

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
UG COURSES – AFFILIATED COLLEGES
B.SC. MICROBIOLOGY
 (Choice Based Credit System)
 (with effect from the academic year 2017-2018 onwards)

Sem	Pt.	Subject Status	Subject Title
III	I	Language	Tamil/Other language
	II	Language	English
	III	Core – V	Microbial Genetics
	III	Major practical-III	Microbial Genetics
	III	Allied– III	Plant pathology Biofertilizer and Biopesticides
	III	Allied practical– III	Plant pathology Biofertilizer and Bio pesticides
	III	Skilled based core	A. Medical Lab Technology or B. Enzymology
	IV	Non major Elective	A. General Microbiology Or B. Applied Food Microbiology
			Common

IV	I	Language	Tamil/Other Language
	II	Language	English
	III	Core – VI	Fundamentals of Immunology
	III	Major practical –IV	Fundamentals of Immunology
	III	Allied-IV	Genetic Engineering
	III	Allied practical-IV	Genetic Engineering
	III	Skillbasedcore	A.Diagnostic Microbiology Or B.Entrepreneurial Microbiology
	IV	Non major Elective	A. Microbes and Infections or B. Basics of biotechnology
	IV	Common	Computer for digital era
V	Extension Activity	NCC,NSS, YRC, YWF	

MSU/2017-18/UG-Colleges/Part-III(B.Sc.,Microbiology)/Semester -III
2017-18/MSU/46th SCAA/Affili.Coll./UG./B.Sc.(Microbio)/Sem-III/Part-III/Core-5

MICROBIAL GENETICS

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Preamble: Molding the student's society with interest in research in the area of life science by teaching with essentials of microbial genetics.

Unit – I Basic tools

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.[12L]

Unit – II Plasmids and application

Bacterial plasmids - structure, types and properties of plasmids - plasmid replication - Transposons and its elements - structure, types and properties.[12L]

Unit – III: Phages and its proliferation

Bacteriophage (T₄) - Lytic cycle and lysogenic cycle, operon systems - lac and Trp[10L]

Unit –IV : Types of mutation and its application

Mutations - Spontaneous, induced, base pair changes, frame shift, deletion, insertion, tandem, duplications, transversions - Genotypic and phenotypic mutants - Reversion and suppression - Ames test [11L]

Unit –V : Gene transfer

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 [15 L] [Total: 60 L]

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Text book Recommended

- 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
- Lewin B. (2007) Genes IX Oxford University Press UK
- Maloy S.R. Croman JR. J.E and Freifelder D (1994) Microbial Genetics, Jones and Barlett Publishers.
- Freifelder D (1991) Molecular Biology, Nanosa Publishing ttouse
- Jeyanthi, G.P. (2008) Molecular biology, MJP Publisher Chennai.

**MSU/2017-18/UG-Colleges/Part-III(B.Sc.,Microbiology)/Semester -III
2017-18/MSU/46thSCAA/Affili.Coll./UG./B.Sc.(Microbio)/Sem-III/Core practical-III**

Preamble: Exposing students exhibiting passion over teaching, research and jobs in industries to basics and routine experiments carried out in diverse areas pertaining to their theory background so as to improve their experimental skills, reliability and effectiveness needed for effective research and employment.

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**Major Practical-III
MICROBIAL GENETICS**

1. Isolation of spontaneous mutants
2. UV-mutagenesis - survival studies
3. Chemical mutagenesis - NTG
4. Conjugation in bacteria (Interrupted & Uninterrupted) – (Demo)
5. Transformation in *E.coli*
6. Transduction of *E.coli* (Demo)
7. Isolation of Plasmid DNA by Agarose gel electrophoresis.
8. Quantification of DNA by Diphenylamine method
9. Demonstration of antibiotic resistant mutant
10. Quantification of Protein by Bradford method.

References:

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

MSU/2017-18/UG-Colleges/Part-III(B.Sc.,Microbiology)/Semester -III
2017-18/MSU/46th SCAA/Affili.Coll./UG./B.Sc.(Microbio)/Sem-III/Allied-3

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PLANT PATHOLOGY, BIOFERTILIZERS AND BIOPESTICIDES 3 0 0 3

Preamble: Introducing the students about the menace and mercy of microbes in plant world.

Unit –I :Plant Diseases and its Control

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. [8 L]

Unit –II:Histopathology of plant

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 related (PR) Proteins, Plantibodies, Phenolics, Quinones, Oxidative bursts) [12 L]

Unit – III: Plant Bacterial Diseases

White rust of crucifers (*Albugo candida*) - Late blight of potato (*Phytophthora infestans*) Ergot of rye (*Claviceps purpurea*) Black stem rust of wheat – *Puccinia graminis tritici* [9 L]

Unit – IV: Biofertilizers

Bacterial biofertilizers - isolation, purification - commercial application of Azotobacter, Azospirillum, Rhizobium, Phosphobacteria, cyanobacteria, Anabena, Nostoc- Mycorrhizae (Endo and ecto) - VAM - Siderophore activity [9 L]

Unit – V: Biopesticides

Biopesticides - *Bacillus thuringiensis*, *Agrobacterium tumefaciens*, Fungi *Trichoderma viridae*, *Beauvaria*, *Phytophthora palmivora*, virus - Nuclear Polyhedrosis Virus.[7 L]

[Total: 45 L]

Text book Recommended

- Prescott LM Harley JP and Klein DA (2013) Microbiology Mcgrawhill, New York
- Salle A.J (1996) Fundamental Principles of Bacteriology
- R.C Dubey and Mahewari – 2014 A Text Book of Microbiology – Chand and Co New Delhi

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2017-18/MSU/46th SCAA/Affili.Coll./UG./B.Sc.(Microbio)/Sem-III/Part-III

ALLIED PRACTICAL – III
PLANT PATHOLOGY, BIOFERTILIZERS, BIOPESTICIDES

Preamble: Exposing students exhibiting passion over teaching, research and jobs in industries to basics and routine experiments carried out in diverse areas pertaining to their theory background so as to improve their experimental skills, reliability and effectiveness needed for effective research and employment.

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- Isolation of Phosphate solublizing microorganisms
- Isolation of *Rhizobium* from root nodules
- Isolation of *Agrobacterium tumifaciens*
- Isolation of *Azospirillum* from paddy fuel
- Isolation of *Azotobacter* from soil
- Identification of Cyanobacteria from paddy fields (*Anabena* and *Nostoc*)-Microscopic observation
- Staining of VAM
- Isolation of Cyanobacteria
- 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
- Isolation of *Bacillus thuringiensis* and *Trichoderma viridae* from soil (Demonstration)

References:

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

MSU/2017-18/UG-Colleges/Part-III (B.Sc.,Microbiology)/Semester -III
2017-18/MSU/46th SCAA/Affili.Coll./UG./B.Sc.(Microbio)/Sem-III/Part-III

Skill based Subjects

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Paper - 1 A: MEDICAL LAB TECHNOLOGY

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Preamble: Exposing the students about principle and applications of commonly employed techniques in medical lab technology to make them employable.

Unit – I: Clinical measurement

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.[12 L]

Unit –II:Haematology

Haematology - Specimen collection - Routine haematological tests - Haemoglobin - Haematocrit - RBC - MCV - MCH - MCHC - Differential counts, Reticulocyte count - ESR - Eosinophil count {12 L)

Unit –III:Serology

Blood clotting mechanisms - Bleeding time - Clotting time determination - Blood grouping, Principles of immunologic reactions - Specimen collection - Preservation - Serological test for Syphilis and Typhoid (10 L)

Unit –IV :Diagnostic Kit Assay

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(11 L)

Unit – V: Clinical Pathology

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(15 L)
[Total: 60 L]

Text book 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

**NON MAJOR ELECTIVE COURSES IN BIOCHEMISTRY – Semester III
(Select any one)**

VACCINOLOGY

Objective

- To learn about basic concepts of immunity & infection
- To study about the different types of vaccine.
- To acquire knowledge about recombinant vaccines

Total Hours :36

Unit – 1

Introduction on infection and immunity, sources of infection and infectious diseases, Immunity innate and acquired immunity prevention of infectious diseases – vaccines – Historical aspects – Edward Jenner, cowpox and small pox vaccine Louis Pasteur and anti rabies vaccine.

Unit- 2

Types of vaccines – Live attenuated, killed, subunit, antitoxins, Antivenom, nucleic acid (DNA) vaccines. Currently licensed vaccines- Recombinant delivery systems for future vaccines- New approaches for better vaccines, Anti- idiotypic vaccines – Adjuvants.

Unit – 3

Practices of immunization therapeutic principles - new approaches to immunization - mucosal vaccine, maternal immunization. National immunization schedule for pregnant women, neonatal and children recommended by WHO.

Unit- 4

Recombinant vaccines; polynucleotide as vaccines; biosynthetic and chemically synthesized vaccines; subunit vaccine; anti idiotypic Vaccine; fusion vaccines; mixed particle vaccines; human mucosal vaccine; combination vaccines; Edible vaccines produced in transgenic plants and microencapsulation.

Unit – 5

EPI vaccines – production of tetanus toxoid, diphtheria toxoid, pertussis vaccine, BCG vaccines; preparation of Hepatitis B vaccine rabies vaccine and AIDS vaccine.

References

1. Roitt et al. Roitt's Essential immunology. 10th ed. Blackwell sci. 2001.
2. Richard A Goldsby et al. Kuby immunology. 4th ed. WH Freeman & Co. 2003

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**MSU/2017-18/UG-Colleges/Part-III(B.Sc.,Microbiology)/Semester -IV
2017-18/MSU/46thSCAA/Affili.Coll/UG./B.Sc.(Microbio)/Sem-IV/Part-III/Core-6**

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MAJOR VI: FUNDAMENTALS OF IMMUNOLOGY

Preamble: Enriching students knowledge in the historical, basic components of immune system and their functions to understand the defense systems and contribute in the field of health improvement.

UNIT – I: Basic concepts of immunology

History of immunology - Immunohaematology, structure, composition, functions of the cells in immune system - Blood groups, blood transfusion - Rh - Incompatibilities - Immunity - Types of immunity: Innate and acquired.[10 L]

UNIT –II : Immune system

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. [15 L]

UNIT – III Antigen and Antibody

Antigens - Types - Properties - Haptens - Adjuvants - Vaccines - Types, toxoids, antitoxins - Immunoglobulins - Structure, types, properties and functions - Complements : Components and pathways.[12 L]

UNIT – IV Antigen and Antibody reactions

Antigen - Antibody reactions – Invitro methods :Precipitation reactions, agglutination and complement fixation - Immunofluorescence - ELISA- RIA - Invivo methods - Skin test - Immune complex in tissue demonstration. [10 L]

UNIT –V : Hypersensitivity

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.[13 L]
[Total: 60 L]

Text Books Recommended:

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

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2017-18/MSU/46th SCAA/Affili.Coll./UG./B.Sc.(Microbio)/Sem-IV/Part-III/Core-
Practical –IV

Preamble: Exposing students exhibiting passion over teaching, research and jobs in industries to basics and routine experiments carried out in diverse areas pertaining to their theory background so as to improve their experimental skills, reliability and effectiveness needed for effective research and employment.

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FUNDAMENTALS OF IMMUNOLOGY

1. ABO Blood grouping and Rh typing
2. Blood collection and serum separation
3. Perform total RBC and WBC count from blood sample
4. Perform Total Platelets count
5. Antigen preparation (Demonstration)
6. Polyclonal Antibody production (Demonstration)
7. Widal test
8. Single Radial Immunodiffusion test
9. Double Immunodiffusion test (Ouchterlony Double Diffusion test)
10. ELISA test (Demonstration)

References:

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

Preamble: Highlighting the tools and applications of genetic engineering to inculcate the desire of research in biotechnology

Unit – I:Protein synthesis:-

Transcription - Initiation, elongation, termination of transcription, post transcriptional processing -
Translation - Initiation, elongation, termination of translation, post translational processing. [12 L]

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
[8 L]

Unit - III Cloning vectors

plasmid based vectors - Natural (pSC 101, pSF 2124, pMB1), Artificial - pBR 322 and pUC
construction: Phage based vectors - Lamda phage vectors and its derivatives: Hybrid vectors -
phagemid, phasmid and cosmid, BAC and YAC [10 L]

Unit –IV Gene mapping

Techniques of restriction mapping - construction of chimaeric DNA - cloning in bacteria - Molecular
probes - Blotting techniques (southern, Western, Northern) Techniques – C DNA library [8 L]

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Unit – V Gene library

Gene amplification - Basic PCR and its modifications - Applications of PCR in biotechnology and genetic engineering - DNA finger printing, Micro array - protein engineering [7 L]
[Total: 45 L]

Text book 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

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2017-18/MSU/46th SCAA/Affili.Coll./UG./B.Sc.(Microbio)/Sem-IV/Part-III/**

ALLIED PRACTICAL – IV

Preamble: Exposing students exhibiting passion over teaching, research and jobs in industries to basics and routine experiments carried out in diverse areas pertaining to their theory background so as to improve their experimental skills, reliability and effectiveness needed for effective research and employment.

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GENETIC ENGINEERING

1. Isolation of Chromosomal DNA from Bacteria.
2. Separation of protein by SDS- PAGE.
3. Quantification of Protein by Lowry's Method.
4. Isolation of RNA from bacteria.
5. Quantification of RNA.
6. Southern blotting technique (Demonstration)
7. Western blotting technique (Demonstration)
8. Northern blotting technique (Demonstration)
9. Isolation of bacteriophages from sewage.
10. Polymerase chain reaction (Demonstration).

References:

- J.G. Cappuccino and N.Sherman 1996 Microbiology - A laboratory manual - Benjamin Cummins, New York
- M. Kannan 1996, Laboratory Manual in General Microbiology
- P. Gunasekaran - Laboratory Manual in Microbiology
- Dr.S.Rajan and Mrs.R.Selvi Christy - Experimental procedures in Life Sciences - Ajantha book house, chennai

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2017-18/MSU/46thSCAA/Affili.Coll./UG./B.Sc.(Microbio)/sem-IV/Part-III/

Skill based subject

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A. ENTREPRENEURIAL MICROBIOLOGY

Preamble: Motivating the students to exploit the microbial techniques and resources to emerge out as an entrepreneur to support the growth of economy of our nation.

Unit – I :Entrepreneurial society

Entrepreneur development – activity – Institutions involved – Government contributions to entrepreneurs – risk assessment (10 L)

Unit – II: Bread baking

Bread – leavening – Baking process – Rye bread, San Francisco dough Bread – idli – Dosa, Fermented fish products – Ngari, Hentak, Tungtap, Gnuchi (15 L)

Unit – III : Mushroom cultivation

Mushroom cultivation – edible and poisonous mushroom – cultivation of *Agaricus campestris*, *Agaricus bisporus*, and *Volvariella volvaciae*, Preparation of compost, filling tray beds, spawning, maintain optimal temperature, casing, watering, harvesting, storage (12 L)

Unit – IV: History of patening

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 (10 L)

Unit – V : Alcoholic products

Indian alcoholic beverages – Ennog/sai mod- Apong – Kodokojaanr – Xajpani – Zutho – judima – Antingba – Kiad – sujan, Brewing of beer: Grape wine – wine from other fruits (13 L)

[Total: 60 L]

Textbook recommended

- Industrial Microbiology – L.E Caseda New age publication
- Entrepreneurial development in India – By Arora
- Experiments in Microbiology, plant pathology Tissue culture and mushroom production technology – K.R Aneja, New age international Publication S.Chand publication 6th Edition Page 51 of 51
- Food microbiology – William C Frazler, Dennis C Weshoff (2013) – 5th edition (Food of Indian origin)

NON MAJOR ELECTIVE COURSES IN BIOCHEMISTRY – Semester IV
(Selectany one)
NUTRITIONAL BIOCHEMISTRY

Objective

To acquire knowledge the biological basis of nutrition and the mechanisms by which diet can influence health

Total Hours :36

Unit – 1

Introduction and definition of food and nutrition, Function of foods and its relation to nutrition and clinical health, essential nutrients, analysis of food composition, food groups.

Unit – 2

Physiological role, nutritional significance and food sources of carbohydrates, fats, proteins, minerals (Calcium, phosphorous, sodium and potassium) and trace elements (Copper, Cobalt, Zinc, Iodine and iron)

Protein malnutrition (kwashiorkor) and under nutrition (marasmus)

Unit- 3

Vitamin- definition, classification, sources, absorption, daily requirements, metabolism, physiology, nutritional significance and deficiency. RDA for infants, children, adolescents (male and female) pregnant & lactating women and old age.

Unit – 4

Measurement of food stuffs by Bomb calorimeter. Calorific values of proteins, carbohydrates and fats. Energy – basal metabolism, measurement of BMR, factors affecting BMR, regulation of body temperature , energy needs, total energy requirement .

Unit – 5

Food production, food storages, functional foods , new protein foods , new fat foods and changing food habits. Food adulteration and Hygiene.

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References

1. Principles of nutrition and dietetics. M. Swaminathan
2. Normal and therapeutic nutrition – Corine Robinson
3. Human nutrition and dietetics – Davidson and Passmore
4. Food nutrition and diet therapy – Krause and Hunscher
5. Advanced text book o food and nutrition – M.Swaminathan(Vol.1 & 2)