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. (1)	Pt. (2)	Sub No. (3)	Subject Status (4)	Subject Title (5)	Contact Hrs./week (6)	L Hrs./week (7)	T Hrs./week (8)	P Hrs./week (9)	C Credits (10)
1	I	1	Language	Tamil/Other language	6	6	0	0	4
	II	2	Language	English	6	6	0	0	4
	III	3	Core – I	Fundamentals of Microbiology	4	4	0	0	4
	III	4	Core – II	Microbial Diversity and Classification	4	4	0	0	4
	III	5	Major Practical – I	Fundamentals of Microbiology, Microbial Diversity and Classification	2	0	0	4	2
	III	6	Allied – I	Bioinstrumentati-on	4	3	1	0	3
	III	7	Allied Practical – I	Bioinstrumentati-on	2	0	0	4	2
	IV	8	Common	Environmental Studies	2	2	0	0	2
				SUB TOTAL	30	25	1	4	25
II	I	9	Language	Tamil/Other Language	6	6	0	0	4
	II	10	Language	English	6	6	0	0	4
	III	11	Core – III	Microbial Physiology and Metabolism	4	4	0	0	4
	III	12	Core – IV	Microbial Biochemistry	4	4	0	0	4
	III	13	Major Practical – II	Microbial Physiology and Metabolism and Microbial Biochemistry	2	0	0	4	2
	III	14	Allied – II	General Biology	4	3	1	0	3

	III	15	Allied Practical – II	General biology	2	0	0	4	2
	IV	16	Common	Value Based Education/Social Harmony	2	2	0	0	2
				SUB TOTAL	30	25	1	4	25
III	I	17	Language	Tamil/Other language	6	6	0	0	4
	II	18	Language	English	6	6	0	0	4
	III	19	Core – V	Microbial Genetics	4	4	0	0	4
	III	20	Major practical-III	Practical	2	0	0	4	2
	III	21	Allied– III	Plant pathology bio fertilizer and bio pesticides	4	3	0	0	3
	III	22	Allied practical – III	Practical	2	0	0	4	2
	III	23	Skilled based core	A.Medical lab technology or B.Enzymology	4	0	0	0	4
	IV	24	Non major Elective	A.General microbiology or B.Food microbiology	2	3	0	0	2
		25	Common	yoga	0	0	0	0	0
				SUB TOTAL	30	25	1	4	25
IV	I	26	Language	Tamil/Other Language	6	6	0	0	4
	II	27	Language	English	6	6	0	0	4
	III	28	Core – VI	Fundamental of immunology	4	4	0	0	4
	III	29	Major practical –IV	Practical	2	0	0	4	2
	III	30	Allied-IV	Genetic Engineering	4	0	0	0	3
	III	31	Allied practical-IV	Practical	2	0	0	4	2
	III	32	Skill based core	A.diagnostic microbiology or B.Entrepreneur microbiology	4	4	0	0	4

	IV	33	Non major Elective	A.Clinical microbiology or B.Basic of biotechnology	2	3	0	0	2
	IV	34	Common	Computer for digital era	0	0	0	0	0
	V	35	Extension Activity	NCC,NSS,YRC,YWF	0	0	0	0	0
				SUB TOTAL	30	25	1	4	26
V	I	36	Core-VII	Environmental and Agricultural Microbiology	5	4	1	0	4
	II	37	Core-VIII	Industrial micro biology	5	4	1	0	4
	III	38	Elective	Bioinformatics	5	3	1	0	4
	III	39	Elective	Dairy micro biology	5	3	1	0	4
	III	40	Major Practical – V	Practical	3	0	0	3	2
	III	41	Major practical-VI	Practical	3	0	0	3	2
	III	42	Major Practical – VII	Practical	2	0	0	2	2
	IV	43	Skill based,common	Personality development/effective development/youth leader ship	2	2	0	0	2
				SUB TOTAL	30	25	1	4	24
VI	I	44	Core-IX	Food micro biology	6	4	0	0	4
	II	45	Core-X	Clinical Microbiology	6	4	0	0	4
	III	46	Core –XI	Microbial bio technology	5	4	0	0	4
	III	47	Major practical-VIII	Practical	3	0	0	4	2
	III	48	Major Practical – IX	Practical	3	0	0	4	2
	III	50	Major practical-X	practical	2	0	0	4	2
	III	51	Project	Project	5	0	0	4	4
				SUB TOTAL	30				22

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – I / Core - 1

FUNDAMENTALS OF MICROBIOLOGY L T P C

4 0 0 4

Unit I Development of Microbiology as a discipline - Spontaneous generation vs.biogenisis-

Contributions of Anton von Leeuwenhock, Louis Pasteur , Robert Koch, Joseph Lister, Alexander

Fleming – Germ Theory of disease, Development of the field of soil microbiology - Contributions of Martinus W Beijernick, Sergei N. Winogradsky - Selman A. Waksman, Establishment of fields of Medical microbiology and Immunology through the work of paul Ehrlich, Elie Metchnikoff, Edwardjenner.[14L]

Unit - II Microscopy - Principles and Application - Bright field, Dark field , Phase Contrast , fluorescence, SEM and TEM - Specimen Preparation of Electron Microscopy .[11L]

Unit - III Bacteria – cell size, shape and arrangement, glycocalyx, Spore, Flagella , fimbriae and pili,cell wall – Composition and dtailed structure of Gram –positive, Gram negative and Archaebacterial cell wall. Lipopolysaccharide (LPS), sphaeroplasts, protoplasts and L forms.[12L]

Unit – IV Sterilisation and disinfection – principles - Methods of sterilization - physical Methods – Dry heat – Moist heat, Filration (Membrane and HEPA) - Radiation – Chemical Sterilization – Chemical agents – Mode of action – phenol coefficient test – Effects of antibiotics and enzymes on the cell wall .[13L]

Unit - V Culture and media preparation – solid and liquid - Types of media - semi synthetic , Enrichment, Selective, transport and differential media, Natural components as media and special purpose media. [10L] [total;60L]

Text books Recommended

1. Prescott LM Harley JP and Klein DA (2013) Microbiology Mccraw ttill, New York
2. Salle A.J (1996) Fundamental Principles of Bacteriology
3. R.C. Dubey and Maheswari - 2014 A Text Book of Microbiology – chand and Co New Delhi.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – I / Core – 2

	L	T	P	C
MICROBIAL DIVERSITY AND CLASSIFICATION	4	0	0	4

Unit-I Bacteria - Aerobic Gram positive (Cocci-Staphylococcous sp Rod-Bacillussp) Gram negative (Cocci – Neisseriasp, rod – Pseudomonas sp) – Anaerobic Gram positive (Cocci-Peptostreptococcus sp, rod – Clostridium sp) – Gram negative (Cocci - Veilonellasp, rod - Bacteriodessp) Facultative- Escherichia coli.[14L]

Unit – II Archaebacteria and other special groups - General characteristics - Methanogens and extremophils Gliding sheathed, Appendaged bacteria - sulphur bacteria , spirochetes, Mycoplasma. Rickeettsia and Actinomycetes (Streptomyces) - Epulopisciumfishelsoni - Thiomargarita namibensis.[11L]

Unit III Viruses - System of Classification (cajans and kings) - General characteristics - Viroids – Prions _ Plant virus (TMV,Cucumber mosaic) - animal Virus (Rhabdo Virus , Pox Virus) - bacteriophages (T4), porcine circovirus.[12L]

Unit IV General characteristics of fungi including habitat, distribution, nutritional requirements, fungul cell - ultra structure - system of classification (Alexopolas) – Type study (Aspergillus, Rhizopus, Agaricus).[13L]

Unit – V Algae - System of classification - General characteristics - mode of multiplication-Type study (Clamydomonas, Volvox, Spirogyra) Protozoa - System of classification - General characteristics – mode of multiplication – Type study (Amoeba, Paramecium and Plasmodium).[10L] [Total;60L]

Text books Recommended

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

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – I / Major Practical– I

FUNDAMENTALS OF MICROBIOLOGY, MICROBIAL DIVERSITY AND CLASSIFICATION.

L T P C

0 0 2 2

1. Laboratory precautions
2. Micrometry - Determination of size of bacteria or yeast
3. Methods of sterilization
4. Motility of bacteria – wet mount / hanging drop method .
5. Preparation and dispensing of culture media – solid and liquid (Nutrient broth and agar)
6. Preparation of agar slant, agar stab and agar plates.
7. Pure culture technique - streak plate and pour plate
8. Serial dilution technique.
9. Simple staining method
10. Gram's Staining method
11. Negative Staining Method.
12. Acid fast Staining method.
13. Spore Staining method.
14. Anaerobic culture technique - Alkaline pyrogallol (Demonstration).

References:

1. J.G. Cappuccino and N.Sherman 1996 Microbiology – A laboratory manual – Benjamin Cumins , 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/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – I / Allied – I

BIOINSTRUMENTATION L T P C

3 1 0 4

Unit - I Buffers - Preparation of Buffers – Standard Buffers – Molar and Normal Solutions PH - PH meter (PH electrode _ Calomel and glass electrode) - Titrations curve - Techniques of PH measurement. [9L]

Unit II Principles and applications of Autoclave – Hot air oven – Incubator, Laminar air flow chamber / Biosafety cabinets , BOD Incubator,Lyophilizer.[9L]

Unit – III Chromatography - Paper, Thin layer, column, Ion - exchange, gas and HPLC, Centrifuge - Types of centrifuge and its application.[9L]

Unit - IV Electrophoresis - Principle - PAGE -SDS - Vertical and slab gel - Horizontal and tube gel types – Paper electrophoresis - Applications - Immuno electrophoresis.[8L]

Unit -V Colorimetry, Flame photometry - spectrometry - UV and Visible spectrophotometer - IR Spectroscopy - Raman Spectroscopy – X ray spectrometry (principle, Components, generation and detection) NMR (Principle and Construction) Continous and pulsed types and uses.[10L] [Total;45L]

Text Books Recommended

1. J.Jayaraman, 1985 Laboratory Manual in Biochemistry wiley Eastern Ltd., New Delhi.
2. D.T.Plummer 1998, An Introduction to practical Biochemistry, Tata MaCraw Hil, New Delhi.
3. P.Palanivelu, 2001 Analytical Biochemistry and separation techniques.
4. Keith Wilson and J walker - 2003 Practical Biochemistry.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – I / Allied Practical – I

BIOINSTRUMENTATION

L T P C
0 0 2 2

1. Cleaning of glass wares.
2. Microscopy - Light, bright field and dark field.
3. Principles and application of Incubator / hot air oven / auto clave / centrifuge Laminar air flow / filteration unit.
4. Preparation of buffers – Acid and alkaline range.
5. Preparations of Molar Solutions.
6. Preparation of 0.1 and 1 Normal solutions.
7. Separation of Amino acid by paper Chromatography.
8. Estimation of free Amino acid by Ninhydrin Method .
9. Separation of Lipid by Thin Layer Chromatography.
10. Separation of Plant pigments by Coloumn Chromatography (Demonstration).
11. Beer Lamberts Law Veryfication.
12. Handling of Micro Pipette and checking their accuracy.
13. Separation of water and oil using centrifuge.
14. Paper Electro phoresis.

References:1. J.G. Cuppuccino 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.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – II / Core –3

MICROBIAL PHYSIOLOGY AND METABOLISM

L T P C

4 0 0 4

Unit –I Basic concept of metabolism - Memberane transport system – passive and active transport system – Facilitated diffusion, group translocation, iron transport – permeases – Transmembrane proteins.

Unit – II Assimilatory and dissimilatory pathways – Respiratory Pathways – Ed, PPP Glycolysis, Kreb's cycle – ETS – ATP generation – chemiosmotic Theory – Energetic of respiratory pathways , Fermentation pathways – Alcohol fermentation. Lactate fermentation (Homofermentative and heterofermentative pathways), concepts of linear and branched pathways.

Unit – III Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification: nitrate / nitrite and nitrate / ammonia respiration: fermentative nitrate reduction – sulphur, corbonate, methane – Bioluminescence (Components and mechanisms).

Unit - IV Definition of growth, Batch culture, Continuous culture generation time and specific growth rate – synchronous and asynchronous culture - Growth curve, Effect of temperature and PH on microbial growth, Effect of oxygen concentration on growth.

Unit – V Introduction to phototrophic metabolism – groups of phototrophic micro organisms, anoxygenic vs, oxygenic photosynthesis with reference to photosynthesis in green bacteria and cyanobacteria – Introduction to nitrogen fixation (Ammonia assimilation / Assimilatory nitrate reduction).

Text books Recommended.

1. Caldwell, D.R. (1995), Microbial Physiology and Metabolism, Wm.C.Brown Publishers, USA.

2. Prescott LM. Harley JP and Klein DA (2013) Microbiology Mccrawttill, Newe York.

3. Salle A.J. (1996) Fundamental Principles of Bacteriology .

4. R.C. Dubey and Maheswari – 2014 A Text Book of Microbiology – chand and Co New Delhi.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – II / Core –4

MICROBIAL BIOCHEMISTRY L T P C

4 0 0 4

Unit – I Structure of atom – chemical bonds – Principles of bioenergetics - First and second law of thermodynamics.

Standard free energy change and equilibrium contrant energy rich compounds: Phosphoenolpyruvate, 1'3 - Bisphosphosphoglycerate. Thioesters, ATP.

Unit - II Families of monosacharides: aldoses and ketoses, trioses, ketroses, pantoses and hexoses – Disaccharide: concepts of reducing and non reducing Sugars, occurrence and Haworth Projections of maltose, lactose, and sucrose, polysaccharide – Storage polysaccharide, starch and glycogen. Structural polysaccharide – cellulose, peptidoglycan and chitin.

Unit – III Functions of proteins – primary structures of proteins, Amino acids - The building block of proteins, Non protein aminoacids – D-alanine and D- glutamic acid , oligopeptides - secondary structure of protein – peptide unit and its salient features. Tertiary and Quatenary structures of protein.

Unit - IV Definition and major classes of storage and structural lipids – storage lipids – fatty acids structure and functions – Essential fatty acid – Saponification – sphingolipids - Lipid functions (cell signals , cofactors, prostaglandins) - introduction of lipid micelles.

Unit – V Vitamins - introduction – fat soluble vitamins (A, D, E and K) - Water soluble vitamins (B complex and C) - Sources, functions and deficiency syndromes of vitamin B – Complex and C Vitamin.

Text books Recommended

1. Styrer ,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 Sons.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – II /Major Practical–II

MICROBIAL PHYSIOLOGY AND METABOLISM,MICROBIAL BIOCHEMISTRY L T P C

0 0 2 2

1.IMVIC test series

2.Carbohytrate fermentation-Glucose and lactose

3.TSI –H2S Production

4.Quantitative test for carbohydrate (DNSA method)

5.Protein estimation(Lowry method)

6.Catalase test

7.Oxidase test

8.Urease test

9.Decarboxylase test

10.Measurement of growth and growth curve

11.Effect of Ph on growth

12. Effect of temperature on growth

13.Effect of salinity on growth

14.Effect of disinfectant-Phenol coefficient test

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

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – II / Allied –II

GENERAL BIOLOGY L T P C

3 1 0 4

Unit – I Ultrastructure of Eubacteria – Cell membrane – Extra mural layer – slime capsule (cytoplasmic inclusions – Mesosomes – Nuclear material - Reserve materials – Pigments.

Unit – II Ultrastructure and functions of Enkaryotic Cell organelles – cell wall – cell membranes – Mitochondtia, chloroplast – Endoplasmic reticulum – Golgi Complex – Nucleus – Ribosomes – Other cell inclusions and flagella.

Unit – III Cell Divisions in Bacteria – Binary fission – Cell division in Eukaryotes – Mitosis Meiosis – Reproduction in Microbes.

Unit – IV Botany – Ultrastructure of plant cell – General characters of Thallophyta - Bryophyta,Pteridophyta and Gymnosperms, plant adaptations in hydrophytes, xerophytes, Halophytes Economic Botany – Economic importance of cereals – Ragi Pulses – cow pea. Beverage – coffee, oil – sunflower, Bio diesel – Jatropha , importance, propagating methods of horticultural plants.

Unit –V Zoology – General characteristics of vertebrate and invertebrate (type study – fish, human beings, earthworm) Human Physiology – Digestive system and Respiratory system. Economic Zoology: Aquaculture, Sericulture, Apiculture.

Text Books Recommended.

1. Prescott L.M.J.P.Harley and C.A.Klein 2014 Brown Publishers
2. Jain VK(2000) Fundamentals of Plant Physiology 5th Edition, Schand Co. Ltd., New Delhi.
3. Pandey B.P. (2007) Plant Anatomy S. Chand and Co. De-New Delhi.
4. Ekambarantha Ayyar and Ananthakrishnan TN 1993 outlines of Zoology Vol I and II Viswanathan and Co. Chennai.
5. Sambasivam I, Kamalakara Rao A.P.Augustine Chellappa S (1983) Text book of Animal Physiology S. Chand and Co., New Delhi.

MSU/ 2017-18 / UG-Colleges /Part-III (B.Sc. Microbiology) / Semester – II / Allied Practical –II

GENERAL BIOLOGY L T P C

0 0 2 2

1.Capsule staining

2.Relationship between OD and CFU measurement

3.Observation of representative forms of Algae-Diatoms-Clamydomonas-Volvox-Cyanobacteria(oscillatoria,Nostoc.Anabaena

3.Mitosis in Onion root

4.Meiosis in flower buds of Allium cepa (Onion)

5.Isolation of Chloroplast from spinach leaves

6.Silver staining for flagella

7. Albert staining

8.Bio diesel preparation (Demonstration)

9.Identification of invertebrate and vertebrates

10.Aqaculture(Demonstration)

11.Sericulture (Demonstration)

12.Apiculture (Demonstration)

13.Horticulture(Demonstration)

14.Observation of fish digestive system

Reference

1. J.G. Cappuccino and N. Sherman 1996 Microbiology – A laboratory Manual – Benjamin Cummins, New York.

2. Dr. S. Rajan and Mrs. R.Selvi Christy – Experimental procedures in Life Sciences – Ajantha book house, Chennai.

3. Dr.S.M.Reddy and Dr.S.Ram Reddy – Microbiology A laboratory manual – BSC Publishers and Distributers – Hyderabad