PERIYAR UNIVERSITY

PERIYARPALKALAI NAGAR

SALEM – 636 011

DEGREE OF BACHELOR OF

SCIENCE

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR - B.Sc. MICROBIOLOGY

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2017 – 2018 ONWARDS

REGULATIONS

CONDITION FOR ADMISSION

A candidate who has passed higher secondary examination in any one of the biological sciences (Botany, Zoology, Biology). (Academic/Vocational stream – Agri, Home Science, Poultry) under higher secondary board of examination, Tamil Nadu or as per norms set by the Government of Tamil Nadu or an examination accepted as Equivalent thereto by the Syndicate subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the BSc., Microbiology degree examination of this University after a course of study of three academic years.

Duration of the course

The course for the degree of Bachelor of Microbiology shall consist of three academic years divided into six semesters.

Course of study

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

Examinations

The theory examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s) in the subsequent examinations. The practical examinations for UG course should be conducted at the end of the every semester.

Maximum Duration for the completion of the UG Programme

The maximum duration for completion of the UG Programme shall not exceed twelve semesters.

Commencement of this Regulation

These regulations shall take effect from the academic year 2017-18, i.e., for students who are to be admitted to the first year of the course during the academic year 2017-18 and thereafter.

SCHEME OF EXAMINATION

Part	Sem	Paper Code	Title of the Paper	Credits	Internal Marks	External Marks
Part - I	I		Tamil – I/ Malayalam – I/ Hindi - I	3	25	75
Part – II			English - I	3	25	75
Part – III – Core - 1			Fundamentals of Microbiology	4	25	75
Part – III – Allied - 1			Biochemistry - I	3	25	75
Part – III – Core Practical - 1			Core Practical – 1 - Fundamentals of Microbiology	4	40	60
Part – IV – Value Education			Manavalakkalai Yoga	2	25	75
Part - I	II		Tamil – II/ Malayalam – II/ Hindi - II	3	25	75
Part – II			English - II	3	25	75
Part – III – Core - 2			Microbial Physiology and Metabolism	4	25	75
SBEC - 1			Microbial Diversity	4	25	75
Part – III – Allied - 2			Biochemistry - II	3	25	75
Part – III – Core Practical - 2			Core Practical – 2 - Microbial Physiology and Diversity	4	40	60
Part – III – Allied Practical - 1			Allied Biochemistry Practical	3	40	60
Part – IV			Environmental Studies	2	25	75
Part - I	III		Tamil – III/ Malayalam – III/ Hindi - III	3	25	75
Part – II			English - III	3	25	75
Part – III – Core - 3			Microbial Genetics	4	25	75
Part – III - SBEC - 2			Principles of Bioinstrumentation	4	25	75
Part – III – Allied - 3			Biostatistics	3	25	75
Part – IV - NMEC - 1			**Choose from Other department NMEC**	2	25	75

Part – III – Core Practical - 3			Core Practical – 3 - Microbial Genetics	4	40	60
Part - I	IV		Tamil – IV/ Malayalam – IV/ Hindi - IV	3	25	75
Part – II			English - IV	3	25	75
Part – III – Core - 4			Immunology	4	25	75
Part – III – Allied - 3			Computer Application in Biology	3	25	75
Part – IV - NMEC - 2			**Choose from Other department NMEC**	2	25	75
Part – III – Core Practical - 4			Core Practical – 4 - Immunology	4	40	60
Part – III – Allied Practical - 2			Allied Practical – II – Biostatistics and Computer Application in Biology	3	40	60
Part – III – Core - 5	V		Medical Bacteriology	4	25	75
Part – III – Core - 6			Food and Dairy Microbiology	4	25	75
Part – III – Elective - 1			Medical Parasitology and Entamology	4	25	75
Part – III – Elective - 2			Medical Mycology	4	25	75
Part – III - SBEC - 3			Recombinant DNA Technology	4	25	75
Part – III – Core Practical - 5			Core Practical – 5 – Medical Microbiology	4	40	60
Part – III – Mini Project			In House Mini Project	1	40	60
Part – III – Core - 7	VI		Soil and Agricultural Microbiology	4	25	75
Part – III – Core - 8			Environmental and Pharmaceutical Microbiology	4	25	75
Part – III – Core - 9			Medical Virology	4	25	75

Part – III – Elective - 3			Industrial Microbiology	4	25	75
Part – III - SBEC - 4			Clinical Lab Technology	4	25	75
Part – III – Core Practical - 6			Core Practical – 6 – Applied Microbiology	4	40	60
Part - V			Extension Activities	1	-	-
Grand Total				140	1160	2940

B.Sc., Microbiology

(CBCS Pattern)

THEORY QUESTION PAPER PATTERN

Time: 3 hours Max. Marks: 75

Part – A (20 Marks) (Answer all the Question)

i) 10 x 1 = 10 (Choose the best answer) 2 questions from each unit

ii) 5 x 2 = 10 (2 Mark Question) 1 questions from each unit

Part – B 5 x 5 = 25

(Either or Choice)

(One question from each unit)

Part – C (3 x 10 = 30)

Answer Any Three out of Five

(One question from each UNIT)

B.Sc., Microbiology

(CBCS Pattern)

CORE PRACTICAL QUESTION PAPER PATTERN

Time: 6 hours

Maximum Marks (University Exam)	**-**	**60**
Major Practical – 1	**-**	**20 Marks**
Minor Practical - 1 & 2	**-**	**2 x 10 = 20 (A & B)**
Spotters	**-**	**5 x 2 = 10**
Record	**-**	**05**
Viva voce	**-**	**05**
Internal Marks	**-**	**40**
Total	**-**	**100**

LIST OF COURSES

CORE COURSES

1. Fundamentals of Microbiology
2. Microbial Physiology and Metabolism
3. Microbial Genetics
4. Immunology
5. Medical Bacteriology
6. Food and Dairy Microbiology
7. Soil and Agricultural Microbiology
8. Environmental and Pharmaceutical Microbiology
9. Medical Virology
10. Core Practical 1
11. Core Practical 2
12. Core Practical 3
13. Core Practical 4
14. Core Practical 5
15. Core Practical 6
16. In House Mini project

ELECTIVE COURSES

1. Elective 1 Medical Parasitology & Entomology
2. Elective 2 Medical Mycology
3. Elective 3 Industrial Microbiology

SKILL BASED ELECTIVE COURSES (SBEC)

1. SBEC – 1 - Microbial Diversity
2. SBEC – 2 - Principles of Bioinstrumentation
3. SBEC – 3 - Recombinant DNA Technology
4. SBEC - 4 - Clinical Lab Technology

PART – III – In – House Mini Project

ALLIED COURSES

1. Biochemistry I
2. Biochemistry II
3. Biostatistics
4. Computer Applications in Biology

5. Allied practical I Biochemistry
6. Allied practical II Computer Applications in Biology

NON MAJOR ELECTIVE COURSES (NMEC)

1. NMEC 1 – Principles of Bioinstrumentation
2. NMEC 2 – Mushroom Technology
3. NMEC 3 – Entrepreneurial Microbiology
4. NMEC 4 – Elemental Concepts of Microbiology

PART – IV

1. Environmental Studies
2. Value Education – Yoga

PART – V

1. Extension Activities (Awareness Programme, Participating in Grama Shaba, Campus Cleaning and YRS&RRC).

* I n – House Mini Project should be worked out after the fourth semester. Project reports should be submitted at the time of V^{th} semester practical examination. It can be done by an Individual or by a Group (Maximum limit 5 members).

CORE – 1 - FUNDAMENTALS OF MICROBIOLOGY

Unit - I

History and scope of Microbiology, Spontaneous generation – Biogenesis theory – Contribution of Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Paul Ehrlich and Flemming.

Unit - II

Microscope- Principles, working mechanism and application – Simple and compound microscope - Dark field – Phase contrast, Fluorescence ,SEM and TEM.

Unit - III

Structure and organization of bacterial cell, Gram positive and Gram negative bacterial cell wall. Types of Staining – Simple, Differential (Gram's, AFB), Special – Capsular staining (negative), Spore. LPCB, KOH mount.

Unit - IV

Sterilization and Disinfection – principles – methods of sterilization – physical methods – Dry heat- Moist heat- Radiation. Filtration (Membrane and HEPA). Chemical sterilization – Chemical agents – mode of action- phenol coefficient test- sterility testing.

Unit - V

Culture and media preparation – solid and liquid . Types of media- Semi synthetic ,Synthetic, Enriched, Enrichment,Selective and Differential media. Pure culture techniques – Tube dilution, Pour, Spread, Streak plate. Anaerobic culture technique- Wright's Tube, Roll tube method, Anaerobic Jar.

REFERENCES

1. Prescott L M, J P Harley and D A Klein (2005). Microbiology. Sixth edition, International edition, McGraw Hill.

2. PelczarTR M J Chan ECS and Kreig N R (2006). Microbiology. Fifth edition, Tata McGraw-Hill INC. New York.

3. Hans G. Schlegel. General microbiology. 7th edition. Cambridge university press (1993).

4. Dubey RC and Maheswari DK (2012). A text of Microbiology (**Revised edition**). S. Chand and Company Ltd., New Delhi.

5. GeetaSumbali and Mehrotra RS (2009). Principles of Microbiology. First edition, Tata McGraw Hill P. Ltd., New Delhi.

6. Robert F Boyd (1984). General microbiology. Times mirror/Mosby college publishers.

7. Powar CB and Daginawala H F (2005). General Microbiology volume 1 and 2. Eighth edition, Himalaya publishing house, Mumbai.

CORE – 2 MICROBIAL PHYSIOLOGY AND METABOLISM

Unit - I

Nutritional requirements of Microorganisms- Autotrophs, Heterotrophs ,Chemotrophs, Copiotrophs and Oligotrophs. Transport Mechanisms – Diffusion – Facilitated Diffusion, Active transport – Group translocation.

Unit - II

Different phases of growth – Growth curve – Generation time – Factors influencing microbial growth – Temperature, pH, Pressure, Salt concentration, Nutrients – synchronous growth and continuous cultivation. Diauxic growth, Sporulation – Endospore formation in bacteria.

Unit - III

Metabolism – EMP, HMP, ED Pathway – TCA cycle – Electron transport chain , Phosphorylation, Oxidative Phosphorylation, Substrate level Phosphorylation

Unit - IV

Anaerobic respiration-sulphur, nitrogenous compounds and CO_2 as a final electron acceptor- Fermentation: Alcoholic fermentation, mixed acid fermentation, lactic acid fermentation

Unit - V

Photosynthesis – Characteristics and types of Photosynthetic Prokaryotes. CO_2 fixation – Oxygenic and Anoxygenic– Bio luminescence.

REFERENCES

1. Prescott L M, J P Harley and D A Klein (2005). Microbiology. Sixth edition, International edition, McGraw Hill.
2. Dubey RC and Maheswari DK (2012). A Text of Microbiology. Revised edition, S. Chand and Company Ltd., New Delhi.
3. GeetaSumbali and Mehrotra RS (2009). Principles of Microbiology. First edition, Tata McGraw Hill P. Ltd., New Delhi.
4. PelczarTR M J Chan ECS and Kreig N R (2006). Microbiology. Tata McGraw-Hill INC., New York.
5. Robert F Boyd (1984). General Microbiology. Times mirror / Mosby college publishers.
6. Moat G, John W. Foster and Michael P. Spector (2002). Microbial physiology. Fourth edition, A John Wiley sons, Inc. publication. New Delhi.
7. David white. The physiology and biochemistry of prokaryotes. Oxford university press. 4^{th} edition (2011).

SBEC – 1 - MICROBIAL DIVERSITY

Unit – I

Prokaryotic and Eukaryotic microorganisms.Classification of microorganisms. General principles and nomenclature – Hackel three kingdom and Whittaker's five kingdom concept.

Unit – II

Classification and characterization of bacteria (Bergey's manual), structure of bacterial cell. Economic importance of bacteria.General characters of Actinomycetes and their importance.

Unit – III

Taxonomy and General characteristics of Fungus. Fungal cell structure, composition.*Mucor, Rhizopus, Aspergillus*and *Penicillium.*Economic importance of fungi.

Unit – IV

Algae - morphology and general characters – Algal cell structure. Cyanobacteria – salient features and its importance, Heterocyst.

Unit – V

Virus – morphology, general characters, structure of animal virus (Adeno virus), plant virus (TMV), bacteriophage (T4), insect virus (PV). Protozoa – general characters, structure of *Euglena, Paramecium.*

REFERENCES

1. Prescott L M, J P Harley and D A Klein (2005). Microbiology. Sixth edition, International edition, McGraw Hill.
2. Dubey RC and Maheswari DK (2012). A text of Microbiology (Revised edition). S.Chand and Company Ltd., New Delhi.
3. GeetaSumbali and Mehrotra RS (2009). Principles of Microbiology. First edition, Tata McGraw Hill P.Ltd., New Delhi.
4. PelczarTR M J Chan ECS and Kreig N R (2006). Microbiology. Fifth edition, Tata McGraw-Hill INC. New York.
5. Robert F Boyd (1984). General microbiology. Times mirror/Mosby college publishers.
6. JagadishChander (1996). A text book of Medical Mycology. Interprint, New Delhi.
7. Atlas and Atlas. Microbiology. Pearson publications. 4^{TH} edition.

CORE - 3 - MICROBIAL GENETICS

Unit – I

Cell Cycle – Mitosis – Meiosis – Bacterial chromosome organization, structure and function of DNA, RNA & its types.Extrachromosomal DNA (Plasmid).

Unit - II

DNA replication in prokaryotes – Meselson–Stahl experiment, Mechanism and enzymology of replication, DNA polymerase III structure, Rolling circle replication.

Unit - III

Mutation – types of mutation - spontaneous and induced – mutagen and mutagenesis. Detection of mutants – Ames test. DNA repair mechanism.

Unit – IV

Transcription in prokaryotes – Translation of proteins.Regulation of gene expression in prokaryotes – Lac operon.Genetic code.

Unit – V

Genetic exchange – Transformation, Conjugation and Transduction (Specialized and Generalized).Transposons.

REFERENCES

1. David R Hyde (2010). Genetics and Molecular biology. Special Indian edition, Tata McGraw Hill P.Ltd., New Delhi.
2. Klug. W.S&Gummings. M.R., (1996), Essentials of Genetics. Mentics Hail. Newjersey.
3. Peter Paolella (2010). Introduction to Molecular Biology. First edition, Tata McGraw-Hill P. Ltd., New Delhi.
4. Gardner. E.J. Simmons, M.J. & D.P. Snusted, (1991), Principles of Genetics, 8th edition. John Wiley & Sons, NY.
5. Ajoy Paul (2007). Text Book of Cell and Molecular Biology. First edition, Books Allied (P) Ltd., Kolkata.
6. Peter Snustad D and Michael J Simmons (2003). Principles of Genetics. Third edition, John Wiley and Sons, Inc. publication, New Delhi.

7. Peter J Russel (2002). Genetics. Benjamin Cummings.

8. Robert H Tamarin (2002). Principles of Genetics. Seventh edition, Tata McGraw Hill P. Ltd., New Delhi.

9. David Friefelder (1995). Molecular biology.Narosa publishing house, New Delhi.

SBEC – 2 - PRINCIPLES OF BIOINSTRUMENTATION

Unit – I

Buffers, molars and normal solutions, pH meter, pH electrodes – calomel and glass electrodes. Incubator, water bath shaker, laminar air flow.

Unit – II

Centrifugation: Principle – types of centrifuges – low speed, high speed, ultra centrifuge, Differential centrifugation – density gradient centrifugation. Conversion of 'G' in to rpm.Applications of centrifuge.

Unit – III

Electrophoresis – SDS – PAGE and agarose gel electrophoresis. Southern blotting – Northern blotting – Western blotting – DOT blotting.

Unit – IV

Chromatography – paper, thin layer, column, ion exchange, gas chromatography and HPLC.

Unit – V

Colorimetry, Spectrometry – UV & visible spectrophotometer, Flame photometry, FACS.Biosensors.

REFERENCES

1. BajpaiPK (2010). Biological Instrumentation and Methodology. Revised edition, S.Chand& Co. Ltd., New Delhi.
2. Palanivelu P (2004). Analytical Biochemistry and Separation techniques. Third edition, MKU Co-op, Press Ltd., Palkalai Nagar, Madurai.
3. Gurumani N (2006). Research Methodology for Biological Sciences. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
4. Subramanian MA (2005). Biophysics – Principles and Techniques. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
5. John G Webster (2004). Bioinstrumentation. Student edition. John Wiley and Sons, Ltd.
6. Ravishankar S (2001). A Text Book of Pharmaceutical Analysis. Third edition. Rx Publications, Tirunelveli.
7. Upadhyay&Upadhyay. Biophysical Chemistry, (2010). Himalaya Publishing house.

CORE – 4 - IMMUNOLOGY

Unit – I

History of immunology, Innate immunity and acquired immunity, Haematopoeisis, Cells and organs of immune system.B – cell and T – cell activation. Phagocytosis.

Unit – II

Antigen – Properties of antigen ,immunogen, Adjuvant, Hapten. Antibody- structure and types.Complement- classical and alternative pathways.

Unit – III

Antigen – Antibody interaction –Agglutination – Precipitation – Flocculation – ODD – RIA– IFT – CFT– ELISA – Immunoelectrophoresis. Monoclonal antibodies (Hybridoma technology).

Unit – IV

Auto immune diseses – Types and mechanisms. Hypersensitivity reactions – types, Antibody mediated (Type – I, Type II, Type III) and Cell mediated (Type – IV).

Unit – V

Immuno hematology, Blood group, Rh – incompatibilities. Transplantation Immunology – HLA Tissue Typing – mechanism of acceptance and rejection. Vaccines – Types, Immunization schedule.

REFERENCES

1. MadhaveeLatha (2012). A Text book Immunology. First edition, S.Chand& Company Ltd, New Delhi.
2. Annadurai B (2008). Immunology and Immunotechnology. First edition, S.Chand& Company Ltd., New Delhi.
2. Kannan I (2007). Immunology. First edition, MJP Publishers, Chennai.
3. Kuby Immunology - Richard A Goldsby, Thomas J Kindt. Barbara A Osborne, (2000). Fourth edition, W H Freeman and company. New York.
4. Tizard K (1983). Immunology. An Introduction. Saunders college publishing, Philadelphia.
5. Roitt, IM (1988). Essentials of Immunology. ELBS-Blackwell Scientific Publishers, London.
6. Bashir SF (2011). Text Book of Immunology. First edition, PHI Learning Private limited, New Delhi.
7. Ananthanarayan&Paniker's. (2013). Text Book of Microbiology, 9th Edition, Universities Press.

CORE – 5 – MEDICAL BACTERIOLOGY

Unit – I

Infections – sources of infections, Types of infections – methods of infections – Definitions – epidemic, pandemic, endemic, Acute, Chronic, systemic and opportunistic diseases. Virulence factors of bacteria causing human infections –Carriers and Types. Normal flora of human.

Unit – II

Morphology, Pathogenicity, Biochemical laboratory diagnosis and prevention of bacterial diseases – *Staphylococcus aureus, Streptococcus pyogens, S. pneumoniae, Neisseria sps.*

Unit – III

Morphology, pathogenicity, biochemical laboratory diagnosis and prevention of bacterial diseases – *Bacillus anthracis, C.diphtheriae, Clostridium tetani, Mycobacterium tuberculosis, M.leprae.*

Unit – IV

Morphology, pathogenicity, biochemical laboratory diagnosis and prevention of bacterial diseases – *Salmonella typhi, Shigelladysentriae, Vibrio cholerae, E.coli, Proteus vulgaris, Klebsiellapneumoniae, Pseudomonas aeruoginosa, Yersinia pestis.*

Unit – V

Morphology, pathogenicity, biochemical laboratory diagnosis and prevention of bacterial diseases –*Treponemapallidum, Leptospirainterrogans, Mycoplasma pneumoniae, Haemophilusinfluenzae*.

REFERENCES

1. Chakraborty P (2003). A Text book of Microbiology. Second edition, Published by New Central Agency (P) Ltd., Kolkata.
2. Ananthanarayan R and JayaramPanikerCK (2005). Text Book of Microbiology. Seventh edition, Orient Longman Limited, Hyderabad.
3. SatishGupte (2005). The Short Textbook of Medical Microbiology.Eighth edition, Jaypee Brothers, Medical publishers (P) Ltd., New Delhi.
4. Baron EJ, Peterson LR and Finegold SM (1994). Bailey and Scotts diagnostic microbiology. 9th edition, Mosby publications.
5. Rajan S (2009). Medical Microbiology. First edition, MJP Publishers, Chennai.
6. Rajesh Bhatia and RatanLalIchhpujani (2004). Essentials of Medical Microbiology. Third edition, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi.
7. Sundararaj, T (2005). Microbiology Laboratory **Manual**, Perungudi, Chennai-96.
8. **Jawetz**, Melnick, &Adelberg's. (2013). Medical Microbiology. 26th Edition. McGraw-Hill.

CORE – 6 - FOOD AND DAIRY 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

Principles of food preservation – General principles and application methods – Asepsis – techniques of removal of microorganisms – Use of temperature (Pasteurization-low and high). Drying, Radiation – Chemical preservatives. Food additives.

Unit – III

Spoilage of food - Cereals, Vegetables, Fruits, Egg, Dairy and fermented foods – Yoghurt, Curd, Butter, Cheese, Flavoured milk, Cannedfoods andSea foods.

Unit – IV

Food quality control measures.Quality assurance of food products. Food standards, quality control of milk – MBRT, Litmus milk, Phosphatase tests. HACCP, FDA, WHO, FSSAI, ISI, EPA.

Unit – V

Food borne diseases: Food poisoning and food borne infections – Bacterial and Mycotoxins–Investigation of food poisoning outbreaks.

REFERENCES

1. Sivashankar B – Moss (2011). Food Processing and Preservation. Eighth edition, PHI Learning P.Ltd., New Delhi.
2. Vijaya Ramesh K (2007). Food Microbiology. First edition, MJP Publishers, Chennai.
3. Adams MR – Moss (2004). Food Microbiology. Second edition, Panima publishing house New Delhi.
4. BanwartGJ (2004). Basic Food Microbiology. Second edition, CBS Publishers and Distributors, New Delhi.
5. James M Jay (2003). Modern Food Microbiology. Fourth edition, CBS Publishers, New Delhi.
6. Frazier WC and West Hoff DC (1988). Food Microbiology. Fourth edition, McGraw Hill, New York.
7. Roday, S. (1998). Food Hygiene and Sanitation. Tata Mcgraw Hill Publications.

ELECTIVE – 1 - MEDICAL PARASITOLOGY & ENTOMOLOGY

Unit – I

Introduction- Classification- Laboratory diagnosis of parasitic infections- Direct and concentration methods, blood smear examination.

Unit – II

*Entamoebahistolytica, Giardia intestinalis, Trichomonasvaginalis.*Haemoflagellate – *Leishmaniadonovani.*

Unit – III

Malarial parasite – *Plasmodium.Taeniasolium,,Paragonimuswestermani, Fasciola hepatica.*

Unit – IV

Ancylostomaduodenale, Ascarislumbricoides, Wuchereriabancrofti, Enterobiusvermicularis.

Unit – V

Medical Entomology – Brief account on morphology, Classification, Metamorphosis of insects – House fly, Mosquito, Tick, Fleas & Mite. Classification of Vector borne diseases and its control measures.

REFERENCES

1. Subhas Chandra Parija (2004). Text book of Medical Parasitology. Second edition, All India Publishers and Distributors, Medical Books Publishers, New Delhi.
2. JayaramPanikerCK (2004). Text book of Medical Parasitology. Fifth edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi.
3. RatanLalIchhpujani and Rajesh Bhatia (2004). Essentials of Medical Microbiology. Third edition, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi.
4. KaryaKarte RP and Damle AS (2005). Medical Parasitology. Revised edition, Books and Allied (P) Ltd., Kolkata.
5. Monica Cheesbrough (2003). District Laboratory Practice in Tropical Countries. Part 1 & 2 Low-Price edition, Cambridge University Press.
6. **Chatterjee** K D. (2016). **Parasitology,** Protozoology& Helminthology. 13th Edition.
7. Gullen,P.J and Cranston, P.S, (2010). The Insects: An Outline of Entamology. 4th Edition, Blackwell Science,Ltd.

ELECTIVE – 2 -MEDICAL MYCOLOGY

Unit - I

Introduction to medical Mycology – Morphological features of fungi – classification of medically important fungi, isolation, identification and diagnosis of fungi from clinical specimens.

Unit - II

Superficial mycosis – Pityriasisversicolor, Tineanigra, *Otomycosis* – Cutaneous mycosis – Dermatophytosis.

Unit - III

Subcutaneous mycosis – Sporotrichosis,Mycetoma, Chromoblastomycosis.Systemic mycosis – Histoplasmosis, Coccidioidomycosis.

Unit - IV

Opportunistic mycosis – Candidiasis, Cryptococcosis – Aspergillosis – Penicillosis.

Unit - V

Allergic fungal diseases – Bronchial Asthma, Maple Bark Stripper's disease - Antifungal agents – sensitivity tests – Mycotoxins and Mycetismus.

REFERENCES

1. Rajan S (2009). Medical Microbiology. First edition, MJP Publishers, Chennai.
2. Chakraborty P (2003). A text book of Microbiology. Second edition, Published by New central book agency (P) Ltd., Kolkata.
3. Monica Cheesbrough (2003). District Laboratory Practice in Tropical Countries. Part 1 & 2 Low-Price edition, Cambridge University Press.
4. Dey NC, Dey TK and Sinha D (1999). Medical Bacteriology including Medical Mycology and Aids. Seventeenth edition, New central book agency (P) Ltd., Kolkata.
5. JagadishChander (1996). A text book of Medical Mycology. Interprint, New Delhi.
6. Mehrotra RS and Aneja KR (2006). An Introduction to Mycology. New age international publishers.

SBEC– 3 - RECOMBINANT DNA TECHNOLOGY

Unit – I

History and achievements of rDNA technology. Cloning vectors – Plasmid based vactors – Natural (pSC101, pMB1), Artificial - pBR322 and pUC. Phage based vectors - λ (Lambda) phage vectors and its derivatives. Hybrid vectors – Phagemid, Phasmid and Cosmid, BAC and YAC. Expression vectors.

Unit – II

Nomenclature, classification of Restriction Endonucleases – ligases, types – gene cloning in prokaryotes – cloning strategies. Construction of genomic library and cDNA library.

Unit – III

Gene transfer Techniques – Physical – Biolistic method, Chemical – Calcium chloride and DEAE methods, Biological invitropakage method – Screening and selection of recombinants.

Unit – IV

Microbial synthesis of commercial products – Insulin, Interferons, Human growth hormone, antibiotics, biopolymers.

Unit – V

Transgenic Plants – Ti plasmid, insect resistant plant. Transgenic animal – mice – retroviral method – DNA microinjection method.PCR methods and its applications.

REFERENCES

1. Mitra (2005). Genetic engineering. Published by Macmillan India Ltd., Chennai.
2. JogdandSN (2005). Gene biotechnology. Himalaya Publishing House, Mumbai.
3. Satyanarayana (2005). Biotechnology. First edition, Books and Allied (P) Ltd., Kolkata.
4. Preeti Joshi (2002). Genetic engineering and its application. First edition, Agrobios (India).
5. Dubey RC (2005). A Text of Biotechnology. Multicolour Illustrative edition, S.Chand and Company Ltd., New Delhi.
6. Bernad R Glick (2003). Molecular Biotechnology - Principles and Applications of Recombinant DNA. Third edition, ASM Press, Washington, D.C.
7. Ramawat K and ShailyGoyal (2010). Molecular Biology and Biotechnology. First edition, S.Chand and company Ltd., New Delhi.
8. T.A.Brown (1995). An Introduction to Gene Cloning. 3rd Edition. Champman& Hall.

CORE - 7 - SOIL AND AGRICULTURAL MICROBIOLOGY

Unit – I

Communitiestypes and significance of soil microbes. Autochthonous and Zymogenous.Factors influencing the soil microbial population.Biogeochemical cycle – Carbon, Nitrogen, Phosphorous and Sulphur.

Unit - II

Biological nitrogen fixation – Nitrogen fixers – types – *Rhizobium*, Symbiotic and non-symbioticnitrogen fixation. Root nodule formation. Structure of nodule& biochemistry of Nitrogen fixation, Nitrogenase, Nitrogen fixation in Cyanobacteria, Heterocyst.Frankia.

Unit – III

Microbial interactions – Commensalism, Synergism, Mutualism, Amensalism, Competition, Parasitism and Predation. Interaction of microbes with plants: Rhizosphere, Phyllosphere, Mycorrhizae.Rumen flora.Insect symbiosis.

Unit – IV

Plant pathology: symptoms, characters of pathogens and control measures: Bacterial diseases – Citrus canker, Blight of rice. Fungal diseases – Red rot of sugarcane, Tikka leaf spot of ground nut. Viral diseases - TMV, Vein clearing disease of Bhendi (*Abelmoschusesculentus*).

Unit – V

Biofertilizers – classification, Mass cultivation and field application – *Rhizobium*, *Azotobacter*, *Azospirillum* ,*Glucanoacetobacterdiazotrophicus*phosphate solubilizers, potash mobilizers (*Frateuriaaurentia*), VAM, Azolla. Liquid biofertilizer.Biopesticides: classification, mode of action - Bacterial insecticides (*Bacillus thuringiensis*) and Viral insecticides (NPV)and *T.viride*.PGPR.

REFERENCES

1. SubbaRao NS (2004). Soil Microbiology. Fourth edition, Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi.
2. Mishra RR (2004). Soil Microbiology. First edition, CBS Publishers and distributors, New Delhi.
3. Rangaswami G and Mahadevan A (2002). Disease of Crop Plants in India. Fourth edition, PHI Learning (P) Ltd., New Delhi.
4. Rangaswami G and Bagyaraj DJ (2002). Agricultural Microbiology. Second edition, PHI Learning (P) Ltd., New Delhi.
5. Robert, L Tate (1995). Soil Microbiology. First edition, John Wiley and Sons, Inc. New York.
6. Sharma, P.D. (2001), Plant Pathology. First Edition. Rastogi Publications.
7. Atlas, R.M. and Bartha, R (1992). Microbial Ecology, Fundamental and Application, 3rd Edition, Bengamin and Cummings.
8. Hans G. Schlegel.(1993).General Microbiology. 7th edition. Cambridge University press.
9. Alexander, A.M. (1987). Introduction to Soil Microbiology. 5th Edition, John Wiley and Sons.
10. SubbaRao NS (1997). Biofertilizer in Agriculture and Forestry, 3rd edition, Oxford &IBU Publications.

CORE – 8 – ENVIRONMENTAL AND PHARMACEUTICAL MICROBIOLOGY

Unit – I

Microbiology of air - Enumeration of bacteria from air - Air sampling devices - Air sanitation - Air borne diseases.

Unit – II

Microbiology of water - Potability of water – MPN technique - Indicator organisms- water purification- Water borne diseases and their control measures.

Unit – III

Microbiology of sewage- chemical and biochemical characteristics of sewage- BOD and COD - Sewage treatment - physical, chemical & biological - aerobic and anaerobic (trickling filter, activated sludge and oxidation pond) treatment- disposable of wastes.

Unit – IV

Antimicrobial chemotherapy – Antibiotics – Mode of action – Antimicrobial Susceptibility testing.Sterility testing of pharmaceutical products – Injectables – IV fluids– Pyrogen testing. Antiseptics, disinfectants and their standardization, Endotoxin test - LAL test, Microbial limit test.

Unit – V

Production of Vaccine – BCG and Typhoid.Production of Toxoid – Tetanus, and Diphtheria.Pharmacopoeia and types.Preparation of Antisera and their standardization.

REFERENCES

1. Vijaya Ramesh K (2004). Environmental Microbiology First edition, MJP publishers (a UNIT of Tamil Nadu book house),
2. Joseph C Daniel (1999). Environmental aspects of Microbiology. First edition, Bright Sun publications, Chennai.
3. Mitchell R (1974). Introduction to Environmental Microbiology. Prantice Hall. Inc., Englewood Cliffs, New Jersey.
4. Murugesan AG and Rajakumari C (2005). Environmental Science and Biotechnology. First edition, MJP Publishers, Chennai.
5. Singh DP and Dwivedi SK (2005). Environmental Microbiology and Biotechnology. First edition, New Age International (P) Ltd., New Delhi.
6. Hugo W B and Russell AD (1998). Pharmaceutical Microbiology. Sixth edition, The Black well Science Ltd., UK.

CORE - 9 – MEDICAL VIROLOGY

Unit - I

General properties - Structural – Classification – Cultivation - Isolation and identification of viruses - Sero diagnosis and molecular diagnosis of viral infections.Antiviral Agents.

Unit - II

Pox viruses – Variola, Herpes viruses – Herpes Simplex Virus, Cytomegalo Virus, Epstein Barr Virus.

Unit - III

Adeno viruses, Hepatitis viruses, Papova viruses, Papilloma, Polyoma, Parvo virus, Retero virus – HIV.

Unit - IV

Picorna viruses – Polio, Rhino virus, Orthomyxovirus – Influenza, Paramyxo virus – Parainfluenza, Mumps, Measles, Rhabdo virus, Rota virus.

Unit - V

Arbo viruses: Flavi viruses – Yellow fever viruses – Dengue virus – Chickungunya virus – Japanese encephalitis virus.Emerging viral diseases.Viral vaccines.

REFERENCES

1. Saravanan P (2006) Virology. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
2. Ananthanarayan R and JayaramPanikerCK (2005) Text Book of Microbiology. Seventh edition, Orient Longman Limited, Hyderabad.
3. Chakraborty P (2003). A Text book of Microbiology. Second edition, Published by New Central Agency (P) Ltd., Kolkata.
4. Morag C and Timbury MC. (1994). Medical Virology. Tenth edition, Churchill Livingstone, London.
5. Dimmok NJ, Primrose SB (1994). Introduction to modern virology Fourth edition, Blackwell scientific company publications.
6. Patric R Murray. (1990). Medical Microbiology. Mosby Publications.
7. Luria SE, Darnell JE, Baltimore D and Compare A (1978). General virology. Third edition, John Wiley and Sons, New York.
8. **Jawetz**, Melnick, &Adelberg's. (2013). Medical Microbiology. 26th Edition. McGraw-Hill.

ELECTIVE 3 – INDUSTRIAL MICROBIOLOGY

Unit– I

Industrially important microorganisms - Screening Techniques- Primary and Secondary - Preservation of cultures - Strain improvement- Development of inoculum for various fermentation processes.

Unit - II

Fermentor – Components, Types of fermentors, Control systems in fermentation – pH, Temperature, Oxygen and foam.Computer applications in fermentation technology.

Unit - III

Media for industrial fermentation - submerged and solid state fermentation- Downstream processing - Recovery and purification of intra cellular and extracellular products.

Unit - IV

Microbial production Alcoholic beverages – Wine, beer, ethanol.Organic acids - Citric acid and Acetic acid.

Unit - V

Microbial production of Amino acid – Lysine. Enzyme - Alpha amylase. Vitamin B12 – Antibiotics – Penicillin, Streptomycin.

REFERENCES

1. SivakumarPK, Joe MM and Sukesh K (2010). An introduction to Industrial Microbiology. First edition, S.Chand& Company Ltd, New Delhi.
2. Agrawal AK and PradeepParihar (2006). Industrial Microbiology. Student edition, Jodhpur.
3. Patel AH (2005). Industrial microbiology. Published by Mac Millan India Ltd., Chennai.
4. Stanbury PF, Whitaker A and Hall SJ (1997). Principles of Fermentation Technology. Second edition, Pergmon Press.
5. LE Cassida JR (2005). Industrial Microbiology. New Age International (P) Ltd., New Delhi.
6. Purohit SS, Saluja AK, KakraniHN, (2004). Pharmaceutical Microbiology. First edition, Agrobios (India).
7. Hugo WB and AD Russel (1998). Pharmaceutical Microbiology. Sixth edition, Black Well Scientific Company Ltd.

SBEC 4 – CLINICAL LAB TECHNOLOGY

Unit – I

Managing Clinical Microbiology Laboratory. Methods ofCollection, transport and processing of clinical specimens – Blood, Urine, Sputum, CSF, Pus &Faeces for microbiological examination. Separation of blood and serum.

Unit – II

Examination of urine: sample collection, physical and chemical tests, principles and methods, microscopic examination – crystals, casts, sediments, pregnancy test.

Unit – III

Blood smear preparation: Staining&differential WBC count – Peripheral blood smear examination and morphological abnormalities – Reticulocyte count – absolute eosinophil count – E.S.R and P.C.V. Blood indices – Platelet count: BT, CT, CRT –Prothrombin time. A.P.P.T and FDP estimation.

Unit – IV

Laboratory methods in Basic Mycology – Collection and transport of clinical specimens – Microscopy, examination of culture media and incubation, Serological test for fungi.Laboratory methods in basic Virology – Viral culture – Media and cells used – specimen processing– Isolation and identification of Viruses. Viral Serology.

Unit – V

Laboratory methods for parasitic infection – Diagnostic techniques for faecal, Gastro intestinal and urino genital specimen.Microscopic examination and its significance.Identification of intestinal protozoa, Blood protozoa, Intestinal and Blood helminthes.

REFERENCES

1. Bailey &Scott's (2014). Diagnostic Microbiology. 13th edition, The C.V. Mosby Company.
2. Abdul Khader. (2003). Medical Laboratory Techniques. First edition, Frontline Publications, Hyderabad.
3. Mukherjee, L. (1997). Medical Laboratory Technology. Volume I & II. Tata McGrew – Hill Publishing Company Limited, New Delhi.
4. Sundararaj, T (2005). Microbiology Laboratory **Manual**, Perungudi, Chennai-96.
5. Godkar,P.B. (2003). Textbook of Medical Laboratory Technology, 2nd Edition, Bhalani Publication.
6. Seiverd, Charles, E. Hematology for Medical Technologies, 4th Edition, Lea &Febiger, US.
7. RaminkSood, (2006). A Textbook of Medical laboratory Technology, Jaypee Brothers Medical Publishers (p).LTD, New Delhi.

NMEC - 1 – PRINCIPLES OF BIOINSTRUMENTATION

Unit – I

Buffers, molars and normal solutions, pH meter, pH electrodes – calomel and glass electrodes. Incubator, water bath shaker, laminar air flow.

Unit – II

Centrifugation: Principle – types of centrifuges – low speed, high speed, ultra centrifuge, Differential centrifugation – density gradient centrifugation. Applications of centrifuge.

Unit – III

Electrophoresis – SDS – PAGE and agarose gel electrophoresis. Southern blotting – Northern blotting – Western blotting – DOT blotting.

Unit – IV

Chromatography – paper, thin layer, column, ion exchange, gas chromatography and HPLC.

Unit – V

Colorimetry, Spectrometry – UV & visible spectrophotometer, Flame photometry, FACS.Biosensors.

REFERENCES

1. BajpaiPK (2010). Biological Instrumentation and Methodology. Revised edition, S.Chand& Co. Ltd., New Delhi.
2. Palanivelu P (2004). Analytical Biochemistry and Separation techniques. Third edition, MKU Co-op, Press Ltd., Palkalai Nagar, Madurai.
3. Gurumani N (2006). Research Methodology for Biological Sciences. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
4. Subramanian MA (2005). Biophysics – Principles and Techniques. First edition, MJP Publishers, A Unit of Tamil Nadu Book House, Chennai.
5. John G Webster (2004). Bioinstrumentation. Student edition. John Wiley and Sons, Ltd.
6. Ravishankar S (2001). A Text Book of Pharmaceutical Analysis. Third edition. Rx Publications, Tirunelveli.
7. Upadhyay&Upadhyay. Biophysical Chemistry, (2010). Himalaya Publishing house.

NMEC- 2 – MUSHROOM TECHNOLOGY

Unit - I

Introduction-History-Scope and importance of mushroom cultivation.Present status of mushroom industry in India – Mushroom research and development – National and international agencies.

Unit - II

Pure Culture – Media – Preparation and maintenance of mother culture in test tube slants –Petriplates- saline bottle – poly propylene bags. Spawn production – types- methods- storage and transportation.

Unit - III

Cultivation Technology – Infrastructure – culture rack – thatched house – substrates – vessels- inoculation methods. Mushroom bed preparation. Preservation technology – long term storage – short term storage.

Unit - IV

Post-harvest handling – Short term & Long term storage.Types and importance of edible mushroom in India –*Agaricusbisporus, Pleurotussps.,Volvariellavolvacea, Calacybeindica.* Mushroom contamination. Poisonous Mushroom.

Unit -V

Nutritional and Medicinal values of Mushroom – protein – carbohydrates – vitamins – minerals – fibre content.Preparation of low calorie foods – soupscurry.Marketing values in India – export value.

REFERENCES

1. Paul StametsJS and Chilton JS. Mushroom Cultivator: A practical guide to growing mushrooms athome, Agarikon Press. 2004.
2. Shu-Ting Chang, Philip G Miles, Chang ST. Mushrooms: Cultivation, nutritional value, medicinal effect and environmental impact, 2nd edition, CRC press. 2004.
3. Swaminathan M. Food and Nutrition, Bappco. The Bangalore Printing and Publishing Co. Ltd., Bangalore. 1990.
4. Suman BC and Sharma VP. Mushroom Cultivation, Processing and Uses. Agribios (India) Publishers, Jodhpur. 2005.
5. Dubey RC and Maheswari DK (2012). A Text of Microbiology. Revised edition, S. Chand and Company Ltd., New Delhi.
6. Marimuthu, *et al.,* (1991). Oyster Mushroom, Dept. of Plant Pathology, TNAU, Coimbatore.
7. Nita Bahl (1988). Handbook of Mushroom, 2nd Edition, Vol. I & II.
8. Tewari and PankajKapoor, S.C. (1988). Mushroom Cultivation. Mittal Publication, Delhi.

NMEC- 3 – ENTREPRENEURIAL MICROBIOLOGY

Unit - I

Entrepreneur development, activity, Institutes involved, Government contributions to entrepreneur, 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.

Unit - III

Mushroom cultivation and composting-cultivation of Agaricuscampestris, Agaricusbisporous and Volvoriellvolvaciae: Preparation of compost, filling tray beds, spawning, maintaining optimal temperature, casing , water harvesting, storage, Biofertilizer-Historical background, ,chemical fertilizers versus biofertilizers, organic farming . Rhizobium sp., Azospirillum sp., Azotobacter sp., as Biofertilizers

Unit - IV

Brewing-Media components, preparation of medium, microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. Production of industrial alchohol.

Unit - V

Patients and secret process, History of patenting, composition,subject matter and characteristics of a patent, inventor, infringement, cost of patent. Patents in India and other countries .Fermentation economis.

REFERENCES

1. SubbaRao NS (1997). Biofertilizer in Agriculture and Forestry, 3rd edition, Oxford &IBU Publications.
2. LE Cassida JR (2005). Industrial Microbiology. New Age International (P) Ltd., New Delhi.
3. Arora. Entrepreneurial Development in India.
4. Aneja, K.R. Experments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology, 6th Edition, New age International Publication.
5. Frazier WC and West Hoff DC (1988). Food Microbiology. Fourth edition, McGraw Hill, New York.

NMEC 4 – ELEMENTAL CONCEPTS OF MICROBIOLOGY

Unit - I

History and scope of microbiology – Louis Pasteur – Robert Koch.Microscope and its applications.Importance of staining.Classification of microorganisms.

Unit - II

Structure and organization of bacterial cell. Sterilization and Disinfection , Methods of sterilization – Physical and chemical methods.

Unit - III

Culture and media preparation, Nutrition – Different phases of growth – Growth curve .Structure and function of DNA and RNA.

Unit - IV

Antigen, Antibody – Humoral and Cell - Mediated immunity.Blood grouping– Infections – Source and methods.Definitions – Epidemic, Pandemic, Endemic.Normal flora. Bacteria – *S. aureus* ,*E. coli* . Fungi-Candida.Virus – Rabies, HIV, Parasite – Malaria.

Unit - V

Fermentation and its uses.Production of Penicillin and Streptomycin, Beer, Wine, Yoghurt.Plant - microbial interaction – N_2 fixation in root nodules.

REFERENCES

1. Prescott L M, J P Harley and D A Klein (2005). Microbiology. Sixth edition, International edition, McGraw Hill.

2. PelczarTR M J Chan ECS and Kreig N R (2006). Microbiology. Fifth edition, Tata McGraw-Hill INC. New York.

3. Kuby Immunology - Richard A Goldsby, Thomas J Kindt. Barbara A Osborne, (2000). Fourth edition, W H Freeman and company. New York.
4. **Jawetz**, Melnick, &Adelberg's. (2013). Medical Microbiology. 26th Edition. McGraw-Hill.

5. Patel AH (2005). Industrial microbiology. Published by Mac Millan India Ltd., Chennai.

6. SubbaRao NS (2004). Soil Microbiology. Fourth edition, Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi.

SEMESTER - I

Hrs	**3**
Cred.	**4**
Code	
Marks	**100**

FIRST YEAR PRACTICAL-I

Max. Marks 100

Practical Exam. Hours: 7 hours/day (End of first semester)

FUNDAMENTALS OF MICROBIOLOGY

1. Handling of Instruments and Laboratory safety measures.
2. Handling and Maintenance of compound microscope.
3. Cleaning of Glassware and preparation of cleaning solutions.
4. Staining techniques
    a. Simple,
    b. Differential staining (Gram's and Ziehl-Neelsen),
    c. Special staining (Spore and Capsular staining methods),
5. Handling of laboratory instruments
    a. Autoclave
    b. Hot air oven
    c. Laminar air flow
    d. pH meter.
6. Media preparation
    a. Liquid media – Peptone water, Nutrient broth.
    b. Solid media – Nutrient agar (Agar slant, Agar plate)
    c. Enriched Medium – Blood agar
    d. Differential medium – Mac Conkey agar.
    e. Enrichment Medium – Selenite F broth
    f. Selective medium – EMB, MSA.

REFERENCES

1. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai. Price Rs.225/-.
2. Dubey RC and Maheswari DK (2004). Practical Microbiology 1st Edition, S.Chand& Company Ltd., New Delhi.
3. Kannan N (2003). Handbook of Laboratory Culture Media, Reagents, Stains and Buffers. Panima Publishing Corporation, New Delhi. Price Rs.395/-.
4. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai
5. Sundararaj T. Microbiology laboratory manual. Revised and published by AswathySundararaj. No.5 First Cross Street, Thirumalai Nagar, Perungudi, Chennai.
6. James G Cappuccino and Natalie Sherman (2004). Microbiology : A laboratory manual. Sixth edition, Published by Pearson Education.
7. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
8. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.

SEMESTER- II

Hrs	**3**
Cred.	**4**
Code	
Marks	**100**

FIRST YEAR PRACTICAL-II

Max. Marks 100

Practical Exam. Hours: 7 hours/day (End of second semester)

MICROBIAL PHYSIOLOGY AND DIVERSITY

1. Microscopic examinations of
   a. Algae – Diatoms, Chlamydomonas, Volvox . –Wet mount
   b. Cyanobacteria:*Oscillatoria*, *Nostoc , Anabaena.-Wet mount*
   c. Fungi – *Mucor* spp., *Aspergillus* spp., *Penicillium*spp, *Alternaria*spp& Yeast.-LPCB
   d. Parasites – *Entamoeba* spp., *Giardia* spp., *Plasmodium,Taenia*, *Ascaris.*
2. Motility determination – Hanging drop method, semisolid agar.
3. Culture characteristics of Microorganisms – colony morphology, shape, margin.
4. Demonstration of pigment production on Nutrient agar medium *(Staphylococcus aureus, Pseudomonas aeruginosa & Serratia)*
5. Pure culture techniques – pour plate, streak plate & spread plate.
6. Measurement of microbial growth- turbidity method
7. Anaerobic cultivation- candle jar, gas pack method.
8. Neubaur counting chamber.
9. Micrometry (Demonstration).
10. Observation of budding cells of yeast.

REFERENCES

1. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai. Price Rs.225/-.
2. Dubey RC and Maheswari DK (2004). Practical Microbiology 1st Edition, S.Chand& Company Ltd., New Delhi.
3. Kannan N (2003). Handbook of Laboratory Culture Media, Reagents, Stains and Buffers. Panima Publishing Corporation, New Delhi. Price Rs.395/-.
4. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai
5. Sundararaj T. Microbiology laboratory manual. Revised and published by AswathySundararaj. No.5 First Cross Street, Thirumalai Nagar, Perungudi, Chennai.
6. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
7. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.

SEMESTER- III

SECOND YEAR PRACTICAL-III

Max. Marks 100

Practical Exam. Hours: 7 hours/day

Hrs	**3**
Cred.	**4**
Code	
Marks	**100**

MICROBIAL GENETICS

1. Observation of mitosis from onion root tip.
2. Isolation of Genomic DNA from Bacteria.
3. Isolation of Genomic DNA from Cyanobacteria .
4. Estimation of DNA (DPA method).
5. Separation of DNA by Agarose gel Electrophoresis.
6. Isolation of Auxotrophic mutant by replica plate method.
7. Isolation of drug resistant mutants by gradient plate method.
8. Isolation of phage from Sewage (Demonstration)

REFERENCES

1. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai
2. Aneja KR (2005).Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.
3. Dubey RC and Maheswari DK (2004).Practical microbiology First edition, S Chand and Company Ltd., New Delhi.
4. James G Cappuccino and Natalie Sherman (2004). Microbiology : A laboratory manual. Sixth edition, Published by Pearson Education.
5. Kannan N (2003). Handbook of laboratory culture media, Reagents, Stains and buffers. Panima Publishing Corporation, New Delhi.
6. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
7. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.
8. The HiMedia Manual (2003). For microbiology and Cell Culture Laboratory Practice. Published by HiMedia Laboratories (P) Ltd., Mumbai.

SEMESTER- IV

Hrs	**3**
Cred.	**4**
Code	
Marks	**100**

SECOND YEAR PRACTICAL-IV

Max. Marks 100

Practical Exam Hours: 7 hours/day (End of third semester)

IMMUNOLOGY

1. Blood collection and plasma/serum separation.
2. Blood grouping – Rh typing – cross matching.
3. Examinations of Blood Cells
    a. Total Count
    b. Differential Count
4. Agglutination reaction
    a. Widal test-slide and tube test
    b. ASO test
    c. RA test
    d. CRP test
    e. Pregnancy test (Slide and Card test).
5. Precipitation reaction
    a. Ouchterlony double immunodiffusion test.
    b. Counter immunoelectrophoresis.
6. Flocculation.-RPR TEST
7. HIV – Tri Dot test .Hepatitis-Hepacard.
8. ELISA-HIV/HBSAg (Demontration).

REFERENCES

1. Aneja KR (2005).Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.
2. Dubey RC and Maheswari DK (2004).Practical Microbiology First edition, S Chand and Company Ltd., New Delhi.
3. Kannan N (2003). Handbook of laboratory culture media, Reagents, Stains and buffers. Panima Publishing Corporation, New Delhi.
4. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
5. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.
6. Myer's and Koshy's manual of diagnostic procedures in medical microbiology and immunology/serology. Published by department of clinical microbiology, CMC and Hospital, Vellore, Tamil Nadu.
7. The HiMedia Manual (2003). For microbiology and Cell Culture Laboratory Practice. Published by HiMedia Laboratories (P) Ltd., Mumbai.
8. Mukherjee, L. (1997). Medical Laboratory Technology. Volume I & II. Tata McGrew – Hill Publishing Company Limited, New Delhi.

SEMESTER - V

Hrs	**3**
Cred.	**4**
Code	
Marks	**100**

THIRD YEAR PRACTICAL-V

Max. Marks 100

Practical Exam. Hours: 7 hours/day (End of fifth semester)

MEDICAL MICROBIOLOGY

1. Staining techniques – Gram's, Ziehl-Neelsen, Capsular, Spore staining.
2. Biochemical identification of bacterial pathogens.

   Following tests to be performed:-TSI, Indole, MR, VP, Citrate, Urease, Catalase & Oxidase test for

   a. *Staphylococcus aureus* iv) *Salmonella typhi*
   b. *Escherichia coli* v) *Proteus vulgaris*
   c. *Klebsiellapneumoniae* vi) *Psedomonasaeruginosa*
3. Normal saline/Lugol's iodine preparation for parasitic Ova/cyst examination.
4. Stool examination by Zinc-sulphate floatation method.
5. Blood smear examination for malarial parasite (*Plasmodium vivax and P. malariae*)
6. Examination of Dermatophytes and other fungi by KOH and Lactophenol cotton blue stain.
7. Examination of *Candida albicans* by Gram's stain, Germ tube.
8. Examination of *Cryptococcus neoformans* by Negative staining.
9. AST – Kirby-bauer disc diffusion method.
10. Egg inoculation technique – All routes (Demontration).
11. ELISA – HIV/HBSAg

REFERENCES

1. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai
2. Aneja KR (2005).Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.
3. Dubey RC and Maheswari DK (2004).Practical microbiology First edition, S Chand and Company Ltd., New Delhi.
4. Sundararaj T. Microbiology laboratory manual. Revised and published by AswathySundararaj. No.5 First Cross Street, Thirumalai Nagar, Perungudi, Chennai.
5. James G Cappuccino and Natalie Sherman (2004). Microbiology : A laboratory manual. Sixth edition, Published by Pearson Education.
6. Kannan N (2003). Handbook of laboratory culture media, Reagents, Stains and buffers. Panima Publishing Corporation, New Delhi.
7. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
8. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.
9. Myer's and Koshy's manual of diagnostic procedures in medical microbiology and immunology/serology. Published by department of clinical microbiology, CMC and Hospital, Vellore, Tamil Nadu.
10. The HiMedia Manual (2003). For microbiology and Cell Culture Laboratory Practice. Published by HiMedia Laboratories (P) Ltd., Mumbai.
11. Bailey &Scott's (2014). Diagnostic Microbiology. 13th edition, The C.V. Mosby Company.

SEMESTER - VI

Hrs	**3**
Cred.	**4**
Code	
Marks	**100**

THIRD YEAR PRACTICAL-VI

Max. Marks 100

Practical Exam. Hours: 7 hours/day (End of sixth semester)

APPLIED MICROBIOLOGY

1. Examination of plant diseases – Blight of rice, Citrus canker, Red rot of sugarcane, Wilt of cotton and Tikka leaf spot, Rust in groundnut.
2. Enumeration of bacteria and fungi from soil.
3. Isolation of Nitrogen fixing bacteria from root nodules of legumes.
4. Isolation of *Azospirillum*and *Azotobacter*from Rhizosphere soil.
5. Study of morphology of Cyanobacteria – *Oscillatoria*, *Anabaena*.
6. Examination of *Mycorrhizae* in Maize roots.
7. Standard plate count technique (SPC) Milk and yogurt.
8. Demonstration of cellulose degradation.
9. Demonstration of phosphate solubilization.
10. MPN test.
11. Enumeration of Microbes from air by settle plate method and air sampling device.
12. Paper and Thin layer chromatography –Amino acids.
13. Isolation of *Lactobacilli* and *Streptococcus lactis* from curd.
14. Methylene blue reductase test, Resazurin test.
15. Demonstration of batch fermentation using Erlenmeyer flask.
16. PAGE

REFERENCES

1. Rajan S and Selvi Christy (2011). Experimental procedures in life sciences. Anjana Book House, publishers and distributors, Chennai
2. Aneja KR (2005).Experiments in Microbiology, Plant pathology and Biotechnology. Fourth edition, New Age International Publishers, Chennai.
3. Dubey RC and Maheswari DK (2004).Practical microbiology First edition, S Chand and Company Ltd., New Delhi.
4. James G Cappuccino and Natalie Sherman (2004). Microbiology : A laboratory manual. Sixth edition, Published by Pearson Education.
5. Kannan N (2003). Handbook of laboratory culture media, Reagents, Stains and buffers. Panima Publishing Corporation, New Delhi.
6. Kannan N (1996). Laboratory Manual in General Microbiology. First edition, Palani Paramount Publications, Palani. Tamil Nau.
7. Horold J Benson (1998). Microbiological Applications - Laboratory Manual in General Microbiology. Seventh International edition, Mc Grew-Hill, Boston.
8. Myer's and Koshy's manual of diagnostic procedures in medical microbiology and immunology/serology. Published by department of clinical microbiology, CMC and Hospital, Vellore, Tamil Nadu.
9. SubbaRao NS (2004). Soil Microbiology. Fourth edition, Oxford and IBH Publishing Co.Pvt. Ltd., New Delhi.