

Scheme for B.Sc.(Microbiology) Programme							
Sem.	CourseNo.	Course code and subject title	Inst.Hrs.		Credits	Total Inst.Hrs.	Total Credits
			T	P			
I Sem	Common1	English	5	-	4	25	20
	<a href="#">Core1</a>	MB1B01U Fundamentals of Microbiology	4	-	4		
	<a href="#">Core2</a>	MB1B02U Microbial Metabolism & Microbial Genetics	4	-	4		
	<a href="#">Core3</a>	MB1B03U Microbiology Practical -1	-	4	2		
	Compl.-1	Biochemistry-1	2	-	2		
	Compl.-2	Biotechnology-1	2	-	2		
	Compl.-3	Practical Biochemistry-1	-	2	1		
II Sem	Common2	English	5	-	4	25	20
	<a href="#">Core 4</a>	MB2B04U Immunology	4	-	4		
	<a href="#">Core5</a>	MB2B0 5U Science Methodology& Biostatistics	4	-	4		
	<a href="#">Core6</a>	MB2B06U Microbiology Practical-2	-	4	2		
	Comp.-5	Biochemistry-2	2	-	2		
	Compl.-6	Biotechnology-2	2	-	2		
	Compl.-7	Practical Biochemistry-2	-	2	1		
III sem.	<a href="#">Core 7</a>	MB3B07U Industrial Microbiology	5	-	4	25	20
	<a href="#">Core 8</a>	MB3B08U Soil Microbiology	4	-	4		
	<a href="#">Core 9</a>	MB3B09U Food Microbiology	4	-	4		
	<a href="#">Core 10</a>	MB3B10U Microbiology Practical-3	-	4	2		
Comp.-9							
Biochemistry-3	2	-	2				
Compl-10	Biotechnology-3	2	-	2			
Compl.-11	Practical Biochemistry-3	-	2	1			
Compl.-12	Practical Biotechnology-3	-	2	1			

Sem.	CourseNo.	Course code and subject title	Inst.Hrs.		Credits	Total Inst.Hrs.	Total Credits
			T	P			
IV Sem	<a href="#">Core11</a>	MB4B11U Aquatic Microbiology	4	-	4	25	20
	<a href="#">Core12</a>	MB4B12U Environmental Microbiology	5	-	4		
	<a href="#">Core 13</a>	MB4B13U Agricultural Microbiology	4	-	4		
	<a href="#">Core 14</a>	MB4B14U Microbiology Practical 4	-	4	2		
	Compl.-13	Biochemistry-4	2	-	2		
	Compl.-14	Biotechnology-4	2	-	2		
	Compl.-15	Practical Biochemistry-4	-	2	1		
V Sem.	Compl.-16	Practical Biotechnology-4	-	2	1	25	20
	<a href="#">Core15</a>	MB5B15U Medical Bacteriology-1	5	-	4		
	<a href="#">Core16</a>	MB5B16U Medical Bacteriology-2	4	-	4		
	<a href="#">Core 17</a>	MB5B17U Medical Mycology	4	-	3		
	<a href="#">Core 18</a>	MB5B18U Medical Parasitology	4	-	3		
	<a href="#">Core 19</a>	MB5B19U Microbiology Practical-5		4	2		
	Open Course		4	-	4		
	<a href="#">Core20</a>	MB6B20 U Medical Virology	4	-	3		
	<a href="#">Core21</a>	MB6B21U Diagnostic Microbiology	5	-	4		

VI Sem.	<a href="#">Core22 (Choice Based Course)</a>	MB6B22AU Microbioprocess / MB6B22BUSanitation Microbiology/ MB6B22CU Medical Entamology	4	-	4	25	20
	<a href="#">Core23</a>	MB6B23U Microbiology Practical-6	-	5	3		
	Core24	MB6B24U Seminar	-	2	1		
	Core25	MB6B25U Project	-	5	3		
	Core26	MB6B26UViva	-	-	2		

Syllabi of  
**Core Courses**

**Core Course- 1****MB1B01U Fundamentals of Microbiology****Total hours of instruction 72****Hours per week 4****Credits: 4****Unit 1**

Definition, Scope and history of microbiology. Beneficial and harmful microbes. Diversity of microbial world. Principles of classification- classification of bacteria & algae. Ultrastructure of prokaryotic cell. Differentiate between eukaryote and prokaryote. Differences between archaeobacteria and eubacteria.

**References**

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan, C.K. Jayaram Panikar](#)  
[Microbiology](#) by Daniel Lim  
[Microbiology: Principles and Explorations](#) by Jacquelyn G. Black  
[Prescott/Harley/Klein's Microbiology](#) by Joanne Willey, Linda Sherwood, and Chris Woolverton

Microbiology Pelczar, Chan and Krieg.

### Unit 2

Microscopes, Staining techniques, Culture media and culture methods (including anaerobic bacteria) Isolation of pure cultures.

#### References:

.Biophysics R.N.Roy

General microbiology Vol 1 Powar & Dagainawala

Microbiology Pelczar, Chan and Krieg.

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan, C.K. Jayaram Panikar](#)

### Unit 3

Sterilisation and disinfection ♦ physical and chemical methods. Antimicrobial agents ♦ mode of action

#### References:

Microbiology Pelczar, Chan and Krieg.. Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan, C.K. Jayaram Panikar](#)

.[Prescott/Harley/Klein's Microbiology](#) by Joanne Willey, Linda Sherwood, and Chris Woolverton

General microbiology Vol 1 Powar & Dagainawala

**Unit 4:** Nutrition, nutritional types, growth requirements and conditions influencing growth, growth curve, growth kinetics, phases of growth, cell division, sporulation, germination. Enumeration & quantitation of bacteria and microbes. Preservation and transport of bacteria.

#### References:

Microbiology Pelczar, Chan and Krieg.

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan, C.K. Jayaram Panikar](#)

[Prescott/Harley/Klein's Microbiology](#) by Joanne Willey, Linda Sherwood, and Chris Woolverton

General microbiology Vol 1 Powar & Dagainawala

### Core Course- 2

#### MB1B02U Microbial metabolism and Microbial genetics

**Total hours of instruction 72**

**Hours per week 4**

**Credits: 4**

**Unit 1 :** Bacterial metabolism, enzymes, factors affecting enzyme activity, transition state in enzyme catalysed reactions, high energy compounds-ATP, GTP, role of reducing power of NAD, NADPH.

#### References:

General microbiology Vol 1 Powar & Dagainawala

General microbiology Vol 2 Powar & Dagainawala

Microbiology Pelczar, Chan and Krieg

**Unit 2 :** Carbohydrate metabolism, glycolysis, alcoholic fermentation, TCA cycle, glyoxalate cycle, electron transport chain, substrate level and oxidative phosphorylation, pentose phosphate pathway. Photosynthesis , nitrogen fixation . Transamination and methanogenesis.

#### References:

General microbiology Vol 1 Powar & Dagainawala

General microbiology Vol 2 Powar & Dagainawala

Microbiology Pelczar, Chan and Krieg

[Prescott/Harley/Klein's Microbiology](#) by Joanne Willey, Linda Sherwood, and Chris Woolverton

**Unit 3:** Bacterial chromosome- structure, replication, extrachromosomal genetic material. Plasmids ♦ structure, replication, incompatibility, plasmid amplification. Transposons ♦ types, transposition. Genetic exchange ♦ conjugation, transformation, transduction. Mechanism and spread of antibiotic resistance in bacteria.

#### References:

Microbial Genetics Stanley R. Maloy, Freifelder and Cronan

Molecular Genetics of Bacteria Snyder and Charminess.

Fundamentals of molecular Biology by Veer Bala Rastogi Ane books India

**Unit 4:** DNA repair & restriction, types of repair systems. Gene expression ♦ transcription, translation, control of gene expression in microbes. Mutation- spontaneous, induced, base pair changes, frame shift, deletion, inversion, insertion, tandem duplications, useful phenotypes (auxotrophic, conditional, lethal, resistant) Reversion vs suppression, Ames test.

#### References

Microbial Genetics Stanley R. Maloy, Freifelder and Cronan

Molecular Genetics of Bacteria Snyder and Charminess.

#### Core Course -3

#### MB1B 03U Microbiology Practical ♦ I

**Total hours of instruction: 72**

**hours/ week: 4**

**Credit : 2**

Study the parts and usage of a Compound Microscope

Study the parts and working and uses of

Autoclaves

Hot air oven

Membrane Filter

Safety Cabinet

Anaerobic Jar

Centrifuge

Incubator

Preparation of culture Media (NB, NA, MA) and dispensing media in test tubes, bottles, petridishes.

Cultivation of Bacteria on nutrient Agar for obtaining isolated colonies. Study of cultural colony characters- Size, shape, colour etc.

Viable Count of bacteria by pour plate/ spread plate method.

Examination of wet films under high power objectives.

Preparation and examination of Hanging drop mount for studying the motility of bacteria.

Preparation of slide smears for staining.

Staining- Principle & techniques

- Simple staining
- Gram Staining

- Negative Staining.

- Special Staining ♦ endospores, volutin granules

Microscopic study of Bacteria ♦ Cocci, Bacilli

Preparation of Fungal media

Cultivation of fungi study of colony characters of yeast and mold.

#### References:

Microbiology ♦ Concepts and Application ♦ Pelzer Jr. Chang Kreig Mac Graw Hill Inc

Microbiology ♦ Prescott, Harley and Klein Wim.C.Brown Publishers.

Practical Microbiology ♦ R.C Dubey, D.K Maheshwari, S Chand and Company, New Delhi.

Microbiology Laboratory Manual ♦ Cappuccino, Sherman, Pearson Education

Manual of Microbiology Kanika Sharma Ane Books Pvt. Ltd.

#### Core Course-4

#### MB2B04U Immunology

**Total Instruction hours- 72**

**Hours / week- 4**

**Credits- 4**

#### Unit I:

History of Immunology, Introduction to Infection, Types of Immunity- innate immunity and acquired immunity, Cells and organs involved in immune system

#### References:

Immunology Janis Kuby, Thomas J. Kindt, Barbara A. Osborne, and Richard A. Goldsby

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

.Kannan (2007), "Immunology", MJP Publishers, Chennai 600005.

Roitt's Essential Immunology by [Peter Delves](#) , [Seamus Martin](#) , [Dennis Burton](#), [Ivan Roitt](#)

#### Unit II:

Antigens- types, properties, Haptens, Adjuvants; Vaccines - Types - Toxoids - antitoxins., Immunoglobulins- Structure, types and properties. Complement- structure properties, function of complement components and pathways, Major histocompatibility complex- HLA, H2

Antigen antibody reaction- precipitation reactions, agglutination reactions, complement fixation, Neutralisation reactions, Immunofluorescence, ELISA, RIA.

#### References:

Immunology Janis Kuby, Thomas J. Kindt, Barbara A. Osborne, and Richard A. Goldsby

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

I.Kannan (2007), "Immunology", MJP Publishers, Chennai 600005.

Roitt's Essential Immunology by [Peter Delves](#) , [Seamus Martin](#) , [Dennis Burton](#), [Ivan Roitt](#)

#### Unit III:

Humoral Immune response- Theories of antibody production, plasma cells and antibody secretion, Monoclonal antibodies, Cell mediated immune response- Cytokines, natural killer cells and antibody dependent cell mediated cytotoxicity

#### References:

Immunology Janis Kuby, Thomas J. Kindt, Barbara A. Osborne, and Richard A. Goldsby

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

.Kannan (2007), "Immunology", MJP Publishers, Chennai 600005.

Roitt's Essential Immunology by [Peter Delves](#) , [Seamus Martin](#) , [Dennis Burton](#), [Ivan Roitt](#)

#### Unit IV:

Immunohaematology- Blood groups. Blood transfusion- Rh incompatibilities, Hypersensitivity Reactions- Type I, II, III, & IV. Brief of Transplantation Immunology, Autoimmunity, Tumor Immunology

**References:**

Immunology Janis Kuby, Thomas J. Kindt, Barbara A. Osborne, and Richard A. Goldsby  
 Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)  
 I.Kannan (2007), "Immunology", MJP Publishers, Chennai 600005.  
 Roitt's Essential Immunology by [Peter Delves](#), [Seamus Martin](#), [Dennis Burton](#), [Ivan Roitt](#)

**Core Course-5****MB2B05U Science Methodology and Biostatistics****Unit I**

Science and Tools of Science

Types of knowledge: practical, theoretical and scientific knowledge. Basis for Scientific laws and factual truths. Revolutions in Science and Technology.

Hypothesis; theories and laws in Science; observations, evidences and proofs. Significance of peer Review.

**Reference:**

Debbie Holmes, Peter Moody, Diana Dine. Research methods for the biosciences, International student edition, Oxford University Press Inc. New York

S.K. Aggarwal. Foundation course in Biology, Ane $\diamond$ s Student Edition, 2<sup>nd</sup> edition

R.C. Sobti, V.L. Sharma. Essentials of Modern Biology, Ane $\diamond$ s Student Edition.

**Unit II**

Experimentation in Science and Data Handling

Design of an experiment; experimentation; observation; data collection; interpretation and deduction. Necessity of units and dimensions; repeatability and replication. Documentation of experiments, Record keeping. Connection between measurements and underlying theory. Documentation of experiments.

Nature and types of data  $\diamond$  typical examples; data acquisition; treatment of data; data interpretation. Significance of statistical tools in data interpretation: graphs, tables, histograms and pi diagrams.

Statistical testing of hypothesis, null hypothesis. Significance test  $\diamond$  Statistics based acceptance or rejection of a hypothesis. Deduction of scientific correlation, patterns and trends.

**Reference:**

Debbie Holmes, Peter Moody, Diana Dine. Research methods for the biosciences, International student edition, Oxford University Press Inc. New York

S.K. Aggarwal. Foundation course in Biology, Ane $\diamond$ s Student Edition, 2<sup>nd</sup> edition

R.C. Sobti, V.L. Sharma. Essentials of Modern Biology, Ane $\diamond$ s Student Edition.

**Unit III**

Nature and scope of statistical methods and their limitation.  
compilation, classification, tabulation, and application in life science.  
Graphical representation, Measure of average and dispersion mean, median, mode.

**Reference**

Fundamentals of Biostatistics. Bernard Rosner  
Biostatistics for medical, nursing and pharmacy students. a. indrayan and L. Satyanarayana.  
Statistics for Biologists. Campbell. R.C

**Unit IV**

Sampling methods ♦ simple random, stratified, systematic and cluster sampling procedures. Sampling distribution, Probability, Tests of significance based on T, Chi-square and F Test Designing and methodology of experiment

**Reference**

Fundamentals of Biostatistics. Bernard Rosner  
Biostatistics for medical, nursing and pharmacy students. a. indrayan and L. Satyanarayana.  
Statistics for Biologists. Campbell. R.C

**Core Course- 6****MB2B06U Microbiology Practical ♦ II****Total hours of instruction: 72****Hours/week: 4****Credit: 2**

Slide agglutination test, Blood grouping, ASO  
Bacterial agglutination test  
Precipitation reaction ♦ RPR, VDRL, ODD,  
RID,  
ELISA-Demonstration  
Titration of Antibody ♦ Widal Test.

**Reference**

Bailey and Scott ♦s Diagnostic Microbiology  
Practical Medical Microbiology by Mackie & Mc Cartney  
Hand book of experimental immunology by D.M. Weir  
Practical Microbiology by Dubey and Maheswari  
Experiments in Microbiology, Plant Pathology and Biotechnology by K.R. Aneja

**Core Course- 7****MB3B07U Industrial Microbiology****Total hours- 90****Hours / week- 5****Credits- 4****Unit I:**

General concepts of industrial microbiology, principles of exploitation of microorganisms of their products. Introduction to microbial products obtained by industrial process-primary and secondary metabolites. Industrial strains characteristics and isolation techniques- primary and secondary staining techniques, strain improvement.

**References**

[Principles of Fermentation Technology](#) by Peter F. Stanbury, Stephen J. Hall, and Allan Whitaker  
[Industrial Microbiology](#) by L.E. Casida  
 Industrial and Environmental Biotechnology by Nuzhat Ahmed ; Fouad M Qureshi and Obaid Y.Khan

**Unit II:**

Industrial fermentation equipment and its uses, types of fermentation -single, batch, continuous, dual or multiple, solid- state and submerged fermentation. Fermentation media formulation strategies, means of providing energy, carbon, nitrogen, vitamin and mineral sources, role of buffers, precursors, inhibitors, inducers and antifoams, products recovery and purification.

**References**

[Principles of Fermentation Technology](#) by Peter F. Stanbury, Stephen J. Hall, and Allan Whitaker  
[Industrial Microbiology](#) by L.E. Casida

**Unit III:**

Industrial products derived from microbes, industrial Enzymes-amylase, proteinase, cellulase, Aminoacid production - glutamic acid and lysine. Production of antibiotics penicillins, streptomycins, Vitamins- riboflavin, cyanocobalamin. Vaccines - genetic recombinant vaccines.

**References**

[Manual of Industrial Microbiology and Biotechnology](#) by Ronald M. Atlas  
[Prescott and Dunn's Industrial Microbiology](#) by Gerald Reed  
[Industrial Microbiology](#) by Samuel C. Prescott  
[Industrial Microbiology](#) by L.E. Casida

**Unit IV:**

Immobilization methods, adsorption; covalent linkages, membrane entrapment- advantages and disadvantages, Intellectual Property Rights (IPR)  
 IPR - Definition - WTO - Definition - Functions - Forms of IPR Protection.

**References**

[Principles of Fermentation Technology](#) by Peter F. Stanbury, Stephen J. Hall, and Allan Whitaker  
[Manual of Industrial Microbiology and Biotechnology](#) by Ronald M. Atlas  
[Prescott and Dunn's Industrial Microbiology](#) by Gerald Reed  
[Industrial Microbiology](#) by Samuel C. Prescott  
[Industrial Microbiology](#) by L.E. Casida



**Core Course-8**  
**MB3 08U Soil microbiology**

**Total hours of instruction :72**  
**Hours / week:4**  
**Credits:4**

**Unit 1**  
Soil environment- soil structure, physico chemical characteristics, microbial composition and influence of soil and environmental factors on soil micro flora .Quantitative and qualitative estimation of microorganisms in soil. Organic matter decomposition, Methanogenesis Humus formation.

**References**  
1.Soil microbiology;An exploratory approach-Mark.s.coyne  
2.Introduction to soil microbiology-Martin Alexander  
3.Soil microorganisms and plant growth-N.S.Subba Rao

**Unit 2**  
- Major biogeochemical cycles and the organisms. Microbial transformation of carbon-nitrogen-phosphorus and sulphur. Microbes in composting and biogas production

**References**  
1.Soil microbiology;An exploratory approach-Mark.s.coyne  
2.Introduction to soil microbiology-Martin Alexander  
3.Soil microorganisms and plant growth-N.S.Subba Rao  
4 Advances in biogas technology-Chawla,O.P

**Unit3**  
- Microorganisms in soil fertility.Rhizosphere concept,R:S ratio ,Interaction between plant and rhizosphere flora.Growth promoting rhizobacteria,soil enzymes,Biocheleters(siderophore).Bifertilizers-Types and importance

**References**  
1.Introduction to soil microbiology-Martin Alexander  
2.Soil microorganisms and plant growth-N.S.Subba Rao  
3.Soil microorganisms and plant growth Somani.L.L and Bhandari,S.C

**Unit 4**

Biological nitrogen fixation ♦ Nitrogenase enzyme-nif genes-symbiotic nitrogen fixation (Rhizobia, Frankia)-non symbiotic nitrogen fixation (Azotobacter, Azospirillum). VAM-ecto-endo-ectendomycorrhizae.

### References

1. Soil microorganisms and plant growth-N.S.Subba Rao
2. Biofertilizers-Somani *etal*
3. Soil microorganisms and crop growth Somani.L.L and Bhandari,S.C
4. Biofertilizers in agriculture-Subba Rao,N.S

### Core Course- 9

#### MB3B09U Food Microbiology

**Total hours- 72**

**Hours / week- 4**

**Credits- 4**

#### Unit I:

History of food microbiology. Food as a substrate for micro organisms -. Micro organisms important in food microbiology; Molds, yeasts and bacteria - General Characteristics - Classification and importance.  
Principles of food preservation - Asepsis - Removal of micro organisms, anaerobic conditions - High temperature - Low temperature - Drying - Food additives.

#### References

Frazier, W.C. 1978. Food Microbiology. McGraw Hill  
[Modern Food Microbiology](#) by James M. Jay, Martin J. Loessner, and David A. Golden

#### Unit II:

Contamination and spoilage - vegetables and fruits, meat and meat products, milk and milk products - fish and sea food - Poultry, Spoilage of canned foods. Food borne infections, poisoning and intoxications Microbiological examination of food, Milk. HACCP- definition and principles (brief)

#### References

Frazier, W.C. 1978. Food Microbiology. McGraw Hill  
[Modern Food Microbiology](#) by James M. Jay, Martin J. Loessner, and David A. Golden

#### Unit III:

Importance of microbes in food industries. Fermented food products by microbes ♦ Bread, Vinegar etc. Alcoholic beverages- wine, beer, cedar. Oriental fermented foods. Fermented vegetables. Milk and mil products- butter, cheese, Probiotics (brief study)

#### Reference

Frazier, W.C. 1978. Food Microbiology. McGraw Hill.

Industrial Microbiology by Samuel C. Prescott

Parihar and Parihar Dairy Microbiology, Saraswati Purohit, Jodhpur India, 2007

Prajapati J. B. (1995), Fundamentals of Dairy Microbiology.

#### Unit IV:

Microbial cells as food-single cell proteins- Bakers yeast

Edible mushroom- types and production

Enzymes in food industry

#### References

Frazier, W.C. 1978. Food Microbiology. McGraw Hill.

Industrial Microbiology by L.E. Casida

#### Core Course 10

#### MB3B10U Microbiology Practical ♦III

**Total hours of instruction: 72**

**Hours / week : 4**

**Credit : 2**

Enumeration of soil microbes by Plate culture method and isolation of microorganisms from soil sample ♦ Bacteria, Fungi, Actinomycetes and Azotobacteria.

Isolation of cellulolytic, Amylolytic, Lipolytic and Proteolytic Bacteria from Soil

Wine Production from grapes

Immobilization of yeast cells

Study of Microbial contamination in food products

Analysis of food samples- Vegetables, Fruits, Fish, Meat and processed food & isolation of bacteria and fungi.

Milk analysis by SPC and MBRT

Enumeration and isolation of Lactobacillus from curd

Enumeration and isolation of Bacteria and mold from fermented foods

Production of Alcohol from Cashew Apple

Mushroom cultivation

**Reference**

Practical Microbiology by Dubey and Maheswari  
 Experiments in Microbiology, Plant Pathology and Biotechnology by K.R. Aneja  
 Text book of Biotechnology by R.C. Dubey

Core Course-11  
 MB4B 11U Aquatic microbiology

**Total hours of instruction:72**

**Hours/week:4**

**Credits-4**

**Unit 1**

The aquatic environment and distribution of microorganisms in the aquatic environment. Aquatic ecosystem-fresh water(ponds,lakes,stream) marine(estuaries.mangroves,deep sea).Water zonations-upwelling.Benthic microorganisms.Marine microflora and biofouling

**References**

.Aquatic microbiology-Rheinheiner  
 .Marine pollution-Clark

**Unit 2**

Techniques for the study of aquatic microorganisms.The role and importance of aquatic microbial ecosystem.microbial consortia.Surface attachment and biofilm development.Antibacterial and bioactive compounds from aquatic microorganisms

**References**

Elements of microbiology- Pelczar,Reid and chan  
 Aquatic microbiology-Rheinheiner

**Unit 3**

Water pollution, microbial changes induced by inorganic and organic pollutants.metals as pollutants.algal blooms.biological and chemical control of algal blooms

**References**

.Elements of microbiology- Pelczar,Reid and chan  
 .Aquatic microbiology-Rheinheiner  
 .Fundamentals of bacteriology-A.J.Salle  
 Ecological aspect of waste water treatment vol 2 biological activities and treatment process-Cruds C.R and hawkes  
 Microbiology-Prescott,M.J;harley,j.p.and klein,D.A

**Unit 4**

Potability of water.Purification and disinfection.indicator organisms.microbiological examination of drinking water.Water born diseases and control measures

**References**

Elements of microbiology- Pelczar, Reid and Chan  
 Aquatic microbiology- Rheinheimer  
 Fundamentals of bacteriology- A.J. Salle  
 Ecological aspect of waste water treatment vol 2 biological activities and treatment process- Cruds C.R and Hawkes  
 Microbiology- Prescott, M.J; Harley, J.P. and Klein, D.A  
 .Industrial microbiology- Casida, L.E

Core Course-12  
 MB4B12U Environmental microbiology

**Total hours of instruction: 90**  
**Hours/week: 5**  
**Credits: 4**

### Unit 1

Concepts of microbial ecology .Microorganisms in the natural environment; Extreme environments and their adaptations. Significance of microbial activities in the environment

### References

.Environmental microbiology- Vijaya Ramesh  
 .Introduction to environmental microbiology- Mitchel, R  
 .Soil microbiology- Waksman S.A  
 .Microbial ecology- Atlas and Bartha

### Unit 2

Aerobiology, .Sources of microorganisms in the air and their quantification techniques. Methods of sampling air. Factors affecting the extent and type of air microflora

### References

Environmental aspects of microbiology- Joseph C. Daniel  
 .Environmental microbiology- Vijaya Ramesh  
 .Introduction to environmental microbiology- Mitchel, R  
 .Microbial ecology- Atlas and Bartha

### Unit 3

Biosensors and biological indicators. Waste water management and sewage treatment. Bioreactors for waste treatments. Biosurfactants. Biodeterioration of industrial products such as textiles, paper, pulp, wood and paints

### References.



Agricultural microbiology- G.Rangaswamy and D.J. Bagyaraj  
 Advances in Agricultural microbiology-subba Rao  
 Diseases of crop plants in India-G.Rangaswamy.  
 Crop diseases and their management-Chaube H.S.and Pundhir V.S

### Unit 3

Phyllosphere microflora and its importance. Endophytic microflora. Microbiology of wood and silage, Tobacco curing. Role of microbes in retting  
 Rumen microbiology

### References

1. Soil microorganisms and plant growth-N.S.Subba Rao
2. Plant microbiology-. Campbell, R
3. Agricultural microbiology- G.Rangaswamy and D.J. Bagyaraj
4. Advances in Agricultural microbiology-subba Rao
5. Microbiology Fundamentals and applications-Ronald M. Atlas

### Unit 4

Biopesticides-Bacterial-viral-fungal pesticides Biological control of plant diseases. Integrated pest management

### References

- 1 Soil microorganisms and plant growth-N.S.Subba Rao
2. Plant microbiology-. Campbell, R
3. Agricultural microbiology- G.Rangaswamy and D.J. Bagyaraj
4. Advances in Agricultural microbiology-subba Rao
5. Microbiology Fundamentals and applications-Ronald M. Atlas
6. Microbial ecology-Atlas and Bartha
7. General microbiology-Pelczar, Reid and Chan
- 8 Microbiology-Prescott, M.J.; Harley, J.P. and Klein, D.A

### Core Course 14

#### MB4B 14U Microbiology Practical IV

**Total hours of instruction: 72**

**Hours / week : 4**

**Credit : 2**

Enumeration and isolation of microorganism from fresh water and marine system.  
 Microbial investigation of drinking water samples, total bacteria count, coliform test ◆ MPN, Membrane Filter Technique.  
 Estimation of BOD.  
 Study of common Plant pathogen  
 Isolation of pathogen- Citrus Canker , wilt.  
 Estimation of rhizosphere microbial population and calculation of R:S ratio.  
 Isolation of nitrogen fixing bacteria ◆ Rhizobium, Azospirillum, Azotobacter

#### Reference.

Experiments in Microbiology, Plant Pathology and Biotechnology by K.R. Aneja  
 Microbiology Laboratory Manual by Cappuccino Sherman

**Core Course- 15****MB5B 15U Medical Bacteriology- I****Total hours- 90****Hours / week- 5****Credits- 4**

Detailed study of Morphology, Cultural characteristics, Biochemical, Epidemiology, Pathogenesis, Laboratory diagnosis, Prophylaxis and Treatment of the following bacteria:

**Unit I:**

Staphylococcus, Streptococcus

**Reference:**

- .Mackie and Mc Carteny Practical Medical Microbiology ♦ 13<sup>th</sup> Edition, Churchill Livingstone.
- .Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
- .David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14<sup>th</sup> edition. ELBS with Churchill Livingstone.
- Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

**Unit II:**

Pneumococcus, Neisseria

**Reference:**

- 1.Mackie and Mc Carteny Practical Medical Microbiology ♦ 13<sup>th</sup> Edition, Churchill Livingstone.
- 2.Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
- 3.David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14<sup>th</sup> edition. ELBS with Churchill Livingstone.
- 4..Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

**Unit III:**

Corynebacterium, Bacillus, Clostridium

**Reference:**

- .Mackie and Mc Carteny Practical Medical Microbiology ♦ 13<sup>th</sup> Edition, Churchill Livingstone.
- Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions. .
- Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

**Unit IV:**

Enterobacteriaceae I- Coliforms, Proteus

Enterobacteriaceae II:- Shigella, Salmonella



**Reference:**

- .Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.  
 .David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14<sup>th</sup> edition. ELBS with Churchill Livingstone.  
 Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

**Unit V:**

Vibrio, Pseudomonas, Haemophilus

**Reference:**

- Mackie and Mc Carteny Practical Medical Microbiology ♦ 13<sup>th</sup> Edition, Churchill Livingstone.  
 .Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.  
 .David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14<sup>th</sup> edition. ELBS with Churchill Livingstone. .  
 .Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

**Core Course- 16****MB5B16U Medical Bacteriology- II****Total hours-72****Hours / week-4****Credits- 4**

Detailed study of Morphology, Cultural characteristics, Biochemical, Pathogenicity, Epidemiology, pathogenesis, laboratory diagnosis, prophylaxis and treatment of the following bacteria

**Unit I:**

Mycobacterium tuberculosis, M. leprae, Atypical mycobacteria, Actinomyces

**Reference:**

- 1..Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
- 2..David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14<sup>th</sup> edition. ELBS with Churchill Livingstone.
- 3.Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

**Unit II:**

Bordetella, Brucella, Yersinia, Pasteurella, Francisella

- 1.Mackie and Mc Carteny Practical Medical Microbiology ♦ 13<sup>th</sup> Edition, Churchill Livingstone.
- 2.Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.
- 3.David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14<sup>th</sup> edition. ELBS with Churchill Livingstone.
- 4..Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

1. .

**Unit III:**

Spirochetes, Mycoplasma

**Reference:**

- .Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)  
 Mackie and Mc Carteny Practical Medical Microbiology ♦ 13<sup>th</sup> Edition, Churchill Livingstone.  
 Ronald M.Atias (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.  
 David Greenwood, Richard C.B.Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14<sup>th</sup> edition. ELBS with Churchill Livingstone.  
 Topley / Wilson♦s (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol..III Bacterial Diseases, Edward Arnold, London.

**Unit IV:**

Rickettsiaceae, Chlamydiae

**Reference:**

- .Mackie and Mc Carteny Practical Medical Microbiology ♦ 13<sup>th</sup> Edition, Churchill Livingstone.  
 Ronald M. Atlas (1989). Microbiology, Fundamentals and Applications. II edition. Maxwell Macmillan International editions.  
 .David Greenwood, Richard C.B. Stack and John Forrest Peutherer. (1992). Medical Microbiology. 14<sup>th</sup> edition. ELBS with Churchill Livingstone. .  
 .Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)

**Core Course 17****MB5B 17U Medical Mycology**

**Total hours of instruction: 72**

**Hours / week : 4**

**Credit : 3**

**Unit I**

General Characters of Fungi- Yeast and mold. Nutrition in Fungi. Cultivation of Fungi ♦ Culture media and cultural characters. Methods for isolation of fungi. Staining methods used in mycology ♦ wet mount and differential staining. Study of microscopic morphology ♦ Ultra structure of yeast.

**Reference**

- Text book of medical mycology - Jagadish Chander , Interprint, New Delhi.  
 Introduction to Mycology- Alexopolus.  
 Botany for Degree students Fungi ♦ B R Vashishta , A K Sinha

**Unit II**

Reproduction in Fungi- Asexual and Sexual method Classification of Fungi ♦ Principles and Approaches. Antifungal agents- Mechanism of action

**Reference**

- Text book of medical mycology - Jagadish Chander , Interprint, New Delhi.  
 Botany for Degree students Fungi ♦ B R Vashishta , A K Sinha

**Unit III**

Fungal Diseases: Causative Fungi, Clinical Manifestations, Laboratory Diagnosis and treatment ♦ Brief account.  
 Superficial mycoses .Pityriasis versicolor , Dermatophytoses, Piedra  
 Subcutaneous mycoses ♦ Mycetoma, Rhinosporidiosis, Phycomycosis, Sporotrichosis

**Reference:**

- Text book of medical mycology - Jagadish Chander , Interprint, New Delhi.  
 Mycology and virology ♦ Topley and Wilson. Volume 4  
 Medical Mycology by Rippon . W B Saunders. Co  
 Manual of Clinical Mycology by Conant, Smith, Baker, Callaway & Mertics

**Core Course 18****MB5B 18U Medical Parasitology**

**Total hours of instruction: 72**

**Hours/week: 4**

**Credit: 3**

**Unit I**

**Parasitology** ♦ General Concepts ♦ Introduction to Parasitology, Classification ♦ Host parasite relationship.

**Laboratory technique in Parasitology** \_ Examination of faeces for ova and cysts ♦ Verm burden. Concentration methods, Floatation, Sedimentation techniques, staining by iron haematoxylin methods, Blood smear examination ♦ thick / thin Smears ♦ Cultivation of protozoal parasites.

**Reference**

Text book of Parasitology by Jayaram Panickar  
Bailey and Scott's Diagnostic Microbiology  
Practical Medical Microbiology ♦ Mackie, McCartney  
Text book of Medical Parasitology by Parija S.C.

**Unit II**

**Protozoology:** Pathogenic mechanisms, Disease transmissions and their life cycles ♦ Entamoeba and human disease , Plasmodia, Leishmania, Trypanosoma, Giardia, Trichomonas, Balantidium, Toxoplasma, Cryptosporidium and other protozoan parasites causing human infections. Influence of parasitic infections on immunocompromised hosts.

**Reference**

Parasitology by K.D. Chatterjee  
Text book of Parasitology by Jayaram Panickar  
Text book Medical Parasitology by Parija S.C.  
Text book of Medical Parasitology by P. Chakraborty

**Unit III**

**Helminthology:** Classification, Cestodes ♦ Taenia. solium ,T. saginata, T.echinococcus , trematodes ♦ Fasciola hepatica, Fasciolopsis buskii , Paragonimus westermanii, Nematodes ♦ Ascaris , Schistosomes, Anchylostoma, Trichuris, Trichinella, Enterobius, Stroglyoids and Wuchereria their life cycle , Transmission, pathogenicity and Lab Diagnosis.

**Reference:**

Text Book of Medical Parasitology by P. Chakraborty  
Text Book of Parasitology By Jayaram Panicker  
Text Book of Medical Parasitology by Parija S.C.

**Core Course-19****MB5B 19 Microbiology Practical ♦ V****Total hours of instruction: 90****Hours/week: 4****Credit: 2**

General procedure for the systematic study of Bacteria ♦ Morphology, Staining, Colony Characteristics on BA ,MA,other selective Media.  
 Biochemical reactions of Bacteria: Sugar Fermentation , IMVIC ,H<sub>2</sub>S production,urease,Catalase, Oxidase ,TSI  
 Identification of Bacteria- Staphylococcus, E.coli, Klebsiella, Pseudomonas, Proteus, Salmonella typhi, Shigella, Vibrio cholerae.  
 Cultivation of Fungi- Study of colony characters of yeasts and Molds.  
 Microscopic morphology of molds- Pencillium, Aspergillus. Mucor, Rhizopus, Fusarium , etc by Lactophenol cotton blue mount examination.  
 Gram staining of yeast.  
 Examination of Germ tube ♦ Candida albicans

**Reference:**

Bailey and Scott ♦s Diagnostic Microbiology  
 Text book of Microbiology ♦ Ananthanarayanan and Jayaram ♦ Orient Longman  
 Text book of Medical Mycology ♦ Jagadish Chander . Interprint  
 Practical Medical Microbiology by Mackie McCartney  
 Manual for identification of Medical Bacteria by. S.T. Cowan

**Core course 20****MB6 B20U Medical Virology****Total hours of instruction: 72****Hours per week : 4****Credit:3****Unit 1**

General characters of viruses ♦ structure, classification, multiplication, cultivation. Structure and replication of bacteriophages

**References**

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan, C.K. Jayaram Panikar](#)  
 Belshe RB Textbook of Human Virology St. Louis: Mosby Year Book.  
 Dimock & Primrose Introduction to modern virology Oxford: Blackwell  
 White & Fenner Medical Virology New York : Academic Press  
 Collier & Oxford Human Virology London Oxford University Press  
 Fields et al Virology Philadelphia: Lippincott ♦ Raven  
 Zuckerman Clinical Virology Chichester : JohnWiley.  
 Topley & Wilson. Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III Bacterial Diseases, Edward Arnold, London.

**Unit 2:**

Characters and pathogenic significance of pox viruses, herpesviruses, picorna viruses & myxoviruses

**References**

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan, C.K. Jayaram Panikar](#)

Belshe RB Textbook of Human Virology St. Louis: Mosby Year Book.  
 Dimock & Primrose Introduction to modern virology Oxford: Blackwell  
 White & Fenner Medical Virology New York : Academic Press  
 Collier & Oxford Human Virology London Oxford University Press  
 Fields et al Virology Philadelphia: Lippincott ♦ Raven  
 Zuckerman Clinical Virology Chichester : JohnWiley.  
 Topley / Wilson♦s (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III  
 Bacterial Diseases, Edward Arnold, London.

**Unit 3:**

Characters and pathogenic significance of arboviruses, rhabdoviruses, hepatitis viruses, oncogenic viruses & HIV

**References**

.Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)  
 Belshe RB Textbook of Human Virology St. Louis: Mosby Year Book.  
 Dimock & Primrose Introduction to modern virology Oxford: Blackwell  
 White & Fenner Medical Virology New York : Academic Press  
 Collier & Oxford Human Virology London Oxford University Press  
 Fields et al Virology Philadelphia: Lippincott ♦ Raven  
 Zuckerman Clinical Virology Chichester : JohnWiley.  
 Topley / Wilson♦s (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III Bacterial Diseases, Edward Arnold, London.

**Unit 4:**

Diagnosis of viral infections. Immunoprophylaxis and chemoprophylaxis of viral infections.

**References**

Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#), [C.K. Jayaram Panikar](#)  
 Belshe RB Textbook of Human Virology St. Louis: Mosby Year Book.  
 Dimock & Primrose Introduction to modern virology Oxford: Blackwell  
 White & Fenner Medical Virology New York : Academic Press  
 Collier & Oxford Human Virology London Oxford University Press  
 Fields et al Virology Philadelphia: Lippincott ♦ Raven  
 Zuckerman Clinical Virology Chichester : JohnWiley.  
 Topley / Wilson♦s (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III  
 Bacterial Diseases, Edward Arnold, London.

**Core Course 21****MB6 B 21U Diagnostic Microbiology**

**Total hours of instruction: 90**

**Hours/week:5**

**Credits:4**

**Unit 1.**

Safety in Clinical Microbiology laboratory. Laboratory associated infections. Classification of microorganisms on the basis of hazards. Good laboratory practices. Microbiological safety cabinets- Types. Disinfection and decontamination of laboratory wastes. WHO safe code of practice for a clinical microbiology laboratory. Guidelines for the collection and transport of specimens

**References**

.Medical Laboratory Manual For Tropical Countries Vol.II Microbiology. MonicaCheesbrough ELBS  
 Bailey &Scott□ Diagnostic Microbiology.E.J. Baron, L.R.Peterson and S.M .Finegold .Mosby

**Unit 2.**

Scheme for the microbiological examination of sputum, throat and mouth specimens, nasopharyngeal swabs and aspirates, ear discharges, eye specimens, CSF, blood and bone marrow

**References**

Medical Laboratory Manual For Tropical Countries Vol.II Microbiology. Monica Cheesbrough ELBS

**Unit 3.**

Microbiological examination of stool specimens, urine, urogenital specimens, skin specimens, pus from wounds, abscesses, burns and sinuses, and effusions.**Ref:**

Medical Laboratory Manual For Tropical Countries Vol.II Microbiology. Monica Cheesbrough ELBS

**Unit 4**

Serological diagnosis: Applications of serological techniques such as agglutination reactions, precipitation reactions, complement fixation tests, and enzyme immunoassay for the diagnosis of Bacterial viral and immunological diseasesMolecular techniques in Microbiology- principles and applications Hybridisation, PCR, RFLP

**References**

.Mackie& McCartney Practical Medical Microbiology J.G.Collee, A.G.Fraser,B.P.Marmion and A.Simmons (Eds.) Churchill Livingstone  
Manual of Clinical Microbiology P.R. Murray,E.J.Baron, J.H.Joorgenson M.A.Pfaller and Yolken R.H. ASM Press Washington DC

**Unit 5**

Laboratory control of antimicrobial therapy Antibiotic sensitivity tests. Disc diffusion and dilution methods, Determination of MIC and MBC. Antibiotic assays in body fluids.. Care and management of laboratory animals. Legal requirements for animal experiments. General aspects of organization of animal experiments- Preparation of animals, common experimental procedures, Humane methods of killing animals. Handling of common laboratory animals: Rabbit, guinea-pig, mouse and rat

**References**

Medical Laboratory Manual For Tropical Countries Vol.II Microbiology. Monica Cheesbrough ELBS  
Ananthanarayanan and Paniker Textbook of Microbiology Orient Longman

**Choice Based Course****MB6 B22AU Microbioprocess**

**Total hours of instruction 72**

**Hours per week 4**

**Credits: 4**

**Unit 1.**

Typical bioprocess. Different stages in bioprocess. Advantages of bioprocess over chemical process. Industrially important microbial metabolites

**References**

- 1.Microbial biotechnology-Principles and Applications L.Y.Kun (Ed.) World Scientific
- 2.Modern concepts of Biotechnology H.D.Kumar Vikas Publishing Co. Pvt. Ltd. New Delhi

**Unit 2.**

Isolation, screening and selection of industrially important microorganism. Mode of culturing- Batch, Continuous and Fed-batch culture. Specific growth rate and yield

**References**

- 1.Industrial Microbiology Casida Jr.Wiley Eastern Ltd.

2.General Microbiology Vol.II Powar&Daginawala Himalaya Publishing House

### Unit 3.

Designing of media for fermentation. Defined and undefined media, Factors affecting fermentation. Optimisation of bioprocess. Precursors, inducers, inhibitors, antifoam agents Submerged and solid state fermentation.

#### References

- 1.Industrial Microbiology Casida Jr.Wiley Eastern Ltd.
- 2.Industrial Microbiology ♦ An Introduction M.J.Waites ,N.L.Morgan, J.S.Rockey & G. Higton Blackwell Science

### Unit 4.

Bioreactor. Parts of bioreactor. Instrumentation of bioreactor. Aerobic microbioprocess. Importance of dissolved oxygen. Volumetric oxygen transfer coefficient. Agitation. Aeration.

#### References

Microbial biotechnology-Principles and Applications L.Y.Kun (Ed.) World Scientific  
Industrial Microbiology ♦ An Introduction M.J.Waites ,N.L.Morgan, J.S.Rockey & G. Higton Blackwell Science

### Unit 5.

Downstream processing- methods. Separation of biomass. Purification of the products-various techniques. Economics and market potentials of fermentation products

#### References

- 1.Industrial Microbiology Casida Jr.Wiley Eastern Ltd.
- 2.Microbial biotechnology-Principles and Applications L.Y.Kun (Ed.) World Scientific

**Choice Based course**  
**MB6B22BU Sanitation Microbiology**

**Total hours of instruction: 72**  
**Hours/ week:4**  
**Credits:4**

### Unit 1

General concept of sanitation and disinfection .Sanitation of industrial and food processing units Air sanitation, Safe location of animal houses, hospitals , industrial fermentation units etc based on air sanitation. Air borne diseases and preventive measures. Biological weapons, their regulation and precaution.

### References

Fundamentals of bacteriology-A.J.Salle  
 Microbiology-Prescott, M.J; harley, j.p. and klein, D.A  
 .Biology of microorganisms-T.D.Brock  
 Environmental aspects of microbiology-Joseph C. Danie  
 .Microbiology essentials and applications-Larry Mckane and Judy Kandel

### Unit 2

Microbiology of municipal sewage and sewage treatment. BOD and COD  
 Concept . Treatment of Industrial effluent- Waste water treatment-Mechanical and biological. Aerobic and anaerobic treatments. Domestic septic tank. Treatment of municipal water supplies. water borne diseases

### References

Fundamentals of bacteriology-A.J.Salle  
 Ecological aspect of waste water treatment vol 2 biological activities and  
 treatment process-Cruds C.R and hawkes  
 Microbiology-Prescott, M.J; harley, j.p. and klein, D.A  
 .Biology of microorganisms-T.D.Brock

### Unit 3

Solid waste disposal-sanitary land fills, composting, vermicompost. Disposal of animal and agricultural waste. Methanogenesis and biogas production

### References

Fundamentals of bacteriology-A.J.Salle  
 Ecological aspect of waste water treatment vol 2 biological activities and treatment process-Cruds C.R and hawkes  
 Microbiology-Prescott, M.J; harley, j.p. and klein, D.A  
 .Biology of microorganisms-T.D.Brock  
 Foundations in microbiology-Talaro, K and Talaro, A  
 Microbiology: an introduction- Tortora, G.j, Funke, B.R. and Case C.L  
 Industrial microbiology-Casida, L.E



**MB6 B22CU Medical Entomology****Total hours of instruction: 72****Hours/week: 4****Credit: 4****Unit 1**

Scope of Medical Entomology. Entomology and disease transmission. Modern concepts of Entomology, Knowledge of the biology and life cycles of Arthropod vectors- metamorphosis. mechanism of disease transmission and types. Control measures with particular reference to vectors and disease in India.

**Reference:**

Applied Entomology by P.G.Fenemore and Alka Prakash

Modern Entomology by D.B.Tembhare

General and applied Entomology by Nayar, Ananthakrishnan and David

**Unit 2**

Arthropods of Medical Importance-A brief account of the Biology, Life cycle, Mechanism of disease transmission and Control measures.  
Class Insecta- Mosquitoes, flies- Sand fly, Tsetse fly, house fly, bed bugs, louse, fleas

**Reference**

A hand book of Medical Entomology and Elementary Parasitology by G.K.Rathnaswamy

Hand book of Medical Entomology- Easwari Nayar

**Unit 3**

Class Arachnida- Ticks (hard and soft), mites

Class Crustacea- Water fleas, crabs, Shrimps

Arthropods producing toxic or allergic reactions in man-biting insects, spiders, scorpions.

**Reference**

A hand book of Medical Entomology and Elementary Parasitology by G.K.Rathnaswamy

Hand book of Medical Entomology- Easwari Nayar

Modern Entomology by D.B.Tembhare

**Unit 4**

Entomological Techniques- Collection and maintenance for short periods for identification or isolation of pathogens. Preservation, labeling etc. for future use.

**Reference**

Applied Entomology by P.G.Fenemore and Alka Prakash

Hand book of Medical Entomology- Easwari Nayar

Modern Entomology by D.B.Tembhare

**Core Course -23****MB6 B23U Microbiology Practicals - VI****Total hours of instruction: 90****Hours/week: 5****Credit:3**

Isolation of pathogens from Clinical Specimens  
Identification of Pathogens- Bacteria  
Antimicrobial activity ♦ Disc diffusion & broth dilution test, MIC  
Serological Test ♦ WIDAL, RPR Card Test

**Reference**

Medical Microbiology by Robert Cruickshank  
Bailey & Scott♦s Diagnostic Microbiology  
Practical Medical Microbiology-Mackie & Mc Cartney  
Microbiology Laboratory Manual ♦ Cappuccino Sherman

**Open Courses Offered by the Department**

1. MB5 D01U Human Physiology (Credits:4)
2. MB5 D02U Bioinstrumentation and

Techniques(Credits:4)

2. MB5 D03U Environmental Science (Credits:4)

**Open Course offered by the Department**

**MB5D 01AU Human Physiology**

**Total hours of instruction :72**

**Hours per week: 4**

**Credits: 4**

**Unit 1.**

Elementary tissues- Epithelial, connective, muscular and nervous tissue. Homeostasis. Structure of different muscles. Mechanism of muscular contraction, Rigor mortis. Introduction to nervous system. Classification of nervous system. Synapse, Myoneural junction, Neurotransmitters

**References:**

Textbook of Medical Physiology. Arthur C.Guyton and John E.Hall  
 .Essentials of Medical Physiology. K.Sembulingam and Prema Sembulingam

**Unit 2.**

Composition and functions of blood, Haemoglobin, Blood clotting. Blood groups, Blood transfusion. Structure of heart. Action potential in cardiac muscle. Cardiac cycle. Heart sounds. Conducting mechanism. Cardiac output Blood pressure, Pulmonary and systemic circulation. Organisation of respiratory system. Pulmonary ventilation. Gas transport. Control of respiration.

References:

1.Textbook of Medical Physiology. Arthur C.Guyton and John E.Hall  
 2.Essentials of Medical Physiology. K.Sembulingam and Prema Sembulingam

**Unit 3**

Salivary and gastric glands and their secretions. HCL secretion and regulation Pancreas structure and pancreatic juice. Structure and functions of liver.Bile.Kidney-structure and functions. Nephron. Renal regulation of water and electrolyte balance

References:

1.Textbook of Medical Physiology. Arthur C.Guyton and John E.Hall  
 2.Essentials of Medical Physiology. K.Sembulingam and Prema Sembulingam

**Unit 4**

Chemical classes of hormones. Action of hormones Endocrine glands- Hypothalamus, pituitary, thyroid, pancreas, adrenal and pineal gland. Role of reproductive hormones, gastrointestinal hormones and neurohormones Endocrine disorders

References:

1. Endocrinology. Mac E. Hadley.  
 2 .Molecular Endocrinology. Fraklyn F.Bolander

**Open Course offered by the Department**  
**MB5D 02U Bioinstrumentation and Techniques**

**Total hours of instruction: 72**

**Hours/week: 4**

**Credits: 4**

**Unit 1**

Colorimetry. Principles and application  
Beer Lamberts Law, Turbidimetry, nephelometry, luminometry, Flame Photometer.

**Reference**

Practical Biochemistry by Pattambiraman  
Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.  
Practical Biochemistry- Principles and Techniques - Ed Keith Wilson and John Walker  
Cambridge University press, Cambridge , U K.  
Modern Experimental Biochemistry Rodney F Boyer, The Benjamin /Cunnings  
Publishing Company

**Unit 2**

Basic Principle and application of chromatography.  
Paper, Gel. Thin layer, gas- liquid, ion exchange, affinity chromatography, H PLC.

**Reference**

Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.  
Practical Biochemistry Principles and Techniques - Ed Keith Wilson and John Walker  
Cambridge University press, Cambridge , U K.  
Modern Experimental Biochemistry Rodney F Boyer, The Benjamin /Cunnings  
Publishing Company

**Unit 3**

Basic Principles and application of centrifugation, Apparatus and procedures. Differential centrifugation , Density gradient centrifugation, Density gradient centrifugation.

**Reference**

Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.  
Practical Biochemistry Principles and Techniques - Ed Keith Wilson and John Walker  
Cambridge University press, Cambridge , U K.  
Modern Experimental Biochemistry Rodney F Boyer, The Benjamin /Cunnings  
Publishing Company

**Unit 4**

Basic Principle and application of Electrophoresis  
Gel Electrophoresis, PAGE, SDS PAGE , Paper. Two dimensional electrophoresis

**Reference**

Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.  
 Practical Biochemistry- Principles and Techniques - Ed Keith Wilson and John Walker  
 Cambridge University press, Cambridge , U K.  
 Modern Experimental Biochemistry - Rodney F Boyer, The Benjamin /Cunnings  
 Publishing Company  
 Biochemical Methods- S. Sadasivam and A. Manikam

**Unit 5**  
 Spectrophotometry: Principles and application ♦UV, Visible and infrared Spectrophotometry fluorescence spectrophotometry, AAS, flow cytometry

### Reference

Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.  
 Practical Biochemistry♦ Principles and Techniques - Ed Keith Wilson and John Walker Cambridge  
 University press, Cambridge , U K.  
 Modern Experimental Biochemistry Rodney F Boyer, The Benjamin /Cunnings  
 Publishing Company  
 .Practical Biochemistry by Pattambiraman

### Open Course offered by the Department MB5D 03U Environmental sciences

**Total hours of instruction: 72**  
**Hours/week:4**  
**Credits:4**

#### Unit 1

Ecology definition and basic principle. Ecosystem-biotic and abiotic components.Energy flow in ecosystem.Structure and function of ecosystem.Food chain and food web.Evolution of life and life forms.

#### References

Fundamentals of ecology-Odum  
 Modern concepts in ecology-Kumar.H.D  
 Ecology and environment-Sharma P.D  
 Ecology principles and application-Chapman and Reiss  
 Environmental biology-Jobes A.M  
 Essential Environmental Studies S.P.Misra,S.N.Pande Ane Books Pvt.Ltd.  
 Environmental Science V.K. Ahluwalia, Sunita Malhotra Ane Books Pvt.Ltd.

#### Unit 2

Population ecology-characteristics of population.Community ecology.Species diversity in community,endangered flora,ecological nichae ecotypes,ecological indicators

#### References

.Fundamentals of ecology-Odum  
 Modern concepts in ecology-Kumar.H.D  
 Ecology and environment-Sharma P.D  
 Ecology principles and application-Chapman and Reiss  
 Environmental biology-Jobes A.M  
 Essential Environmental Studies S.P.Misra,S.N.Pande Ane Books Pvt.Ltd.

#### Unit 3

Environmental pollution-air and water pollution-Sources,typesand effects of pollution on human beings and plants .Green house effect,global warming, and acid rain

#### References

A text book of environmental sciences-Aravind kumar  
Environmental sciences- Jones and Bartlet  
Microbial ecology-Atlas and Bartha  
Essentials of environmental studies-Kurian Joseph and Nagendran R  
Environmental Science V.K. Ahluwalia, Sunita Malhotra Ane Books Pvt.Ltd.  
Essential Environmental Studies S.P.Misra,S.N.Pande Ane Books Pvt.Ltd.

#### **Unit 4**

Environmental management-air,water and soil quality management.Management of forestry-social forestry,management of mangrove vegetation.National parks and sanctuaries

#### **References**

Ecology and environment-Sharma P.D  
Microbial ecology-Atlas and Bartha  
Ecology principles and application-Chapman and Reiss  
Environmental biology-Jobes A.M  
A text book of environmental sciences-Aravind kumar  
Environmental sciences- Jones and Bartlett  
Essentials of environmental studies-Kurian Joseph and Nagendran R

#### **Complimentary Courses**

Offered by the Department

- 1. MB1C01U Fundamentals of Microbiology-1**
- 2. MB1C02U Microbiology Practical-1**
- 3. MB2C03U Fundamentals of Microbiology-II**
- 4. MB2C04U Microbiology Practical-1I**
- 5. MB3C05U Applied Microbiology**
- 6. MB3C06U Microbiology Practical-III**
- 7 MB4C07U Medical Microbiology**
- 8. MB4C08U Microbiology Practical-IV**

**Complimentary course offered by the Department**

**MB1C01U Fundamentals of Microbiology-1**

**Total hours of instruction: 36**

**Hours/week:2****Credits:2****Unit 1:**

Microbial world.Scope and history of microbiology. Beneficial and harmful microbes. Principles of classification- bacteria, algae and protozoa. Ultrastructure of bacteria. Microscopy ♦ optical, phase contrast, fluorescent, darkfield, electron. Staining ♦ preparation of specimens for staining, simple staining, differential staining & negative staining. Microscopic examination of microorganisms- hanging drop

**Reference**

[Prescott/Harley/Klein's Microbiology](#), by Joanne Willey, Linda Sherwood, and Chris Woolverton  
 Microbiology Pelczar, Chan and Krieg.  
 General microbiology Vol 2 Powar & Dagainawala  
 Biophysics R.N.Roy

**Unit 2:**

Nutritional requirements & factors affecting growth of bacteria. Growth curve, measurement of growth. Pure culture concepts. Culture media & culture methods. Sterilisation and disinfection-Physical and chemical methods Antimicrobial agents Antibiotics-Mechanisms of action ( a brief study )

**Reference**

Microbiology Pelczar, Chan and Krieg  
[Prescott/Harley/Klein's Microbiology](#), by Joanne Willey, Linda Sherwood, and Chris Woolverton  
 General microbiology Vol 2 Powar & Dagainawala  
 Ananthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan](#),  
[C.K. Jayaram Panikar](#)

**Complimentary Course offered by the Department**  
**MB1C02U Microbiology Practical-1**

**Total hours of instruction: 36****Hours/week:2****Credit:1**

Study the parts and usage of a compound microscope

Study the parts and working and uses of

Autoclaves

Hot air oven

Membrane Filter

Safety Cabinet

Anaerobic Jar

Centrifuge

Incubator

Preparation of culture Media (NB, NA, MA) and dispensing media in test tubes, bottles, petridishes.

Examination of wet films under high power objectives.

Preparation and examination of Hanging drop mount for studying the motility of bacteria.

Preparation of slide smears for staining.

Staining techniques

- Simple staining
- Gram Staining
- Negative Staining.

Microscopic study of Bacteria ♦ Cocci, Bacilli

**References:**

Microbiology ♦ Concepts and Application ♦ Pelzer Jr. Chang Kreig Mac Graw Hill Inc  
 Microbiology ♦ Prescott, Harley and Klein Wim.C.Brown Publishers  
 Practical Microbiology ♦ R.C Dubey, D.K Maheshwari, S Chand and Company, New Delhi.  
 Microbiology Laboratory Manual ♦ Cappuccino Sherman, Pearson Education.

**Complimentary course offered by the Department****MB2C03U Fundamentals of Microbiology-II**

**Total hours of instruction:36:****Hours /week:2****Credits:2**

**Unit 1:** Microbial metabolism, pathways and cycles. Bacterial genetics. Mutation, mutagens. Genetic exchange- transformation, transduction and conjugation. Extra chromosomal genetic material. Transposons Genetic mechanisms of drug resistance in bacteria

**References**

Aanthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan, C.K. Jayaram Panikar](#)

[Prescott/Harley/Klein's Microbiology](#) by Joanne Willey, Linda Sherwood, and Chris Woolverton

Microbiology Pelczar, Chan and Krieg

.Microbial Genetics Stanley R. Maloy, Freifelder and Cronan

Molecular Genetics of Bacteria Snyder and Charminess.

**Unit 2:** Introduction to virology ♦ structure, classification, replication & cultivation. Bacteriophage ♦ structure and multiplication & cultivation. Introduction to mycology, General characters of fungi, classification, cultivation, cultural characters , microscopic morphology. Importance of fungi ♦ industry, food production, pathogens (man animals and plants).

**References**

1Aanthanarayan and Paniker's Textbook of Microbiology [R. Ananthanarayan, C.K. Jayaram Panikar](#)

2.[Prescott/Harley/Klein's Microbiology](#) by Joanne Willey, Linda Sherwood, and Chris Woolverton

3. Microbiology Pelczar, Chan and Krieg

4 .Microbial Genetics Stanley R. Maloy, Freifelder and Cronan

5. Molecular Genetics of Bacteria Snyder and Charminess

**Complimentary course offered by the Department  
MB2C04U Microbiology Practical-II**

**Total hours of instruction:36****Hours/ week:2****Credit:1**

Preparation of fungal media

Cultivation of fungi study of colony characters of yeast and mold.

Microscopic morphology of yeast and molds.

Cultivation of Bacteria on nutrient Agar for obtaining isolated colonies.Study of cultural colony characters- Size, shape, colour etc.

Viable Count of bacteria by pour plate/ spread plate method.

**References:**

Microbiology ♦ Concepts and Application ♦ Pelzer Jr. Chang Kreig Mac Graw Hill Inc

Microbiology ♦ Prescott, Harley and Klein Wim.C.Brown Publishers.

Practical Microbiology ♦ R.C Dubey, D.K Maheshwari, S Chand and Company, New Delhi.

Microbiology Laboratory Manual ♦ Cappuccino, Sherman, Pearson Education.



**Complimentary Course offered by the Department  
MB3C05U Applied Microbiology**

**Total hours of instruction:36:  
Hours /week:2  
Credits:2**

**Unit 1;**

Food as substrate for microorganisms. Principles of food preservation, chemical preservation. Production of edible mushrooms , milk products. Spoilage of meat and milk. Design and parts of a fermenter. Oriental fermented Food products Single cell protein Microbiological examination of food and milk

**References:**

[Principles of Fermentation Technology](#) by Peter F. Stanbury, Stephen J. Hall, and Allan Whitaker

[Manual of Industrial Microbiology and Biotechnology](#) by Ronald M. Atlas

[Prescott and Dunn's Industrial Microbiology](#) by Gerald Reed

[Industrial Microbiology](#) by Samuel C. Prescott

Food Microbiology Frazier

**Unit 2:**

Aerobiology definition, assessment of air quality. Soil microorganisms & interactions. Biofertilizers Biodegradation, Biopesticides, biogas, bacterial insecticide Aquatic microbiology - fresh water and marine. Microbial assessment of water quality, water purification. Biogeochemical cycles.

**References**

Bioremediation Baker & Herson

Agricultural Microbiology Bagraja & Rangaswami

Biodegradation & Bioremediation Martin Alexander

Microbiology Pelczar, Chan and Krieg.

**Complimentary Course offered by the Department  
MB3C06U Microbiology Practical-1II**

**Total hours of instruction:36:  
Hours /week:2  
Credits:1**

Isolation & Enumeration of microorganisms from soil sample  
Study of microbial contamination in food products.  
Analysis of milk quality by Methylene blue reductase test  
Study of microorganisms in air exposed plate method.

**References:**

Practical Microbiology R.C Dubey, D.K Maheshwari, S Chand and Company, New Delhi.

Experiments in Microbiology, Plant Pathology and Biotechnology- K R Aneja , New Age International Publishers

**Complimentary course offered by the Department****MB4C07U Medical Microbiology****Total hours of instruction:36:****Hours /week:2****Credits:2****Unit .1**

Sources of infection. Methods of transfer of infections. Factors determining pathogenic potentials of microbes. A brief study of important pathogenic bacteria-

Staphylococcus,Streptococcus,Bacillus,Corynebacterium,Clostridium,Mycobacterium,Neisseria,Escherichia,Salmonella,Shigella,Vibrio,Haemophilus and Psuedomonas

**References:**

Ananthanarayanan and Paniker Textbook of Microbiology Orient Longman

Microbiology M.J.Pelczar,Jr. ECSCan and N.R.Krieg Tata McGraw-Hill

**Unit2**

A brief study of important human viruses Pox, Herpes, Polio, Rhino, Influenza, Rhabdo, Hepatitis and Human Immunodeficiency viruses

Diseases caused by fungi. Dermatophytoses, Candidiasis & Mycetoma .A brief study of systemic mycoses

**References**

Ananthanarayanan and Paniker Textbook of Microbiology Orient Longman

Microbiology M.J.Pelczar,Jr. ECSCan and N.R.Krieg Tata McGraw-Hill

**Complimentary course offered by the Department****MB4 C08U Microbiology Practical-IV****Total hours of instruction:36****Hours/week:2****Credits:1**

Demonstration of Agglutination & Precipitation reaction

General procedure for the Systematic study of Bacteria

- Morphology- Colony characters &- Biochemical reactions

-Sugar fermentation

-IMVIC

-Oxidase

-Catalase

Demonstration of antibacterial activity by disc diffusion method

Indentification of common fungus like Mucor, Rhizopus, Penicillium , Aspergillus by Lactophenol cotton blue mount examination.

**References:**

Text Book of Microbiology, R Ananthanarayanan and C K Jayaram Panicker

Microbiology Laboratory Manual ♦ Cappuccino, Sherman, Pearson Education.

Bailey and Scott♦s Diagnostic Microbiology.

