DEPARTMENT OF MICROBIOLOGY

1	B.SC MICROBIOLGY	INTRODUCTORY MICROBIOLOGY	1
2	B.SC MICROBIOLGY	MICROBIAL PHYSIOLOGY AND BICHEMISTRY	2
3	B.SC MICROBIOLGY	MEDICAL MICROBIOLGY & BASICS OF IMMUNOLOGY	3
4	B.SC MICROBIOLGY	MOLECULAR BIOLGY AND MICROBIAL GENETICS	4
5	B.SC MICROBIOLGY	INDUSTRIAL AND FOOD MICROBIOLOGY	5
6	B.SC MICROBIOLGY	CELL BIOLOGY	6
7	B.SC MICROBIOLGY	ENVIROMENTAL MICROBIOLOGY	7
8	M.SC MICROBIOLGY	MBP 105 GENERAL MICROBIOLGY & VIROLOGY	10
9	M.SC MICROBIOLGY	MBP 106 BIOLOGY CHEMISTRY & CELL BIOLOGY & ENZYMOLOGY	11
	M.SC MICROBIOLGY	MBP 205 MICROBIAL PHYSIOLOGY & MOLECULAR BIOLOGY	13
10	M.SC MICROBIOLGY	MBP 206 ADV.IMMUNOL & BIOPHY.TECH & INTRUMENTATION	15
11	M.SC MICROBIOLGY	MBP 305 MICRO.AND GEN.ENGI& BIOIN. AND COMP.METH	18
12	M.SC MICROBIOLGY	MBP 306 BIOPROCESS TECNOLOGY & AGRI.MICROBIOLOGY	20
13	M.SC MICROBIOLGY	MBP 405 MEDICAL MICROBIOLOGY	23
14	M.SC MICROBIOLGY	MBP 406 MICROBIAL TECHNOLOGY	24

Dr A. Sheshachalam
PRINCIPAL
Principal
Vaagdevi Degree & P.G. College
Kishanpura, Hanamkonda

References:

1. Michael J. Pelczar, Jr. E.C.S.Chan, Noel R. Krieg Microbiology Tata McGraw- Hill Publisher.
2. Prescott, M.J., Harly, J.P. and Klein Microbiology 5th Edition, WCB Mc GrawHill, New York.
3. Madigan, M.T., Martinkl, J.M and Parker,j. Broch Biology of Microorganism, 9th Edition, MacMillan Press, England.
4. Dube, R.C. and Maheshwari, D.K. General Microbiology S Chand, New Delhi.

I-Semester Practical Paper-I

Introductory Microbiology **2HPW-Credits-1**

5th Credit: Practicals

1. Compound microscope and its handling.
2. Sterilization techniques: Autoclave, Hot air oven and filtration
3. Calibration of microscope by ocular , stage micrometer and measurement of bacterial and fungal spores.
4. Simple and differential staining (Gram staining), Spore staining, capsule staining and flagellar staining.
5. Microscopic observation of bacteria (Gram positive bacilli and cocci, Gram negative bacilli), cyanobacteria (Nostoc, Spirulina), fungi (Saccharomyces, Rhizopus, Aspergillus, Penicillium)
6. Bacterial motility: hanging drop method
7. Preparation of culture media: Solid/Liquid.
8. Isolation of bacteria by serial dilution and pure cultures methods (streak, spread and pour plate techniques)
9. Preservation of microbial cultures- Slant, Stab, mineral oil overlay and glycerol stocks
10. Bacterial biochemical identification-IMViC test, carbohydrate fermentation test

References:

1. Experiments in Microbiology by K.R. Aneja.
2. Gopal Reddy.M., Reddy. M.N., Sai Gopal, DVR and Mallaiah K.V. Laboratory Experiments in Microbiology.
3. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology, S. Chand and Co New Delhi.
4. Alcamo, I.E. Laboratory Fundamentals of Microbiology. Jones and Bartlett Publishers, USA.

6. N.J. Dimmock, A.J Easton, and K.N. Leppard. Introduction to Modern Virology. Blackwell Publishing.

II-Semester Practical Paper – II

Microbial Physiology and Biochemistry 2 HPW- CREDITS-1

5th Credit: Practicals

1. Setting up of Winogradsky's column
2. Cultivation of photosynthetic bacteria
3. Determination of viable count of bacteria
4. Turbidometric measurement of bacterial growth curve
5. Factors affecting bacterial growth – pH, temperature, salts
6. Qualitative tests for carbohydrates and amino acids
7. Determination of pH
8. Preparation of Buffers
9. Colorimetry - Principles, laws, determination of absorption maxima
10. Paper chromatography-separation of sugars/amino acids

References:

1. Experiments in Microbiology by K.R. Aneja.
2. Gopal Reddy.M., Reddy. M.N., Sai Gopal, DVR and Mallaiah K.V. Laboratory Experiments in Microbiology.
3. Dubey, R.C. and Maheshwari, D.K. Practical Microbiology, S. Chand and Co New Delhi.
4. Alcamo, I.E. Laboratory Fundamentals of Microbiology. Jones and Bartlett Publishers, USA.
5. Mahy, B.W.J. and Kangro, H.O. Virology – Methods Manual Academic Press, USA.
6. Burleson et al Virology – A Laboratory Manual. Academic Press, USA.

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
Under Graduate Courses (Under CBCS 2020 – 2021 onwards)
B.Sc. MICROBIOLOGY II Year
SEMESTER – III

MEDICAL MICROBIOLOGY & BASICS OF IMMUNOLOGY PRACTICAL
(PAPER – III: Discipline Specific Course)

Practical: 3 Hours/Week Credits: 1 Marks: 25

1. Enumeration of RBC and WBC
2. Estimation of blood haemoglobin.
3. Determination of blood groups and Rh typing.
4. Isolation and identification of medically important bacteria by cultural, microscopic and biochemical tests.
5. Antibiotic sensitivity testing – disc diffusion method.
6. Parasites – Malarial parasite, *Entamoeba* (study of permanent slides).
7. Tests for disinfectant (Phenol coefficient).
8. Typing of human blood groups-slide agglutination
9. Estimation of hemoglobin content of human blood
10. Preparation of blood smear and different blood cell count
11. RBC count
12. WBC count
13. Differential staining of WBC by Leishman's stain
14. Widal-slide agglutination test
15. RPR card test for syphilis
16. Tridot test
17. Tube flocculation test

KAKATIYA UNIVERSITY - WARANGAL - TELANGANA
Under Graduate Courses (Under CBCS 2020 – 2021 onwards)
B.Sc. MICROBIOLOGY II Year
SEMESTER – IV

MOLECULAR BIOLGY AND MICROBIAL GENETICS PRACTICAL
(PAPER – IV: Discipline Specific Course)

Practical: 3 Hours/Week Credits: 1 Marks: 25

1. Estimation DNA by diphenylamine (DPA) method.
2. Estimation of RNA by orcinol method
3. Study of cell division in onion root tip (mitotic divisions)
4. Isolation of DNA from bacteria.
5. Isolation of mutants of bacteria by UV exposure.
6. Problems related to Mendilian laws mono and dihybrid cross (problems)
7. Problems related to gene interactions
8. Problems related to DNA and RNA characteristics, Transcription and Translation.

KAKATIYA UNIVERSITY
B. Sc (CBCS) Microbiology – III Year
Semester-V – B (Discipline Specific Elective)
INDUSTRIAL AND FOOD MICROBIOLOGY

Practical syllabus

1. Microbial fermentation for the production and estimation of amylase.
2. Microbial fermentation for the production and estimation of citric acid.
3. Microbial fermentation for the production and estimation of ethanol.
4. Determination of the microbiological quality of milk sample by MBRT.
5. Isolation of fungi from spoilt bread/fruits/vegetables.
6. Preparation of yogurt.

References:

7. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2ndEdition. Panima Publishing Company, New Delhi.
8. Patel AH. (1996). Industrial Microbiology .1st Edition. MacMillan India Limited Publishing Company Ltd. New Delhi, India.
9. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An introduction.9th Edition. Pearson Education.
10. Willey JM, Sherwood LM AND Woolverton CJ (2013), Prescott, Harley and Klein's Microbiology.9thEdition. McGraw Hill Higher education.
11. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
12. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.
13. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
14. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.
15. Frazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGraw-Hill Publishing Company Ltd, New Delhi, India.
16. Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7th edition, CBS Publishers and Distributors, Delhi, India.

KAKATIYA UNIVERSITY
B. Sc (CBCS) Microbiology – III Year
Semester-VI – A (Discipline Specific Elective)
CELL BIOLOGY

Practical syllabus

1. Study a representative plant and animal cell by microscopy.
2. Cytochemical staining of DNA – Feulgen.
3. Study of polyploidy in Onion root tip by colchicine treatment.
4. Identification and study of cancer cells by photomicrographs.
5. Study of cell division in onion root tip (mitotic divisions)
6. Study of different stages of Mitosis.
7. Study of different stages of Meiosis by permanent slides.

References:

1. Hardin J, Bertoni G and Kleinsmith LJ. (2010). Becker's World of the Cell. 8th edition. Pearson.
2. Karp G. (2010) Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
3. De Robertis, EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8th edition. Lipincott Williams and Wilkins, Philadelphia.
4. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.

KAKATIYA UNIVERSITY
B. Sc (CBCS) Microbiology – III Year
SEMESTER – VI - C
ENVIRONMENTAL MICROBIOLOGY

Practical's

1. Determination of Biochemical Oxygen Demand (BOD) of sewage water
2. Determination of Chemical Oxygen Demand (COD) of industrial waste water
3.Bacteriological examination of water using multiple tube fermentation test: presumptive test, confirmed test and completed coli form test
4. Analysis of Air Microflora

KAKATIYA UNIVERSITY
M.Sc. Microbiology Syllabus
For the candidates admitted from the academic year 2021-2022
For University College and affiliated colleges

S. No	Paper Code	Title of Paper	Instruction Hours/week	No. of Credits	Marks		Total
					Internal Marks	External Marks	
Semester I							
1	MBT 101	General Microbiology	4	4	20	80	100
2	MBT 102	Virology	4	4	20	80	100
3	MBT 103	Biological Chemistry	4	4	20	80	100
4	MBT 104	Cell biology & Enzymology	4	4	20	80	100
5	MBP 105	General microbiology & Virology	6	4	-	100	100
6	MBP106	Biological chemistry & Cell Biology & Enzymology	6	4	-	100	100
7	MBS 107	Seminar	1	1		-	25
		Total		25			625
Semester II							
1	MBT 201	Microbial Physiology & Metabolism	4	4	20	80	100
2	MBT 202	Molecular Biology	4	4	20	80	100
3	MBT 203	Advanced Immunology	4	4	20	80	100
4	MBT 204	Biophysical Techniques & Instrumentation	4	4	20	80	100
5	MBP 205	Microbial Physiology & Molecular Biology	6	4	-	100	100
6	MBP 206	Adv. Immunol & Biophy. Tech. & Instrumentation	6	4	-	100	100
7	MBS 207	Seminar	1	1		-	25
		Total		25			625

FACULTY OF SCIENCE M.Sc. MICROBIOLOGY
Semester-I
Practical Syllabus Paper-I
MBP- 105: GENERAL MICROBIOLOGY

Experiments

1. Preparation of culture media.
2. Micrometry-Calibration and measurement of microorganisms using ocular and stage micrometers and calculation of the mean and standard deviation.
3. Demonstration of bacterial motility by hanging drop technique
4. Gram staining
5. Endospore staining
6. Flagella staining
7. Capsule staining
8. Staining of PHB granules
9. Demonstration of mycorrhizal association.
10. Measurement of bacteria growth by turbidometric methods.
11. Cultivation of anaerobic bacteria:
    i) Shake culture technique ii) Pyrogallic acid iii) Candle method iv) Liquid paraffin method v) Gaspak jar method
12. Identification of bacterial cultures by performing biochemical tests
    a. Indole test
    b. Methyl red test
    c. VogesProskauer test
    d. Citrate test
    e. Oxidase test
    f. Carbohydrate fermentation and Gas production
    g. Catalase test
    h. Gelatinase test
    i. Caseinase test
    j. Amylase test
    k. H_2S production test
    l. Nitrate reduction test
    m. Urease test

Spotters

1.Fungi:*Rhizopus,Mucor, Penicillium, Aspergillus, Alternaria, Curvularia,*
2.Algae: *Nostoc, Scytonema, Oscillatoria, Anabaena, Spirulina,*
3.Protozoa: *Trypanosoma, Giardia, Leishmania, Entamoeba histolytica, Plasmodium,* (permanent slides),
4.Helmithes: *Ascaris* (round warm), Tape warm (*Tenea solinum*).

FACULTY OF SCIENCE M.Sc. MICROBIOLOGY
Semester-I
Practical Syllabus Paper-II
MBP 105: VIROLOGY

Experiments

1) Isolation of phages from soil/sewage.
2) Cultivation and preservation of phages.
3) One step growth curve for determination of virus titer.
4) Cultivation of animal viruses in developing chick embryo (Amniotic, allontic, CAM).
5) Lysogeny-transduction.
6) Demonstration of cytopathological changes (slides/pictures).
7) Symptomatic observations of plant viral infections.
8) Estimation of chlorophyll content in healthy and viral infected leaves.
9) Estimation of protein content in healthy and viral infected leaves.
10) Haemagglutination inhibition.

Spotters

1. Beijrinick.
2. W.M Stanely.
3. Tobacco mosaic virus (TMV).
4. Adenovirus.
5. T4 phage.
6. HIV.
7. SARS CoV.
8. Symptoms of plant viral diseases.
9. Symptomsof animal viral diseases.
10. Prions.
11. Density-gradient centrifugation.
12. Genome of Øx174.
13. Plates showing plaques.
14. Latex droplet method.
15. ELISA.
16. *E.coli* infected with T4 phage.

FACULTY OF SCIENCE M.Sc. MICROBIOLOGY
Semester - I

Practical Syllabus Paper - II

MBP 106: BIOLOGICAL CHEMISTRY

Experiments

1. Quantitative estimation of glucose by Anthrone method
2. Quantitative estimation of reducing sugars by 3, 5, DNS method
3. Quantitative estimation of fructose
4. Quantitative estimation of proteins by Lowry's method
5. Quantitative estimation of Indole Acetic Acid
6. Quantitative estimation of Ascorbic acid
7. Quantitative estimation of Amino acid
8. Qualitative test of carbohydrates: Glucose, Xylose, Starch, Lactose, Maltose, Sucrose
9. Qualitative test of amino acids: Tryptophan, Tyrosine, Methionine, Arginine, Proline,
10. Qualitative test of proteins: Gelatin, Globulin, Albumin, Peptone, Casein
11. Determination of iodine number of fat
12. Qualitative test of lipids: Cholesterol

Spotters

1. Structure of monosaccharides
2. Structure of Oligosaccharides
3. Structure of Polysaccharides
4. Structure of Amino acids
5. Structure of Proteins
6. Structure of Phospholipids
7. Structure of Cholestrol
8. Structure of nucleotides
9. Structure of DNA
10. Structure of t-RNA
11. Structure of Cyanocobalamine (Vit B12)
12. Structure of Porphyrin

FACULTY OF SCIENCE M.Sc. MICROBIOLOGY
Semester – I
Practical Syllabus Paper- IV
MBP 106: CELL BIOLOGY AND ENZYMOLOGY

Experiments

1. Demonstration of mitotic cell division stages
2. Demonstration of meiotic cell division stages
3. Evaluation of kinetic constant of the purified enzyme.
4. Effect of PH on enzyme activity
5. Effect of temperature on enzyme activity
6. Effect of time on enzyme activity
7. Effect of enzyme concentration on enzyme activity
8. Effect of enzyme inhibitors on enzyme activity.
9. Immobilization of Enzymes
10. Enzyme purification
11. Estimation of arginase activity
12. Estimation of catalase activity.

Spotters

1. Giant chromosomes
2. Polytene chromosome
3. Lampbrush chromosome
4. Cell cycle
5. Metaphase
6. Anaphase
7. Lock and key model
8. Allosteric inhibitors
9. Un- Competitive enzyme activity
10. Non-Competitive enzyme activity
11. Competitive enzyme activity
12. Lineweaver-Burk plots.

FACULTY OF SCIENCE M.Sc. MICROBIOLOGY

Semester – II

Practical Syllabus Paper – I

MBP 205: MICROBIAL PHYSIOLOGY & METABOLISM

Experiments

1. Growth of the bacteria at different P^H.
2. Effect of different temperatures on bacterial growth.
3. Effect of osmotic pressure.
4. Isolation of photosynthetic bacteria from sewage water.
5. Estimation & characterization of bacterial chlorophylls.
6. Enrichment cultivation of photosynthetic bacteria – Winogradsky column.
7. Determination of Thermal death time.
8. Carbohydrate catabolism by microorganisms through oxidation and fermentation of glucose.
9. Estimation of ethanol in fermentation broth.
10. Estimation of lactic acid in fermentation broth.

Spotters

1. Passive diffusion.
2. Facilitated diffusion.
3. PSI.
4. PSII.
5. Halobacterial photosynthesis.
6. Electron transport.
7. Biotransformation.
8. Bioluminescence.
9. Quorum sensing.
10. Phospholipids.
11. Steroids.
12. Ribonucleotide reductase.

FACULTY OF SCIENCE M.Sc. MICROBIOLOGY

Semester – II

Practical Syllabus Paper – II

MBP 205: MOLECULAR BIOLOGY

Experiments

1. Estimation of DNA by DPA method.
2. Estimation of RNA by orcinol method
3. Isolation of DNA from sheep Liver / yeast/ *E.coli*
4. Determination of purity of DNA
5. Isolation of RNA from plant sample
6. Isolation of RNA from viral infected plant sample
7. Problems on DNA characteristics
8. Problems related to Transcription, Genetic code,
9. Problems related to Translation and Gene regulation.

Spotters

1. ATPase
2. Semiconservative model of DNA replication
3. Rolling circle replication
4. Replication fork
5. Nucleosomes
6. DNA damages
7. Action of topoisomarases
8. Okazaki fragments
9. RNA splicing &spliceosome
10. Structure of *lac* operon
11. Structure of *Trp* operon
12. Structure of *Ara* operon
13. Structure of CAMP.
14. Structure of PPPPGTP.
15. Molecular Chaperons
16. Ribosomes.

FACULTY OF SCIENCE M.Sc. MICROBIOLOGY
Semester – II
Practical Syllabus Paper- III
MBP 206: ADVANCED IMMUNOLOGY

Experiments

1. Typing of human blood groups. (Haemagglutination).
2. Differential staining of WBC by Leishman's stain.
3. Enumeration of RBC and WBC.
4. Estimation of hemoglobin count in blood.
5. Widal tests: i) Slide agglutination ii) Tube agglutination methods.
6. VDRL test (Venereal disease research laboratory).
7. Hepatitis-B Surface antigen test.
8. HCG test (Agglutination inhibition test).
9. ELISA test.
10. Detection of rheumatoid factor (RF factor).
11. ASO Test- Anti streptolysin 'O" test.
12. Immuno diffusion test: i) Single radial immuno diffusion ii) Double immuno diffusion.
13. Immunoblotting for detection of proteins by staining.
14. Immuno electrophoresis.
15. Isolation of lymphocytes.

Spotters

1. Lymph node.
2. Spleen.
3. Thymus gland.
4. Structure of IgG, IgM, IgA, IgE.
5. Monoclonal antibodies.
6. ELISA plate.
7. Immuno precipitation.
8. Flow cytometry.
9. Immunofluoresecence.
10. RIA.
11. Hypersensitive reactions Type-I,II,II,IV
12. Systemic lupus erythematosus (SLE).
13. Myasthenia gravis disease.

FACULTY OF SCIENCE M.Sc. MICROBIOLOGY
Semester –II
Practical Syllabus Paper- IV
MBP 206: BIOPHYSICAL TECHNIQUES & INSTRUMENTATION

Experiments

1. Determination of Pka value of amino acid
2. Determination of y max of a given solution
3. Separation of Carbohydrates by Paper Chromatography
4. Separation of Amino Acids by Paper Chromatography
5. Separation of Lipids by Thin Layer Chromatography
6. Demonstration of Column Chromatography
7. Verification of Lambert-Beers Law By UV-VIS Spectrophotometer
8. Separation of Proteins by Electrophoresis
9. Separation of DNA by Electrophoresis
10. Ultraviolet Spectroscopy of Proteins
11. Membrane separation-Dialysis.

Spotters

1. Gas Liquid Chromatography
2. Gel filtration Chromatography
3. Column Chromatography
4. HPLC
5. Ion Exchange Chromatography
6. Affinity Chromatography
7. Electrophoretic Unit
8. Banding pattern of Proteins (Gel image)
9. Banding patterns of DNA (Gel image)
10. Southern blotting
11. Northern blotting
12. Western bolting.
13. Centrifuge.
14. U.V spectrophotometer.
15. Fluorescence spectrophotometer.
16. Raman spectroscopy.

KAKATIYA UNIVERSITY
M.Sc. Microbiology Syllabus
For the candidates admitted from the academic year 2021-2022
For University College and affiliated colleges

S. No	Paper Code	Title of Paper	Instruction Hours/week	No. of Credits	Marks		Total
					Internal Marks	External Marks	
Semester III							
1	MBT 301	Microbial Genetics & Genetic Engineering	4	4	20	80	100
2	MBT 302	Bioinformatics & Computational Methods	4	4	20	80	100
3	MBT 303	Bioprocess Technology	4	4	20	80	100
4	MBT 304	Agricultural Microbiology	4	4	20	80	100
5	MBP 305	Micro. and Gen. Engi. & Bioin. and Comp. Meth.	6	4	-	100	100
6	MBP 306	Bioprocess Technology & Agri. Microbiology	6	4	-	100	100
7	MBS 307	Seminar/Tutorials	1	1		-	25
		Total		25			625
Semester IV							
1	MBT 401	Environmental Microbiology	4	4	20	80	100
2	MBT 402	Medical Microbiology	4	4	20	80	100
3	MBT 403	Microbial Technology	4	4	20	80	100
4	MBT 404	Pharmaceutical Microbiology	4	4	20	80	100
5	MBP 405	Environmental Microbiol. & Medical Microbiol.	6	4	-	100	100
6	MBP 406	Microbial Technology & Pharmaceutical Micbio.	6	4	-	100	100
7	MBS 407	Seminar/Tutorials	1	1		-	25
		Total		25			625

Recommended Books

1. Brown, T.A. 1999 Gene Cloning. 3rd edition. Chapman and Hall Publications, USA.
2. Burrel, M.M. 1993. Enzymes of Molecular Biology, Humana Press.
3. Glick, B.R. and Pasternak, J.J. 1998 Molecular Biotechnology – Principles and Applications of Recombinant DNA, ASM Press, Washington D.C.
4. Lewin, B. 2008 Genes IX. Oxford University Press, Oxford.
5. Winnacker, E.L. 1987 From genes to Clones. VCH Publications,Germany.
6. Antony JF, Griffiths, Gilbert, W.M., Lewontin, R.C. and Miller, J.H. 2002 Modern Genetic Analysis,
7. Integrating Genes and Genomes, 2nd edition, WH Freeman and Company, New York.
8. Molecular Biology of cell. Albert *et al.,* 4th Edition Garland Publishing Inc.
9. Maloy, S.R., Cronan, J.R. Freifelder, D. 1994 Microbial Genetics, Jones and Bartlett Publishers.
10. Gene, 4th edition, Benjamin/Cummings publishing company.
11. Freifelder, D. 1997 Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
12. Twynan, R.M. 2003 Advanced Molecular Biology. Viva books Pvt. Ltd. New Delhi.

Semester- III
Practical Paper – I

MBP 305: MICROBIAL GENETICS & GENETIC ENGINEERING

1. Isolation of auxotrophic mutants by Replica plate technique
2. Mutagenesis and UV survival curve
3. Isolation of petite mutants
4. Restriction analysis of DNA and agarose gel electrophoresis
5. Diauxic growth experiment
6. Preparation of competent cells
7. Transformation- selection of recombinants-Blue and white selection(X-gal method)
8. Amplification of DNA by PCR
9. Problems related to
   (a) Mutation (b) Recombination(Conjugation, transformation, transduction), (c) Gene mapping (d) Restriction mapping (e) Primer design and PCR amplifications (f) DNA libraries.

Spotters:

1. Bacterial conjugation
2. Holiday model
3. Thymine dimers
4. Ames Test
5. Cassette mutagenesis
6. Sticky ends
7. pBR322
8. X-gal plate
9. Replica plating technique
10. PCR
11. rDNA production of human growth hormone
12. Viral vectors
13. Real-Time PCR
14. Liposomes
15. Restriction endonucleases
16. In vivo gene therapy

9. Jean-Michel claverie, Cedric Notredme Bioinformatics A Beginner's Guide, Wliiey Publication
10. Jonathan Pevsner. 2004 Bioinformatics and Functional Genomics
11. Stephen Misener and Stephen A. Krawetz. Bioinformatics methods and protocols
12. Wardlaw, AC 1985 Practical statistics for experimental Biologists.
13. Rastogi VB. Fundamentals of Biostatistics, Ane Books, New Delhi
14. Khan and Khanum Fundamentals of Biostatistics, Ukaaz Publications, Hyderabad

Semester- III
Practical Paper – I

MBP 305 BIOINFORMATICS & COMPUTATIONAL METHODS

1. Aligning sequences using Clustal-X
2. Sequence data retrieval in FASTA format from NCBI database.
3. Similarity search in BLAST for protein or nucleotide sequence.
4. Prediction of secondary structure of protein
5. Viewing the Protein Data Box (PDB) files using Rasmol software.
6. Conversion of raw sequences into different sequence format by using Read Seq Tool.
7. Problems on mean, median, mode, standard deviation and standard error
8. Problems on probability distributions
9. Problems on Chi-square test
10. Problems on one way and two-way ANOVA and F-test analysis
11. Problems on Karl Pearson's Correlation coefficient and Rank Correlation coefficient
12. Problems on Regression analysis

Spotters:

1. Gene banks
2. Phylogenetic tree
3. DNA microarrays
4. Protein structure
5. Proteome analysis
6. K-mer frequency diagram
7. Clustal-x alignment map
8. Graphical presentation of Data
9. Histogram
10. Frequency polygon
11. Frequency curve
12. Pie chart
13. Cartogram
14. Scatter Diagram of correlation
15. Regression analysis

10. Prescott & Dunn, Industrial microbiology,
11. Prescott & Dunn's Fundamentals of Applied Microbiology (2nd edition)
12. Rao. D.J. 2005 Intriducion to Biochemical Engineering McGraw-Hill
13. Reed, G. Industrial Microbiology, CBS Publishers

Semester- III
Practical Paper- II
MBP 306: BIOPROCESS TECHNOLOGY

1. The use of Logarithms in microbial growth study and fermentation process.
2. Determination of the midpoint of the Logarithmic phase of microbial growth in fermentation process.
3. Harvesting the microbial cells and determination of the yield of fermentation products.
4. Manometric study in fermentation process.
5. Isolation and identification of secondary metabolites in the fermentation process.
6. Design and construction of microbial fermentor.
7. Screening of microorganisms through war cup method in strain improvement.
8. Production and estimation of Streptomycin.
9. Production and estimation of Lactic acid.
10. Production and estimation of Ethyl alcohol.
11. Production and estimation of Penicillin.
12. Production and estimation of Indole Acetic Acid (IAA).
13. Estimation of Cynacobalamine (Vitamin B12).

Spotters:

1. Design of fermenter
2. Seed Flask
3. Seed fermenter
4. Production fermenter
5. Air sparger
6. Foam breaker
7. Stirrer gland
8. Baffles
9. Impellers
10. Bread
11. Monometric fermenter
12. Strain improvement
13. Immobilized beads

Recommended Books

1. Agrio, G.N. Plant pathology
2. Alexander, M Soil Microbiology
3. Bilgrami,K.S. and H.C. Dube Modern Plant pathology
4. Biofertilizedrs by N.S. Subba Rao
5. Mehrotra,R.S. Plant Pathology
6. Microbial ecology: Principles, methods & applications & Biological nitrogen fixation.
7. R.S. Singh An introduction to principles of plant pathology
8. Rangaswami, G. and A. Mahadevan Diseases of crop plants
9. Rangaswamy,G and. Bhagyaraj D.J .Agricultural Microbiology
10. Singh,R.S. Plant diseases resistance
11. Rander Plank Plant disease resistance
12. Vidyasekaran Molecular plant pathology

Semester- III
Practical Paper- II
MBP 306: AGRICULTURAL MICROBIOLOGY

1. Isolation of phosphate solubilizing microorganisms
2. Estimation or organic matter in agricultural soils to assess the soil-fertility
3. Estimation of cell wall degrading enzymes: cellulases (exo-and endo-glucanases), polymethyl esterase, poly galacturunase, pectic lyase in host-pathogen interactions
4. Estimation of accumulated soil enzymes : catalase/peroxidase, phosphatase, urease,
5. Isolation and identification of cyanobacteria used as biofertilizers-*Nostoc, Anabaena, Scytonema*
6. Isolation of *Rhizobium* from root nodules
7. Classification and symptomology of plant diseases covered in theory (unit III)
8. Determination of Disease Tolerance Index (DTI) in crop plants
9. Enumeration of Rhizosphere microflora and comparison with normal soil microflora (Rhizosphere effect)
10. Enumeration of ammonifiers, nitrifiers and denitrifiers in soil samples
11. Assay of fungicides by humid chamber technique and calculation of LD50 value
12. Section cutting of infected plant parts.

Spotters:

1. Downy mildew of peas
2. Downy mildew of bajra
3. White rust of crucifers
4. Powdery mildew of cucurbits
5. Whip smut of sugarcane
6. Wilt of pigeon pea
7. Wilt of cotton
8. Root rot of cotton
9. Stem rot of rice
10. Brown spot diseases of rice
11. Blast diseases of rice
12. Bacterial blight of paddy
13. Angular leaf spot of cotton
14. Stalic rot of maize
15. Sesamum phylloidy
16. Yellow vein mosaic of bhendi

Recommended Books

1. Alexander M. — Soil Microbiology
2. Atlas & Batra — Microbial Ecology
3. Burns R.G & J.H.Slater — Experimental Microbial Ecology
4. Gabriel Bitton — Wastewater Microbiology
5. Gilbert S. Omen — Environmental Biotechnology
6. Gray T.R.G.&S.T.Williams — Soil Microorganisms
7. Gregory P.H. — The Microbiology of Atmosphere
8. Lautit M.W&C.M.Eds.Keuin — Microbial Ecology Proc.
9. Lynch J.M and N.J. Poole — Microbial Ecology: A conceptual approach
10. Michael S.Switzenbaury(Ed) — Anaerobic Treatment of Sewage
11. Mishra R.R — Soil Microbiology
12. Ralph Mitchell — Environmental Microbiology
13. Ratledge C. — Biochemistry of Microbial degradation
14. Subba Rao N.S. — Soil Microbiology

Semester - IV
Practical Paper- I

MBP 405: ENVIRONMENTAL MICROBIOLOGY

1. Determination of Biochemical Oxygen Demand (BOD) of sewage water
2. Determination of Chemical Oxygen Demand (COD) of industrial wastewater
3. Bacteriological examination of water using multiple tube fermentation test: presumptive test, confirmed test and completed coli form test.
4. Estimation of Gross primary productivity (GPP), Net Primary Productivity (NPP), and Respiratory Consumption (RC) to determine the autotrophic/heterotrophic status of aquatic bodies
5. Estimation of phosphates, sulphates and nitrates (eutrophication factors) in polluted and unpolluted water bodies
6. Disinfection of potable water by chlorine (bleaching power method) – determination of chlorine demand and residual chlorine
7. Biomonitoring of water quality by algal indices: Nyagaard's index, Palmer's index, Kothe's index, Margalef's index.
8. Bioremediation of heavy metals : chromium/cadmium/lead
9. Phytoremediation of toxic metals by cyanobacterial species
10. Assay of lignolytic enzymes (lignin peroxidase and laccase) by white rot fungi
11. Decolourization of dye effluents by immobilized bacteria and fungi
12. Biodesulphurization of coal by *Thiobacillus ferrooxidans*
13. Air sampling by Petri plate method/gravity slide method/tilak air sampler
14. Estimation of xylanase enzyme: Role in biopulping

Spotters:

1. Multiple tube fermenter
2. Winogradsky column
3. Aeroflora agar plate
4. Dye effluent treatment
5. Decomposed litter Humus
6. Bioleaching rayon pulp
7. Desulphurised coal (Clean coal)
8. Drug sensitivity
9. Anderson air samplers
10. Water cycle
11. Burkard trap
12. Air quality index (AQI)
13. AAFEB
14. Impingers
15. HEPA filter

7. Molecular Microbiology: Diagnostic Principles and Practice. 3rd Edition. David H. Persing, et al. Practices of Sequencing Quality Assurance, Chapter53. American Society of Microbiology Press. 2016
8. Jayaram Paniker. Text book of Medical parasitology (8th edition).
9. Panjarathinam R Orient Longman. Text book of Medical Parasitology, Kindle edition, Orient Blackswan Private Limited (16 December 2020).
10. Sumeeta Khurana and Abhishek Mewara, Textbook of Medical Parasitology, Universities Press India Pvt. Ltd.29 June 2021.
11. Clinical Virology, (ASM books) 4th Edition by Douglas D. Richman, Richard J. Whitley and Frederick G. Hayden, ASM Press, Wiley.American Society for Microbiology, 2016.
12. Ryan & Sherris Medical Microbiology, Eighth Edition, McGraw Hill.

Semester - IV
Practical Paper - I

MBP 405: MEDICAL MICROBIOLOGY

1. Preparation of different types of culture media for identification of pathogens: Blood Agar, Chocolate Agar, Mannitol Salt Agar, Wilson Blair Agar, Bismuth sulfite Agar, TSI Agar etc.
2. Different types of staining techniques for identification of pathogens: Gram's staining, Acid Fast staining, Albert staining, Capsular staining, Endospore staining, etc.
3. Identification of various pathogenic bacteria by biochemical, enzymatic and serological methods.
4. Bacteriological examination of urine, blood, pus, sputum, stool specimens. from patients for diagnosis of disease
5. Animal inoculation technique.
6. Microscopic studies of virus-infected materials.
7. Handling of lab animals.
8. Examination of pathogenic fungi under microscope (Dermatophytes, *Candida* spp.)
9. Isolation of *Cryptococcus neoformans* from bird fecal matter
10. Examination of stool for helminthes & Entamoeba.
11. Examination of blood smears to identify malarial parasites.
12. Isolation, observation and identification of normal microbial flora of human body.

Spotters

1. Smallpox
2. HSV infection
3. Staphylococcal skin Infection
4. Tetanus infection
5. *Corynebacterium* infection
6. EMB plate
7. Measles
8. Mumps
9. *Candida albicans* infection of the tongue
10. Ringworm infection
11. *Microsporum*
12. *Histoplasma capsulatum*
13. *Cryptococcus neoformans*
14. Elephantiasis
15. Leishmaniasis

Published by:CRC Press
6. Frazier, W.C. and Werthaff, D.C. 1998 Food Microbiology 4th edition. Tata Mc Grow Hill New Delhi
7. Hui Y H 2006 Food Biochemistry and Food Processing Blackwell
8. Joshi, V.K. Ashok Pondey 1999 Biotechnology and Food fermentation Vol. I & II.
9. Katherine Smart 2003 Brewing Yeast Fermentation Performance John Wiley & Sons Inc
10. Prescott and Dunn's, Industrial Microbiology 4th edution.
11. Robison, R.K. 1990 Dairy Microbiology.
12. Thomas J. Montville, Karl Matthews, 2005 Food Microbiology: An Introduction: Amer Society for Microbiology

Semester – IV
Practical Paper - II

MBP 406: MICROBIAL TECHNOLOGY

1. Enumeration of microorganisms from food, feed, vegetable and fruits.
2. Methylene blue reductase test for milk quality.
3. Microbial reactions in litmus milk.
4. Assay of cellobiohydrolase.
5. Assay of endogluconase.
6. Production and assay of α - amylase.
7. Production and assay of β – amylase.
8. Production and assay of protease.
9. Production and assay of lipase.
10. Production and assay of asparaginase.
11. Production and assay of phosphatase.
12. Biotransformation of organic compounds through MOS.

Spotters:

1. Infected food
2. Infected vegetables
3. Infected fruits
4. Aflatoxin
5. Mushroom spawn
6. Croping (Casing)
7. Biopesticides
8. VAM spores by funnel technique
9. Baker's yeast
10. Cheese
11. Yoghurt
12. Curd
13. *Trichoderma* powder
14. Antagonistic activity

9. Microbiological Assays. Hewitt.
10. Antiviral Drugs. Kargor, S.
11. Burger's Medicinal chemistry Vol. I – III. Ed. Nanfield E. World.
12. The control of antibiotic resistant bacteria. Stuart, Harris and Harris.
13. Indian Pharmacopea; United States Pharmacopea; British Pharmacopea.

Semester – IV
Practical Paper - II

MBP 406: PHARMACEUTICAL MICROBIOLOGY

1. Sampling of pharmaceuticals for microbial contamination and load (syrups, suspensions, creams and ointments, ophthalmic preparations)
2. Bioassay of chloramphenicol by plate assay method or turbidometric assay method.
3. Determination of D value, Z value for heat sterilization in pharmaceuticals.
4. Neutralization test – Plaque neutralization, Haeme adsorption test.
5. Determination of antimicrobial activity of a chemical compound (Phenol, resorcinol, thymol, formaldehyde) to that of phenol under Standardization experimental conditions.
6. Sterility testing methods for pharmaceutical and cosmetic products
7. Tests for disinfectants (Phenol coefficient/RWC)
8. Determination of antibacterial spectrum of drugs/antibiotics
9. Chemical assays for antimicrobial drugs
10. Testing for antibiotic/drug sensitivity/resistance
11. Determination of MIC valued for antimicrobial chemicals
12. Microbiological assays for antibiotics (Liquid tube assay, agar tube assay, agar plate assays)
13. Efficacy testing of preservatives like parabens

Spotters:

1. Syrups
2. Creams
3. Ointment
4. D-value
5. Z-value
6. Plaque neutralization
7. Heame adsorption test
8. Antimicrobial activity
9. Sterility testing
10. Tetracycline
11. Minimal inhibitory concentration (MIC)
12. Synthetic drugs
13. Cosmetic product (any available product)