MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI

UG COURSES – AFFILIATED COLLEGES

B.Sc. Microbiology

(Choice Based Credit System)

(with effect from the academic year 2016-2017 onwards)

(44th SCAA meeting held on 30.05.2016)

Sem.	Pt. I/II/ III/ IV/ V	Sub No.	Subject status	Subject Title	Hrs./ week	Cre - dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
III	I	17	Language	Tamil/Other Language	6	3	25	75	100	30	40
	II	18	Language	English	6	3	25	75	100	30	40
	III	19	Core - 5	MICROBIAL GENETICS	4	4	25	75	100	30	40
		20	Major Practical - III (For Major V)	MICROBIAL GENETICS AND FUNDAMENTALS OF IMMUNOLOGY	2	-	50	50	100	20	40
		21	Allied - III	PLANT PATHOLOGY BIOFERTILIZER AND BIOPESTICIDES	4	4	25	75	100	30	40
		22	Allied Practical -III	PLANT PATHOLOGY, BIOFERTILIZERS, BIOPESTICIDES AND GENETIC ENGINEERING	2	-	50	50	100	20	40
	IV	23	Skilled Based subject-I	(A)MEDICAL LAB TECHNOLOGY (OR) (B)ENZYMOLOGY	4	4	25	75	100	30	40
	IV	24	Non-Major Elective-I	(A) GENERAL MICROBIOLOGY (OR) (B) FOOD MICROBIOLOGY	2	2	25	75	100	30	40
Subtotal					30	20					

Sem.	Pt. I/II/ III/ IV/V	Sub. No.	Subject status	Subject Title	Hrs. / week	Cre-dits	Marks				
							Maximum			Passing minimum	
							Int.	Ext.	Tot.	Ext.	Tot.
IV	I	25	Language	Tamil/Other Language	6	3	25	75	100	30	40
	II	26	Language	English	6	3	25	75	100	30	40
	III	27	Core - 6	FUNDAMENTALS OF IMMUNOLOGY	4	4	25	75	100	30	40
		28	Major Practical-IV	MICROBIAL GENETICS AND FUNDAMENTALS OF IMMUNOLOGY	2	2	50	50	100	20	40
		29	Allied -IV	GENETIC ENGINEERING	4	4	25	75	100	30	40
		30	Allied Practical-IV	PLANT PATHOLOGY, BIOFERTILIZERS, BIOPESTICIDES AND GENETIC ENGINEERING	2	2	50	50	100	20	40
	IV	31	Skill Based Subject -II	(A)DIAGNOSTIC MICROBIOLOGY (OR) (B)ENTREPRENEUR MICROBIOLOGY	4	4	25	75	100	30	40
	IV	32	Non-Major Elective-II	(A)CLINICAL MICROBIOLOGY (OR) (B) BASICS OF BIOTECHNOLOGY	2	2	25	75	100	30	40
	V		Extension Activity	NCC,NSS, YRC, YWF		1					
Subtotal					30	25					

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology) Semester- III/Ppr.no.19/ Core-5

MICROBIAL GENETICS

Unit - I

Genetics - Historical introduction - Experiments of Hershey, chase and Griffith - DNA Structure - circular and super helical - RNA as the genetic material - Genetic code and table - organization and functioning of prokaryotic genetic material (Viral and E-coli) - Replication of RNA - Reverse transcriptase.

Unit - II

Bacterial plasmids - structure, types and properties of plasmids - plasmid replication - Transposons and its elements - structure, types and properties.

Unit - III

Bacteriophage (T_4) - Lytic cycle and lysogenic cycle, operon systems - lac and Trp

Unit - IV

Mutations - Spontaneous, induced, base pair changes, frame shift, deletion, insertion, tendem, duplications, transversions - Genotyphic and phenotypic mutants - Reversion and suppression - Ames test

Unit - V

Gene transfer mechanisms - conjugation (cell transmissible plasmids, F factor and Hfr strains) - Transformation (Natural transformation, competence, DNA uptake, role of natural transformation artificially induced competence and electroporation) - Genetic recombination (Requirements molecular basis and genetic analysis of recombination in bacteria) - Generalized and specialized transduction

Text books Recommended

1. Watson JD., Hopkins N.H., Roberts J.W., Steitz JA and weiner A.A.M (1987) Molecular biology of the Gene. The Benjamin Cumming Publishing Company
2. Lewin B. (2007) Genes IX Oxford University Press UK
3. Maloy S.R. Croman JR. J.E and Freifelder D (1994) Microbial Genetics, Jones and Barlett Publishers.
4. Freifelder D (1991) Molecular Biology, Nanosa Publishing ttouse
5. Jeyanthi, G.P. (2008) Molecular biology, MJP Publisher Chennai.

MAJOR PRACTICAL - II

MICROBIAL GENETICS AND FUNDAMENTALS OF IMMUNOLOGY

1. Isolation of spontaneous mutans
2. UV-mutagenesis - survival studies
3. Chemical mutagenesis - NTG
4. Uninterrupted conjucation in bacteria
5. Interruped mating in bacteria
6. Plasmid DNA Isolation from *E. coli* (Demonstration)
7. Demonstration of antibiotic resistant mutant
8. Quntification of DNA
9. Quntification of RNA
10. Agarose gel electrophoresis (Demonstration)
11. Demonstration of Antigen - Antibody reaction Quchteriony technique
12. Identification of human blood groups
13. Perform total leucocuyte count of given blood sample
14. Separate serum from blood sample
15. Perform DOT ELISA
16. Perform Immunoelectrophoresis
17. Skin test - Immediate and deleyed hypersensitivity reactions to egg protein, bacterial and fungal antigens.

References:

1. J.G. Cappuccino and N.Sherman 1996 Microbiology - A laboratory manual - Benjamin Cummins, New York
2. M. Kannan 1996, Laboratory Manual in General Microbiology
3. P. Gunasekaran - Laboratory Manual in Microbiology
4. Dr.S.Rajan and Mrs.R.Selvi Christy - Experimental procedures in Life Sciences - Ajantha book house, chennai
5. Dr.S.M.Reddy and Dr.S.Ram Reddy - Microbiology A laboratory manual - BSC Publishers and Distributors - Hyderabad

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology) Semester- III/Ppr.no.21/Allied – III

PLANT PATHOLOGY BIOFERTILIZERS AND BIOPESTICIDES

Unit - I

Concept of plant disease - definitions of disease cycle and pathogenicity, Symptoms associated with microbial plant diseases. Stages in development of a disease - infection - invasion, colonization - dissemination of pathogens and perennation.

Unit - II

Concepts of constitutive defence mechanisms in plants - inducible structural defenses (histological - cork layer, abscission layer, tyloses, gums) inducible biochemical defences Hypersensitive response (HR), Systemic acquired resistance (SAR) - Phytoalexins - pathogens is related (PR) Proteins, Plantibodies, Phenolics, Quinones, Oxidative bursts)

Unit - III

White rust of crucifers *(Albugo candida)* - Late blight of potato *(Phytophthorainfestans)* Ergot of rye *(Clavicepspurpurea)*Black stem rust of wheat - *Pucciniagraministritici*

Unit - IV

Bacterial biofertilizers - isolation, purification - commercial application of Azotobacter, Azospirillum, Rhizobium, Phosphobacteria, cyanobacteria, Anabena, Nostoc- Mycorrhizae (Endo and ecto) - VAM - Siderophore activity

Unit - V

Biopesticides - Bacillus thuringiensis, Agrobacterium tumifaciens, FungiTrichodermaviridae, BeauvariaPhytophthorapalmivora, virus - Nuclear Polyhedrosis virus.

Text books Recommended

1. Prescott LM Harley JP and klein DA (2013) Microbiology Mccrawttill, New yourk
2. Salle A.J (1996) Fundamental Principles of Bacteriology
3. R.C Dubey and Mahewari – 2014 A Text Book of Microbiology – chand and Co New Delhi

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology)/ Semester - III & IV/Ppr.no.22/Allied Practical – IV

PLANT PATHOLOGY, BIOFERTILIZERS, BIOPESTICIDES AND GENETIC ENGINEERING

1. Isolation of Phosphate solublizing microorganisms
2. Isolation of Rhizobium from root nodules
3. Isolation of Agrobacterium tumifaciens
4. Isolation of Azospirillum from paddy fueld
5. Isolation of Azotobacter from soil
6. Identification of Cyanobacteria from paddy fields (Anabena and Nostoc)-Microscopic observation
7. Staining of VAM
8. Isolation of Cyanobacteria
9. Observation of bacterial, fungal and virally infected plant parts (Blight of paddy, citrus canker, Late blight of potato and stem rust of wheat), Tobacco mosaic - Cucumber mosaic virus infection
10. Isolation of Bacillus thuringiensis and Trichodermaviridae from soil (Demonstraction)
11. Southern blotting technique (Demonstration)
12. Western blotting technique (Demonstration)
13. Northern blotting technique (Demonstration)
14. Isolation of bacteriophages from sewage
15. Polymerase chain reaction (Demonstration)

References:

1. J.G. Cappuccino and N.Sherman 1996 Microbiology - A laboratory manual - Benjamin Cummins, New York
2. M. Kannan 1996, Laboratory Manual in General Microbiology
3. P. Gunasekaran - Laboratory Manual in Microbiology
4. Dr.S.Rajan and Mrs.R.Selvi Christy - Experimental procedures in Life Sciences - Ajantha book house, chennai
5. Dr.S.M.Reddy and Dr.S.Ram Reddy - Microbiology A laboratory manual - BSC Publishers and Distributors - Hyderabad

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology)
Semester- III/Ppr.no.23(A)/Skilled Based -1(A)

MEDICAL LAB TECHNOLOGY

Unit - I

Organization of the clinical laboratory - Role of medical lab technician - Safety regulation - first aid - clinical lab records - units of measurements- laboratory calculations - Quality control of lab findings.

Unit - II

Haematology - Specimen collection - Routine haematological tests - Haemoglobin - Haematocrit - RBC - MCV - MCH - MCHC - Differential counts, Reticulocyte count - ESR - Eosinophil count

Unit - III

Blood clotting mechanisms - Bleeding time - Clotting time determination - Blood grouping, Principles of immunologic reactions - Specimen collection - Preservation - Serological test for Syphilis and Typhoid

Unit - IV

Agglutination tests - C reactive protein (CRP) test - RA test - Serodiagnosis of *Streptococcal* infections - Pregnancy test, Enzyme assays - Phosphatase - Transaminases - Creatine kinase - Lactic dehydrogenase - Blood gases and bicarbonate

Unit - V

Clinical pathology - Urine analysis - routine examination of urine - rapid chemical test of urine - CSF - Semen analysis - routine biochemical tests - Glucose, Protein, urea, Creatine in and Bilirubin

Text books Recommended

1. Ananthanaryanan R and Panikar J (200) Text book of Microbiology, Orient Longmans
2. Rajan (2007) Medical Microbiology MJP Publisher, Chennai
3. Kani L Mukherjee, Medical Lab technology Hill Publishing Co., Ltd., New Delhi Vol I-III

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology)/ Semester- III/Ppr.no.23(B)/Skilled Based –I(B)

ENZYMOLOGY

Unit - I

Enzyme techniques - Activity of enzymes - properties - Handling modes - Enzymatic analysis - isolation

Unit - II

Enzyme kinetics - velocity of a reaction - order - progress curre - influenzing factors - MichaelisMenton kinetics

Unit - III

Co enzymes : introduction cofactors - substrate enzyme relationship - classification - characteristics

Unit - IV

Mechanism of enzyme action : Enzymes specificity - active sites - Mechanism of action - pathway of enzyme - catalytic reaction - Mapping of active site.

Unit - V

Enzyme technology : Role of enzymes in industries and health care - Enzyme production - extraction - purification and Stabilization - Abzymes - Biosensors - Ribozymes

Text books Recommended

1. Stryer, L. 1995, Biochemistry, Ed. W.H.Freeman and Company, New York
2. Berg JM Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company
3. Voet D and Voet J.G. (2004) Biochemistry 3rd edition John Wiley and S

MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Microbiology)/ Semester- III/Ppr.no.24(A)/Non Major Elective-1(A)

GENERAL MICROBIOLOGY

Unit - I

History and scope of microbiology: Discovery of microbes - spontaneous generation - Role of microbes in disease - Industrial microbiology and microbial ecology

Unit - II

Microscopy - Basic types - sterilization methods - Disinfectants - Types

Unit - III

Principles of staining proceduo - simple, gram's, negative, capsule, spore

Unit - IV

Components of growth media - General, selective and differential - pure culture techniques and preservation of cultures.

Unit - V

Cell structure - Microbial nutrition Growth curve

Text books Recommended

1. Prescott LM Harley JP and klein DA (2013) Microbiology Mccrawttill, New yourk
2. Salle A.J (1996) Fundamental Principles of Bacteriology
3. R.C Dubey and Mahewari – 2014 A Text Book of Microbiology – chand and Co New Delhi

MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Microbiology) /
Semester- III/Ppr.no.24 (B)/Non Major Elective - 1(B)

FOOD MICROBIOLOGY

Unit - I

Food as a substrate for microorganisms - mold, yeast and bacteria - General characteristics and importance

Unit - II

Principles of food preserration - Asepsis - Removal of microorganisms - Anaerobic conditions

Unit - III

Food spoilage - fruits - vegetables - meat - canned food - sources - control - spoilage problems

Unit - IV

Preservation techniques - freezing and refrigeration - Heat - Vacuum packing - Addition of chemicals - Additives

Unit - V

Food poisoning - Bacterial, viral, fungal and Chemical

Text books Recommended

1. Adams, M.R and Moss Food Microbiology
2. Frazier w.c and westhoff D.C (2012) Food migobiology
3. Jay. J.M (2010) Modern Food Migobiology CBS publishers
4. BanwartGj (1989) Basic Food Migobiology Chapman, Hall New York
5. Vijaya Ramesh K (2007 Food Migobiology MJP Publishers, Chennai

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology)/ Semester-IV/Ppr.no.27/Core - 6

FUNDAMENTALS OF IMMUNOLOGY

UNIT - I

History of immunology - Immunohaematology, structure, composition, functions of the cells and organs in immune system - Blood groups, blood transfusion - Rh - Incompatibilities - Immunity - Types of immunity: Innate and acquired.

UNIT - II

Immune systems - Anatomy of lympho reticular systems - Primary lymphoid organs - Secondary lymphoid tissues - Cells of immune system - Detailed aspects of T Cells and B Cells - Receptors - Activation and functions - Humoral immune response - Cell mediated immune response - Lymphokines, cytokines;

UNIT - III

Antigens - Types - Properties - Haptens - Adjuvents - Vaccines - Types, toxoids, antitoxins - Immunoglobulins - Structure, types, properties and functions - Complements : Components and pathways.

UNIT - IV

Antigen - Antibody reactions - Invivo methods (Precipitation reactions, agglutination and complement fixation) - Immunofluorescence - EQSA- RIA - Invivo methods - Skin test - Immune complex in tissue demonstration.

UNIT - V

Hypersensitivity reactions - Antibody mediated - Type I: Anaphylaxis - Type II: Antibody - dependent cell cytotoxicity - Type III: Immune complex reactions - Respective diseases and immunological methods of diagnosis - Type IV: Hypersensitivity reaction - MHC and transplantations.

Text Books Recommended:

1. Donald. M. Weir and John Steward. (1993). Immunology (7^{th} Edition) ELBS, London
2. Hue Davis. (1997). Introductory Immunology (1^{st} Edition) Chapman & Hall Publisher, London.
3. Ivan M. Roit. (1998). Essential Immunology - Blackwell Scientific Publications, Oxford
4. Paul (1998). Fundamental Immunology, (2^{nd} Edition), Raver Press, New York.
5. Peter J. Delves and Ivan M. Roit (Eds) (1998) Encyclopeida of Immunology - (2^{nd} Edition) Academic Press.

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology)/ Semester - III & IV/Ppr.no.28/ Major Practical - IV

MAJOR PRACTICAL - II

MICROBIAL GENETICS AND FUNDAMENTALS OF IMMUNOLOGY

1. Isolation of spontaneous mutans
2. UV-mutagenesis - survival studies
3. Chemical mutagenesis - NTG
4. Uninterrupted conjucation in bacteria
5. Interruped mating in bacteria
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MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology) Semester- IV/Ppr.no.29/ Allied - IV

GENETIC ENGINEERING

Unit - I

Protein sunthesis:- Transcription - Initiation, elongation, termination of transcription, post - transcriptional processing, spliceosomes, Ribozymes, Introns and exons - Translation - Initiation, elongation, termination of translation, post - translational processing

Unit - II

Restriction enzymes (Eco RI, Hind III, Sma, Hae III and BamHI) - Types and sources - Recognition sequences and utilities - enzymes involved in genetic engineering

Unit - III

Cloning vectors - plasmid based vectors - Natural (Psc 101, PSF 2124, PMBI), Artificial - PBR 322 and PUC construction: Phage based vectors - Lamda phage vectors and its derivatives: Hybrid vectors - phagemid, phasmid and cosmid, BAC and YAC

Unit - IV

Techniques of restriction mapping - construction of chimaeric DNA - cloning in bacteria - Molecular probes - Blotting techniques (southern, Western, Northern) Techniques - DNA libraries

Unit - V

Gene amplification - Basic PCR and its modifications - Applications of PCR in biotechnology and genetic engineering - DNA finger printing, Micro array - protein engineering

Text books Recommended

1. Brown, T.A (1999) Gene cloning. (3rd Edition) chapman and Hall publication

2. Old RW and primrose, 1995 principles of Gene manipulation, 5th edition, Blackwell scientific publication FRG

3. T.A. Brown 1995, 3rd edition, An introduction to Gene cloning

4. Glick B.R and Pasternak JJ 1994 Molecular Biotechnology, Principles and Application of recombinant DNA, ASM press Washington

PLANT PATHOLOGY, BIOFERTILIZERS, BIOPESTICIDES AND GENETIC ENGINEERING

1. Isolation of Phosphate solublizing microorganisms
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MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology) Semester -IV/ Ppr.no.31 (A)/ Skilled Based –II (A)

DIAGNOSTIC MICROBIOLOGY

Unit - I

Laboratory methods in basic mycology - collection and transport of clinical specimans - Direct Microscopic examination, culture media and incubation, serological test for fungi - Antifungal susceptibility testing

Unit - II

Mycology - Superficial infections - Dermatophytes - Microsporum, Trichophyton, Epidermophyton - Madura mycosis - Opportunistic fungal infections - *Candida albicans, Aspergillus, Mucor*

Unit - III

Laboratory methods for parasitic infections - Diagnostic techniques for faecal, gastrointestinal and urino - genital specimen parasitic diseases - *Entamoebahistolytica, Giardia, TaeniaSolium, Ascaris, Enterobolus, Trichuristrichura, Plasmodium vivax, Wucheriabancrofti*

Unit - IV

Etiology and laboratory diagnosis of urinary tract infections - Meningitis, Diarrhea, Respiratory tract infections - pyogenic infection

Unit - V

Laboratory methods in basic virology - viral culture, Media and cells used - specimen processing - isolation and identification of viruses, Detection of viral antigen (flourescent antibody and solid phase immunoassays) viral serology.

T**ext books Recommended**

1. Ananthanaryanan R and Panikar J (200) Text book of Microbiology, Orient Longmans
2. Rajan (2007) Medical Microbiology MJP Publisher, Chennai
3. Kani L Mukherjee, Medical Lab technology Hill Publishing Co., Ltd., New Delhi Vol I-III

MSU/2016-17/UG-Colleges/Part-III (B.Sc. Microbiology) Semester- IV/ Ppr.no.31 (B)/ Skilled Based – II (B)

ENTREPRENEURIAL MICROBIOLOGY

Unit – I

Entrepreneur development – activity – Institutions involved – Government contributions to entrepreurs – risk assessment

Unit – II

Bread – leavening – Baking process – Rye bread, San Francisco dough Bread – idli – Dosa, Fermented fish products – Ngari, Hentak, Tungtap, Gnuchi

Unit – III

Mushroom cultivation – edible and poisonous mushroom – cultivation of Agaricuscampestris, Agaricusbisporus, and Volvariellavolvaciae, Preparation of compost, filling tray beds, spawning, maintain optimal temperature, casing, watering, harvesting, storage

Unit – IV

Patent and secret process, History of patening, composition, subject matter and characteristics of a patent, inventor, infringement, cost of patent. Patent in india and other countries – Fermentation economics

Unit – V

Indian alcoholic beverages – Ennog/sai mod- Apong – Kodokojaanr – Xajpani – Zutho – judima – Antingba – Kiad – sujan, Brewing of beer: Grape wine – wine from other fruits

Textbooks recommended

1. Industrial Microbiology – L.E Caseda New age publication
2. Entrepreneurial development in India – By Arora
3. Experiments in Microbiology, plant pathology Tissue culture and mushroom production technology – K.R Aneja, New age international Publication S.Chand publication 6th Edition
4. Food microbiology – William C Frazler, Dennis C Weshoff (2013) – 5th edition (Food of Indian origin)

MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Microbiology) Semester- IV/Ppr.no.32(A)/ Non Major Elective –II (A)

CLINICAL MICROBIOLOGY

Unit - I

Sources of infection - Routes of transmission - control measures - Testing by Koch's postulates - Antibiotic sensitivity testing

Unit - II

Bacterial pathogens - *Streptococcal, staphylococci, E.coli, Vibrio, Salmonella, Shigella and Mycobacterium*

Unit - III

Fungal pathogens - *Candida, Aspergillus* - Dermatophytes

Unit - IV

Viral pathogens - Pox virus, Mumps virus, Rabies virus and HIV

Unit - V

Protozoan pathogens - Malarial, Amoebic Giardiasis and Yellow fever

Text books Recommended

1. Ananthanaryanan R and Panikar J (200) Text book of Microbiology, Orient Longmans
2. Rajan (2007) Medical Microbiology MJP Publisher, Chennai
3. Kani L Mukherjee, Medical Lab technology Hill Publishing Co., Ltd., New Delhi Vol I-III

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MSU/2016-17/UG-Colleges/Part-IV (B.Sc. Microbiology) Semester- IV/Ppr.no.32 (B)/ Non Major Elective –II (B)

BASICS OF BIOTECHNOLOGY

Unit - I

History of biotechnology - selection of Industrial microorganisms - Media and strain improvement

Unit - II

Fermentation process - standard fermented - Types of fermentation (Batch, Continuous and fed batch) - media used

Unit - III

Industrial production of enzymes (Amylase) Beverages - wine, beer, Antibiotics (Penicillin)

Unit - IV

Vaccine production and Therapeutic agents - Attenuated and live - Engineered organisms

Unit - V

Role of microbes in agriculture and environment - GMO's

Text Books Recommended

1. Gupta P.K. (1996). Elements of Biotechnology. Rastogi and Co., Meerut. India
2. MukheshPasupuleti (2006). Molecular Biotechnology. MJP Publishers. Chennai.
3. Dubey. R-C (1996). A Text Book of Biotechnology. S.Chand and Co. Ltd., New Delhi.

PART - IV: EXTENSION ACTIVITIES

(NCC, NSS, YRC or YWF)