

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2017-18
B.Sc.-Ist Semester-Ist

Paper-Fundamentals of Microbiology and Microbial Physiology

Sr. No.	Month	Name of Unit	Topics Names	Required Lecture	Total Lects.
1	July	UNIT I:	a. Discovery of microscope- Leeuenhoek, Robert Hook.	08	15
		A. History of Microbiology:	b. Controversy over Spontaneous, generation, Contributions of Aristotle, Redi, Needham, Schulze and Schwan, Schroder& Vandusch, Louis Pasteur, John Tyndall c. Germ theory of diseases- Joseph Lister, Koch postulates, River postulates. d. Pure culture concept- Joseph Lister, Koch, DeBarry.		
		B. Scope of Microbiology as a modern Science	a. Industrial Microbiology, Environmental Microbiology, Medical microbiology, Food and Dairy Microbiology, Genetic engineering and Biotechnology. b. Different types of Microorganisms (outline) c. Distribution of Microorganisms in nature, and their beneficial and harmful activities	07	
2	July - Aug	UNIT II:	i) Definitions- Magnification, Resolving power, numerical ap erture, focal length, Working Distance Aberrations, ii) Objectives- Functions, low and high power objectives, Oil mmersion objectives, iii) Ocular- Functions, Huygenian, Ramsden, Hyperplane and compensating. iv) Condensor- Functions, Abbe, parabolic v) Iris diaphragm	06	15
		B. Principles, construction, ray diagram and applications:	i) Compound Microscope, ii) Darkfield Microscope, iii) Phase Constrast microscope iv) Fluorescent Microscope, v) Electron Microscope.	05	

		C. Staining:	Dyes and Staining,- Definations, auxochromes, Chromophore, mordents, chromogens, Leucostains, Principles and Methods of the following techniques: i. Simple staining ii. Differential- Gram, Acid fast, iii. Structural-Endospore, flagell	04	

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3	Aug	UNIT III : Classification of Microorganism:	A.Bacterial Classification: i. Definition- Taxonomy, Classification, Taxonomic rank, Identification, Nomenclature, ii. Bergy's manual of systematic Bacteriology, General characteristics enlisting all parts with major characters and examples(Vol.I to IV) iii. Methods of Classification: Intuitive, Numerical taxonomy, Genetic relatedness,	08	15
			B. General characteristics of : i. Viruses, ii. Fungi (Including yeasts) iii. Actinomycetes, iv. Mycoplasma and Rickettsia v. Algae	07	
4	Sep	UNIT IV: Structural Organization of Bacteria:	a) Concept of prokaryotes and Eukaryotes; Comparison and Differences. b) Typical Bacterial cell c) Shape, Size and Arrangement of Bacteria d) Structure and functions of following: i. Capsule and slime layer ii. Cell wall- Gram positive and Gram negative bacteria. iii. Cytoplasmic membrane- fluid mosaic model iv. Flagella- Arrangement, Mechanism of flagellar movement. v. Pili-Arrangement and function vi. Ribosomes- Prokaryotic and Eucaryotic vii. Plasmid- Definition, General characters, classes viii. Bacterial chromosome ix. Endospores- Structure and arrangements	15	15

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5	Sept- Oct	UNITV: A. Microbial Nutrition:	i. Basic Nutritional Requirements: Sources of C, N, O, P, S, Energy, Macronutrients, Growth factors, water etc. ii. Media; Synthetic, Nonsynthetic, Liquid and Solid, Semi solid, Differential, Enriched, Selective media. Role of beef extract, yeast extract, peptone, agar and gelatin. iii. Determination of nutritional requirements: Auxanographic technique, Replica plating technique. iv. Nutritional classification; on the basis of source of carbon and energy	08	14
		B. Pure Culture Techniques:	i. Definition- Pure and Mixed culture: ii. Methods of Isolation of Pure culture, Serial dilution, Streak plate, pour plate, spread plate, Enrichment culture, and Single cell isolation method. iii. Methods of preservation of pure culture- Agar slants, Sa line suspension, Overlaying with oil, Freeze drying.	07	
6	Oct	UNIT VI: Reproduction and Growth of Bacteria:	a) Reproduction: Binary fission, Budding, Fragmentation, Sporulation, b) Growth rate and generation time- Definition, mathematical expression. c) Bacterial growth curve d) Synchronous culture: Definition, methods of isolation (Helmstetter- Cummings Technique) and application. e) Continuous culture: Definition, method (chemostat, and Turbidostat Techniques) and Application. f) Measurement of Growth: i. Cell number measurement- Breed method, Colony count ii. Cell mass measurement- Dry weight and Turbidity measurement. iii. Cell activity measurement- Biochemical activity iv. Factors influencing bacterial Growth- Temperature, pH, Gaseous	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2017-18
B.Sc.-Ist Semester-IInd

Paper- Microbiology, Biochemistry, Biostatistics & Computers

Sr. No.	Month	Name of Unit	Topics Names	Required Lecture	Total Lects.
1	Dec-17 Jan-18	UNIT I : VIRUSES	i) Discovery of viruses ii) Structure of viruses iii) Classification of viruses (LHT System) iv) Replication of viruses – Lytic cycle (T4), Lysogeny (Lambda phage) v) Cultivation of viruses – Embryo culture, Tissue culture method . vi) Interferon	15	15
2	Jan	UNIT-II : MICROBIAL CONTROL	i) Definition and Terms- Sterilization, disinfection, Antiseptic, Sanitizer, Germicide, Microbiostatic, Antimicrobial agent ii) Mechanism of cell Injury - Damage of cell wall, cell membrane, Inhibition of metabolic reactions. iii) Physical Control :- Temperature, osmotic pressure, Radiation, filtration. iv) Chemical Control – Chemistry and mode of action of halogens, heavy metals and their derivatives, Alcohols, Detergents and Gaseous Sterilization. v) Chemotherapeutic agents.- Definition and mode of action of penicillin , tetracycline, Norfloxacin	15	15
3	Feb	UNIT-III APPLIED ASPECTS OF MICROORGANISMS IN -	i) Agriculture – Biofertilizers & Biopesticides. ii) Human and Animal Health – Antibiotics, Vaccines iii) Industry (Food, Chemical & Pharmaceutical) – List of Microbial products (and producing organisms) iv) Environmental – Biodegradation and Bioremediation	15	15
4	Feb March	UNIT-IV BASIC BIOCHEMISTRY	i) Carbohydrates – Classification, different types of Glycosidic linkages eg- Maltose sucrose, Lactose, starch ii) Lipids – Classification, concept of saturated and unsaturated fatty acids, outline of conjugated & derived lipids iii) Proteins – Classification of Amino acids, concept of peptide bond , elementary concept of	15	15

			protein structure. iv) Nucleic acid – Purine & pyrimidine bases, nucleotides , & nucleosides , structure of DNA, structure of RNA (mRNA , tRNA, rRNA)		
5	March	UNIT-V : BIOSTATISTIC S	i) Importance & application – Tabulation & Classification of data, Frequency distribution & graphical distribution of data. ii) Measures of central tendencies – Mean , Mode, Median & their Properties iii) Co relation & their Linear regression – Coefficient of cor relation, linear least square Fit method of regression. iv) Hypothesis testing- (chi square test) x2 test, t-test v) Different models of data presentation with special refer ence to Biological samples.	15	15
6	April	UNIT-VI COPUTER CONCEPTS :-	i) Components of computer system – Hardware, input devices, CPU, output devices , Monitor, software. ii) Memory concept- Computer memory primary & second ary memory in computers iii) Window Operating systems :- Introduction graphical user interface systems, desktop menus, launching a program through start menu. iv) MS-Word- creating, saving operating editing, closing a document, entering & editing texts. v) Using Internet explorer , MS power point, creating e-mails.	15	15

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Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology

Teaching Plan Session-2017-18
B.Sc.-IInd Semester-IIIrd

Paper-Molecular Biology and Genetic Engineering.

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	July	Unit I : Gene multiplication and expression	a) Concept of gene – Definition of Gene, Muton, recon, cistron, gene within gene, split gene. b) Replication of DNA- Modes of replication, (Conservative, Semiconservative and Dispersive). Experiment of Meselson and Stahl to prove semiconservative mode of replication. Mechanism of replication with enzymes involved, models of replication: Knife and fork, rolling circle. c) DNA repair mechanisms- light and dark. d) Genetic code- Characteristic features of genetic code. e) Out line of Protein synthesis- Transcription and Translation	15	15
2	July Aug	Unit II : Gene Regulation and Mutation	a) Gene regulation Mechanisms - lac operon , trp operon. b) Mutation- Definition & types of mutations - Base pair substitution, frame-shift, point, missense, nonsense & silent mutations, Random Vs. Directed mutation, Rate of mutation, Effect of Mutation on Phenotype, c) Genetic suppressions:- Intragenic (Intracodon suppression, reading frame Suppression) and extragenic suppression (Non sense and Missense Suppression). d) Molecular basis of spontaneous and induced mutations - Spontaneous mutation (Tautomerism), Induced Mutation (Chemical Mutagens) e.g. Base analogues, Nitrous Oxide, Hydroxylamine, Acridine dyes, Physical mutagens e.g. X-rays, Gamma rays, U.V. light.	15	15
3	Aug	Unit III : Genetic recombination:	Mechanism of recombination : Breakage and reunion, breakage and copying, complete copy choice Transfer of genetic material in prokaryotes: a) Transformation: Experiment of Griffith. Avery, MacLeod and McCarty experiment to prove Genetic Transformation. Mechanism of Transformation. b) Transduction: Experiment of Zinder and Lederberg. General mechanism of Transduction. Types of Transduction: Generalized and Restricted, Complete and Abortive, Low Frequency and High Frequency Transduction. Comparison between Transformation and Transduction. c) Conjugation: Experiment of Lederberg	15	15

			and Tatum, Experiment of Davis, Nature and function of F Plasmid. Hfr formation. Various Mating types. Mechanism of conjugation: i) F ⁺ x F ⁻ ii) Hfr X F ⁻ . F' Plasmid and Sexduction		
4	Sept	Unit-IV Tools of Genetic Engineering:	a) Introduction to basic technique of genetic engineering. b) Enzymes for splicing: Restriction endonucleases. c) Range of DNA manipulating enzymes: Nucleases, Ligases, Polymerases, DNA modifying enzymes, Topoisomerases. d) Vectors: Ideal characters and types: Plasmid, Cosmid and Bacteriophage.	15	15
5	Sept	Unit V : Techniques of genetic engineering:	a) Isolation of Genomic and Plasmid DNA from bacteria, Analysis of DNA fragment size by agarose gel electrophoresis. b) Introducing DNA into host cell, competent cells, transduction of cells and identification of transformed cell (e.g. Antibiotic resistance gene in Plasmid) Selection of clones: Direct (colony hybridization) and Indirect method (southern blotting). c) Definition, method and applications of gene mapping, DNA sequencing (by microarray) and PCR. d) Introduction to expression of cloned genes. Construction of gene library. Cells for cloning.	15	15
6	Oct	Unit VI : Applications of Genetic Engineering:	a) Health care biotechnology: - Recombinant Insulin, Recombinant Hepatitis vaccine, Gene therapy, DNA probes in diagnosis. b) Agricultural biotechnology: - Transgenic plants. c) Environmental biotechnology: - Genetically engineered microbes for pollution control. d) Industrial biotechnology: - Strain improvement for industrial product	15	15

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Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2017-18
B.Sc.-IInd Semester-IVth

Medical Microbiology

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Dec-17 Jan-18	Unit I : Epidemiology	a) Definition, classification and scope of epidemiology. b) Infection- Types of infection and modes of transmission c) Normal flora of human body. d) Infection process, pathogenicity and virulence, Microbial virulence factors: toxins, enzymes e) Control of communicable diseases.	15	15
2	Jan	Unit II : Immunology	a) Organs and cells of immune system b) General Nonspecific factors- Physiological barriers, Natural cellular factors, Natural humoral factors. c) Immunity- Definition and classification d) Innate immunity- Species, Racial, Individual, Herd immunity. e) Acquired immunity- Active and passive immunity, f) Immune response and hypersensitivity	15	15
3	Feb	Unit III : Serology	a) Antigens- Definition, types and factors determining antigenicity, Bacterial antigens. b) Antibodies- Definition, Structure, classification, Properties and differences, monoclonal antibodies. c) Antigen Antibody reactions- Agglutination, Precipitation, Complement fixation test, ELISA and RIA.	15	15
4	Feb March	Unit IV : Pathogenic Bacteria	Study of following bacteria with respect to their morphology, cultural and biochemical properties, antigenic structure, pathogenesis, laboratory diagnosis and prophylaxis: a) Staphylococcus aureus. b) Clostridium tetani. c) Salmonella typhi. d) Mycobacterium tuberculosis. e) Treponema pallidum. f) Vibrio cholerae.	15	15
5	March	Unit V : Other Pathogenic organisms	a) Viruses- AIDS , Hepatitis, Polio, Rabies. b) Rickettsias- R. prowazekii c) Protozoa- E. histolytica d) Fungi-C. albicans	15	15
6	April	Unit VI : Antimicrobial chemotherapy	a) Ideal characters of chemotherapeutic agents b) Major antimicrobial agents and its clinical uses- i) Antibacterial agents: Rifampicin, Chloramphenicol, Streptomycin and Ciprofloxacin ii) Antiviral agents: Azidothymidine, Amantadine. iii) Antifungal agents: Griseofulvin, Amphotericin B, Imidazoles. c) Basic mechanism of antibiotic action d) Antimicrobial	15	15

			susceptibility testing: Introduction to CLSI (NCCLS), MIC. Disc diffusion, agar dilution, broth dilution (macro and micro).		

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Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2017-18
B.Sc.-IIIrd Semester-Vth

(Environmental Microbiology and Bioinstrumentation)

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	July	Unit-I : Microbial Associations and Air Microbiology	A. Microbial Associations : Definition and examples of positive(Mutualism, Commensalism, Synergism), negative (Antagonism, Competition, Parasitism) and neutral association	08	15
		B. Air Microbiology	a) The atmosphere and its layers. b) Different types of microorganisms in air. c) Techniques for microbiological analysis of air: i) Solid impingement devices ii) Liquid impingement devices. d) Airborne diseases : Etiology, symptoms and prevention. e) Control of microorganisms in air	07	
2	July Aug	Unit-II : Microbiology of Soil.	a) Microorganisms in soil. b) Rhizosphere. c) Decomposition of plant and animal residues in soil. d) Definition, formation, function and microbiology of humus and compost. e) Biological Nitrogen fixation : Type of nitrogen fixing microorganisms, factors affecting and mechanism of symbiotic and non-symbiotic nitrogen fixation. Process of nodulation, nitrogenase complex, recombinant DNA and nitrogen fixation, legume inoculants. f) Cycles of elements in nature : i) Carbon cycle : CO ₂ fixation, organic carbon degradation. ii) Nitrogen cycle : Proteolysis, amino acid degradation, Nitrification, Denitrification, Degradation of nucleic acids. iii) Sulphur cycle iv) Phosphorus cycle. v) Biofertilizers, biological pest control	15	15
3	Sept	Unit III : Water Microbiology	a) Planktons : Definition, types, factors affecting growth of planktons, methods of enumeration, beneficial and harmful activities of planktons b) Control of plankton problems c) Eutrophication and its control	15	15
4		Unit IV : Assessment of Water Quality and Treatment Bacteriological analysis of water:	i) Significance of bacteriological analysis of water. ii) Collection and handling of water sample from various sources. iii) Indicators of excretal pollution. iv) Multiple tube dilution technique, MPN. v) IMViC classification of coliform. vi) Membrane filter technique for coliform	15	15

			and faecal Streptococci. vii) ICMR and WHO Bacteriological standards of drinking water		
5	Sept	Unit V : A) Water Treatment	a) Self purification of water : Various zones and factors responsible for self purification. b) Treatment of water : Aeration, Coagulation, Flocculation, Sedimentation and Filtration. c) Slow and Rapid sand filters : Construction, mechanism of filtration, differences. d) Methods of chlorination : Plain, super chlorination, ammoniachlorine treatment, Break-point chlorination	08	15
		B)Waste Water Treatment	a) Aims of sewage treatment, composition of sewage. b) Municipal sewage treatment plant. c) Preliminary treatment (seiving and Grit chamber) d) Primary treatment(sedimentation) e) Secondary treatment (Aerobic) i) Trickling filter ii) Activated sludge process iii) Oxidation pond f) Anaerobic sludge digestion g) Domestic sewage treatment by septic tank and Imhoff tank. h) Concept of COD,BOD. i) Outline of bio-gas production	07	
6	Oct	Unit VI : Bio- Instrumentation	a) Spectroscopy- Definition, Principle, types (UV&IR) & its applications. b) Electrophoresis- Definition, Principle, types (Paper&Gel) & its applications. c) Chromatography- Definition, Principle, types (Paper&TLC) & its applications. d) I sotopic Tracer Techniques - Definition, Principle & applications	15	15

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Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2017-18
B.Sc.-IIIrdSemester-VIth

(Industrial Fermentation, Food Microbiology and Metabolism)

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Dec-17 Jan-18	Unit- I : Fermentation in General	a) Definition and scope of Industrial microbiology and biotechnology. b) Important classes of industrial microorganisms. c) Fermentation :- Definition and types (batch and continuous, aerobic and anaerobic, surface and submerged fermentations) d) Production strains e) Screening :- Definition, Primary screening (crowded plate technique, auxonography, enrichment culture technique, use of indicator dyes), secondary screening. f) Scale up process :- Definition and significance. g) Inoculum buildup : Spore and vegetative inoculum. h) General layout of fermentation plant :- Fermentation equipment and its uses. i) Raw materials :- Composition and uses. Saccharine, starchy, cellulose raw materials, hydrocarbon and vegetable oils, nitrogenous material (corn steep liquor). j) Antifoam agents. k) Sterilization of media :- Batch and continous sterilization. l) Detection and assay of fermentation products	15	15
2	Jan	Unit- II : Industrial Productions I:	Microorganisms, raw material, inoculums buildup, fermentation conditions, recovery, uses and mechanism of the following products. a) Ethyl-alcohol : From molasses and waste sulphite liquor. b) Beer. c) Wine (Red table and White table). d) Acetone- Butanol from corn. e) Citric acid f) Vinegar- Fring's process	15	15

3	Feb	Unit- III : Industrial Productions II:	a) Baker's yeast : From molasses, Definition of compressed and active dry yeast. b) Single cell protein : From bacteria. c) Penicillin. d) Amylase : Bacterial and fungal. e) Vitamin B12.	15	15
4	Feb March	Unit-IV : Microbiology of Milk	a) Definition b) Composition and types of milk. c) Sources of microorganisms in Milk. d) Types of microorganisms in milk. e) Pasteurization of milk : LHT, HTST, UHT. Phosphatase test. f) Grades of milk. g) Concentrated milk and milk powder. h) Preparation of fermented milk products, butter and cheese.	15	15
5	March	Unit-V : Food Microbiology	a) Sources of contamination of fresh food. b) Microbial spoilage of foods. c) Preservation of foods :- Low and high temperature, dehydration, high osmotic pressure, chemical preservation, radiations and canning. d) Fermented foods : Idli, pickles and sauerkraut. e) Food poisoning : Food infection and food intoxication. f) Indicators of food contamination as per WHO.	15	15
6	April	Unit VI : Enzymology and Metabolism A Enzymology :	a) Nature and Definition. b) Classification and nomenclature of enzymes. c) Terminologies used in enzymology :- Enzyme, active site, substrate, co-enzyme, cofactors, prosthetic group, poloenzyme, apoenzyme, activation energy, isoenzyme, allosteric enzyme, inhibitors, immobilised enzymes.	10	15
		B Metabolism :	a) General strategies of metabolism. b) EMP pathway, TCA cycle. c) Oxidative phosphorylation and Electron transport chain.	05	

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B.Sc.-Ist Semester-Ist

Paper-Fundamentals of Microbiology and Microbial Physiology

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		A. History of Microbiology:	b. Controversy over Spontaneous, generation, Contributions of Aristotle, Redi, Needham, Schulze and Schwan, Schroder& Vandusch, Louis Pasteur, John Tyndall c. Germ theory of diseases- Joseph Lister, Koch postulates, River postulates. d. Pure culture concept- Joseph Lister, Koch, DeBarry.		
		B. Scope of Microbiology as a modern Science	a. Industrial Microbiology, Environmental Microbiology, Medical microbiology, Food and Dairy Microbiology, Genetic engineering and Biotechnology. b. Different types of Microorganisms (outline) c. Distribution of Microorganisms in nature, and their beneficial and harmful activities	07	
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		B. Principles, construction, ray diagram and applications:	i) Compound Microscope, ii) Darkfield Microscope, iii) Phase Constrast microscope iv) Fluorescent Microscope, v) Electron Microscope.	05	

		C. Staining:	Dyes and Staining,- Definations, auxochromes, Chromophore, mordents, chromogens, Leucostains, Principles and Methods of the following techniques: i. Simple staining ii. Differential- Gram, Acid fast, iii. Structural-Endospore, flagell	04	

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			B. General characteristics of : i. Viruses, ii. Fungi (Including yeasts) iii. Actinomycetes, iv. Mycoplasma and Rickettsia v. Algae	07	
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		B. Pure Culture Techniques:	i. Definition- Pure and Mixed culture: ii. Methods of Isolation of Pure culture, Serial dilution, Streak plate, pour plate, spread plate, Enrichment culture, and Single cell isolation method. iii. Methods of preservation of pure culture- Agar slants, Sa line suspension, Overlaying with oil, Freeze drying.	07	
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			protein structure. iv) Nucleic acid – Purine & pyrimidine bases, nucleotides , & nucleosides , structure of DNA, structure of RNA (mRNA , tRNA, rRNA)		
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B.Sc.-IInd Semester-IIIrd

Paper-Molecular Biology and Genetic Engineering.

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			Transduction. c) Conjugation: Experiment of Lederberg and Tatum, Experiment of Davis, Nature and function of F Plasmid. Hfr formation. Various Mating types. Mechanism of conjugation: i) F ⁺ x F ⁻ ii) Hfr X F ⁻ . F' Plasmid and Sexduction		
4	Sept	Unit-IV Tools of Genetic Engineering:	a) Introduction to basic technique of genetic engineering. b) Enzymes for splicing: Restriction endonucleases. c) Range of DNA manipulating enzymes: Nucleases, Ligases, Polymerases, DNA modifying enzymes, Topoisomerases. d) Vectors: Ideal characters and types: Plasmid, Cosmid and Bacteriophage.	15	15
5	Sept	Unit V : Techniques of genetic engineering:	a) Isolation of Genomic and Plasmid DNA from bacteria, Analysis of DNA fragment size by agarose gel electrophoresis. b) Introducing DNA into host cell, competent cells, transduction of cells and identification of transformed cell (e.g. Antibiotic resistance gene in Plasmid) Selection of clones: Direct (colony hybridization) and Indirect method (southern blotting). c) Definition, method and applications of gene mapping, DNA sequencing (by microarray) and PCR. d) Introduction to expression of cloned genes. Construction of gene library. Cells for cloning.	15	15
6	Oct	Unit VI : Applications of Genetic Engineering:	a) Health care biotechnology: - Recombinant Insulin, Recombinant Hepatitis vaccine, Gene therapy, DNA probes in diagnosis. b) Agricultural biotechnology: - Transgenic plants. c) Environmental biotechnology: - Genetically engineered microbes for pollution control. d) Industrial biotechnology: - Strain improvement for industrial product	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2018-19
B.Sc.-IInd Semester-IVth

Medical Microbiology

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Dec-17 Jan-18	Unit I : Epidemiology	a) Definition, classification and scope of epidemiology. b) Infection- Types of infection and modes of transmission c) Normal flora of human body. d) Infection process, pathogenicity and virulence, Microbial virulence factors: toxins, enzymes e) Control of communicable diseases.	15	15
2	Jan	Unit II : Immunology	a) Organs and cells of immune system b) General Nonspecific factors- Physiological barriers, Natural cellular factors, Natural humoral factors. c) Immunity- Definition and classification d) Innate immunity- Species, Racial, Individual, Herd immunity. e) Acquired immunity- Active and passive immunity, f) Immune response and hypersensitivity	15	15
3	Feb	Unit III : Serology	a) Antigens- Definition, types and factors determining antigenicity, Bacterial antigens. b) Antibodies- Definition, Structure, classification, Properties and differences, monoclonal antibodies. c) Antigen Antibody reactions- Agglutination, Precipitation, Complement fixation test, ELISA and RIA.	15	15
4	Feb March	Unit IV : Pathogenic Bacteria	Study of following bacteria with respect to their morphology, cultural and biochemical properties, antigenic structure, pathogenesis, laboratory diagnosis and prophylaxis: a) Staphylococcus aureus. b) Clostridium tetani. c) Salmonella typhi. d) Mycobacterium tuberculosis. e) Treponema pallidum. f) Vibrio cholerae.	15	15
5	March	Unit V : Other Pathogenic organisms	a) Viruses- AIDS , Hepatitis, Polio, Rabies. b) Rickettsias- R. prowazekii c) Protozoa- E. histolytica d) Fungi- C. albicans	15	15
6	April	Unit VI : Antimicrobial chemotherapy	a) Ideal characters of chemotherapeutic agents b) Major antimicrobial agents and its clinical uses- i) Antibacterial agents: Rifampicin, Chloramphenicol, Streptomycin and Ciprofloxacin ii) Antiviral agents: Azidothymidine, Amantadine. iii) Antifungal agents:	15	15

			Griseofulvin, Amphotericin B, Imidazoles. c) Basic mechanism of antibiotic action d) Antimicrobial susceptibility testing: Introduction to CLSI (NCCLS), MIC. Disc diffusion, agar dilution, broth dilution (macro and micro).		

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana**Department of Microbiology****Teaching Plan Session-2018-19****B.Sc.-IIIrd Semester-Vth****(Environmental Microbiology and Bioinstrumentation)**

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	July	Unit-I : Microbial Associations and Air Microbiology	A. Microbial Associations : Definition and examples of positive(Mutualism, Commensalism, Synergism), negative (Antagonism,Competition, Parasitism) and neutral association	08	15
		B. Air Microbiology	a) The atmosphere and its layers. b) Different types of microorganisms in air. c) Techniques for microbiological analysis of air: i) Solid impingement devices ii) Liquid impingement devices. d) Airborne diseases : Etiology, symptoms and prevention. e) Control of microorganisms in air	07	
2	July Aug	Unit-II : Microbiology of Soil.	a) Microorganisms in soil. b) Rhizosphere. c) Decomposition of plant and animal residues in soil. d) Definition, formation, function and microbiology of humus and compost. e) Biological Nitrogen fixation : Type of nitrogen fixing microorganisms, factors affecting and mechanism of symbiotic and non-symbiotic nitrogen fixation. Process of nodulation, nitrogenase complex, recombinant DNA and nitrogen fixation, legume inoculants. f) Cycles of elements in nature : i) Carbon cycle : CO ₂ fixation, organic carbon degradation. ii) Nitrogen cycle : Proteolysis, amino acid degradation, Nitrification, Denitrification, Degradation of nucleic acids. iii) Sulphur cycle Iv) Phosphorus cycle. v) Biofertilizers, biological pest control	15	15
3	Sept	Unit III : Water Microbiology	a) Planktons : Definition, types, factors affecting growth of planktons, methods of enumeration, beneficial and harmful activities of planktons b) Control of plankton problems c) Eutrophication and its control	15	15
4		Unit IV : Assessment of Water Quality and Treatment Bacteriological	i) Significance of bacteriological analysis of water. ii) Collection and handling of water sample from various sources. iii) Indicators of excretal pollution. iv) Multiple tube dilution technique, MPN. v) IMViC classification	15	15

		analysis of water:	of coliform. vi) Membrane filter technique for coliform and faecal Streptococci. vii) ICMR and WHO Bacteriological standards of drinking water		
5	Sept	Unit V : A) Water Treatment	a) Self purification of water : Various zones and factors responsible for self purification. b) Treatment of water : Aeration, Coagulation, Flocculation, Sedimentation and Filtration. c) Slow and Rapid sand filters : Construction, mechanism of filtration, differences. d) Methods of chlorination : Plain, super chlorination, ammoniachlorine treatment, Break-point chlorination	08	15
		B)Waste Water Treatment	a) Aims of sewage treatment, composition of sewage. b) Municipal sewage treatment plant. c) Preliminary treatment (seiving and Grit chamber) d) Primary treatment(sedimentation) e) Secondary treatment (Aerobic) i) Trickling filter ii) Activated sludge process iii) Oxidation pond f) Anaerobic sludge digestion g) Domestic sewage treatment by septic tank and Imhoff tank. h) Concept of COD,BOD. i) Outline of bio-gas production	07	
6	Oct	Unit VI : Bio-Instrumentation	a) Spectroscopy- Definition, Principle, types (UV&IR) & its applications. b) Electrophoresis- Definition, Principle, types (Paper&Gel) & its applications. c) Chromatography- Definition, Principle, types (Paper&TLC) & its applications. d) I sotopic Tracer Techniques - Definition, Principle & applications	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2018-19
B.Sc.-IIIrdSemester-VIth

(Industrial Fermentation, Food Microbiology and Metabolism)

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Dec-17 Jan-18	Unit- I : Fermentation in General	a) Definition and scope of Industrial microbiology and biotechnology. b) Important classes of industrial microorganisms. c) Fermentation :- Definition and types (batch and continuous, aerobic and anaerobic, surface and submerged fermentations) d) Production strains e) Screening :- Definition, Primary screening (crowded plate technique, auxonography, enrichment culture technique, use of indicator dyes), secondary screening. f) Scale up process :- Definition and significance. g) Inoculum buildup : Spore and vegetative inoculum. h) General layout of fermentation plant :- Fermentation equipment and its uses. i) Raw materials :- Composition and uses. Saccharine, starchy, cellulose raw materials, hydrocarbon and vegetable oils, nitrogenous material (corn steep liquor). j) Antifoam agents. k) Sterilization of media :- Batch and continous sterilization. l) Detection and assay of fermentation products	15	15
2	Jan	Unit- II : Industrial Productions I:	Microorganisms, raw material, inoculums buildup, fermentation conditions, recovery, uses and mechanism of the following products. a) Ethyl-alcohol : From molasses and waste sulphite liquor. b) Beer. c) Wine (Red table and White table). d) Acetone- Butanol from corn. e) Citric acid f) Vinegar- Fring's process	15	15

3	Feb	Unit- III : Industrial Productions II:	a) Baker's yeast : From molasses, Definition of compressed and active dry yeast. b) Single cell protein : From bacteria. c) Penicillin. d) Amylase : Bacterial and fungal. e) Vitamin B12.	15	15
4	Feb March	Unit-IV : Microbiology of Milk	a) Definition b) Composition and types of milk. c) Sources of microorganisms in Milk. d) Types of microorganisms in milk. e) Pasteurization of milk : LHT, HTST, UHT. Phosphatase test. f) Grades of milk. g) Concentrated milk and milk powder. h) Preparation of fermented milk products, butter and cheese.	15	15
5	March	Unit-V : Food Microbiology	a) Sources of contamination of fresh food. b) Microbial spoilage of foods. c) Preservation of foods :- Low and high temperature, dehydration, high osmotic pressure, chemical preservation, radiations and canning. d) Fermented foods : Idli, pickles and sauerkraut. e) Food poisoning : Food infection and food intoxication. f) Indicators of food contamination as per WHO.	15	15
6	April	Unit VI : Enzymology and Metabolism A Enzymology :	a) Nature and Definition. b) Classification and nomenclature of enzymes. c) Terminologies used in enzymology :- Enzyme, active site, substrate, co-enzyme, cofactors, prosthetic group, poloenzyme, apoenzyme, activation energy, isoenzyme, allosteric enzyme, inhibitors, immobilised enzymes.	10	15
		B Metabolism :	a) General strategies of metabolism. b) EMP pathway, TCA cycle. c) Oxidative phosphorylation and Electron transport chain.	05	

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2019-20
B.Sc.-Ist Semester-Ist

Paper-Fundamentals of Microbiology and Microbial Physiology

Sr. No.	Month	Name of Unit	Topics Names	Required Lecture	Total Lects.
1	July	UNIT I:	a. Discovery of microscope- Leeuenhoek, Robert Hook.	08	15
		A. History of Microbiology:	b. Controversy over Spontaneous, generation, Contributions of Aristotle, Redi, Needham, Schulze and Schwan, Schroder & Vandsusch, Louis Pasteur, John Tyndall c. Germ theory of diseases- Joseph Lister, Koch postulates, River postulates. d. Pure culture concept- Joseph Lister, Koch, DeBarry.		
		B. Scope of Microbiology as a modern Science	a. Industrial Microbiology, Environmental Microbiology, Medical microbiology, Food and Dairy Microbiology, Genetic engineering and Biotechnology. b. Different types of Microorganisms (outline) c. Distribution of Microorganisms in nature, and their beneficial and harmful activities	07	
2	July - Aug	UNIT II:	i) Definitions- Magnification, Resolving power, numerical ap erture, focal length, Working Distance Aberrations, ii) Objectives- Functions, low and high power objectives, Oil mmersion objectives, iii) Ocular- Functions, Huygenian, Ramsden, Hyperplane and compensating. iv) Condensor- Functions, Abbe, parabolic v) Iris diaphragm	06	15
		B. Principles, construction, ray diagram and applications:	i) Compound Microscope, ii) Darkfield Microscope, iii) Phase Contrast microscope iv) Fluorescent Microscope, v) Electron Microscope.	05	

		C. Staining:	Dyes and Staining,- Definations, auxochromes, Chromophore, mordents, chromogens, Leucostains, Principles and Methods of the following techniques: i. Simple staining ii. Differential- Gram, Acid fast, iii. Structural-Endospore, flagell	04	

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lect.	Total Lects.
3	Aug	UNIT III : Classification of Microorganism:	A.Bacterial Classification: i. Definition- Taxonomy, Classification, Taxonomic rank, Identification, Nomenclature, ii. Bergy's manual of systematic Bacteriology, General characteristics enlisting all partswith major characters and examples(Vol.I to IV) iii. Methods of Classification: Intuitive,Numerical taxanomy, Genetic relatedness,	08	15
			B. General characteristics of : i. Viruses, ii. Fungi (Including yeasts) iii. Actinomycetes, iv. Mycoplasma and Rickettsia v. Algae	07	
4	Sep	UNIT IV: Structural Organization of Bacteria:	a) Concept of prokaryoes and Eukaryotes; Comparison and Differences. b) Typical Bacterial cell c) Shape, Size and Arrangement of Bacteria d) Structure and functions of following: . Capsule and slime layer ii. Cell wall- Gram positive and Gram negative bacteria. iii. Cytoplasmic membrane- fluid mosaic model iv. Flagella- Arrangement, Mechanism of flagellar move ment. v. Pili-Arrangement and function vi. Ribosomes- Procaryotic and Eucaryotic vii. Plasmid- Definition, General characters, classes viii. Bacterial chromosome ix. Endospors- Structure and arrangements	15	15

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lect.	Total Lects.
5	Sept- Oct	UNITV: A. Microbial Nutrition:	i. Basic Nutritional Requirements: Sources of C, N, O, P, S, Energy, Macronutrients, Growth factors, water etc. ii. Media; Synthetic, Nonsynthetic, Liquid and Solid, Semi solid, Differential, Enriched, Selective media. Role of beef extract, yeast extract, peptone, agar and gelatin. iii. Determination of nutritional requirements: Auxanographic technique, Replica plating technique. iv. Nutritional classification; on the basis of source of carbon and energy	08	14
		B. Pure Culture Techniques:	i. Definition- Pure and Mixed culture: ii. Methods of Isolation of Pure culture, Serial dilution, Streak plate, pour plate, spread plate, Enrichment culture, and Single cell isolation method. iii. Methods of preservation of pure culture- Agar slants, Sa line suspension, Overlaying with oil, Freeze drying.	07	
6	Oct	UNIT VI: Reproduction and Growth of Bacteria:	a) Reproduction: Binary fission, Budding, Fragmentation, Sporulation, b) Growth rate and generation time- Definition, mathematical expression. c) Bacterial growth curve d) Synchronous culture: Definition, methods of isolation (Helmstetter- Cummings Technique) and application. e) Continuous culture: Definition, method (chemostat, and Turbidostat Techniques) and Application. f) Measurement of Growth: i. Cell number measurement- Breed method, Colony count ii. Cell mass measurement- Dry weight and Turbidity measurement. iii. Cell activity measurement- Biochemical activity iv. Factors influencing bacterial Growth- Temperature, pH, Gaseous	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology

Teaching Plan Session-2019-20

B.Sc.-Ist Semester-IInd

Paper- Microbiology, Biochemistry, Biostatistics & Computers

Sr. No.	Month	Name of Unit	Topics Names	Required Lecture	Total Lects.
1	Dec-17 Jan-18	UNIT I : VIRUSES	i) Discovery of viruses ii) Structure of viruses iii) Classification of viruses (LHT System) iv) Replication of viruses – Lytic cycle (T4), Lysogeny (Lambda phage) v) Cultivation of viruses – Embryo culture, Tissue culture method . vi) Interferon	15	15
2	Jan	UNIT-II : MICROBIAL CONTROL	i) Definition and Terms- Sterilization, disinfection, Antiseptic, Sanitizer, Germicide, Microbiostatic, Antimicrobial agent ii) Mechanism of cell Injury - Damage of cell wall, cell membrane, Inhibition of metabolic reactions. iii) Physical Control :- Temperature, osmotic pressure, Radiation, filtration. iv) Chemical Control – Chemistry and mode of action of halogens, heavy metals and their derivatives, Alcohols, Detergents and Gaseous Sterilization. v) Chemotherapeutic agents.- Definition and mode of action of penicillin , tetracycline, Norfloxacin	15	15
3	Feb	UNIT-III APPLIED ASPECTS OF MICROORGANISMS IN -	i) Agriculture – Biofertilizers & Biopesticides. ii) Human and Animal Health – Antibiotics, Vaccines iii) Industry (Food, Chemical & Pharmaceutical) – List of Microbial products (and producing organisms) iv) Environmental – Biodegradation and Bioleaching	15	15
4	Feb March	UNIT-IV BASIC BIOCHEMISTRY	i) Carbohydrates – Classification, different types of Glycosidic linkages eg- Maltose sucrose, Lactose, starch ii) Lipids – Classification, concept of saturated and unsaturated fatty acids, outline of conjugated & derived lipids iii) Proteins – Classification of Amino	15	15

			acids, concept of peptide bond , elementary concept of protein structure. iv) Nucleic acid – Purine & pyrimidine bases, nucleotides , & nucleosides , structure of DNA, structure of RNA (mRNA , tRNA, rRNA)		
5	March	UNIT-V : BIOSTATISTICS	i) Importance & application – Tabulation & Classification of data, Frequency distribution & graphical distribution of data. ii) Measures of central tendencies – Mean , Mode, Median & their Properties iii) Co relation & their Linear regression – Coefficient of correlation, linear least square Fit method of regression. iv) Hypothesis testing- (chi square test) x2 test, t-test v) Different models of data presentation with special reference to Biological samples.	15	15
6	April	UNIT-VI COMPUTER CONCEPTS :-	i) Components of computer system – Hardware, input devices, CPU, output devices , Monitor, software. ii) Memory concept- Computer memory primary & secondary memory in computers iii) Window Operating systems :- Introduction graphical user interface systems, desktop menus, launching a program through start menu. iv) MS-Word- creating, saving operating editing, closing a document, entering & editing texts. v) Using Internet explorer , MS power point, creating e-mails.	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2019-20

B.Sc.-IInd Semester-IIIrd

Paper-Molecular Biology and Genetic Engineering.

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	July	Unit I : Gene multiplication and expression	a) Concept of gene – Definition of Gene, Muton, recon, cistron, gene within gene, split gene. b) Replication of DNA- Modes of replication, (Conservative, Semiconservative and Dispersive). Experiment of Meselson and Stahl to prove semiconservative mode of replication. Mechanism of replication with enzymes involved, models of replication: Knife and fork, rolling circle. c) DNA repair mechanisms- light and dark. d) Genetic code- Characteristic features of genetic code. e) Out line of Protein synthesis- Transcription and Translation	15	15
2	July Aug	Unit II : Gene Regulation and Mutation	a) Gene regulation Mechanisms - lac operon , trp operon. b) Mutation- Definition & types of mutations - Base pair substitution, frame-shift, point, missense, nonsense & silent mutations, Random Vs. Directed mutation, Rate of mutation, Effect of Mutation on Phenotype, c) Genetic suppressions:- Intragenic (Intracodon suppression, reading frame Suppression) and extragenic suppression (Non sense and Missense Suppression). d) Molecular basis of spontaneous and induced mutations - Spontaneous mutation (Tautomerism), Induced Mutation (Chemical Mutagens) e.g. Base analogues, Nitrous Oxide, Hydroxylamine, Acridine dyes, Physical mutagens e.g. X-rays, Gamma rays, U.V. light.	15	15
3	Aug	Unit III : Genetic recombination:	Mechanism of recombination : Breakage and reunion, breakage and copying, complete copy choice Transfer of genetic material in prokaryotes: a) Transformation: Experiment of Griffith. Avery, MacLeod and McCarty experiment to prove Genetic Transformation. Mechanism of Transformation. b) Transduction: Experiment of Zinder and Lederberg. General mechanism of Transduction. Types of Transduction: Generalized and Restricted, Complete and	15	15

			Abortive, Low Frequency and High Frequency Transduction. Comparison between Transformation and Transduction. c) Conjugation: Experiment of Lederberg and Tatum, Experiment of Davis, Nature and function of F Plasmid. Hfr formation. Various Mating types. Mechanism of conjugation: i) F ⁺ x F ⁻ ii) Hfr X F ⁻ . F' Plasmid and Sexduction		
4	Sept	Unit-IV Tools of Genetic Engineering:	a) Introduction to basic technique of genetic engineering. b) Enzymes for splicing: Restriction endonucleases. c) Range of DNA manipulating enzymes: Nucleases, Ligases, Polymerases, DNA modifying enzymes, Topoisomerases. d) Vectors: Ideal characters and types: Plasmid, Cosmid and Bacteriophage.	15	15
5	Sept	Unit V : Techniques of genetic engineering:	a) Isolation of Genomic and Plasmid DNA from bacteria, Analysis of DNA fragment size by agarose gel electrophoresis. b) Introducing DNA into host cell, competent cells, transduction of cells and identification of transformed cell (e.g. Antibiotic resistance gene in Plasmid) Selection of clones: Direct (colony hybridization) and Indirect method (southern blotting). c) Definition, method and applications of gene mapping, DNA sequencing (by microarray) and PCR. d) Introduction to expression of cloned genes. Construction of gene library. Cells for cloning.	15	15
6	Oct	Unit VI : Applications of Genetic Engineering:	a) Health care biotechnology: - Recombinant Insulin, Recombinant Hepatitis vaccine, Gene therapy, DNA probes in diagnosis. b) Agricultural biotechnology: - Transgenic plants. c) Environmental biotechnology: - Genetically engineered microbes for pollution control. d) Industrial biotechnology: - Strain improvement for industrial product	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana**Department of Microbiology**

Teaching Plan Session-2019-20

B.Sc.-IInd Semester-IVth**Medical Microbiology**

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Dec-17 Jan-18	Unit I : Epidemiology	a) Definition, classification and scope of epidemiology. b) Infection- Types of infection and modes of transmission c) Normal flora of human body. d) Infection process, pathogenicity and virulence, Microbial virulence factors: toxins, enzymes e) Control of communicable diseases.	15	15
2	Jan	Unit II : Immunology	a) Organs and cells of immune system b) General Nonspecific factors- Physiological barriers, Natural cellular factors, Natural humoral factors. c) Immunity- Definition and classification d) Innate immunity- Species, Racial, Individual, Herd immunity. e) Acquired immunity- Active and passive immunity, f) Immune response and hypersensitivity	15	15
3	Feb	Unit III : Serology	a) Antigens- Definition, types and factors determining antigenicity, Bacterial antigens. b) Antibodies- Definition, Structure, classification, Properties and differences, monoclonal antibodies. c) Antigen Antibody reactions- Agglutination, Precipitation, Complement fixation test, ELISA and RIA.	15	15
4	Feb March	Unit IV : Pathogenic Bacteria	Study of following bacteria with respect to their morphology, cultural and biochemical properties, antigenic structure, pathogenesis, laboratory diagnosis and prophylaxis: a) Staphylococcus aureus. b) Clostridium tetani. c) Salmonella typhi. d) Mycobacterium tuberculosis. e) Treponema pallidum. f) Vibrio cholerae.	15	15
5	March	Unit V : Other Pathogenic organisms	a) Viruses- AIDS , Hepatitis, Polio, Rabies. b) Rickettsias- R. prowazekii c) Protozoa- E. histolytica d) Fungi- C. albicans	15	15
6	April	Unit VI : Antimicrobial chemotherapy	a) Ideal characters of chemotherapeutic agents b) Major antimicrobial agents and its clinical uses- i) Antibacterial agents: Rifampicin, Chloramphenicol,	15	15

			Streptomycin and Ciprofloxacin ii) Antiviral agents: Azidothymidine, Amantadine. iii) Antifungal agents: Griseofulvin, Amphotericin B, Imidazoles. c) Basic mechanism of antibiotic action d) Antimicrobial susceptibility testing: Introduction to CLSI (NCCLS), MIC. Disc diffusion, agar dilution, broth dilution (macro and micro).		

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2019-20
B.Sc.-IIIrd Semester-Vth

(Environmental Microbiology and Bioinstrumentation)

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	July	Unit-I : Microbial Associations and Air Microbiology	A. Microbial Associations : Definition and examples of positive(Mutualism, Commensalism, Synergism), negative (Antagonism, Competition, Parasitism) and neutral association	08	15
		B. Air Microbiology	a) The atmosphere and its layers. b) Different types of microorganisms in air. c) Techniques for microbiological analysis of air: i) Solid impingement devices ii) Liquid impingement devices. d) Airborne diseases : Etiology, symptoms and prevention. e) Control of microorganisms in air	07	
2	July Aug	Unit-II Microbiology of Soil.	: a) Microorganisms in soil. b) Rhizosphere. c) Decomposition of plant and animal residues in soil. d) Definition, formation, function and microbiology of humus and compost. e) Biological Nitrogen fixation : Type of nitrogen fixing microorganisms, factors affecting and mechanism of symbiotic and non-symbiotic nitrogen fixation. Process of nodulation, nitrogenase complex, recombinant DNA and nitrogen fixation, legume inoculants. f) Cycles of elements in nature : i) Carbon cycle : CO ₂ fixation, organic carbon degradation. ii) Nitrogen cycle : Proteolysis, amino acid degradation, Nitrification, Denitrification, Degradation of nucleic acids. iii) Sulphur cycle Iv) Phosphorus cycle. v) Biofertilizers, biological pest control	15	15
3	Sept	Unit III : Water Microbiology	a) Planktons : Definition, types, factors affecting growth of planktons, methods of enumeration, beneficial and harmful activities of planktons b) Control of plankton problems c) Eutrophication and its control	15	15

4		Unit IV : Assessment of Water Quality and Treatment Bacteriological analysis of water:	i) Significance of bacteriological analysis of water. ii) Collection and handling of water sample from various sources. iii) Indicators of excretal pollution. iv) Multiple tube dilution technique, MPN. v) IMViC classification of coliform. vi) Membrane filter technique for coliform and faecal Streptococci. vii) ICMR and WHO Bacteriological standards of drinking water	15	15
5	Sept	Unit V : A) Water Treatment	a) Self purification of water : Various zones and factors responsible for self purification. b) Treatment of water : Aeration, Coagulation, Flocculation, Sedimentation and Filtration. c) Slow and Rapid sand filters : Construction, mechanism of filtration, differences. d) Methods of chlorination : Plain, super chlorination, ammoniachlorine treatment, Break-point chlorination	08	15
		B)Waste Water Treatment	a) Aims of sewage treatment, composition of sewage. b) Muncipal sewage treatment plant. c) Preliminary treatment (seiving and Grit chamber) d) Primary treatment(sedimentation) e) Secondary treatment (Aerobic) i) Trickling filter ii) Activated sludge process iii) Oxidation pond f) Anaerobic sludge digestion g) Domestic sewage treatment by septic tank and Imhoff tank. h) Concept of COD,BOD. i) Outline of bio-gas production	07	
6	Oct	Unit VI : Bio- Instrumentation	a) Spectroscopy- Definition, Principle, types (UV&IR) & its applications. b) Electrophoresis- Definition, Principle, types (Paper&Gel) & its applications. c) Chromatography- Definition, Principle, types (Paper&TLC) & its applications. d) I sotopic Tracer Techniques - Definition, Principle & applications	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2019-20
B.Sc.-IIIrdSemester-VIth

(Industrial Fermentation, Food Microbiology and Metabolism)

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Dec-17 Jan-18	Unit- I : Fermentation in General	a) Definition and scope of Industrial microbiology and biotechnology. b) Important classes of industrial microorganisms. c) Fermentation :- Definition and types (batch and continuous, aerobic and anaerobic, surface and submerged fermentations) d) Production strains e) Screening :- Definition, Primary screening (crowded plate technique, auxonography, enrichment culture technique, use of indicator dyes), secondary screening. f) Scale up process :- Definition and significance. g) Inoculum buildup : Spore and vegetative inoculum. h) General layout of fermentation plant :- Fermentation equipment and its uses. i) Raw materials :- Composition and uses. Saccharine, starchy, cellulose raw materials, hydrocarbon and vegetable oils, nitrogenous material (corn steep liquor). j) Antifoam agents. k) Sterilization of media :- Batch and continous sterilization. l) Detection and assay of fermentation products	15	15
2	Jan	Unit- II : Industrial Productions I:	:Microorganisms, raw material, inoculums buildup, fermentation conditions, recovery, uses and mechanism of the following products. a) Ethyl-alcohol : From molasses and waste sulphite liquor. b) Beer. c) Wine (Red table and White table). d) Acetone- Butanol from corn. e) Citric acid f) Vinegar- Fring's process	15	15

3	Feb	Unit- III : Industrial Productions II:	a) Baker's yeast : From molasses, Definition of compressed and active dry yeast. b) Single cell protein : From bacteria. c) Penicillin. d) Amylase : Bacterial and fungal. e) Vitamin B12.	15	15
4	Feb March	Unit-IV : Microbiology of Milk	a) Definition b) Composition and types of milk. c) Sources of microorganisms in Milk. d) Types of microorganisms in milk. e) Pasteurization of milk : LHT, HTST, UHT. Phosphatase test. f) Grades of milk. g) Concentrated milk and milk powder. h) Preparation of fermented milk products, butter and cheese.	15	15
5	March	Unit-V : Food Microbiology	a) Sources of contamination of fresh food. b) Microbial spoilage of foods. c) Preservation of foods :- Low and high temperature, dehydration, high osmotic pressure, chemical preservation, radiations and canning. d) Fermented foods : Idli, pickles and sauerkraut. e) Food poisoning : Food infection and food intoxication. f) Indicators of food contamination as per WHO.	15	15
6	April	Unit VI : Enzymology and Metabolism A Enzymology :	a) Nature and Definition. b) Classification and nomenclature of enzymes. c) Terminologies used in enzymology :- Enzyme, active site, substrate, co-enzyme, cofactors, prosthetic group, poloenzyme, apoenzyme, activation energy, isoenzyme, allosteric enzyme, inhibitors, immobilised enzymes.	10	15
		B Metabolism :	a) General strategies of metabolism. b) EMP pathway, TCA cycle. c) Oxidative phosphorylation and Electron transport chain.	05	

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2020-21
B.Sc.-Ist Semester-Ist

Paper-Fundamentals of Microbiology and Microbial Physiology

Sr. No.	Month	Name of Unit	Topics Names	Required Lecture	Total Lects.
1	July	UNIT I:	a. Discovery of microscope- Leeuwenhoek, Robert Hook.	08	15
		A. History of Microbiology:	b. Controversy over Spontaneous, generation, Contributions of Aristotle, Redi, Needham, Schulze and Schwan, Schroder & Vandsusch, Louis Pasteur, John Tyndall c. Germ theory of diseases- Joseph Lister, Koch postulates, River postulates. d. Pure culture concept- Joseph Lister, Koch, DeBarry.		
		B. Scope of Microbiology as a modern Science	a. Industrial Microbiology, Environmental Microbiology, Medical microbiology, Food and Dairy Microbiology, Genetic engineering and Biotechnology. b. Different types of Microorganisms (outline) c. Distribution of Microorganisms in nature, and their beneficial and harmful activities	07	
2	July - Aug	UNIT II:	i) Definitions- Magnification, Resolving power, numerical aperture, focal length, Working Distance Aberrations, ii) Objectives- Functions, low and high power objectives, Oil immersion objectives, iii) Ocular- Functions, Huygenian, Ramsden, Hyperplane and compensating. iv) Condensor- Functions, Abbe, parabolic v) Iris diaphragm	06	15
		B. Principles, construction, ray diagram and applications:	i) Compound Microscope, ii) Darkfield Microscope, iii) Phase Contrast microscope iv) Fluorescent Microscope, v) Electron Microscope.	05	

		C. Staining:	Dyes and Staining,- Definations, auxochromes, Chromophore, mordents, chromogens, Leucostains, Principles and Methods of the following techniques: i. Simple staining ii. Differential- Gram, Acid fast, iii. Structural-Endospore, flagell	04	

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lect.	Total Lects.
3	Aug	UNIT III : Classification of Microorganism:	A.Bacterial Classification: i. Definition- Taxonomy, Classification, Taxonomic rank, Identification, Nomenclature, ii. Bergy's manual of systematic Bacteriology, General characteristics enlisting all parts with major characters and examples(Vol.I to IV) iii. Methods of Classification: Intuitive, Numerical taxonomy, Genetic relatedness,	08	15
			B. General characteristics of : i. Viruses, ii. Fungi (Including yeasts) iii. Actinomycetes, iv. Mycoplasma and Rickettsia v. Algae	07	
4	Sep	UNIT IV: Structural Organization of Bacteria:	a) Concept of prokaryotes and Eukaryotes; Comparison and Differences. b) Typical Bacterial cell c) Shape, Size and Arrangement of Bacteria d) Structure and functions of following: i. Capsule and slime layer ii. Cell wall- Gram positive and Gram negative bacteria. iii. Cytoplasmic membrane- fluid mosaic model iv. Flagella- Arrangement, Mechanism of flagellar movement. v. Pili-Arrangement and function vi. Ribosomes- Prokaryotic and Eucaryotic vii. Plasmid- Definition, General characters, classes viii. Bacterial chromosome ix. Endospores- Structure and arrangements	15	15

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lect.	Total Lects.
5	Sept- Oct	UNITV: A. Microbial Nutrition:	i. Basic Nutritional Requirements: Sources of C, N, O, P, S, Energy, Macronutrients, Growth factors, water etc. ii. Media; Synthetic, Nonsynthetic, Liquid and Solid, Semi solid, Differential, Enriched, Selective media. Role of beef extract, yeast extract, peptone, agar and gelatin. iii. Determination of nutritional requirements: Auxanographic technique, Replica plating technique. iv. Nutritional classification; on the basis of source of carbon and energy	08	14
		B. Pure Culture Techniques:	i. Definition- Pure and Mixed culture: ii. Methods of Isolation of Pure culture, Serial dilution, Streak plate, pour plate, spread plate, Enrichment culture, and Single cell isolation method. iii. Methods of preservation of pure culture- Agar slants, Sa line suspension, Overlaying with oil, Freeze drying.	07	
6	Oct	UNIT VI: Reproduction and Growth of Bacteria:	a) Reproduction: Binary fission, Budding, Fragmentation, Sporulation, b) Growth rate and generation time- Definition, mathematical expression. c) Bacterial growth curve d) Synchronous culture: Definition, methods of isolation (Helmstetter- Cummings Technique) and application. e) Continuous culture: Definition, method (chemostat, and Turbidostat Techniques) and Application. f) Measurement of Growth: i. Cell number measurement- Breed method, Colony count ii. Cell mass measurement- Dry weight and Turbidity measurement. iii. Cell activity measurement- Biochemical activity iv. Factors influencing bacterial Growth- Temperature, pH, Gaseous	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2020-21
B.Sc.-Ist Semester-IInd

Paper- Microbiology, Biochemistry, Biostatistics & Computers

Sr. No.	Month	Name of Unit	Topics Names	Required Lecture	Total Lects.
1	Dec-17 Jan-18	UNIT I : VIRUSES	i) Discovery of viruses ii) Structure of viruses iii) Classification of viruses (LHT System) iv) Replication of viruses – Lytic cycle (T4), Lysogeny (Lambda phage) v) Cultivation of viruses – Embryo culture, Tissue culture method . vi) Interferon	15	15
2	Jan	UNIT-II : MICROBIAL CONTROL	i) Definition and Terms- Sterilization, disinfection, Antiseptic, Sanitizer, Germicide, Microbiostatis, Antimicrobial agent ii) Mechanism of cell Injury - Damage of cell wall, cell membrane, Inhibition of metabolic reactions. iii) Physical Control :- Temperature, osmotic pressure, Radiation, filtration. iv) Chemical Control – Chemistry and mode of action of halogens, heavy metals and their derivatives, Alcohols, Detergents and Gaseous Sterilization. v) Chemotherapeutic agents.- Definition and mode of action of penicillin , tetracycline, Norfloxacin	15	15
3	Feb	UNIT-III APPLIED ASPECTS OF MICROORGANISMS IN -	i) Agriculture – Biofertilizers & Biopesticides. ii) Human and Animal Health – Antibiotics, Vaccines iii) Industry (Food, Chemical & Pharmaceutical) – List of Microbial products (and producing organisms) iv) Environmental – Biodegradation and Biobleaching	15	15
4	Feb March	UNIT-IV BASIC BIOCHEMISTRY	i) Carbohydrates – Classification, different types of Glycosidic linkages eg- Maltose sucrose, Lactose, starch ii) Lipids – Classification, concept of saturated and unsaturated fatty acids, outline of conjugated & derived lipids iii) Proteins – Classification of Amino acids, concept of peptide bond , elementary concept of	15	15

			protein structure. iv) Nucleic acid – Purine & pyrimidine bases, nucleotides , & nucleosides , structure of DNA, structure of RNA (mRNA , tRNA, rRNA)		
5	March	UNIT-V : BIOSTATISTIC S	i) Importance & application – Tabulation & Classification of data, Frequency distribution & graphical distribution of data. ii) Measures of central tendencies – Mean , Mode, Median & their Properties iii) Co relation & their Linear regression – Coefficient of cor relation, linear least square Fit method of regression. iv) Hypothesis testing- (chi square test) x2 test, t-test v) Different models of data presentation with special refer ence to Biological samples.	15	15
6	April	UNIT-VI COPUTER CONCEPTS :-	i) Components of computer system – Hardware, input devices, CPU, output devices , Monitor, software. ii) Memory concept- Computer memory primary & second ary memory in computers iii) Window Operating systems :- Introduction graphical user interface systems, desktop menus, launching a program through start menu. iv) MS-Word- creating, saving operating editing, closing a document, entering & editing texts. v) Using Internet explorer , MS power point, creating e-mails.	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana**Department of Microbiology****Teaching Plan Session-2020-21****B.Sc.-IInd Semester-IIIrd****Paper-Molecular Biology and Genetic Engineering.**

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	July	Unit I : Gene multiplication and expression	a) Concept of gene – Definition of Gene, Muton, recon, cistron, gene within gene, split gene. b) Replication of DNA- Modes of replication, (Conservative, Semiconservative and Dispersive). Experiment of Meselson and Stahl to prove semiconservative mode of replication. Mechanism of replication with enzymes involved, models of replication: Knife and fork, rolling circle. c) DNA repair mechanisms- light and dark. d) Genetic code- Characteristic features of genetic code. e) Out line of Protein synthesis- Transcription and Translation	15	15
2	July Aug	Unit II : Gene Regulation and Mutation	a) Gene regulation Mechanisms - lac operon , trp operon. b) Mutation- Definition & types of mutations - Base pair substitution, frame-shift, point, missense, nonsense & silent mutations, Random Vs. Directed mutation, Rate of mutation, Effect of Mutation on Phenotype, c) Genetic suppressions:- Intragenic (Intracodon suppression, reading frame Suppression) and extragenic suppression (Non sense and Missense Suppression). d) Molecular basis of spontaneous and induced mutations - Spontaneous mutation (Tautomerism), Induced Mutation (Chemical Mutagens) e.g. Base analogues, Nitrous Oxide, Hydroxylamine, Acridine dyes, Physical mutagens e.g. X-rays, Gamma rays, U.V. light.	15	15
3	Aug	Unit III : Genetic recombination:	Mechanism of recombination : Breakage and reunion, breakage and copying, complete copy choice Transfer of genetic material in prokaryotes: a) Transformation: Experiment of Griffith. Avery, MacLeod and McCarty experiment to prove Genetic Transformation. Mechanism of Transformation. b) Transduction: Experiment of Zinder and Lederberg. General mechanism of Transduction. Types of Transduction: Generalized and Restricted, Complete and Abortive, Low Frequency and High Frequency Transduction. Comparison between Transformation and	15	15

			Transduction. c) Conjugation: Experiment of Lederberg and Tatum, Experiment of Davis, Nature and function of F Plasmid. Hfr formation. Various Mating types. Mechanism of conjugation: i) F ⁺ x F ⁻ ii) Hfr X F ⁻ . F' Plasmid and Sexduction		
4	Sept	Unit-IV Tools of Genetic Engineering:	a) Introduction to basic technique of genetic engineering. b) Enzymes for splicing: Restriction endonucleases. c) Range of DNA manipulating enzymes: Nucleases, Ligases, Polymerases, DNA modifying enzymes, Topoisomerases. d) Vectors: Ideal characters and types: Plasmid, Cosmid and Bacteriophage.	15	15
5	Sept	Unit V : Techniques of genetic engineering:	a) Isolation of Genomic and Plasmid DNA from bacteria, Analysis of DNA fragment size by agarose gel electrophoresis. b) Introducing DNA into host cell, competent cells, transduction of cells and identification of transformed cell (e.g. Antibiotic resistance gene in Plasmid) Selection of clones: Direct (colony hybridization) and Indirect method (southern blotting). c) Definition, method and applications of gene mapping, DNA sequencing (by microarray) and PCR. d) Introduction to expression of cloned genes. Construction of gene library. Cells for cloning.	15	15
6	Oct	Unit VI : Applications of Genetic Engineering:	a) Health care biotechnology: - Recombinant Insulin, Recombinant Hepatitis vaccine, Gene therapy, DNA probes in diagnosis. b) Agricultural biotechnology: - Transgenic plants. c) Environmental biotechnology: - Genetically engineered microbes for pollution control. d) Industrial biotechnology: - Strain improvement for industrial product	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2020-21
B.Sc.-IInd Semester-IVth

Medical Microbiology

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Dec-17 Jan-18	Unit I : Epidemiology	a) Definition, classification and scope of epidemiology. b) Infection- Types of infection and modes of transmission c) Normal flora of human body. d) Infection process, pathogenicity and virulence, Microbial virulence factors: toxins, enzymes e) Control of communicable diseases.	15	15
2	Jan	Unit II : Immunology	a) Organs and cells of immune system b) General Nonspecific factors- Physiological barriers, Natural cellular factors, Natural humoral factors. c) Immunity- Definition and classification d) Innate immunity- Species, Racial, Individual, Herd immunity. e) Acquired immunity- Active and passive immunity, f) Immune response and hypersensitivity	15	15
3	Feb	Unit III : Serology	a) Antigens- Definition, types and factors determining antigenicity, Bacterial antigens. b) Antibodies- Definition, Structure, classification, Properties and differences, monoclonal antibodies. c) Antigen Antibody reactions- Agglutination, Precipitation, Complement fixation test, ELISA and RIA.	15	15
4	Feb March	Unit IV : Pathogenic Bacteria	Study of following bacteria with respect to their morphology, cultural and biochemical properties, antigenic structure, pathogenesis, laboratory diagnosis and prophylaxis: a) Staphylococcus aureus. b) Clostridium tetani. c) Salmonella typhi. d) Mycobacterium tuberculosis. e) Treponema pallidum. f) Vibrio cholerae.	15	15
5	March	Unit V : Other Pathogenic organisms	a) Viruses- AIDS , Hepatitis, Polio, Rabies. b) Rickettsias- R. prowazekii c) Protozoa- E. histolytica d) Fungi- C. albicans	15	15
6	April	Unit VI : Antimicrobial chemotherapy	a) Ideal characters of chemotherapeutic agents b) Major antimicrobial agents and its clinical uses- i) Antibacterial agents: Rifampicin, Chloramphenicol, Streptomycin and Ciprofloxacin ii) Antiviral agents: Azidothymidine, Amantadine. iii) Antifungal agents:	15	15

			Griseofulvin, Amphotericin B, Imidazoles. c) Basic mechanism of antibiotic action d) Antimicrobial susceptibility testing: Introduction to CLSI (NCCLS), MIC. Disc diffusion, agar dilution, broth dilution (macro and micro).		

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana**Department of Microbiology****Teaching Plan Session-2020-21****B.Sc.-IIIrd Semester-Vth****(Environmental Microbiology and Bioinstrumentation)**

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	July	Unit-I : Microbial Associations and Air Microbiology	A. Microbial Associations : Definition and examples of positive(Mutualism, Commensalism, Synergism), negative (Antagonism, Competition, Parasitism) and neutral association	08	15
		B. Air Microbiology	a) The atmosphere and its layers. b) Different types of microorganisms in air. c) Techniques for microbiological analysis of air: i) Solid impingement devices ii) Liquid impingement devices. d) Airborne diseases : Etiology, symptoms and prevention. e) Control of microorganisms in air	07	
2	July Aug	Unit-II : Microbiology of Soil.	a) Microorganisms in soil. b) Rhizosphere. c) Decomposition of plant and animal residues in soil. d) Definition, formation, function and microbiology of humus and compost. e) Biological Nitrogen fixation : Type of nitrogen fixing microorganisms, factors affecting and mechanism of symbiotic and non-symbiotic nitrogen fixation. Process of nodulation, nitrogenase complex, recombinant DNA and nitrogen fixation, legume inoculants. f) Cycles of elements in nature : i) Carbon cycle : CO ₂ fixation, organic carbon degradation. ii) Nitrogen cycle : Proteolysis, amino acid degradation, Nitrification, Denitrification, Degradation of nucleic acids. iii) Sulphur cycle iv) Phosphorus cycle. v) Biofertilizers, biological pest control	15	15
3	Sept	Unit III : Water Microbiology	a) Planktons : Definition, types, factors affecting growth of planktons, methods of enumeration, beneficial and harmful activities of planktons b) Control of plankton problems c) Eutrophication and its control	15	15
4		Unit IV : Assessment of Water Quality and Treatment Bacteriological	i) Significance of bacteriological analysis of water. ii) Collection and handling of water sample from various sources. iii) Indicators of excretal pollution. iv) Multiple tube dilution technique, MPN. v) IMViC classification	15	15

		analysis of water:	of coliform. vi) Membrane filter technique for coliform and faecal Streptococci. vii) ICMR and WHO Bacteriological standards of drinking water		
5	Sept	Unit V : A) Water Treatment	a) Self purification of water : Various zones and factors responsible for self purification. b) Treatment of water : Aeration, Coagulation, Flocculation, Sedimentation and Filtration. c) Slow and Rapid sand filters : Construction, mechanism of filtration, differences. d) Methods of chlorination : Plain, super chlorination, ammoniachlorine treatment, Break-point chlorination	08	15
		B)Waste Water Treatment	a) Aims of sewage treatment, composition of sewage. b) Municipal sewage treatment plant. c) Preliminary treatment (seiving and Grit chamber) d) Primary treatment(sedimentation) e) Secondary treatment (Aerobic) i) Trickling filter ii) Activated sludge process iii) Oxidation pond f) Anaerobic sludge digestion g) Domestic sewage treatment by septic tank and Imhoff tank. h) Concept of COD,BOD. i) Outline of bio-gas production	07	
6	Oct	Unit VI : Bio-Instrumentation	a) Spectroscopy- Definition, Principle, types (UV&IR) & its applications. b) Electrophoresis- Definition, Principle, types (Paper&Gel) & its applications. c) Chromatography- Definition, Principle, types (Paper&TLC) & its applications. d) I sotopic Tracer Techniques - Definition, Principle & applications	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2020-21
B.Sc.-IIIrdSemester-VIth

(Industrial Fermentation, Food Microbiology and Metabolism)

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Dec-17 Jan-18	Unit- I : Fermentation in General	a) Definition and scope of Industrial microbiology and biotechnology. b) Important classes of industrial microorganisms. c) Fermentation :- Definition and types (batch and continuous, aerobic and anaerobic, surface and submerged fermentations) d) Production strains e) Screening :- Definition, Primary screening (crowded plate technique, auxonography, enrichment culture technique, use of indicator dyes), secondary screening. f) Scale up process :- Definition and significance. g) Inoculum buildup : Spore and vegetative inoculum. h) General layout of fermentation plant :- Fermentation equipment and its uses. i) Raw materials :- Composition and uses. Saccharine, starchy, cellulose raw materials, hydrocarbon and vegetable oils, nitrogenous material (corn steep liquor). j) Antifoam agents. k) Sterilization of media :- Batch and continous sterilization. l) Detection and assay of fermentation products	15	15
2	Jan	Unit- II : Industrial Productions I:	Microorganisms, raw material, inoculums buildup, fermentation conditions, recovery, uses and mechanism of the following products. a) Ethyl-alcohol : From molasses and waste sulphite liquor. b) Beer. c) Wine (Red table and White table). d) Acetone- Butanol from corn. e) Citric acid f) Vinegar- Fring's process	15	15

3	Feb	Unit- III : Industrial Productions II:	a) Baker's yeast : From molasses, Definition of compressed and active dry yeast. b) Single cell protein : From bacteria. c) Penicillin. d) Amylase : Bacterial and fungal. e) Vitamin B12.	15	15
4	Feb March	Unit-IV : Microbiology of Milk	a) Definition b) Composition and types of milk. c) Sources of microorganisms in Milk. d) Types of microorganisms in milk. e) Pasteurization of milk : LHT, HTST, UHT. Phosphatase test. f) Grades of milk. g) Concentrated milk and milk powder. h) Preparation of fermented milk products, butter and cheese.	15	15
5	March	Unit-V : Food Microbiology	a) Sources of contamination of fresh food. b) Microbial spoilage of foods. c) Preservation of foods :- Low and high temperature, dehydration, high osmotic pressure, chemical preservation, radiations and canning. d) Fermented foods : Idli, pickles and sauerkraut. e) Food poisoning : Food infection and food intoxication. f) Indicators of food contamination as per WHO.	15	15
6	April	Unit VI : Enzymology and Metabolism A Enzymology :	a) Nature and Definition. b) Classification and nomenclature of enzymes. c) Terminologies used in enzymology :- Enzyme, active site, substrate, co-enzyme, cofactors, prosthetic group, poloenzyme, apoenzyme, activation energy, isoenzyme, allosteric enzyme, inhibitors, immobilised enzymes.	10	15
		B Metabolism :	a) General strategies of metabolism. b) EMP pathway, TCA cycle. c) Oxidative phosphorylation and Electron transport chain.	05	

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2021-22
B.Sc.-Ist Semester-Ist

Paper-Fundamentals of Microbiology and Microbial Physiology

Sr. No.	Month	Name of Unit	Topics Names	Required Lecture	Total Lects.
1	Oct	UNIT I:			
		A. History of Microbiology:	a. Discovery of microscope- Leeuwenhoek, Robert Hook. b. Controversy over Spontaneous, generation, Contributions of Aristotle, Redi, Needham, Schulze and Schwan, Schroder & Vandyke, Louis Pasteur, John Tyndall c. Germ theory of diseases- Joseph Lister, Koch postulates, River postulates. d. Pure culture concept- Joseph Lister, Koch, DeBarry.	08	15
B. Scope of Microbiology as a modern Science	a. Industrial Microbiology, Environmental Microbiology, Medical microbiology, Food and Dairy Microbiology, Genetic engineering and Biotechnology. b. Different types of Microorganisms (outline) c. Distribution of Microorganisms in nature, and their beneficial and harmful activities	07			
2	Oct	UNIT II:			
		A. Microscopy:	i) Definitions- Magnification, Resolving power, numerical aperture, focal length, Working Distance Aberrations, ii) Objectives- Functions, low and high power objectives, Oil immersion objectives, iii) Ocular- Functions, Huygenian, Ramsden, Hyperplane and compensating. iv) Condensor- Functions, Abbe, parabolic v) Iris diaphragm	06	15
B. Principles, construction, ray diagram and applications:	i) Compound Microscope, ii) Darkfield Microscope, iii) Phase Contrast microscope iv) Fluorescent Microscope, v) Electron Microscope.	05			

		C. Staining:	Dyes and Staining,- Definations, auxochromes, Chromophore, mordents, chromogens, Leucostains, Principles and Methods of the following techniques: i. Simple staining ii. Differential- Gram, Acid fast, iii. Structural-Endospore, flagell	04	

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lect.	Total Lects.
3	Nov	UNIT III : Classification of Microorganism:	A.Bacterial Classification: i. Definition- Taxonomy, Classification, Taxonomic rank, Identification, Nomenclature, ii. Bergy's manual of systematic Bacteriology, General characteristics enlisting all parts with major characters and examples(Vol.I to IV) iii. Methods of Classification: Intuitive, Numerical taxonomy, Genetic relatedness,	08	15
			B. General characteristics of : i. Viruses, ii. Fungi (Including yeasts) iii. Actinomycetes, iv. Mycoplasma and Rickettsia v. Algae	07	
4	Dec	UNIT IV: Structural Organization of Bacteria:	a) Concept of prokaryotes and Eukaryotes; Comparison and Differences. b) Typical Bacterial cell c) Shape, Size and Arrangement of Bacteria d) Structure and functions of following: . Capsule and slime layer ii. Cell wall- Gram positive and Gram negative bacteria. iii. Cytoplasmic membrane- fluid mosaic model iv. Flagella- Arrangement, Mechanism of flagellar movement. v. Pili-Arrangement and function vi. Ribosomes- Prokaryotic and Eucaryotic vii. Plasmid- Definition, General characters, classes viii. Bacterial chromosome ix. Endospores- Structure and arrangements	15	15

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lect.	Total Lects.
5	Dec-21	UNITV: A. Microbial Nutrition:	i. Basic Nutritional Requirements: Sources of C, N, O, P, S, Energy, Macronutrients, Growth factors, water etc. ii. Media; Synthetic, Nonsynthetic, Liquid and Solid, Semi solid, Differential, Enriched, Selective media. Role of beef extract, yeast extract, peptone, agar and gelatin. iii. Determination of nutritional requirements: Auxanographic technique, Replica plating technique. iv. Nutritional classification; on the basis of source of carbon and energy	08	14
		B. Pure Culture Techniques:	i. Definition- Pure and Mixed culture: ii. Methods of Isolation of Pure culture, Serial dilution, Streak plate, pour plate, spread plate, Enrichment culture, and Single cell isolation method. iii. Methods of preservation of pure culture- Agar slants, Sa line suspension, Overlaying with oil, Freeze drying.	07	
6	Jan-22	UNIT VI: Reproduction and Growth of Bacteria:	a) Reproduction: Binary fission, Budding, Fragmentation, Sporulation, b) Growth rate and generation time- Definition, mathematical expression. c) Bacterial growth curve d) Synchronous culture: Definition, methods of isolation (Helmstetter- Cummings Technique) and application. e) Continuous culture: Definition, method (chemostat, and Turbidostat Techniques) and Application. f) Measurement of Growth: i. Cell number measurement- Breed method, Colony count ii. Cell mass measurement- Dry weight and Turbidity measurement. iii. Cell activity measurement- Biochemical activity iv. Factors influencing bacterial Growth- Temperature, pH, Gaseous	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2021-22
B.Sc.-Ist Semester-IInd

Paper- Microbiology, Biochemistry, Biostatistics & Computers

Sr. No.	Month	Name of Unit	Topics Names	Required Lecture	Total Lects.
1	Feb-22	UNIT I : VIRUSES	i) Discovery of viruses ii) Structure of viruses iii) Classification of viruses (LHT System) iv) Replication of viruses – Lytic cycle (T4), Lysogeny (Lambda phage) v) Cultivation of viruses – Embryo culture, Tissue culture method . vi) Interferon	15	15
2	March	UNIT-II : MICROBIAL CONTROL	i) Definition and Terms- Sterilization, disinfection, Antiseptic, Sanitizer, Germicide, Microbiostatic, Antimicrobial agent ii) Mechanism of cell Injury - Damage of cell wall, cell membrane, Inhibition of metabolic reactions. iii) Physical Control :- Temperature, osmotic pressure, Radiation, filtration. iv) Chemical Control – Chemistry and mode of action of halogens, heavy metals and their derivatives, Alcohols, Detergents and Gaseous Sterilization. v) Chemotherapeutic agents.- Definition and mode of action of penicillin , tetracycline, Norfloxacin	15	15
3	March	UNIT-III APPLIED ASPECTS OF MICROORGANISMS IN -	i) Agriculture – Biofertilizers & Biopesticides. ii) Human and Animal Health – Antibiotics, Vaccines iii) Industry (Food, Chemical & Pharmaceutical) – List of Microbial products (and producing organisms) iv) Environmental – Biodegradation and Bioleaching	15	15
4	April	UNIT-IV BASIC BIOCHEMISTRY	i) Carbohydrates – Classification, different types of Glycosidic linkages eg- Maltose sucrose, Lactose, starch ii) Lipids – Classification, concept of saturated and unsaturated fatty acids, outline of conjugated & derived lipids iii) Proteins – Classification of Amino acids, concept of peptide bond , elementary concept of protein structure. iv) Nucleic acid – Purine &	15	15

			pyrimidine bases, nucleotides , & nucleosides , structure of DNA, structure of RNA (mRNA , tRNA, rRNA)		
5	April	UNIT-V : BIOSTATISTIC S	i) Importance & application – Tabulation & Classification of data, Frequency distribution & graphical distribution of data. ii) Measures of central tendencies – Mean , Mode, Median & their Properties iii) Co relation & their Linear regression – Coefficient of cor relation, linear least square Fit method of regression. iv) Hypothesis testing- (chi square test) x2 test, t-test v) Different models of data presentation with special refer ence to Biological samples.	15	15
6	May	UNIT-VI COPUTER CONCEPTS :-	i) Components of computer system – Hardware, input devices, CPU, output devices , Monitor, software. ii) Memory concept- Computer memory primary & second ary memory in computers iii) Window Operating systems :- Introduction graphical user interface systems, desktop menus, launching a program through start menu. iv) MS-Word- creating, saving operating editing, closing a document, entering & editing texts. v) Using Internet explorer , MS power point, creating e-mails.	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2021-22

B.Sc.-IInd Semester-IIIrd

Paper-Molecular Biology and Genetic Engineering.

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Oct	Unit I : Gene multiplication and expression	a) Concept of gene – Definition of Gene, Muton, recon, cistron, gene within gene, split gene. b) Replication of DNA- Modes of replication, (Conservative, Semiconservative and Dispersive). Experiment of Meselson and Stahl to prove semiconservative mode of replication. Mechanism of replication with enzymes involved, models of replication: Knife and fork, rolling circle. c) DNA repair mechanisms- light and dark. d) Genetic code- Characteristic features of genetic code. e) Out line of Protein synthesis- Transcription and Translation	15	15
2	Oct	Unit II : Gene Regulation and Mutation	a) Gene regulation Mechanisms - lac operon , trp operon. b) Mutation- Definition & types of mutations - Base pair substitution, frame-shift, point, missense, nonsense & silent mutations, Random Vs. Directed mutation, Rate of mutation, Effect of Mutation on Phenotype, c) Genetic suppressions:- Intragenic (Intracodon suppression, reading frame Suppression) and extragenic suppression (Non sense and Missense Suppression). d) Molecular basis of spontaneous and induced mutations - Spontaneous mutation (Tautomerism), Induced Mutation (Chemical Mutagens) e.g. Base analogues, Nitrous Oxide, Hydroxylamine, Acridine dyes, Physical mutagens e.g. X-rays, Gamma rays, U.V. light.	15	15
3	Nov	Unit III : Genetic recombination:	Mechanism of recombination : Breakage and reunion, breakage and copying, complete copy choice Transfer of genetic material in prokaryotes: a) Transformation: Experiment of Griffith. Avery, MacLeod and McCarty experiment to prove Genetic Transformation. Mechanism of Transformation. b) Transduction: Experiment of Zinder and Lederberg. General mechanism of Transduction. Types of Transduction: Generalized and Restricted, Complete and Abortive, Low Frequency and High Frequency Transduction. Comparison between Transformation and Transduction. c) Conjugation: Experiment of Lederberg	15	15

			and Tatum, Experiment of Davis, Nature and function of F Plasmid. Hfr formation. Various Mating types. Mechanism of conjugation: i) F ⁺ x F ⁻ ii) Hfr X F ⁻ . F' Plasmid and Sexduction		
4	Dec	Unit-IV Tools of Genetic Engineering:	a) Introduction to basic technique of genetic engineering. b) Enzymes for splicing: Restriction endonucleases. c) Range of DNA manipulating enzymes: Nucleases, Ligases, Polymerases, DNA modifying enzymes, Topoisomerases. d) Vectors: Ideal characters and types: Plasmid, Cosmid and Bacteriophage.	15	15
5	Dec	Unit V : Techniques of genetic engineering:	a) Isolation of Genomic and Plasmid DNA from bacteria, Analysis of DNA fragment size by agarose gel electrophoresis. b) Introducing DNA into host cell, competent cells, transduction of cells and identification of transformed cell (e.g. Antibiotic resistance gene in Plasmid) Selection of clones: Direct (colony hybridization) and Indirect method (southern blotting). c) Definition, method and applications of gene mapping, DNA sequencing (by microarray) and PCR. d) Introduction to expression of cloned genes. Construction of gene library. Cells for cloning.	15	15
6	Jan-22	Unit VI : Applications of Genetic Engineering:	a) Health care biotechnology: - Recombinant Insulin, Recombinant Hepatitis vaccine, Gene therapy, DNA probes in diagnosis. b) Agricultural biotechnology: - Transgenic plants. c) Environmental biotechnology: - Genetically engineered microbes for pollution control. d) Industrial biotechnology: - Strain improvement for industrial product	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2021-22
B.Sc.-IInd Semester-IVth

Medical Microbiology

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Feb	Unit I : Epidemiology	a) Definition, classification and scope of epidemiology. b) Infection- Types of infection and modes of transmission c) Normal flora of human body. d) Infection process, pathogenicity and virulence, Microbial virulence factors: toxins, enzymes e) Control of communicable diseases.	15	15
2	March	Unit II : Immunology	a) Organs and cells of immune system b) General Nonspecific factors- Physiological barriers, Natural cellular factors, Natural humoral factors. c) Immunity- Definition and classification d) Innate immunity- Species, Racial, Individual, Herd immunity. e) Acquired immunity- Active and passive immunity, f) Immune response and hypersensitivity	15	15
3	March	Unit III : Serology	a) Antigens- Definition, types and factors determining antigenicity, Bacterial antigens. b) Antibodies- Definition, Structure, classification, Properties and differences, monoclonal antibodies. c) Antigen Antibody reactions- Agglutination, Precipitation, Complement fixation test, ELISA and RIA.	15	15
4	April	Unit IV : Pathogenic Bacteria	Study of following bacteria with respect to their morphology, cultural and biochemical properties, antigenic structure, pathogenesis, laboratory diagnosis and prophylaxis: a) Staphylococcus aureus. b) Clostridium tetani. c) Salmonella typhi. d) Mycobacterium tuberculosis. e) Treponema pallidum. f) Vibrio cholerae.	15	15
5	April	Unit V : Other Pathogenic organisms	a) Viruses- AIDS , Hepatitis, Polio, Rabies. b) Rickettsias- R. prowazekii c) Protozoa- E. histolytica d) Fungi-C. albicans	15	15

6	May	Unit VI : Antimicrobial chemotherapy	a) Ideal characters of chemotherapeutic agents b) Major antimicrobial agents and its clinical uses- i) Antibacterial agents: Rifampicin, Chloramphenicol, Streptomycin and Ciprofloxacin ii) Antiviral agents: Azidothymidine, Amantadine. iii) Antifungal agents: Griseofulvin, Amphotericin B, Imidazoles. c) Basic mechanism of antibiotic action d) Antimicrobial susceptibility testing: Introduction to CLSI (NCCLS), MIC. Disc diffusion, agar dilution, broth dilution (macro and micro).	15	15

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Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2021-22
B.Sc.-IIIrd Semester-Vth

(Environmental Microbiology and Bioinstrumentation)

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Oct	Unit-I : Microbial Associations and Air Microbiology	A. Microbial Associations : Definition and examples of positive(Mutualism, Commensalism, Synergism), negative (Antagonism,Competition, Parasitism) and neutral association	08	15
		B. Air Microbiology	a) The atmosphere and its layers. b) Different types of microorganisms in air. c) Techniques for microbiological analysis of air: i) Solid impingement devices ii) Liquid impingement devices. d) Airborne diseases : Etiology, symptoms and prevention. e) Control of microorganisms in air	07	
2	Oct	Unit-II : Microbiology of Soil.	a) Microorganisms in soil. b) Rhizosphere. c) Decomposition of plant and animal residues in soil. d) Definition, formation, function and microbiology of humus and compost. e) Biological Nitrogen fixation : Type of nitrogen fixing microorganisms, factors affecting and mechanism of symbiotic and non-symbiotic nitrogen fixation. Process of nodulation, nitrogenase complex, recombinant DNA and nitrogen fixation, legume inoculants. f) Cycles of elements in nature : i) Carbon cycle : CO ₂ fixation, organic carbon degradation. ii) Nitrogen cycle : Proteolysis, amino acid degradation, Nitrification, Denitrification, Degradation of nucleic acids. iii) Sulphur cycle Iv) Phosphorus cycle. v) Biofertilizers, biological pest control	15	15
3	Nov	Unit III : Water Microbiology	a) Planktons : Definition, types, factors affecting growth of planktons, methods of enumeration, beneficial and harmful activities of planktons b) Control of plankton problems c) Eutrophication and its control	15	15
4	Dec	Unit IV : Assessment of Water Quality and Treatment Bacteriological analysis of	i) Significance of bacteriological analysis of water. ii) Collection and handling of water sample from various sources. iii) Indicators of excretal pollution. iv) Multiple tube dilution technique, MPN. v) IMViC classification of coliform. vi) Membrane filter technique for coliform	15	15

		water:	and faecal Streptococci. vii) ICMR and WHO Bacteriological standards of drinking water		
5	Dec	Unit V : A) Water Treatment	a) Self purification of water : Various zones and factors responsible for self purification. b) Treatment of water : Aeration, Coagulation, Flocculation, Sedimentation and Filtration. c) Slow and Rapid sand filters : Construction, mechanism of filtration, differences. d) Methods of chlorination : Plain, super chlorination, ammoniachlorine treatment, Break-point chlorination	08	15
		B)Waste Water Treatment	a) Aims of sewage treatment, composition of sewage. b) Municipal sewage treatment plant. c) Preliminary treatment (seiving and Grit chamber) d) Primary treatment(sedimentation) e) Secondary treatment (Aerobic) i) Trickling filter ii) Activated sludge process iii) Oxidation pond f) Anaerobic sludge digestion g) Domestic sewage treatment by septic tank and Imhoff tank. h) Concept of COD,BOD. i) Outline of bio-gas production	07	
6	Jan	Unit VI : Bio- Instrumentation	a) Spectroscopy- Definition, Principle, types (UV&IR) & its applications. b) Electrophoresis- Definition, Principle, types (Paper&Gel) & its applications. c) Chromatography- Definition, Principle, types (Paper&TLC) & its applications. d) I sotopic Tracer Techniques - Definition, Principle & applications	15	15

Name & Sign of Teacher

Late Ku. Durga K. Banmeru Science College, Lonar Dist- Buldana
Department of Microbiology
Teaching Plan Session-2021-22
B.Sc.-IIIrdSemester-VIth

(Industrial Fermentation, Food Microbiology and Metabolism)

Sr. No.	Month	Name of Unit	Topics Names	Requ. Lecture	Total Lects
1	Feb	Unit- I : Fermentation in General	a) Definition and scope of Industrial microbiology and biotechnology. b) Important classes of industrial microorganisms. c) Fermentation :- Definition and types (batch and continuous, aerobic and anaerobic, surface and submerged fermentations) d) Production strains e) Screening :- Definition, Primary screening (crowded plate technique, auxonography, enrichment culture technique, use of indicator dyes), secondary screening. f) Scale up process :- Definition and significance. g) Inoculum buildup : Spore and vegetative inoculum. h) General layout of fermentation plant :- Fermentation equipment and its uses. i) Raw materials :- Composition and uses. Saccharine, starchy, cellulose raw materials, hydrocarbon and vegetable oils, nitrogenous material (corn steep liquor). j) Antifoam agents. k) Sterilization of media :- Batch and continous sterilization. l) Detection and assay of fermentation products	15	15
2	march	Unit- II : Industrial Productions I:	Microorganisms, raw material, inoculums buildup, fermentation conditions, recovery, uses and mechanism of the following products. a) Ethyl-alcohol : From molasses and waste sulphite liquor. b) Beer. c) Wine (Red table and White table). d) Acetone- Butanol from corn. e) Citric acid f) Vinegar- Fring's process	15	15

3	March	Unit- III : Industrial Productions II:	a) Baker's yeast : From molasses, Definition of compressed and active dry yeast. b) Single cell protein : From bacteria. c) Penicillin. d) Amylase : Bacterial and fungal. e) Vitamin B12.	15	15
4	April	Unit-IV : Microbiology of Milk	a) Definition b) Composition and types of milk. c) Sources of microorganisms in Milk. d) Types of microorganisms in milk. e) Pasteurization of milk : LHT, HTST, UHT. Phosphatase test. f) Grades of milk. g) Concentrated milk and milk powder. h) Preparation of fermented milk products, butter and cheese.	15	15
5	April	Unit-V : Food Microbiology	a) Sources of contamination of fresh food. b) Microbial spoilage of foods. c) Preservation of foods :- Low and high temperature, dehydration, high osmotic pressure, chemical preservation, radiations and canning. d) Fermented foods : Idli, pickles and sauerkraut. e) Food poisoning : Food infection and food intoxication. f) Indicators of food contamination as per WHO.	15	15
6	May	Unit VI : Enzymology and Metabolism A Enzymology :	a) Nature and Definition. b) Classification and nomenclature of enzymes. c) Terminologies used in enzymology :- Enzyme, active site, substrate, co-enzyme, cofactors, prosthetic group, poloenzyme, apoenzyme, activation energy, isoenzyme, allosteric enzyme, inhibitors, immobilised enzymes.	10	15
		B Metabolism :	a) General strategies of metabolism. b) EMP pathway, TCA cycle. c) Oxidative phosphorylation and Electron transport chain.	05	

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