klebsiella* on EMB
22. Growth of *Vibrio cholera* on TCBS
23. Blood agar with hemolytic/ non hemolytic
24. Mac Conkey agar with LF/ Non LF
25. Growth of *Salmonella* on SS agar
26. Antibiotic Sensitivity test
27. Metachromatic granules
28. *Ascaris* male & female
29. Cyst of *Balantidium coli*
30. Microfilaria of *Wuchereria bancrofti*
31. Rat flea
32. *Salmonella typhi* biochemicals
33. NIH swab
34. *Pneumococci*

CLASS: III – B. Sc., MICROBIOLOGY (Revised in June 2017)

Sub: Code: MBP603S

Subject: Applied Microbiology

1. Open plate method
2. Enumeration of bacteria from water sample
3. Coliform count in water (MPN Technique)
4. Presence/Absence test for coliforms in water
5. Microscopic Examination of curd
6. Isolation of *Lactobacillus* and *Staphylococcus* from curd
7. Microscopic examination of fungi by Lactophenol cotton blue method – *Mucor* and *Rhizopus*
8. Microscopic examination of microorganisms in spoiled food
9. Isolation of bacteria from spoiled food
10. Detection of bacteria in milk by SPC
11. Methylene blue reduction test
12. Phosphatase test for Milk
13. Turbidity test for sterilized Milk
14. Cross section of root nodule

List of Spotters

1. Butter
2. Cheese
3. Canned food
4. Spoiled vegetable
5. Spoiled bread
6. *Rhizopus* Lactophenol cotton blue mount
7. *Mucor* Lactophenol cotton blue mount
8. BOD bottle
9. Membrane filter
10. Trickling filter
11. Lactophenol cotton blue stain
12. Methylene blue for MBRT
13. Yeast
14. Bread
15. Vinegar
16. Mushroom
17. *E coli* on EMB agar
18. Lactose fermenting colonies on MacConkey agar
19. YEMA medium
20. Root nodule
21. Cross section of root nodule
22. MPN Preliminary test - Lauryl tryptose broth with Durham's tube
23. MPN Confirmed test - Brilliant green lactose bile broth with Durham's tube

24. Curd
25. Milk
26. Milk sample with Methylene blue in screw cap tube
27. Teasing needle
28. *Lactobacillus* on Oxgall Agar
29. Staph. aureus on Baird parker agar

THEORY EXAMINATION (UG)

Question Paper Pattern (Both for Main and Allied Subjects)

Continuous internal assessment (CIA) (25 marks)

Two internal Examinations	15 marks
Assignment/ Seminar	10 marks
Total	25 marks

External Examination (75 marks)

Time: 3 hours
Max. Marks: 75

Part – A 10 X 1 = 10 Marks
(MCQ pattern, without choice, 2 questions from each unit)

Part – B 5 X 3 = 15 Marks
(Short answer type – not exceeding 50 words, 5 out of 7 Questions have to be answered, not more than 2 questions from each unit)

Part – C 5 X 10 = 50 Marks
(Essay type answers - not exceeding 750 words, either or choice, 1 question from each unit)

PRACTICAL EXAMINATION (UG)

Continuous internal assessment (CIA) (40 marks)

Based on the periodical evaluation of record and experiments assessed by the staff in charge

External Examination (60 marks) - For Core

6 Hrs. Exam, 3 Hrs. per day on two consecutive days Total

Marks: 60

One Major experiment - 20 marks One

Minor experiment - 10 marks Viva voce

- 10 marks

Spotters - 10 marks

Record - 10 marks

Total - 60 marks

External Examination (60 marks) – For Allied

3 Hrs. Exam

Total Marks: 60

Two experiments - 30 marks

(Each 15 marks)

Viva voce - 10 marks

Spotters - 10 marks

Record - 10 marks

Total - 60 marks

II B. Sc Bio-Chemistry	PRINCIPLES OF MICROBIOLOGY For the students admitted in the year 2008 onwards	AMBC301
SEMESTER – III		HRS/WK - 5
ALLIED THEORY – 1		CREDIT - 4

Objective:

To make the students to understand the basic principles of microbiology.

Unit – 1 (15 Hrs)

Introduction - History and scope of Microbiology - Shape and Size of bacterial cells - Structure of bacterial cell -Structure and functions of cell organelles (Cell wall, structures found outside the cell wall and within the cell wall) - Structure of Endospore

Unit – 2 (15 Hrs)

Microscopy - Simple, Compound, Dark field, Phase contrast, Fluorescent, Electron Microscopes - Staining – Classification Microorganisms - Haeckel’s, Whitaker’s - Prokaryotes and eukaryotes - Taxonomical ranks - Binomial Nomenclature - Characteristics used in Taxonomy

Unit – 3 (15 Hrs)

Sterilization - Physical agents - Moist heat, Dry heat, Radiation, Filtration -Chemical agents - Phenols and phenolic compounds, Alcohols, Gaseous agents - Antibiotics – Classification, Mode of action - Antifungal and antiviral agents – examples

Unit – 4 (15 Hrs)

Motility of bacteria - Nutrient requirements of microorganisms - Growth factors - Nutritional types - Culture media - Pure culture - Microbial growth - Growth curve - Measurement of microbial growth - Continuous culture - Environmental factors affecting growth - Bacterial reproduction

Unit – 5 (15 Hrs)

Brief description of important groups of bacteria - Archaeobacteria, Spirochetes, Mycoplasma, Actinomycetes, Photosynthetic bacteria, Cyanobacteria, Methanogenic bacteria, Sulfate utilizing bacteria - General characteristics of Algae, Fungi, Protozoa and viruses - Human diseases and the pathogen involved – Role of microorganisms in the environment.

Text Books

- Michael J. Pelzar.1993. Jr., E.C.S. Chan, Noel R. Krieg, Microbiology, (Fifth edition), New Delhi.,Tata McCraw Hill.
- Prescott, L. M., J. P. Harely and D. A. Klain, 2003. Microbiology, (5th Edition) New York, McGraw Hill.

Reference Books

- Roger Y. Stanier, John L. Ingraham, Mark L. Wheelis, Page R. Painter, Microbiology, (5th edition), Macmillan.

- Atlas R. A.,1997. Principles of Microbiology (2nd Edition), Iowa, Wm. C. Brown Publishers.
- Talaro K. P. and A. Talaro, 1999 Foundations in Microbiology, (3rd Edition), WCB McGraw Hill.

II B. Sc (Biochemistry)	ALLIED MICROBIOLOGY PRACTICAL For the students admitted from the year 2008	AMBCP01
SEMESTER - III		HRS/WK-3
ALLIED PRACTICAL-1		CREDIT - 2

Objective:

To enable the students to learn the basic staining procedures in Microbiology

Microscopy

1. Simple staining
2. Gram staining – Gram positive cocci
3. Gram staining – Gram negative bacilli
4. Acid-fast staining
5. Spore staining
6. Capsule staining
7. Motility – Hanging drop method
8. Observation of Fungi (*Penicillium*, *Aspergillus*, *Mucor*, *Rhizopus*) – LPCB mount, Algae (*Chlorella*, *Spirogyra*) and Protozoa (*Amoeba*, *Paramecium*), Yeast (*Saccharomyces cerevisiae*) – Gram staining
9. Media preparation and culture technique (Demonstration only)

SPOTTERS:

1. Inoculation loop
2. Inoculation needle
3. Anaerobic jar
4. Hot air oven
5. Autoclave
6. Laminar air flow
7. Incubator
8. Mac conkey Agar
9. TCBS Plate
10. EMB Agar
11. Spirochetes
12. Eyepiece
13. Objective lens
14. Membrane filter
15. Acid Fast Bacilli
16. Gram positive cocci
17. Gram negative rods
18. Gram positive yeast
19. Spore staining
20. *Aspergillus*
21. Dark field microscopy
22. NA slant with liquid paraffin
23. Water bath
24. L – rod

25. pH meter
26. Crystal violet
27. Chlamydomonas
28. Mushroom
29. Immersion oil
30. Centrifuge

II - B. Sc. CHEMISTRY	FOOD PROCESSING TECHNOLOGY	AOFT301
SEMESTER-III		HRS/WK-3
ELECTIVE		CREDIT-2

Objective: To make the students understand the basic techniques and regulations of food processing industry

UNIT I: (10hrs)

Aim and objectives of preservation and processing of foods – classification of foods by ease of spoilage – methods of food preservation – principles of food preservation – asepsis – removal of microorganisms – maintenance of anaerobic conditions.

UNIT II: (10hrs)

Preservation of food by use of high and low temperature. Factors affecting heat resistance (Thermal death time) – heat penetration – heat treatments employed in processing foods – canned foods – low temperature storage – chilling and freezing – freezing of foods and its consequences.

UNIT III: (10hrs)

Preservation of foods by drying, additives and radiation. Methods of drying – treatments of foods before drying – procedures after drying – intermediate moisture foods – antimicrobial preservatives – added preservatives – developed preservatives – Ultra violet radiation – ionizing radiations – gamma rays and cathode rays – microwave processing.

UNIT IV: (8hrs)

Food sanitation - Microbiology of the food product – good manufacturing practices – Hazard Analysis Critical Control Points – health of employees. Food control – enforcement and control agencies – international agencies (FAO, WHO, FDA & ISO) – national agencies (Agmark, ISI, BIS).

UNIT V: (7hrs)

Food and food components – Food Adulteration – Food additives. - Dairy Technology. Market milk – Special milk - Cream – Butter – Ice Cream – Cheese – Dried milk products
– Packaging of milk and milk products.

Text Books:

William C. Frazier., Dennis C. Westhoff, *Food Microbiology*, 1995 (Fourth Edition), Tata McGraw Hill, New Delhi.

Reference Books:

- Sukumar De, *Outlines of Dairy Technology*, 1991, Oxford University Press.
- A.Y. Sathe, *A First Course in Food Analysis*, 1999 New Age International (P) Limited, Publishers, New Delhi.