**Bharathiar University, Coimbatore.**

**B.Sc. Microbiology Degree Course**

**Scheme of Examination - CBCS Pattern (Affiliated Colleges)**

(For the students admitted from the academic year 2014 – 2015 batch onwards)

<table>
<thead>
<tr>
<th>Part</th>
<th>Study Components</th>
<th>Course title</th>
<th>Examinations</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ins. hrs/week</td>
<td>Dir.Hrs.</td>
</tr>
<tr>
<td>Semester I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Language – I</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>II</td>
<td>English – I</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
<td>Core Paper I - Fundamentals of Microbiology</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Practical I and Viva Voce</td>
<td></td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Allied A : Paper I – Biostatistics and Computer Applications I</td>
<td></td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Allied Practical</td>
<td></td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>IV</td>
<td>Environmental Studies #</td>
<td></td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Semester II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Language – II</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>II</td>
<td>English – II</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
<td>Core Paper II - Microbial Diversity</td>
<td></td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Core Paper III - Cell Biology</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Core Practical I and Viva Voce</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Allied A : Paper II – Biostatistics and Computer Applications II</td>
<td></td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Allied Practical</td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>IV</td>
<td>Value Education – Human Rights #</td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Semester III</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Language – III</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>II</td>
<td>English – III</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
<td>Core Paper IV - Bioinstrumentation – Principles and Applications</td>
<td></td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Core Practical II</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Allied B: Paper I – Biochemistry I</td>
<td></td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Allied Practical</td>
<td></td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>IV</td>
<td>Skill based Subject I – Medical Laboratory Technology – Clinical Laboratory Technology</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Tamil @ / Advanced Tamil# (OR)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non-major elective - I (Yoga for Human Excellence)# / Women’s Rights#</td>
<td></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Semester IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Language – IV</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>II</td>
<td>English – IV</td>
<td></td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
<td>Core Paper V – Microbial Physiology</td>
<td></td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Core Practical – II</td>
<td>3 6 20 55 75 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allied B : Paper II – Biochemistry II</td>
<td>4 3 20 55 75 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allied Practical</td>
<td>2 3 20 30 50 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV Skill based Subject 2 - Medical Laboratory Technology – Diagnostic Microbiology I (Bacteriology and Serology)</td>
<td>3 3 20 55 75 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tamil @ /Advanced Tamil # (OR) Non-major elective -II (General Awareness #)</td>
<td>2 3 50 50 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Semester V

| Core Paper VI - Microbial Genetics | 5 3 25 75 100 4 |
| Core Paper VII – Principles of Immunology | 4 3 25 75 100 4 |
| Core Paper VIII– Food Microbiology | 4 3 25 75 100 4 |
| Core Paper IX – Recombinant DNA Technology - I | 4 3 25 75 100 4 |
| Elective I | 4 3 25 75 100 4 |
| Core Practical - III | 6 3 - - - - |
| IV Skill based Subject 3 – Medical Laboratory Technology – Diagnostic Microbiology II (Virology, Mycology and Parasitology) | 3 3 20 55 75 3 |

### Semester VI

| Core Paper X – Fermentation Technology | 4 3 25 75 100 4 |
| Core Paper XI – Environmental and Agricultural Microbiology | 4 3 25 75 100 4 |
| Core Paper XII – Virology | 4 3 25 75 100 4 |
| Core Practical – III | 6 9 40 60 100 4 |
| Elective – II | 4 3 25 75 100 4 |
| Elective – III | 4 3 25 75 100 4 |
| IV Skill Based Subject 4 - Diagnostic Microbiology – Practical | 4 3 30 45 75 3 |

### V Extension Activities @

| - - - - 50 2 |

| Total | 3500 140 |

Students should undergo an institutional training for a continuous period of 15 days before semester VI.

@ No University Examinations. Only Continuous Internal Assessment (CIA)

# No Continuous Internal Assessment (CIA). Only University Examinations.

### List of Elective papers (Colleges can choose any one of the paper as electives)

<table>
<thead>
<tr>
<th>Elective – I</th>
<th>A Medical Microbiology - I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B Dairy Microbiology</td>
</tr>
<tr>
<td></td>
<td>C Plant BioTechnology</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elective – II</th>
<th>A Recombinant DNA Technology - II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B Enterpreneurial Microbiology</td>
</tr>
<tr>
<td></td>
<td>C Bio-Molecules</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elective - III</th>
<th>A Medical Microbiology – II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B Medical Biochemistry</td>
</tr>
<tr>
<td></td>
<td>C Bionanotechnology</td>
</tr>
</tbody>
</table>
SEMESTER - I  

CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY  

UNIT – I  

UNIT – II  
Microscopy– Principles and application – Bright field, Darkfield, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of Electron microscopy.  

UNIT- III  
Structure and organization of bacterial cell wall: Gram positive and Gram Negative bacterial cell wall. Staining – Principles - Types of staining– Simple, Differential (Gram , Spore, AFB),Capsule staining (Negative).  

UNIT – IV  

UNIT – V  
Culture & -Media preparation - Solid and Liquid- Types of Media – Crude, Semi-Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method. Pure culture technique – Tube dilution, Pour,Spread, Streak plate.  

References  
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II
Taxonomy & General Characteristics of Fungi - Life Cycle of Aspergillus, Mucor, Rhizopus and Penicillium - Modes of reproduction & its economic importance.

UNIT – II
Algae – Morphology & General Characters – Basic knowledge on its reproduction & its economic importance.

UNIT – IV
Protozoa – General characteristics and the economic importance of Sarcodina, Mastigophora, Rhizopoda, Ciliata, Sporozoa.

UNIT – V

References

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.
UNIT V

References

GR A CORE PRACTICAL 1
1. Laboratory precautions
2. Preparation of cleaning solutions
3. Culture media preparation – Liquid and Solid medium
4. Selective and differential media: Mac conkey and Blood agar
5. Methods of sterilization
6. Pure culture techniques – Pour plate, Spread plate and Loopping method
7. Sterewing techniques: Simple, Quadrant and continuous
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Determination of Motility – Hanging drop & SIM agar
10. Cultural characteristics of Microorganisms - Colony morphology on Nutrient agar
11. slants, Nutrient broth
12. Maintenance and preservation of cultures
13. Staining of Bacteria - Simple, Negative, Gram, Spore, Fungal wet mount –LCB - Slide culture method
14. Observation of representative forms of (Algae) – Diatoms – Chlamydomonas -

References
SEMESTER –III

CORE PAPER IV: BIOINSTRUMENTATION
PRINCIPLES AND APPLICATIONS

UNIT – I
Buffers, Molar and Normal solutions, $pH$ meter, $pH$ electrodes- colomel and glass electrode.

UNIT – II
Principles and Applications of Autoclave, Hot air oven, Incubator, Laminar air flow, BOD incubator, Metabolic shaker, Incinerator.

UNIT –III

UNIT –IV

UNIT-V

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.

EMESTER – IV

CORE PAPER V: MICROBIAL PHYSIOLOGY

UNIT – I
Nutrition: Nutritional requirements of Microorganisms – Autotrophs, Heterotrophs, Photoautrophs, Chemoautrophs, Copiotrophs, Oligotrophs.

UNIT – II
UNIT - III

UNIT- IV
Anaerobic respiration – sulphur , nitrogenous compounds and Co2 as final electron Acceptor - Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V
Photosynthesis – Oxygenic and Anoxygenic , Carbon dioxide fixation, Biosynthesis of bacterial cellwall, Biosynthesis of aminoacids ( Glutamic acid family )- Bioluminescence.

References

GR A CORE PRACTICAL II

1. Protein estimation ( Lowry et al / Bradford )
2. Estimation of Carbohydrates( DNSA method)
3. Micrometry
4. Paper chromatography
5. Thin layer chromatography
7. Cultivation of anaerobic Microorganisms – Wrights tube – McIntosh fildes jar
8. Physiological characterization:
   Indole, MR, VP, Citrate utilization tests,
   Carbohydrate fermentation tests – TSI – H2S production – Starch hydrolysis –
   Catalase – Oxidase – Urease – Nitrate –
   Gelatin and Casein hydrolysis tests
9. Preparation of Buffers – Acidic and Alkaline range
10. Preparation of Molar solutions
11. Preparation of 0.1 and1 Normal solutions
SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-The genetic material, RNA - The genetic material, Characters of a genetic material, chemistry & Molecular structure of DNA, special structure of DNA, Structure and types of RNA.

UNIT-II
Bacterial chromosome, Organization of genes in prokaryotes, DNA – Replication in prokaryotes –Mechanism & enzymology of replication – Theta replication & Rolling circle replication.

UNIT-III

UNIT-IV
Mutation - spontaneous and induced Mutagen & Mutagenesis – DNA repair mechanism.

UNIT-V

References

CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I
History and Scope of Immunology - The basis of defence mechanisms - Cell and Organs involved in immune system - Phagocytosis.

UNIT- II
Types of immunity – Antigen – Antibody – types - Complement pathways - Classical and Alternate – Immunoglobins - structure and functions.

UNIT- III
Allergy and Hypersensitivity - Classification types and Mechanisms – Autoimmunity mechanisms and autoimmune response diseases: RA, SLE and Myasthenia Gravis.
UNIT - IV
Quantitative study of Antigen - Antibody reactions – Agglutination: RPR and Hemaaglutination Precipitation: Double Immuno Diffusion, ELISA, Radioimmune assay (RIA) - Monoclonal antibodies and its applications (Hybridoma technology)

UNIT – V
Immunohematology - Blood transfusion - ABO grouping - Rh factor - Tissue transplantation - HLA typing - Mechanism of acceptance and rejection.

References

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I
Food and Microorganisms – Important microorganisms in food (Bacteria, Mold and yeasts) ; Factors affecting the growth of microorganisms in food – pH, moisture, oxidation – Reduction potential , Nutrient content and Inhibitory substances and biological structure.

UNIT – II

UNIT - III
Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV

UNIT- V
Food borne diseases – Food poisoning and Food borne infections – Bacterial and Mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
CORE PAPER IX
RECOMBINANT DNA TECHNOLOGY- I

UNIT - I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT – II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT - III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial – pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT - IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods.

UNIT - V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application - Microarray.

References
SEMESTER -VI
CORE PAPER X - FERMENTATION TECHNOLOGY

UNIT –I
Fermentation- Definition & types - Submerged and Solid state. Fermentors & its types (Tower, cylindroconical & airlift) – Batch fermentation – Continuous fermentation.

UNIT -II
Industrially important strains- Screening methods- Strain development for Improved yield-Mutation, Recombination and protoplasmic fusion.

UNIT -III

UNIT- IV
Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster Pleurotus) and Button (Agaricus) mushroom.

UNIT -V
Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References

CORE PAPER XI
ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- Factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, Ammensalism, Commensalism, Syntropism, Parasitism and Predation with suitable examples.

UNIT -II

UNIT- III
biofertilizers in agriculture - Rhizobium and phosphate Solubilizers - Mycorrhizial association –
Phosphorous cycle.

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

CORE PAPER XII – VIROLOGY

UNIT -I
Early development of virology –cultivation of Viruses- virus purification and assays.

UNIT- II

UNIT-III

UNIT -IV
Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.
UNIT- V

References

CORE PRACTICAL III
1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Phenol Coefficient method
4. Isolation of E. coli plasmid DNA by agarose gel electrophoresis
5. Methylene blue reduction test
6. Microbial analysis of spoiled food – Bread and Vegetables
7. Identification of fungal food spoilers – Aspergillus, Mucor, Penicillium, Rhizopus
8. Direct microscopic examination of curd – observation of lactobacilli
9. Enzyme production and assay – protease and amylase
10. Alcohol production / wine
11. Immobilization- Demonstration
12. Isolation of free living nitrogen fixers – Azotobacter, Azospirillum – Phosphate solubilizers – Rhizobium from nodule
15. Microscopic identification of clinically important fungi – Candida albicans, Cryptococcus neoformans and Aspergillus

SEMESTER III
SKILL BASED SUBJECT I
MEDICAL LABORATORY TECHNOLOGY
CLINICAL LAB TECHNOLOGY

UNIT – I
Methods of collection of urine, blood, sputum, stool etc. The techniques of preservation of samples. Separation of blood plasma and serum.

UNIT – II
Examination of urine: Sample collection, physical and chemical tests, principles and methods, microscopic examination- crystals, casts, sediments, pregnancy tests.

UNIT – III
UNIT – IV
Tissue reception, labeling, fixation for different tissue and section cutting-Preparation of paraffin blocks (Dehydration, clearing, embedding, blocking)-Handling and care of microtome sharpening of razors, and section cutting-Preparation of common stains. H & E, congo red, methyle violet, Leishman stain, Giesma, Papainicolau, VG, PAS, PASM etc. and staining techniques-Mounting of museum specimens, record keeping, indexing of slides.

UNIT – V
Examination Of Stool - Indication, Collection, Container, Transport, Preservation for different types of fecal analysis; Physical, Chemical and Microscopic examination and its significance

References

SEMESTER IV
SKILL BASED SUBJECT II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Identification of organisms - Biochemical reaction – Sugar fermentation test - Susceptibility testing – MIC, E test - reporting of results & interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.
SEMESTER V     SKILL BASED SUBJECT III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens – Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing.

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic Virology- Detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
SEMESTER VI

SKILL BASED SUBJECT IV

PRACTICAL

2. Slide agglutination - Blood grouping
3. Tube agglutination - WIDAL
4. Precipitation – RPR
5. Immunodiffusion - Radial, Ouchterlony’s
6. Immunoelectrophoresis - Rocket and Counter current
7. ELISA
8. SDS-PAGE
9. Observation of fungi - LCB or KOH mount

ELECTIVE I - A

MEDICAL MICROBIOLOGY – I

UNIT - I

UNIT - II
Morphology, Pathogenicity and laboratory diagnosis- Gram positive & negative coccus - *Staphylococcus aureus, Streptococcus pyogenes, Pneumococcus and Neisseria sp.*

UNIT - III
Morphology, Pathogenicity and laboratory diagnosis- Gram positive organisms - *Bacillus anthracis, Corynebacterium diptheriae, Clostridium botulinum, Clostridium tetani.*

UNIT - IV
Morphology, Pathogenicity and laboratory diagnosis- Gram negative Organisms - *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.*

UNIT –V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae & Mycoplasma.*

References

**ELECTIVE I – B : DAIRY MICROBIOLOGY**

**Unit I**
Milk - Introduction, composition, Microorganisms in Milk – Bacteria, Yeasts, Moulds. Starter Cultures – Starter cultures their biochemical activities. (Streptococcus thermophilus, Lactobacillus bulgaricus) starter culture preparation, mesophilic and thermophilic organisms. Dairy processing unit operations: Clarification, separation, standardization, toning of milk, Pasteurization, UHT treatment, homogenization, Membrane processing, storage, transportation and distribution of milk. Judging and grading of milk and its products.

**Unit II**

**Unit-III**
Microbiology of fermented milk products - Acid fermented milks (acidophilus milk, yoghurt). Slightly acid fermented milks (Cultured butter milk), Acid-alcoholic fermented milk (Kefir). Fermented milk production with extended self life (labneh). Milk borne diseases, antimicrobial systems in milk, sources for contamination of milk - bacterial with examples of infective and toxic types –, Clostridium, Salmonella, Shigella, Staphylococcus, Campylobacter, Listeria. Mycotoxins in food with reference to Aspergillus species.

**Unit – IV**

**Unit V**
References
3. Applied dairy microbiology edited by Elmer Marth and James Steele.

ELECTIVE I – C : PLANT BIOTECHNOLOGY

UNIT – I
Plant Tissue culture – History, Plant tissue culture media, types, constituents and preparation of media, selection of suitable medium.

UNIT – II
Protoplast culture and somatic hybridization, production of Haploid plants, Somaclonal variations, Clonal propagation (micro propagation) germplasm conservation and cryopreservation.

UNIT – III
Genetic Engineering of plants – Gene transfer methods – vector mediated gene transfer, virus – mediated gene transfer, Direct or Vectorless DNA transfer.

UNIT – IV

UNIT – V
Molecular Marker Aided plant Breeding – Molecular markers, Molecular marker assisted selection, Arid & semi-arid plant Biotech, Green house & Green home technology.

References:
1. Dr. U. Sathyanarayana – Biotechnology. Books and Allied Publications
ELECTIVE II – A
RECOMBINANT DNA TECHNOLOGY - II

UNIT – I
Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT – II
Vaccines – Subunit vaccines, Edible vaccine, Recombinant vaccine – Monoclonal antibody. Gene therapy.

UNIT – III
Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV

UNIT - V
DNA finger printing and its Application. Human Genome Project and History and its Application.

References

ELECTIVE II – B : ENTREPRENEURIAL MICROBIOLOGY

UNIT I:
Entrepreneur development, activity, Institutes involved, Government contributions to entrepreurs, risk assessment. Industrial Microbiology, Definition, scope and historical development.

UNIT II:
Microbial cells as fermentation products- Bakers yeast, food and feed yeasts, Bacterial Insecticides, Legume Inoculants, Mushrooms, Algae. Enzymes as fermentation products- Bacterial and Fungal Amylases, Proteolytic Enzymes, Pectinases, Invertases, and other enzymes.
UNIT III:
Mushroom cultivation and Composting- Cultivation of Agaricus campestris, Agaricus bisporus, and Volvariella volvacea; Preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing, watering, harvesting, storage. Biofertilizers- Historical background, Chemical fertilizers versus biofertilizers, organic farming. Rhizobium sp, Azospirillum sp, Azotobacter sp, as Biofertilizers.

UNIT IV:

UNIT V:
Brewing- Media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. Production of Industrial alcohol.

References:
1. Industrial Microbiology- L.E.Casida, jr, New age International publication.
2. Entrepreneurial Development in India- By Arora

ELECTIVE II – C : BIO-MOLECULES

UNIT - I

UNIT - II
UNIT- III

UNIT- IV
Nucleic acids; Structure of Purines and Pyrimidines; Nucleotides and Nucleosides. DNA: double helix: A, B and Z forms; DNA denaturation and renaturation. RNA: types, unusual bases. DNA as genetic material Structure of chromatids, nucleosome and histones.

UNIT- V

References

ELECTIVE III - A
MEDICAL MICROBIOLOGY – II

UNIT- I

UNIT -II
Parasitic diseases- Entamoeba histolytica, Giardia, Taenia solium, Ascaris, Enterobius, Trichuris trichura, Plasmodium vivax, Wuchereria bancrofti.

UNIT -III
Etiology and laboratory diagnosis of Urinary tract infection- Meningitis, Diarrhea, Respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: Sexually Transmitted Diseases Bacteria), Nosocomial infections - definition, sources and detection; phage typing, Bacteriocin typing.
UNIT – V

References

ELECTIVE III– B : MEDICAL BIOCHEMISTRY

Unit I
Disorders of carbohydrate metabolism – Diabetes mellitus, Glucose tolerance tests, sugar levels in blood, renal threshold for glucose, factors influencing blood glucose level, glycogen storage diseases, pentosuria, galactosemia.

Unit II
Disorders of lipids- Plasma lipo proteins, cholesterol, triglycerides and phospholipids in health and disease, hyperlipidemia, hyperlipoproteinemia, Gaucher's disease, Tay-Sach’s, ketone bodies, ß-lipoproteinemia.

Unit III
Disorders of liver and kidney- Jaundice, fatty liver, normal and abnormal functions of liver and kidney, inulin and urea clearance.

Unit IV
Abnormalities in nitrogen metabolism- Uremia, hyperurecemia, porphyria and factors affecting nitrogen balance.

Unit V

References
ELECTIVE III – C : BIONANOTECHNOLOGY

Unit I:

Unit II:

Unit III:

Unit IV:

Unit V:
Applications of Bionanotechnology- Nanomedicines; Immunotoxins, Liposomes as drug carriers, Gene therapy, Personalised Medicines; Lab on chip concept. DNA Computers, Artificial Life, Hybrid materials, Biosensors.

References:
1. Goodsell - Bionanotechnology
3. Vladimir P Torchilin, Nanoparticles as Drug Carriers. Imperial College Press, North Eastern University, USA. 2006