PERIYAR UNIVERSITY
SALEM - 11

SYLLABUS

CHOICE BASED CREDIT SYSTEM

SEMESTER PATTERN

B.Sc. Microbiology

(Candidates admitted from 2008-2009 onwards)

PERIYAR UNIVERSITY

B.Sc., MICROBIOLOGY

(Candidates admitted from 2008-2009 onwards)

REGULATIONS

1. Condition for Admission:

A candidate who has passed Higher Secondary examination in any one of the biological sciences (Academic/Vocational stream) under higher secondary board of examination, Tami 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 B.Sc., Microbiology degree examination of this University after a course of study of three academic years.

2. Duration of the Course:

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

3. 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.

PERIYAR UNIVERSITY – B.Sc. DEGREE

Choice Based Credit System

BRANCH: MICROBIOLOGY

(Candidates admitted from 2008 – 2009 onwards)

COURSE COMPONENTS

Sem	Course	Title of the course	Hrs/Wk	Credits	Max. Marks		
					Internal	External	Total
I	Part – I	Tamil	6	3	25	75	100
	Part – II	English	6	3	25	75	100
	Core	Fundamentals of Microbiology	5	5	25	75	100
	Core	Major Practical – I	3	-	-	-	-
	Allied	Biochemistry – I	4	3	25	75	100
	Allied	Practical – I	3	-	-	-	-
	Part IV	Environmental Studies	1	-	-	-	-
		Value Education	2	2	25	75	100
		Total	**30**	**16**			**500**
II	Part – I	Tamil	6	3	25	75	100
	Part – II	English	6	3	25	75	100
	Core	Microbial Physiology	5	5	25	75	100
	Core	Major Practical – I	3	-	40	60	100
	Allied	Biochemistry – II	4	4	25	75	100
	Allied	Practical – I	3	3	40	60	100
	Part IV	Environmental Studies	1	2	25	75	100
	SBEC	Microbial Diversity	2	2	25	75	100
		Total	**30**	**22**			**800**
III	Part – I	Tamil	6	3	25	75	100
	Part – II	English	6	3	25	75	100
	Core	Microbial Genetics	4	4	25	75	100
	Core	Major Practical – II	3	-	-	-	-
	Allied	Biostatistics	7	6	25	75	100
	SBEC	General Hygienic and sanitary Practices	2	2	25	75	100
	NMEC	Bioinstrumentation – I	2	2	25	75	100
		Total	**30**	**20**			**600**

Sem	Course	Title of the course	Hrs/Wk	Credits	Max. Marks		
					Internal	External	Total
IV	Part – I	Tamil	6	3	25	75	100
	Part – II	English	6	3	25	75	100
	Core	Immunology	6	5	25	75	100
	Core	Major Practical – II	3	4	40	60	100
	Allied	Computer Application in Biology	4	4	25	75	100
	Allied	Practical – II	3	2	40	60	100
	NMEC	Bioinstrumentation – II	2	2	25	75	100
		Total	**30**	**23**			**700**
V	Core	Medical Bacteriology	5	5	25	75	100
	Core	Food & Dairy Microbiology	5	5	25	75	100
	Elective	Medical Parasitology	5	5	25	75	100
	Elective	Medical Mycology	5	5	25	75	100
	SBEC	Recombinant DNA Technology – I	2	2	25	75	100
	SBEC	Recombinant DNA Technology – II	2	2	25	75	100
	Core	Major Practical – III	6	-	-	-	-
		Total	**30**	**32**	**-**	**-**	**600**
VI	Core	Soil and Agricultural Microbiology	5	5	25	75	100
	Core	Environmental Microbiology	5	5	25	75	100
	Core	Medical Virology	5	5	25	75	100
	Elective	Fermentation Technology	5	5	25	75	100
	SBEC	Microbial Technology – I	2	2	25	75	100
	SBEC	Microbial Technology – II	2	2	25	75	100
	Core	Major Practical – III	-	-	40	60	100
	Core	Major Practical – IV	6	8	40	60	100
		Total	**30**	**32**	**-**	**-**	**800**
		Extension Activities					**100**

TOTAL NO. OF COURSES : 41

TOTAL NO. OF CREDITS : 145

CORE -1 – FUNDAMENTALS OF MICROBIOLOGY-

UNIT I - Definition and scope of Microbiology – History and recent developments – Spontaneous generation – Biogenesis Contributions of Leeuwenhoek, Louis pasteur, Robert koch, Elie Metchinkoff and Fleming.

UNIT II - Microscopy – Simple and compound Microscopy – Dark field – Phase contrast – Fluorescence and Electron Microscopy.

UNIT III - Stain and Staining techniques – Simple, differential and special staining (Endospore, capsular & Granular).

UNIT IV - Sterilization – Principles – dry heat – moist heat – Radiation – Filtration. Disinfection and disinfective agents – Sterility control for dry heat, moist heat and radiation.

UNIT V - Antimicrobial chemotherapy - Antibiotics – mode of actions – antimicrobial resistance – Tests for sensitivity to antimicrobial agents.

References:

1. Dubey RC and Maheswari DK (2005). A Text book of Microbiology. S.Chand &Company Ltd., New Delhi.
2. Sundara Rajan S (2003). College Microbiology. Volume 1 & 2. Revised Edition, Vardhana Publications, Bangalore. Price Rs.150/- + Rs.171/-.
3. Powar CB and Daginawala HF (2005). General Microbiology, Volume I & II, 8th Edition, Himalaya Publishing House, Mumbai.
4. Pelczar Tr. MJ, Chan ECS & Kreig NR (1993). Microbiology MC Graw-Hill Inc., New York.
5. Robert F Boyd (1984). General Microbiology. Times Mirror/Mosby College Publishers.
6. Prescott LM, JP Harley and DA Klein (1993). Microbiology, 2nd Edition, WM, C Brown Publishers.

CORE– MICROBIAL PHYSIOLOGY

UNIT I - Cellular structures of prokaryotes and eukaryotes – Ultra structure and Functions of Prokaryotic cell wall, flagella, slime layer, capsule, pili, cytoplasmic membrane and cytoplasmic inclusions – Sporulation and its mechanism – Structure and functions of cyanobacteria.

UNIT II - Growth of bacteria – multiplication – nutritional requirements – factors affecting growth – growth curve – Determination of growth. Culture techniques – Pure culture, Anaerobic culture – Preservation of cultures.

UNIT III - Metabolism – ATP Synthesis & Utilization – (Photophosphorylation, Oxidative phosphorylation, Substrate level phosphorylation). Metabolic pathways – glycolysis, pentose phosphate pathway, EMP, TCA and Glyoxalate cycle.

UNIT IV - Fermentation types – Lactic acid,Butanol and Propionic acid.

UNIT V - Photosynthesis – characteristics and metabolism of Autotrophs – Photosynthetic bacteria and cyanobacteria – Autotrophic Co_2 fixation and mechanisms of photosynthesis.

References:

1. Dubey RC and Maheswari DK (2005). A Text book of Microbiology. S.Chand &Company Ltd., New Delhi.

2. Sundara Rajan S (2003). College Microbiology. Volume 1 & 2. Revised Edition, Vardhana Publications, Bangalore. Price Rs.150/- + Rs.171/-.

3. Pelczar Tr. MJ, Chan ECS & Kreig NR (1993). Microbiology MC Graw-Hill Inc., New York.

4. Robert F Boyd (1984). General Microbiology. Times Mirror/Mosby College Publishers.

5. Moat G, John W. Foster & Michael P.Spector (2002). Microbial Physiology. 4th Edition, A John Wiley Sons, Inc., Publication. New Delhi.

CORE – MICROBIAL GENETICS

UNIT I - Introduction and History of Microbial Genetics. DNA as a Genetic material. Physical structure and Chemical composition of DNA – RNA and its types RNA as a Genetic material.

UNIT II - DNA Replication – Types and Experimental proof of replication – Enzymes involved in DNA replication.

UNIT III - Prokaryotic Transcription ,Translation. Genetic code – Regulation of gene expression in prokaryotes – lac Operon.

UNIT IV - Gene transfer mechanisms – Transformation, conjugation and Transduction. Plasmid – Characteristics and types.

UNIT V - Mutation – types of mutation – Molecular basis of mutation – Mutagenesis, Detection of mutants – Ames test, DNA repair mechanisms.

References:

1. David Freifelder (1995). Molecular Biology. Narosa Publishing House, New Delhi.

2. Peter Snustad D and Michael J Simmons (2003). Principles of Genetics. 3rd Edition, John Wiley & Sons, Inc., Publication, New Delhi.

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

4. Robert H Tamarin (2002). Principles of Genetics. 7th Edition, Tata Mc Graw-Hill Publication, New Delhi.

CORE– IMMUNOLOGY

UNIT I - History of Immunology – Host-parasite relationship – Immunity – Innate and acquired immunity – Humoral and Cell-mediated immunity.

UNIT II - Structures and functions of Cells and organs involved in immune system. Primary and secondary lymphoid organs.

UNIT III - Antigens – Types, properties – Immunoglobulins – Structure, types and properties – Complement – Classical and alternative pathways.

UNIT IV - Antigen – Antibody reactions – Agglutination – Precipitation – Complement fixation – Immunofluorescence – ELISA-RIA.

UNIT V - Hypersensitivity reactions – Antibody mediated – Type I, Type II and Type III – cell mediated - Type IV – Immunohaematology.

References:

1. Chakraborty P (2003). A Text book of Microbiology. 2nd Edition, Published by New Central Book Agency (P) Ltd., Kolkata. Price Rs.485/-.

2. Ananthanarayan R & Jayaram Paniker CK (2000). Text book of Microbiology. 6th Edition, Orient Longman Limited, Chennai.

3. Kuby Immunology – Riachard A Goldsby, Thomas J Kindt. Barbara A Osborne, (2000) 4th Edition. W H Freeman and Company, New York.

4. Tizard K (1983). Immunology. An Introduction. Saunders College Publishing, Philadelphia.

5. Roitt, IM (1988). Essential of Immunology. ELBS-Blackwell Scientific publishers, London.

CORE – MEDICAL BACTERIOLOGY

UNIT I - Collection and transport of clinical specimens for microbiological examination – Virulence factors of bacteria causing human infections – Normal flora of human body.

UNIT II - *Staphylococcus aureus, Streptococcus pyogenes, S.pneumoniae, Neisseria gonorrhoeae, N.meningitidis.*

UNIT III- *Mycobacterium tuberculosis, Mycobacterium leprae, Corynebacterium diphtheriae, Clostridium tetani, Bacillus anthracis, Actinomycetes..*

UNIT IV - *Salmonella typhi, Shigella dysentriae, Vibrio cholerae, Escherichia coli, Klebsiella pneumoniae, proteus mirabilis, Pseudomonas aeruginosa, Yersinia pestis.*

UNIT V - *Treponema pallidum, Leptospira interrogans,Mycoplasma pneumoniae, Chlamydia trachomatis.*

References:

1. Chakraborty P (2003). A Text book of Microbiology. 2nd Edition, Published by New Central Book Agency (P) Ltd., Kolkata. Price Rs.485/-.

2. Ananthanarayan R & Jayaram Paniker CK (2000). Text book of Microbiology. 6th Edition, Orient Longman Limited, Chennai. Price Rs.310/-.

3. Satish Gupte (2002). The short textbook of Medical Microbiology. 8th Edition, Jaypee Brothers, Medical Publishers (P) Ltd., New Delhi. Price Rs.250/-

4. Baron EJ, Peterson LR and Finegold SM (1994). Bailey and Scott's diagnostic Microbiology. 9th Edition, Mosby Publications.

CORE– FOOD AND DAIRY MICROBIOLOGY

UNIT I - Food as a substrate for microbes – Microbes involved in food microbiology – Mould, Yeast, Bacteria – Factors affecting the growth of Microorganisms in food.

UNIT II - Principles of food preservation – Asepsis – Removal of microorganisms, anaerobic conditions – high and low temperatures – drying – radiation – chemical preservatives – food additives.

UNIT III - Food spoilage – General principles – underlying food spoilage and contamination – Cereals, vegetables, fruits, and poultry products, meat, fish, sea foods.

UNIT IV - Microorganisms in milk and milk products – Yoghurt, butter milk, butter and cheese – Quality control of Milk – MBRT, SPC, Phosphatase tests.

UNIT V - Food-borne diseases – Food poisoning – infective and toxic bacterial food borne diseases and their diagnosis – Food sanitation and its control measures.

References:

1. Adams MR Moss MO (2004). Food Microbiology, 2nd Edition, Panima Publishing House, New Delhi. Price Rs.395/-.

2. James M Jay (2003). Modern Food Microbiology. 4th Edition, CBS Publishers & Distributors, New Delhi. Price Rs.250/-.

3. Frazier WC and Westhoff DC (1988). Food Microbiology, 4th Edition, Mc Graw Hill, New York

CORE– MEDICAL VIROLOGY

UNIT I - General properties – classification – cultivation – Isolation and Identification of viruses – Serodiagnosis and Molecular diagnosis of viral infections.

UNIT II - Pox viruses – Variola, vaccinia. Herpes viruses – Herpes simplex, Varicella zoster, Cytomegalovirus, Epstein Barr virus.

UNIT III - Adeno viruses – Hepatitis viruses – Papova viruses – Papilloma, Polyoma - Parvo virus.

UNIT IV - Picorna viruses – Polio, Rhino virus. Orthomyxo virus – Influenza. Paramyxo viruses – Para influenza, mumps, measles. Rhabdo virus - Reo virus - Rota virus.

UNIT V - Alpha viruses – Eastern Equine Encephalitis virus. Flavi viruses – Yellow Fever Virus, Dengue virus, Japanese B encephalitis virus, KFD – Rubella - Retro viruses – HIV.

References:

1. Chakraborty P (2003). A Text book of Microbiology. 2nd Edition, Published by New Central Book Agency (P) Ltd., Kolkata. Price Rs.485/-.
2. Ananthanarayan R & Jayaram Paniker CK (2000). Text book of Microbiology. 6th Edition, Orient Longman Limited, Chennai.
3. Dimmok NJ, Prmrose SB (1994). Introduction to Modern Virology, 4th Edition, Blackwell Scientific Company Publications.
4. Patric R Murray (1990). Medical Microbiology. Mosby Publications.
5. Baron EJ, Peterson LR and Finegold SM (1994). Bailey and Scott's diagnostic Microbiology. 9th Edition, Mosby Publications.
6. Luria, SE, Darnell JE, Baltimore D and Compare A (1978). General Virology, 3rd Edition, John Wiley and Sons, New York.

CORE– SOIL AND AGRICULTURAL MICROBIOLOGY

UNIT I - Introduction to Soil microbiology - Properties of soil (Structure, texture, formation). Types and significance of soil microbes – Bacteria, Fungi, Actinomycetes, Algae, Protozoa, Nematode and Viruses – Factors affecting microbial population.

UNIT II - Biogeochemical cycle – Carbon, Phosphorus, Nitrogen – Biological Nitrogen fixation – Nitrogen fixers Root nodule formation – Nitrogenase, Hydrogenase.

UNIT III - Microbial interaction between microbes – Neutralism, Commensalism, Synergism, Mutualism, Amensalism,Symbiosis, Competition, Parasitism and Predation. Interaction of Microbes with plants – Rhizosphere and Mycorrhizae – Interaction of microbes – insects and rumen.

UNIT IV - Plant pathology (symptoms, disease cycle and control measures) – Bacterial diseases – Blight of rice, Citrus canker – Fungal disease – Red rot of sugarcane, Wilt of cotton, Tikka leaf spot of groundnut.

UNIT V - Biofertilizer – Rhizobium and Azotobacter, Cyanobacteria, Azolla – Mass multiplication and crop response. Biopesticide – Bacterial, fungal and viral.

References:

1. Subba Rao NS (2004). Soil Microbiology. 4th Edition, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. Price Rs.295/-.

2. Mishra RR (2004). Soil Microbiology. 1st Edition, CBS Publishers and Distributors, New Delhi. Price Rs.175/-.

3. Rangaswami G and Mahadevan A (2002). Diseases of crop plants in India. 4th Edition, Printice-Hall of India Pvt. Ltd., New Delhi.

4. Robert, L Tate, (1995). Soil Microbiology. 1st Edition, John Wiley & Sons, Inc. New York.

CORE– ENVIRONMENTAL MICROBIOLOGY

UNIT I - Ecosystems,types – Dynamics of ecosystems – Unculturable and culturable bacteria – Conventional and molecular methods of studying microbial diversity.

UNIT II - Microbiology of air – Aeromicrobial pathways – Enumeration of bacteria from air – Air sampling devices – Air sanitation- Air borne diseases.

UNIT III - Microbiology of water – Potability of water quality – Indicator organisms – water purification – waterborne diseases and their control measures.

UNIT IV - Microbiology of sewage – chemical and biochemical characteristics of sewage – BOD & COD – Sewage treatment – Physical, chemical and biological (trickling filter, activated sludge and oxidation pond) treatment – Disposable of wastes.

UNIT V - Positive and negative roles of microbes in environment – Introduction to biodegradation – xenobiotics – bioaccumulation – Bioleaching of ores – Biodegradation of paper, oil and pesticide.

References:

1. Vijaya Ramesh K (2004). Environmental Microbiology. 1st Edition, MJP Publishers (A unit of Tamil Nadu Book house), Chennai. Price Rs.160/-.

2. Joseph C Daniel (1999). Environment Aspects of Microbiology. 1st Edition, Bright sun Publications, Chennai.

3. Mithell R (1974). Introduction to Environmental Microbiology. Prantice Hall. Inc., Englewood Cliffs, New Jersey.

4. Atlas, RN and Bartha R (1992). Microbial Ecology: Fundamentals and applications. 3rd Edition, Redwood city, Benjamin/Cummings.

ELECTIVE– MEDICAL PARASITOLOGY

UNIT I - Introduction – classification - Laboratory diagnosis of parasitic infections - direct and concentration methods, Blood smear examination.

UNIT II- *Entamoeba histolytica, Giardia intestinalis, Trichomonas vaginalis Balantidium coli.*

UNIT III Haemoflagellates – *Leishmania donovani, Trypanosoma brucei, T.Cruci,* Malarial parasite – *Plasmodium.*

UNIT IV - *Taenia solium, Taenia saginata Paragonimus westermani,Fasciola hepatica, Fasciolopsis buski*

UNIT V *Ancylostoma duodenale, Ascaris lumbricoides, Wuchreria bancrofti. Enterobias vermicularis*

References

1. Karyakarte RP & Damle AS (2005). Medical Parasitology. Books & Allied (P) Ltd., Kolkatta.

2.. Chakraborty P (2003). A Text book of Microbiology. 2nd Edition, Published by New Central Book Agency (P) Ltd., Kolkata. Price Rs.485/-.

3. Parija S.C. (2006) Text book of Medical Parasitology.

ELECTIVE – MEIDCAL MYCOLOGY

UNIT I Introduction to Medical Mycology – Morphological features of fungi- Classification of medically important fungi

UNIT II Superficial mycosis – *Pityriasis versicolor, Tinea nigra* Cutaneous mycosis – Dermatophytosis

UNIT III Subcutaneous mycosis – Sporotrichosis, Mycetoma. Chromoblastomycosis

UNIT -IV Systemic mycosis – Histoplasmosis. Opportunistic mycosis – Candidosis, Cryptococcosis – Aspergillosis –

UNIT V Antifungal agents. – Myco toxins

References:

1 Mehrotra RS and Aneja KR (1990). An introduction to Mycology. New Age International Publishers.

2 Jagadish Chander (1996). A text book of Medical Mycology. Interprint, New Delhi.

3. Chakraborty P (2003). A Text book of Microbiology. 2nd Edition, Published by New Central Book Agency (P) Ltd., Kolkata. Price Rs.485/-.

ELECTIVE - FERMENTATION TECHNOLOGY

UNIT I - Industrially important microorganisms – screening techniques – primary and secondary – Preservation of cultures – Strain improvement – Development of inoculum for various fermentation process.

UNIT II - Media for industrial fermentation – Submerged and solid state fermentation – Down stream processing – Recovery and purification of intracellular and extracellular products.

UNIT III - Fermentor –Components of fermentor – Types of bioreactors – Heat production – heat transfer – Oxygen transfer – Stirring and mixing – Scale up – control of temperature – p^H , Foam pressure – computer applications in fermentation technology.

UNIT IV - Microbial production of Wine, ethanol. Organic acid – Citric acid and Lactic acid.

UNIT V - Microbial production of Amino acid – Lysine, Enzyme – α-amylase, Vitamin B12.

References:

1. Patel AH (2005). Industrial Microbiology. Published by Macmillan India Ltd., Chennai. Price Rs.246/-.

2. Agrawal AK and Pradeep Parihar (2005). Industrial Microbiology: Fundamentals and applications. 1st Edition, Published by Agrobios (India).

3. Cassida LE (1996). Industrial Microbiology. New Age International Publishers, Chennai.

4. Hugo WB and AD Russell (1998). Pharmaceutical Microbiology, Sixth edition, Blackwell Scientific Company Ltd.

5. Fermentation Technology – Stawbery.

SBEC - Microbial Diversity

UNIT - I

Diversity of Microbial world – Organizing, Classifying and Naming of Microorganism – Whittaker system of Classification.

UNIT – II

Bacterial Taxonomy- Methods in Bacterial Identification- Bergey's Systematic Classification of Bacteria.

UNIT- III

Fungal Classification – Alexopolous Method.

UNIT – IV

Photosynthetic Protists- Algal classification.

UNIT- V

Classification of Viruses and Medically Important Protozoa.

References:

1. Dubey RC and Maheswari DK (2005). A Text book of Microbiology. S.Chand &Company Ltd., New Delhi.
2. Sundara Rajan S (2003). College Microbiology. Volume 1 & 2. Revised Edition, Vardhana Publications, Bangalore. Price Rs.150/- + Rs.171/-.
3. Powar CB and Daginawala HF (2005). General Microbiology, Volume I & II, 8th Edition, Himalaya Publishing House, Mumbai.
4. Pelczar Tr. MJ, Chan ECS & Kreig NR (1993). Microbiology MC Graw-Hill Inc., New York.
5. Robert F Boyd (1984). General Microbiology. Times Mirror/Mosby College Publishers.
6. Prescott LM, JP Harley and DA Klein (1993). Microbiology, 2nd Edition, WM, C Brown Publishers.

SBEC – GENERAL HYGIENIC AND SANITARY PRACTICES

UNIT I - Introduction – distribution of microbes in nature- common diseases caused by microbes – control of disease causing microbes.

UNIT II - water quality and control – water pollution, criteria for drinking water , sanitary surveys – bacteriological evidence for pollution- water borne diseases – control methods.

UNIT III - Hygienic practices in industries – factory and hospital hygiene – sterilization control

UNIT IV - Microflora of fresh food- spoilage of food- preservation- microbiological safety- HACCP system.

UNIT V - Immunization – schedule – routine – individual immunization.

References:

1. Pelczar JR, Chan ECS & Kreig NR (2006). Microbiology. 5th edition, Tata Mc Graw Hill, New Delhi.

2. Purohit ss, AK Saluja, HN Kakarni (2004). Pharmaceutical Microbiology, 1st edition, Agrobios (India).

3. Frazier , food Microbiology , 4th edition Tata Mc Graw Hill , New Delhi.

SBEC – RECOMBINANT DNA TECHNOLOGY - I

UNIT I - Recombinant DNA: Historical perspective and early experiment.- Achievements of r DNA technology.

UNIT II - Cloning Vectors -Plasmids – PUC18 Ti DNA based vectors Ri plasmid vectors.,Viral vector cosmid, phagmids and YAC - pBR322 – Bacteriophage vector – M_{13} phage.

UNIT III - Enzymes in Genetic Engineering – Restriction endonucleases, ligases, Alkaline phosphatase, polynucleotide kinase, Terminal deoxynucleotide transferase – III, Taq polymerase, Reverse transcriptase - use of linkers and adaptors.

References:

1. Mitra (2005). Genetic Engineering. Published by Macmillan India Ltd., Chennai. Price Rs.365/-

2. Jogdand SN (2005). Gene Biotechnology. Himalaya Publishing House, Mumbai.

3. Satyanarayana U (2005). Biotechnology. 1st Edition, Books and Allied (P) Ltd., Kolkata.

4. Singh BD (2005). Biotechnology. 2nd revised and enlarged Edition, Kalyani Publishers, Chennai.

5. Preeti Joshi (2002). Genetic Engineering and its applications. 1st Edition, Agrobios (India).

6. Primrose SB, RM Twyman and RW Old (2001). Principles of Gene Manipulation. 6th Edition, Blackwell Science Ltd.

SBEC – RECOMBINANT DNA TECHNOLOGY – I I

UNIT I - Gene cloning in prokaryotes - Cloning strategies:- Construction of genomic libraries and cDNA libraries – isolation of mRNA – reverse transcription

UNIT II Gene transfer in Bacteria Transformation - transfection – Electroporation and particle bombardment – microinjection – liposome mediated gene transfer- ultrasonication – Screening of cloned foreign genes.

UNIT II - Gene amplification. PCR methods and application – DNA sequencing methods – di-deoxy and chemical method.

References:

1. Mitra (2005). Genetic Engineering. Published by Macmillan India Ltd., Chennai. Price Rs.365/-
2. Jogdand SN (2005). Gene Biotechnology. Himalaya Publishing House, Mumbai.
3. Satyanarayana U (2005). Biotechnology. 1st Edition, Books and Allied (P) Ltd., Kolkata.
4. Singh BD (2005). Biotechnology. 2nd revised and enlarged Edition, Kalyani Publishers, Chennai.
5. Preeti Joshi (2002). Genetic Engineering and its applications. 1st Edition, Agrobios (India).
6. Primrose SB, RM Twyman and RW Old (2001). Principles of Gene Manipulation. 6th Edition, Blackwell Science Ltd.

SBEC– MICROBIAL BIOTECHNOLOGY - I

UNIT I - Biotechnology – definition and history – Enzyme biotechnology – enzyme production from microbes – applications – enzyme immobilization – product produced.

UNIT II - Microbial algal technology – cultivation methods of spirulina – biotechnological potentials of microalgae – Food, Feed and Fuel production. Pharmaceutically valuable compounds of microalgae.

UNIT III - Production of biotechnological products – SCP (Yeast, Mushroom),

References:

1. Satyanarayana U (2005). Biotechnology. 1st Edition, Books and Allied (P) Ltd., Kolkata.
2. Jogdand SN (2005). Gene Biotechnology. Himalaya Publishing House, Mumbai.
3. Singh BD (2005). Biotechnology. 2nd revised and enlarged Edition, Kalyani Publishers, Chennai.
4. Kumarasan V (2001). Biotechnology. Published by Saras Publication, Nagercoil, Tamil Nadu. Price Rs.105/-.
5. Bernad R Glick and Jack J Pasternak (1998). Molecular Biotechnology. Principles and Applications of Recombinant DNA. 2nd Edition. ASM Press, Washington, D.C.

SBEC – MICROBIAL BIOTECHNOLOGY II

UNIT I Biofertilizer - VAM, Biopesticides – *Bacillus thuringiensis* Biopolymers – *Xanthomonas campestris*.

UNIT II - Microbial synthesis of commercial production – pharmaceutical products – Insulin – interferon – Growth harmones.

UNIT III - Molecular Diagnostics – Immunological diagnostic procedures – Monoclonal antibodies – DNA Diagnostic Systems – Diagnosis of Malaria – PCR – OLA., Genetic diseases,Sickle cell anemia,

References:

1. Satyanarayana U (2005). Biotechnology. 1st Edition, Books and Allied (P) Ltd., Kolkata.
2. Jogdand SN (2005). Gene Biotechnology. Himalaya Publishing House, Mumbai.
3. Singh BD (2005). Biotechnology. 2nd revised and enlarged Edition, Kalyani Publishers, Chennai.
4. Kumarasan V (2001). Biotechnology. Published by Saras Publication, Nagercoil, Tamil Nadu. Price Rs.105/-.
5. Bernad R Glick and Jack J Pasternak (1998). Molecular Biotechnology. Principles and Applications of Recombinant DNA. 2nd Edition. ASM Press, Washington, D.C.

NMEC – BIOINSTRUMENTATION AND TECHNIQUES - I

UNIT I - Basic rules of a Microbiology Laboratory – Basic requirements Microbiology Laboratory – Basic principles, operating mechanism and applications of autoclave, hot air oven, Laminar air flow and p^H meter.

UNIT II - Centrifugation methods – Basic principles of sedimentation, centrifugal force, Swedberg constant. Types of centrifuges – Differential, density gradient and ultra centrifugation.

UNIT III - Chromatography – preparation, packing of columns, adsorption and elution. Paper, Thin layer, Ion-exchange and HPLC techniques and their application.

References:

1. Prakash M and Arora CK. Laboratory instrumentation. Anmol Publications Pvt. Ltd.
2. Keith Wilson and John Walker (2000). Practical Biochemistry. 5th Edition, Cambridge University Press.
3. Practical Biochemistry by Boyer.

NMEC – BIOINSTRUMENTATION AND TECHNIQUES - II

UNIT I- Spectrophotometric methods – Beer's Lambert's Law – Principles, operating mechanism and applications of colorimeter, Spectrophotometer and Flurescence spectroscopy.

UNIT -II Electrophoresis – Basic principles and their applications – Agarose gel electrophoresis – SDS PAGE –

UNIT III Blotting techniques – Southern, Western and northern blottings– Autoradiography – scintillation counter and Geiger Muller counter.

References:

1. Prakash M and Arora CK. Laboratory instrumentation. Anmol Publications Pvt. Ltd.
2. Keith Wilson and John Walker (2000). Practical Biochemistry. 5th Edition, Cambridge University Press.
3. Practical Biochemistry by Boyer.

MAIN PRACTICAL – I
(End of the First year)

1. Handling and Maintenance of compound microscope.
2. Cleaning of Glasswares.
3. Staining techniques – Simple, Gram's, Ziehl-Neelsen, Spore and Capsular staining methods.
4. Handling of laboratory instruments
   i) Autoclave ii) Hot air oven iii) Laminar air flow
   iv) p^H meter.
5. Microscopic examinations of
   Algae – *Oscillatoria, Spirulina* spp.
   Fungi – *Mucor* spp., *Aspergillus* spp., *Penicillium* spp. & *Alternaria* spp.
   Protozoa – *Entamoeba* spp., *Giardia* spp., *Ascaris* spp.
   Bacteria – *Staphylococcus* spp. *Lactobacillus* spp. *Escherichia* spp. *Vibrio* spp. & *Leptospira* spp
6. Motility determination – Hanging drop method, semisolid agar.
7. Media preparation
   Liquid media – Peptone water, Nutrient broth.
   Solid media – Nutrient agar (Agar slant, Agar plate)
   Enriched Medium – Blood agar
   Differential medium – Mac Conkey agar.
   Enrichment Medium – Selenite F broth
   Selective medium – EMB
8. Culture characteristics of Microorganisms on different media.
9. Demonstration of pigment production on Nutrient agar medium
   (*Staphylococcus aureus, Pseudomonas aeruginosa & Serratia* spp.)
10. Pure culture techniques – pour plate, streak plate & spread plate.
11. Antibiotic sensitivity test – Kirby – bauer disc diffusion method.

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/-.

MAIN PRACTICAL – II
(End of the Second year)

1. Isolation of Genomic DNA (crude method).
2. Isolation of Auxotrophic mutant by replica plate method.
3. Isolation of drug resistant mutants by gradient plate method.
4. Isolation of plasmid DNA by alkaline lysis method (Demonstration only).
5. Isolation of phage from Sewage (Demonstration only).
6. Blood collection and plasma/serum separation.
7. Blood grouping – Rh typing – cross matching.
8. Precipitation reaction
    i) RPR card test/VDRL test.
    ii) Ouchterlony double immunodiffusion test.
    iii) Counter immunoelectrophoresis.
9. Agglutination reaction
    i) Widal test
    ii) ASO test
    iii) RA test
    iv) CRP test
    v) Pregnancy test (Direct/Indirect)
10. ELISA – HBs Ag/HIV 1 & 2 test (Demonstration only).

References:

1. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai. Price Rs.225/-.

2. Myer's and Koshi's Manual of Diagnostic Procedures in Medical Microbiology and Immunology/Serology. Published by Department of Clinical Microbiology, CMC and Hospital, Vellore, Tamil Nadu.

MAIN PRACTICAL – III
(End of the Third year)

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

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

i)	*Staphylococcus aureus*	*iv)*	*Salmonella typhi*
ii)	*Escherichia coli*	*v)*	*Proteus vulgaris*
iii)	*Klebsiella pneumoniae*	vi)	*Psedomonas aeruginosa*

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. Wet mount examination of *Trichomonas vaginalis.*
7. Examination of fungi by KOH and Lactophenol cotton blue stain – Dermatophytes and other fungi.
8. Examination of *Candida albicans* by Gram's stain, Germ tube and Sugar assimilation test.
9. Examination of *Cryptococcus neoformans* by Negative staining.
10. AST – Kirby-bauer disc diffusion method.
11. Isolation of Lactobacilli and Staphylococci from curd.
12. Methylene blue reductase test.

References:

1. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai. Price Rs.225/-.
2. Myer's and Koshi's Manual of Diagnostic Procedures in Medical Microbiology and Immunology/Serology. Published by Department of Clinical Microbiology, CMC and Hospital, Vellore, Tamil Nadu.
3. James G Cappuccino & Natalie Sherman (2004). Microbiology: A Laboratory Manual. 6th Edition, Published by Pearson Education.
4. Dubey RC and Maheswari DK (2004). Practical Microbiology 1st Edition, S.Chand & Company Ltd., New Delhi.
5. Kannan N (2003). Handbook of Laboratory Culture Media, Reagents, Stains and Buffers. Panima Publishing Corporation, New Delhi. Price Rs.395/-.

MAIN PRACTICAL – IV
(End of the Third year)

1. Examination of plant diseases – Blast disease in paddy, Blight of rice, citrus canker, Red rot of sugarcane, Wilt of cotton and Tikka leaf spot.
2. Isolation of Nitrogen fixing bacteria from root nodules of legumes.
3. Study of morphology of cyanobacteria.
4. Enumeration of bacteria from soil.
5. Standard plate count technique (SPC)
6. MPN test.
7. Enumeration of Microbes from air by settle plate method and air sampling device.
8. Isolation of bacteriophage from sewage.
9. Paper and Thin layer chromatography.
10. SDS-PAGE electrophoresis.
11. Indentification of viral antibodies/antigen through ELISA technique – HIV 1 & 2 / HBs Ag.
12. Egg inoculation technique – All routes.
13. Demonstration of batch fermentation using Erlenmeyer flask.

References:

1. Aneja KR (2005). Experiments in Microbiology, Plant pathology and Biotechnology. 4th Edition, New Age International Publishers, Chennai. Price Rs.225/-.

2. James G Cappuccino & Natalie Sherman (2004). Microbiology: A Laboratory Manual. 6th Edition, Published by Pearson Education.

3. Dubey RC and Maheswari DK (2004). Practical Microbiology 1st Edition, S.Chand & Company Ltd., New Delhi.

4. Kannan N (2003). Handbook of Laboratory Culture Media, Reagents, Stains and Buffers. Panima Publishing Corporation, New Delhi. Price Rs.395/-.

B.Sc., Microbiology

(CBCS PATTERN)

THEORY QUESTION PAPER PATTERN

Maximum marks 75

Section A (10 x 2 = 20)

Answer all questions

Section B (5x5 = 25)

Internal choice

Section C (3x 10 = 30)

Answer any three out of five

B.Sc., Microbiology

(CBCS PATTERN)

CORE PRACTICAL QUESTION PAPER PATTERN

Maximum marks (University exam) 60

Experiment 1	- 20 marks
Experiment 2	- 20 marks
Spotters (5x2 marks)	- 10 marks
Record	- 10 marks

PERIYAR UNIVERSITY

B.Sc., MICROBIOLOGY

(Candidates admitted from 2008 – 2009 onwards)

Choice Based Credit system

List of Courses

CORE COURSES

1. Fundamentals of microbiology
2. Microbial physiology
3. Microbial genetics
4. Immunology
5. Medical Bacteriology
6. Food and Dairy Microbiology
7. Soil and Agricultural Microbiology
8. Environmental Microbiology
9. Medical Virology
10. Core Practical I
11. Core Practical II
12 Core Practical III
13 Core Practical IV

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

ELECTIVE COURSES

1. Medical Parasitology
2. Medical Mycology
3. Fermentation Technology

SKILL BASED ELECTIVE COURSES

1. Microbial diversity
2. Medical Laboratory techniques
3. Recombinant DNA technology I
4. Recombinant DNA technology II
5. Microbial Biotechnology I
6. Microbial Biotechnology II

NON MAJOR ELECTIVE COURSES

1. Bioinstrumentation I
2. Bioinstrumentation II

PART IV

1. Environmental Studies
2. Value Education - Yoga

PART V

1. Extension Activities