VIVEKANAD COLLEGE KOLHAPUR (EMPOWERED AUTONOMOUS INSTITUTE)

STATEMENT OF SYLLABUS COVERED

Year 2024-2025 (Sem-I, II)

Name of Teacher – Mr.S.G.Kulkarni **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I Sem-I	- **DSC07BTE 12 Biotechnology-II (Biochemistry-I)**	**Unit I** Origin of life Basic concept, A.I.Oparin, Haldane , Urey Miller expt Concept of Biomolecules- Carbohydrates, Protein ,Lipid, Nucleic acid. Properties of Water- Interactions in aqueous systems, Ionization of water , weak acid, weak base, Ionic properties of water Ph ,pka Value definition ,H-H equation , Titration curve of Amino acid. Biological buffer systems. Biological Buffer Systems- Phosphate, Bicarbonate, Hemoglobin buffer system , Protein buffer system Nucliec acid- Nucleosides, Nucleotides, polynmucleotides ,DNA and its different forms RNA and its different forms	**Unit I** Origin of life Basic concept, A.I.Oparin, Haldane , Urey Miller expt Concept of Biomolecules- Carbohydrates, Protein ,Lipid, Nucleic acid. Properties of Water- Interactions in aqueous systems, Ionization of water , weak acid, weak base, Ionic properties of water Ph ,pka Value definition ,H-H equation , Titration curve of Amino acid. Biological buffer systems. Biological Buffer Systems- Phosphate, Bicarbonate, Hemoglobin buffer system , Protein buffer system Nucliec acid- Nucleosides, Nucleotides, polynmucleotides ,DNA and its different forms RNA and its different form	---	Completed

		Unit II	**Unit II**		
		Carbohydrates- classification , glyceraldehydes, simple aldoses, ketoses, open and ring structure of aldoses, ketoses, confirmation of D-Glucose, biological importance of carbohydrates, Reactions of monosaccharides(Oxidation, reduction, osazone) , glycosidic bond , disaccharides, (Sucrose, maltose, lactose), polysaccharides- homopolysaccharides- starch, glycogen, cellulose, mutarotation of glucose. Lipids:- Classification , Simple lipid, - Triacylglycerol, and waxes, Compound lipids- Phospholipid, e.g- Phosphotidylcholine, ethanolamine, sphingolipids, sphingomyelin, cerebrocides, gangliosides Physical properties:- state, colour, odour, melting points, solubility, specific gravity geometric isomerism , insulation emulsification , surface tension. Chemical properties:- SAPvalue, Iodine ,Acid. Rancidity, Derived lipids:- Cholesterol, LDL, VLDL, HDL, Chylomicrons, Liposome	Carbohydrates- classification , glyceraldehydes, simple aldoses, ketoses, open and ring structure of aldoses, ketoses, confirmation of D-Glucose, biological importance of carbohydrates, Reactions of monosaccharides(Oxidation, reduction, osazone) , glycosidic bond , disaccharides, (Sucrose, maltose, lactose), polysaccharides- homopolysaccharides- starch, glycogen, cellulose, mutarotation of glucose. Lipids:- Classification , Simple lipid, - Triacylglycerol, and waxes, Compound lipids- Phospholipid, e.g- Phosphotidylcholine, ethanolamine, sphingolipids, sphingomyelin, cerebrocides, gangliosides Physical properties:- state, colour, odour, melting points, solubility, specific gravity geometric isomerism , insulation emulsification , surface tension. Chemical properties:- SAPvalue, Iodine ,Acid. Rancidity, Derived lipids:- Cholesterol, LDL, VLDL, HDL, Chylomicrons, Liposome		

B.Sc. I Sem-II	- DSC07BTE 22 Biotechnology-IV (Biochemistry-II)	**Unit I** **Proteins-** Amino acid classification , Peptide bond concept Classification of protein based on Composition , Protein sequencing methods Classification depending upon R group , single letter code of amino acids. Properties of amino acids Simple, conjugate, derived Snger's Edmans, Dansyl chloride Structural level classification of proteins Priamary, secondary, tertiary structure of proteins , α-helix, β-sheets Ramchandran plot , Quatarnary structure of proteins-Hb, Biological finctions of proteins. **Chromatography-** Introduction, theory, Principle, applications of Paper, TLC, column chromatography- Size exclusion, Ion exchange, Affinity chromatography. **Unit II** **Enzymes** Intro, IUB classification , active site, energy of activation , transition state, graph presentation , Lock and key , induced fit hypothesis, Types of enzyme inhibition competitive, uncompetitive, non competitive, Km equation , LB plot Vitamines as a coenzymes Classification of Water soluble vitamin B1,B3,B5,B6 and their coenzyme role in different biochemical reaction , Fat soluble	**Unit I** **Proteins-** Amino acid classification , Peptide bond concept Classification of protein based on Composition , Protein sequencing methods Classification depending upon R group , single letter code of amino acids. Properties of amino acids Simple, conjugate, derived Snger's Edmans, Dansyl chloride Structural level classification of proteins Priamary, secondary, tertiary structure of proteins , α-helix, β-sheets Ramchandran plot , Quatarnary structure of proteins-Hb, Biological finctions of proteins. **Chromatography-** Introduction, theory, Principle, applications of Paper, TLC, column chromatography- Size exclusion. Ion exchange, Affinity chromatography. **Unit II** **Enzymes** Intro, IUB classification , active site, energy of activation , transition state, graph presentation , Lock and key , induced fit hypothesis, Types of enzyme inhibition competitive, uncompetitive, non competitive, Km equation , LB plot Vitamines as a coenzymes Classification of Water soluble vitamin B1,B3,B5,B6 and their coenzyme role in different biochemical reaction , Fat soluble	---	Completed

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 . **Term – II (Sem-III, IV)**

Name of Teacher – Mr. S. G. Kulkarni **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. II Sem-III	**DSC-VI** **DSC07BTE32** **Metabolic Pathways-I**	**Unit I** Metabolism and Carbohydrate Metabolism Introduction to metabolism and catabolism and its 3 stages , methods employed to study the metabolism, High energy compounds with examples Introduction, reaction and energetics of Glycolysis, Gluconeogesis , TCA cycle, Glyoxylate cycle, HMP and its significance Shuttle system- Malate Aspartate shuttle, Glycerol phosphate shuttle system , Cori cycle. **Unit II** Biosynthesis of fatty acid with respect to palmitic acid & degradation of fatty acid β- oxidation w.r.to palmitic acid Aerobic- Flow of electorns in ETC, Redox potential componenets of ETC, Mechanism of ATP generation – Chemiosmotic hypothesis, ATP synthase complex, Inhibitors of ETC , Anaerobic respiration , Alcoholic and Lactic acid fermentation .	**Unit I** Metabolism and Carbohydrate Metabolism Introduction to metabolism and catabolism and its 3 stages , methods employed to study the metabolism, High energy compounds with examples ntroduction, reaction and energetics of Glycolysis, Gluconeogesis , TCA cycle, Glyoxylate cycle, HMP and its significance Shuttle system- Malate Aspartate shuttle, Glycerol phosphate shuttle system , Cori cycle. **Unit II** Biosynthesis of fatty acid with respect to palmitic acid & degradation of fatty acid β-oxidation w.r.to palmitic acid Aerobic- Flow of electorns in ETC, Redox potential componenets of ETC, Mechanism of ATP generation – Chemiosmotic hypothesis, ATP synthase complex, Inhibitors of ETC , Anaerobic respiration , Alcoholic and Lactic acid fermentation .	---	Completed

B.Sc. II Sem-IV	**DSC-VII** **DSC07BTE42** **Metabolic Pathways-II**	**UNIT-I** **Plant Water relation and Photosynthesis** Introduction, Absorption of Water- Mechanism, Theories (Active, Passive), Translocation of Water- Mechanism, Theories (Root pressure, Capillary), Transpiration. Ultra structure of chloroplast, Photosynthetic pigments, red-drop and Emerson's enhanacement effect, mechanism of photosyntheisis, light reaction, dark reaction , C-3 pathway, C-4 pathway, CAM, photorespiration **UNIT-II** Role of nitrogen in plants, source of nitrogen , nitrogen fixation – symbiotic and non symbiotic, mechanism of nitrogen fixation , nif gene- concept and significance, transamination reaction Introduction to plant hormones Biosynthesis of Plant hormones- Auxin, Cytokinin , Gibeerlins Secondary Metabolism Introduction examples and biological concept Photoperiodism and vernalisation Types of plants SDP,LDP, DNP, mechanism of Photoperiodism, Theories, Vernalization , theories and mechanism , importance and applications	**UNIT-II** **Plant Water relation and Photosynthesis** Introduction, Absorption of Water- Mechanism, Theories (Active, Passive), Translocation of Water- Mechanism, Theories (Root pressure, Capillary), Transpiration. Ultra structure of chloroplast, Photosynthetic pigments, red-drop and Emerson's enhanacement effect, mechanism of photosyntheisis, light reaction, dark reaction , C-3 pathway, C-4 pathway, CAM, photorespiration **UNIT-II** Role of nitrogen in plants, source of nitrogen , nitrogen fixation – symbiotic and non symbiotic, mechanism of nitrogen fixation , nif gene- concept and significance, transamination reaction Introduction to plant hormones Biosynthesis of Plant hormones- Auxin, Cytokinin , Gibeerlins Secondary Metabolism Introduction examples and biological concept Photoperiodism and vernalisation Types of plants SDP,LDP, DNP, mechanism of Photoperiodism, Theories, Vernalization , theories and mechanism , importance and applications		

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 Term – I

Name of Teacher –Ms. R. M. Shetty **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. II	Microbial genetics	**Unit I** Mendel's law of inheritance Interaction of genes Linkage Rossing over Structural changes in chromosomes Numerical changes in chromosomes Extrachromosomal or cytoplasmic or organellar inheritance **Unit II** Mutation Plasmid Genetic recombination in bacteria Genetic diseases	**Unit I** Mendel's law of inheritance Interaction of genes Linkage Rossing over Structural changes in chromosomes Numerical changes in chromosomes Extrachromosomal or cytoplasmic or organellar inheritance **Unit II** Mutation Plasmid Genetic recombination in bacteria Genetic diseases	---	Completed
B.Sc. III	Application of Biotechnology in Agriculture	**Unit I** Methods of crop improvement Plant breeding markers Somatic Hybridization Germplasm conservation **Unit II** Transgenic Plants Molecular farming	**Unit I** Methods of crop improvement Plant breeding markers Somatic Hybridization Germplasm conservation **Unit II** Transgenic Plants Molecular farming	---	Completed

		Forms of Protection-IPR & IPP Biofertilizers Biopesticides	Forms of Protection-IPR & IPP Biofertilizers Biopesticides		

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 **Term – II**

Name of Teacher –Ms. R. M. Shetty **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	DDC07BTE21-Biotechnology-III-Biotechnology for Human welfare-II	**Unit I** Agriculture Biotechnology Genetically Modified Crop Animal cell culture Plant cell culture **Unit II** Applied biotechnology Conservation Biotechnology Single cell protein (SCP) Concept of probiotics	**Unit I** Agriculture Biotechnology Genetically Modified Crop Animal cell culture Plant cell culture **Unit II** Applied biotechnology Conservation Biotechnology Single cell protein (SCP) Concept of probiotics	---	Completed
B.Sc. III	Bioinformatics	**Unit I** Introduction to Bioinformatics History of bioinformatics Introduction to Genomics Sequence retrieval system Human Genome Project (HGP) Literature Database Introduction to Proteomics **Unit II** Sequence Alignment and Phylogenetic analysis construction of phylogenetic tree Phylogenetic analysis tools	**Unit I** Introduction to Bioinformatics History of bioinformatics Introduction to Genomics Sequence retrieval system Human Genome Project (HGP) Literature Database Introduction to Proteomics **Unit II** Sequence Alignment and Phylogenetic analysis construction of phylogenetic tree	---	Completed

		Drug designing Molecular Docking Structure and ligand-based drug designing ADME property	Phylogenetic analysis tools Drug designing Molecular Docking Structure and ligand-based drug designing ADME property		

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Year 2024-2025 **Term - I**

Name of Teacher –Miss. V.N. More **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	MIN07BTE12 Microbiology-II (Techniques in Microbiology)	**Unit I** Concept of Sterilization:- Definitions of: Sterilization, Disinfection, Antiseptic, Germicide, Microbiostasis, Asepsis, Sanitization. Methods of sterilization by- a) Physical agents: i) temperature dry heat, moist heat ii) Radiation- U.V, Gamma radiation iii) Bacteria proof filter- membrane filter. b) Chemical agents: - Phenol & Phenolic compounds, Alcohol, Heavy metals (e.g. mercury). c) Gaseous agents- Ethylene oxide, formaldehyde Checking efficiency of sterilization- biological and chemical indicator Checking efficiency of Disinfection- Phenol coefficient- Rideal Walker coefficient. Chick Martin Test. **Unit II** Microscopy and Staining Techniques Microscopy: Microscopy a) General principles of microscopy- Image formation, magnification, numerical aperture (Uses of oil immersion objective), resolving power of microscope and working distance. b) Ray diagram, special features, applications and comparative study of compound microscope and Electron Microscope (Scanning and Transmission Electron Microscope). Stains and staining procedures - Definition of dye and	**Unit I** Concept of Sterilization:- Definitions of: Sterilization, Disinfection, Antiseptic, Germicide, Microbiostasis, Asepsis, Sanitization. Methods of sterilization by- a) Physical agents: i) temperature dry heat, moist heat ii) Radiation- U.V, Gamma radiation iii) Bacteria proof filter- membrane filter. b) Chemical agents: - Phenol & Phenolic compounds, Alcohol, Heavy metals (e.g. mercury). c) Gaseous agents- Ethylene oxide, formaldehyde Checking efficiency of sterilization- biological and chemical indicator Checking efficiency of Disinfection- Phenol coefficient- Rideal Walker coefficient, Chick Martin Test. **Unit II** Microscopy and Staining Techniques Microscopy: Microscopy a) General principles of microscopy- Image formation, magnification, numerical aperture (Uses of oil immersion objective), resolving power of microscope and working distance. b) Ray diagram, special features, applications and comparative study of compound microscope and Electron Microscope (Scanning and Transmission	---	Completed

		stain, Classification of stains – Acidic, Basic and Neutral, Principles, Procedure, Mechanism and application of staining, Procedures - i) Simple staining, ii) Negative staining, iii) Differential staining : Gram staining and Acid fast staining, iv) Special staining: Capsule staining, cell wall staining, endospore staining	Electron Microscope). Stains and staining procedures - Definition of dye and stain, Classification of stains – Acidic, Basic and Neutral, Principles, Procedure, Mechanism and appiication of staining, Procedures - i) Simple staining, ii) Negative staining, iii) Differential staining : Gram staining and Acid fast staining, iv) Special staining: Capsule staining, cell wall staining, endospore staining		

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Year 2024-2025 **Term - II**

Name of Teacher – Miss. V.N. More **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	MIN07BTE22 Microbiology –IV (Virology) (Credits-2)	**Unit I** General Virology: A. History, Origin and Evolution of viruses B. General characteristics of Viruses C. Structure of viruses i Enveloped and Non enveloped viruses ii. Capsid symmetries – Icosohedraland Helical iii. Structural components of virus – Protein - Envelope proteins, Matrix proteins and Lipoproteins, Genome – dsDNA, ssDNA, dsRNA, ssRNA (positive sense, negative sense and ambisense), linear, circular, segmented D. Classification & nomenclature of viruses i. ICTV nomenclature ii. Baltimore classification **Unit II** A. Isolation, Cultivation, Purification and Enumeration of Viruses i. Isolation and cultivation of viruses- Bacteriophages, Animal viruses, Plant viruses ii. Purification of viruses- Centrifugation and precipitation iii. Enumeration of viruses- Direct and Indirect method B. Replication of viruses: i. Bacteriophages – T4 phage (Lytic), Lambada phage(Lytic and lysogeny) ii. Plant viruses – TMV iii. Animal viruses – HIV, nCoV, HPV	**Unit I** General Virology: A. History, Origin and Evolution of viruses B. General characteristics of Viruses C. Structure of viruses i Enveloped and Non enveloped viruses ii. Capsid symmetries – Icosohedraland Helical iii. Structural components of virus – Protein - Envelope proteins, Matrix proteins and Lipoproteins, Genome – dsDNA, ssDNA, dsRNA, ssRNA (positive sense, negative sense and ambisense), linear, circular, segmented D. Classification & nomenclature of viruses i. ICTV nomenclature ii. Baltimore classification **Unit II** A. Isolation, Cultivation, Purification and Enumeration of Viruses i. Isolation and cultivation of viruses- Bacteriophages, Animal viruses, Plant viruses ii. Purification of viruses- Centrifugation and precipitation iii. Enumeration of viruses- Direct and Indirect method B. Replication of viruses: i. Bacteriophages – T4 phage (Lytic), Lambada phage(Lytic and lysogeny) ii. Plant viruses – TMV iii. Animal viruses – HIV, nCoV, HPV	---	Completed

	B.Sc. II		**Unit I Introduction-** **Types of immunity**-i)Innate (specific and non-specific) ii) Acquired (Active and Passive), **Types of Defense**- a) first line of defense (barriers at the portal of entry, physical and chemical barriers) b) second line of defense (Phagocytosis– oxygen dependent and independent) c) third line of defense-specific defense mechanism. **Introduction to cells and organs of immune system-** Organs of immune system-primary and secondary lymphoid organsstructure and their role. Cells of immune system-a)broad categories of leucocytes, their role and properties b) B-lymphocytes c) T-cells-subsets d) other cells (APC, Null, NK) **Unit II** **Antigen and Antibody** **Antigen**- definition, nature, types of antigen, factors affecting antigenicity. **Antibody**- definition, nature, basic structure of immunoglobulin molecule, major human immunoglobulin classes, properties and functions. Theories of antibody production. **Immune response**-primary and secondary immune response, **Antigen Antibody reactions**-Principle and applications of a)agglutination b) Precipitation c) complement fixation d) ELISA. **Hypersensitivity**- Concept and types with example. (Type-I,II,III)	**Unit I** **Introduction-** **Types of immunity**-i)Innate (specific and non-specific) ii) Acquired (Active and Passive), **Types of Defense**- a) first line of defense (barriers at the portal of entry, physical and chemical barriers) b) second line of defense (Phagocytosis– oxygen dependent and independent) c) third line of defense-specific defense mechanism. **Introduction to cells and organs of immune system-** Organs of immune system-primary and secondary lymphoid organsstructure and their role. Cells of immune system-a)broad categories of leucocytes, their role and properties b) B-lymphocytes c) T-cells-subsets d) other cells (APC, Null, NK) **Unit II** **Antigen and Antibody** **Antigen**- definition, nature, types of antigen, factors affecting antigenicity. **Antibody**- definition, nature, basic structure of immunoglobulin molecule, major human immunoglobulin classes, properties and functions. Theories of antibody production. **Immune response**-primary and secondary immune response, **Antigen Antibody reactions**-Principle and applications of a)agglutination b) Precipitation c) complement fixation d) ELISA. **Hypersensitivity**- Concept and types with example. (Type-I,II,III)	---	Completed

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 **Term - I**

Name of Teacher –Miss. V. N. Arekar **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	**Sem I** **DSC07BTE11** Biotechnology I-Biotechnology for Human Welfare I	**Unit I - Introduction to Biotechnology:**Origin and definition, History of Biotechnology, Scope and importance, Branches of Biotechnology in India, CSIR Institutes in India, Commercial potential & Achievements of Biotechnology **Production of Biofertilizer and biopesticide** **Unit II - Health Biotechnology:** Gene Therapy, Vaccines- concept, types of vaccines, Stem Cells, **Forensic science-** Global history and development of forensic science, Sir Alec Jeffrey's Important Contribution, Divisions of FSL	**Unit I - Introduction to Biotechnology:**Origin and definition, History of Biotechnology, Scope and importance, Branches of Biotechnology in India, CSIR Institutes in India, Commercial potential & Achievements of Biotechnology **Production of Biofertilizer and biopesticide** **Unit II - Health Biotechnology:** Gene Therapy, Vaccines- concept, types of vaccines, Stem Cells, **Forensic science-** Global history and development of forensic science, Sir Alec Jeffrey's Important Contribution, Divisions of FSL	---	Completed
B.Sc. II	**Sem III** **MIN07BTE32** Environmental Microbiology	**Unit I :Water Pollution** - Hardness, Water softening methods, COD and BOD, Purification of water, **Air Pollution** -London and LA Smog, Greenhouse Effect, Ozone Depletion, **Soil Pollution** - Role of pesticide **Environmental Toxicology** - Pesticide Toxicity –Mode of action of toxicants (Metals, organophosphates, carbamates and mutagens) **Unit II: Environmental Impact Assessment, Bioremediation** –Concept and types, Agricultural bioremediation, **Biofuel production.**	**Unit I :Water Pollution** - Hardness, Water softening methods, COD and BOD, Purification of water, **Air Pollution** -London and LA Smog, Greenhouse Effect, Ozone Depletion, **Soil Pollution** - Role of pesticide **Environmental Toxicology** - Pesticide Toxicity –Mode of action of toxicants (Metals, organophosphates, carbamates and mutagens) **Unit II: Environmental Impact Assessment, Bioremediation** –Concept and types, Agricultural bioremediation, **Biofuel production.**	---	Completed

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 **Term - II**

Name of Teacher –Miss. V. N. Arekar **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	**Sem II** **OEC07BTE21:** OE III- Ecology	**Unit I - Ecosystem, Productivity-** Kinds of productivity, **Food chain, Ecological pyramids, Energy flow in ecosystem, Biogeochemical cycle:** Carbon, Nitrogen, Sulphur, Phosphorus cycle, **Biodiversity** - conservation & importance of biodiversity, **Hot Spots.** **Unit II- Population Ecology-** population characteristics & growth curve **Evolution:** Lamarckism, Darwinism, Modern synthetic & mutational theory, Hardy-Weinberg law and Equation	**Unit I - Ecosystem, Productivity-** Kinds of productivity, **Food chain, Ecological pyramids, Energy flow in ecosystem, Biogeochemical cycle:** Carbon, Nitrogen, Sulphur, Phosphorus cycle, **Biodiversity** - conservation & importance of biodiversity, **Hot Spots.** **Unit II- Population Ecology-** population characteristics & growth curve **Evolution:** Lamarckism, Darwinism, Modern synthetic & mutational theory, Hardy-Weinberg law and Equation	---	Completed
B.Sc. III	**Sem VI** Application of Biotechnology in Health	**Unit I :Stem cells and Transgenic Technology** :Concept of stem cell progenitors, stem cell technology and its application, **Transgenic :echnology, Vaccines-** types of vaccine, Subunit vaccines- ,Recombinant vaccines, **Bioreporters Unit II: Monoclonal Antibodies-** Hybridoma Technology, **Biosensors, Gene Therapy, Public health:** DNA sample preparation, Methods of disease Diagnosis	**Unit I :Stem cells and Transgenic Technology** :Concept of stem cell progenitors, stem cell technology and its application, **Transgenic technology, Vaccines-** types of vaccine, Subunit vaccines- ,Recombinant vaccines, **Bioreporters Unit II: Monoclonal Antibodies-** Hybridoma Technology, **Biosensors, Gene Therapy, Public health:** DNA sample preparation, Methods of disease Diagnosis	---	Completed

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 **Term - I**

Name of Teacher – Miss. A.S. Kale **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	Bioinstrumentation	**Unit I** Methods of cell disruption Centrifugation and Types of centrifuge Basic laboratory instrumentation **Unit II** Microscopy Principle, working & application of Types of Microscopy Colorimeter UV-Visible Spectroscopy	**Unit I** Methods of cell disruption Centrifugation and Types of centrifuge Basic laboratory instrumentation **Unit II** Microscopy Principle, working & application of Types of Microscopy Colorimeter UV-Visible Spectroscopy	---	Completed
B.Sc. II	Molecular Biology I	**Unit I** Experimental evidences for DNA as a genetic material Properties and Function of DNA Organization of genome **Unit II** Nucleic Acid Biosynthesis DNA Replication DNA repair	**Unit I** Experimental evidences for DNA as a genetic material Properties and Function of DNA Organization of genome **Unit II** Nucleic Acid Biosynthesis DNA Replication DNA repair	---	Completed

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 **Term - II**

Name of Teacher – Miss. A.S. Kale **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	Basic in cell biology	**Unit I** Cell structure Organization of cell Ultrastructure and function of cell organelles Types of membrane transport **Unit II** Nucleus Chromosome structure Cytoskeleton assembly Microfilaments	**Unit I** Cell structure Organization of cell Ultrastructure and function of cell organelles Types of membrane transport **Unit II** Nucleus Chromosome structure Cytoskeleton assembly Microfilaments	---	Completed
B.Sc. II	Advance in cell biology	**Unit I** Secretary pathway and protein trafficking Transport of protein Cell signaling Cell surface receptor protein **Unit II** Cell division cycle Cell cycle checkpoint Cell division Synaptonemal complex	**Unit I** Secretary pathway and protein trafficking Transport of protein Cell signaling Cell surface receptor protein **Unit II** Cell division cycle Cell cycle checkpoint Cell division Synaptonemal complex	---	Completed

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 **Term - I**

Name of Teacher –Miss. T.S. Vagavekar **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	MIN07BTE11 Microbiology-I (Introduction to Microbial world)	**Unit I** **Development of microbiology as a discipline** – Biogenesis Vs Abiogenesis. Ubiquitous nature of microbial life. Development from simple to complex life form. **Significance of Scientific contributions in development in Microbiology as a discipline:** **A. Early contributions** Robert Hook, Anton Van Leeuwenhoek, Louis Pasteur, Robert Koch, John Tyndall. **B. Scientific contribution leading to diversification of Microbiology** **i.** Medical Microbiology and Immunology- Edward Jenner, Paul Ehrlich, Ellie Metchnikoff, Lister. **ii.** Food Microbiology and Fermentation Alexander Fleming, Louis Pasteur, Selman Waksman **iii.** Soil Microbiology- Winogradsky, Martinus Beijerinck **iv.** Microbial Genetics – Watson and Crick, Hargobind Khurana, Griffith, Avery, McCarty, and Macloed. **Beneficial and harmful activities of microorganisms in** – Medical, Environmental, Food, Agriculture, Industrial microbiology **Applied branches of Microbiology and major microbiological institutes in India.** **Unit II** **Diversity of Microbial World:**	**Unit I** **Development of microbiology as a discipline** – Biogenesis Vs Abiogenesis. Ubiquitous nature of microbial life. Development from simple to complex life form. **Significance of Scientific contributions in development in Microbiology as a discipline:** **A. Early contributions** Robert Hook, Anton Van Leeuwenhoek, Louis Pasteur, Robert Koch, John Tyndall. **B. Scientific contribution leading to diversification of Microbiology** **i.** Medical Microbiology and Immunology- Edward Jenner, Paul Ehrlich, Ellie Metchnikoff, Lister. **ii.** Food Microbiology and Fermentation Alexander Fleming, Louis Pasteur, Selman Waksman **iii.** Soil Microbiology- Winogradsky, Martinus Beijerinck **iv.** Microbial Genetics – Watson and Crick, Hargobind Khurana, Griffith, Avery, McCarty, and Macloed. **Beneficial and harmful activities of microorganisms in** – Medical, Environmental, Food, Agriculture, Industrial microbiology **Applied branches of Microbiology and major microbiological institutes in India.** **Unit II** **Diversity of Microbial World:**	---	Completed

		A. Systematic of Classification- Binomial nomenclature, three kingdom, five kingdom classification and utility. **Bacterial taxonomy:** General principles of bacterial nomenclature - a) Taxonomic ranks, b) Common or Vernacular name, c) Scientific or International name, Criteria for bacterial classification- Morphological, cultural, biochemical & serological characters, Concept of bacterial species & strain. Introduction to Bergey's manual of systematic bacteriology. **B. Differences in Cellular and Acellular microorganisms** Differences in prokaryotic and eukaryotic (Occurrence, morphology,mode of reproduction and economic importance) **C. Different groups microorganisms-** Bacteria, Yeast, Fungi, Actinomycetes, Algae, Viruses, Protozoa, Viroids and Prions	**A. Systematic of Classification-** Binomial nomenclature, three kingdom, five kingdom classification and utility. **Bacterial taxonomy:** General principles of bacterial nomenclature - a) Taxonomic ranks, b) Common or Vernacular name, c) Scientific or International name, Criteria for bacterial classification- Morphological, cultural, biochemical & serological characters, Concept of bacterial species & strain. Introduction to Bergey's manual of systematic bacteriology. **B. Differences in Cellular and Acellular microorganisms** Differences in prokaryotic and eukaryotic (Occurrence, morphology,mode of reproduction and economic importance) **C. Different groups microorganisms-** Bacteria, Yeast, Fungi, Actinomycetes, Algae, Viruses, Protozoa, Viroids and Prions		
B.Sc. III	DSE-1352-E-Industrial Biotechnology	**Unit I** **Introduction to Industrial Biotechnology** Concept and range of fermentation technology, Types of fermentations (Batch, continuous, dual, multiple), Concept of solid state & submerged fermentation. Microbial metabolic products- Primary & Secondary products. Basic design of Fermentor Components of Fermentor and their functions, Types of Fermentor- Stirred tank Fermentor, Airlift Fermentor, Tower Fermentor. **Microbial Screening, Scale up and strain improvement** Primary and secondary screening, Primary screening of antibiotics, organic acids and amines, enzymes, vitamins and amino acid producers, volatile component degraders, organisms using specific carbon and nitrogen sources. Secondary screening of antibiotic	**Unit I** **Introduction to Industrial Biotechnology** Concept and range of fermentation technology, Types of fermentations (Batch, continuous, dual, multiple), Concept of solid state & submerged fermentation. Microbial metabolic products- Primary & Secondary products. Basic design of Fermentor Components of Fermentor and their functions, Types of Fermentor- Stirred tank Fermentor, Airlift Fermentor, Tower Fermentor. **Microbial Screening, Scale up and strain improvement** Primary and secondary screening, Primary screening of antibiotics, organic acids and amines, enzymes, vitamins and amino acid producers, volatile component degraders, organisms using specific carbon and nitrogen sources. Secondary screening of antibiotic	---	Completed

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		producers, Scale up of fermentations, Strain improvement- concept and methods -mutation, genetic recombination. Maintenance and preservation of industrially important cultures. Microbiological assay **Unit II** Fermentation Media Concept of pure and mixed culture, Composition of typical fermentation media, Criteria for typical fermentation medium, Types of fermentation media, General role of media components- water, carbon source, nitrogen source, minerals, precursors, growth factors, buffers, antifoams, inducers, inhibitors. Optimization of media- Plackett and Burmann design, Factors affecting fermentation process. Microbial growth kinetics basic concept (Batch, Continuous and Fed Batch). **Downstream Process and Product Recovery** Downstream Processes in fermentation and bioprocess technology Solid and liquid separation, Flocculation and Flotation, filtration and centrifugation, Cell disruption by solid and liquid shear, ultrasonication, enzyme action and mechanical disruption. Product recovery and purification- principle, Precipitation, Crystallization, Liquid-Liquid extraction, Distillation (Fractional and Steam), evaporation, Chromatographic separation (Principles), Adsorption and concentration, Membrane filtration, drying and packing.	producers, Scale up of fermentations, Strain improvement- concept and methods -mutation, genetic recombination. Maintenance and preservation of industrially important cultures. Microbiological assay **Unit II** Fermentation Media Concept of pure and mixed culture, Composition of typical fermentation media, Criteria for typical fermentation medium, Types of fermentation media, General role of media components- water, carbon source, nitrogen source, minerals, precursors, growth factors, buffers, antifoams, inducers, inhibitors. Optimization of media- Plackett and Burmann design, Factors affecting fermentation process. Microbial growth kinetics basic concept (Batch, Continuous and Fed Batch). **Downstream Process and Product Recovery** Downstream Processes in fermentation and bioprocess technology Solid and liquid separation, Flocculation and Flotation, filtration and centrifugation, Cell disruption by solid and liquid shear, ultrasonication, enzyme action and mechanical disruption. Product recovery and purification- principle, Precipitation, Crystallization, Liquid-Liquid extraction, Distillation (Fractional and Steam), evaporation, Chromatographic separation (Principles), Adsorption and concentration, Membrane filtration, drying and packing.		

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 **Term – II**

Name of Teacher –Miss. T.S. Vagvekar **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. I	**MIN07BTE21** Microbiology-III (Bacterial Cytology and Cultivation)	**Unit I** **Morphology and cytology of Bacteria** **Morphology of Bacteria** – i) Size, ii) Shape, iii) Arrangements **Cytology of Bacteria** – **1. Cell wall:** Composition and detailed structure of Gram positive and Gram negative cell walls, archaebacterial cell wall, Lipopolysaccharide, Sphaeroplasts, protoplasts and L: forms. Effect of antibiotics and enzymes on the cell wall **2. Cell membrane :** Strucure , function and chemical composition of bacterial and archael cell membranes **3. Endospore :**Structure , formation and stages of sporulation **4. Capsule :** Structure , composition and function **5. Flagella :** Structure , composition and function **6. Fimbriae and pili :** structure , composition and function **7. Cytoplasm :** Ribosomes, mesosomes, nucleoid, chromosome and plasmids, Cell inclusion - gas vesicles, carboxysomes , PHB granules , metachromatic granules and glycogen bodies **Unit II** **Microbial nutrition** Nutritional requirements of microorganisms : Water;	**Unit I** **Morphology and cytology of Bacteria** **Morphology of Bacteria** – i) Size, ii) Shape, iii) Arrangements **Cytology of Bacteria** – **1. Cell wall:** Composition and detailed structure of Gram positive and Gram negative cell walls, archaebacterial cell wall, Lipopolysaccharide, Sphaeroplasts, protoplasts and L: forms. Effect of antibiotics and enzymes on the cell wall **2. Cell membrane :** Strucure , function and chemical composition of bacterial and archael cell membranes **3. Endospore :**Structure , formation and stages of sporulation **4. Capsule :** Structure , composition and function **5. Flagella :** Structure , composition and function **6. Fimbriae and pili :** structure , composition and function **7. Cytoplasm :** Ribosomes, mesosomes, nucleoid, chromosome and plasmids, Cell inclusion - gas vesicles, carboxysomes , PHB granules , metachromatic granules and glycogen bodies **Unit II** **Microbial nutrition** Nutritional requirements of microorganisms : Water;	---	Completed

		Micronutrients; Macronutrients; Carbon, Energy source; Oxygen and Hydrogen; Nitrogen, Sulphur and Phosphorous and growth factors- auxotroph, prototroph and fastidious organisms. Nutritional types of microorganism based on carbon and energy sources - a. Autotrophs b. Heterotrophs c. Phototrophs d. Chemotrophs, e. Photoautotrophs f. Chemoautotrophsg .Photoheterotrophs, h. Chemoheterotrophs. **Culture media and pure culture techniques:** Common components of media and their functions Peptone, Yeast extract, NaCl, Agar and Sugar. Culture media – a) Living Media (Lab. Animals, plants, bacteria, embryonated eggs, tissue cultures), b) Non living media – i) Natural, ii) Synthetic, iii) Semisynthetic, iv) Differential, v) Enriched, vi) Enrichment, vii) Selective. **Methods for isolation of pure culture** – i) Streak plate ii) Pour plate iii) Spread plate **Microbial growth:** Definition of growth, phases & growth curve – a] Continuous culture, b] Synchronous growth, c] Diauxic growth Effect of environmental factors on growth-temperature, pH., osmotic pressure, hydrostatic pressure, surface tension, heavy metals, ultraviolet light.	Micronutrients; Macronutrients; Carbon, Energy source; Oxygen and Hydrogen; Nitrogen, Sulphur and Phosphorous and growth factors- auxotroph, prototroph and fastidious organisms. Nutritional types of microorganism based on carbon and energy sources - a. Autotrophs b. Heterotrophs c. Phototrophs d. Chemotrophs, e. Photoautotrophs f. Chemoautotrophsg .Photoheterotrophs, h. Chemoheterotrophs. **Culture media and pure culture techniques:** Common components of media and their functions Peptone, Yeast extract, NaCl, Agar and Sugar. Culture media – a) Living Media (Lab. Animals, plants, bacteria, embryonated eggs, tissue cultures), b) Non living media – i) Natural, ii) Synthetic, iii) Semisynthetic, iv) Differential, v) Enriched, vi) Enrichment, vii) Selective. **Methods for isolation of pure culture** – i) Streak plate ii) Pour plate iii) Spread plate **Microbial growth:** Definition of growth, phases & growth curve – a] Continuous culture, b] Synchronous growth, c] Diauxic growth Effect of environmental factors on growth-temperature, pH., osmotic pressure, hydrostatic pressure, surface tension, heavy metals, ultraviolet light.		
B.Sc. III	**DSE-1352-F-** Food and Microbial Biotechnology	**Unit I** **Microbial Production of Industrial product** **Microbial Production of** - Edible mushroom, Single Cell Protein- Spirulina, Yeast **Pharma product-** Antibiotics - Penicillin, **Organic products** - Citric acid, Vitamins (B 12), Amino acids- Lysine, **Industrial Enzyme** - amylase –koji fermentation **Fermented Foods and Beverages** Nutraceutical Dairy Products – Cheese, Probiotic – Homo and Heterolactic fermentation, Bakery Products – Bread ,	**Unit I** **Microbial Production of Industrial product** **Microbial Production of** - Edible mushroom, Single Cell Protein- Spirulina, Yeast **Pharma product-** Antibiotics - Penicillin, **Organic products** - Citric acid, Vitamins (B 12), Amino acids- Lysine, **Industrial Enzyme** - amylase –koji fermentation **Fermented Foods and Beverages** Nutraceutical Dairy Products – Cheese, Probiotic – Homo and Heterolactic fermentation, Bakery Products – Bread ,	---	Completed

		Fermented Pickles – Sauerkraut, Beverages – Beer, Wine (Red table and white table), Champagne **Unit II** **Food Spoilage, preservation & toxicity** Types of spoilage- Physical, Chemical and Biological (auto and microbial), Preservation methods- High and Low temperatures, Controlled atmosphere and Anerobiosis, Radiations and Asepsis, Chemical preservatives (Salt, sugar, organic acids, SO_2, NO_2). Food Toxicity – Mycotoxin (Aflatoxin), Exotoxin (*Staphylococcal*), Neurotoxin (Botulinum), Food borne illness- Shigellosis, Amoebiosis, Aspergiliosis. **Fermentation economics** Contribution of various expense heads to a process (Recurring and non-recurring expenditure) citing any suitable example **Quality Assurance of fermentation product:** Detection and quantification of the product by physicochemical, biological and enzymatic methods, Sterility testing,	Fermented Pickles – Sauerkraut, Beverages – Beer, Wine (Red table and white table), Champagne **Unit II** **Food Spoilage, preservation & toxicity** Types of spoilage- Physical, Chemical and Biological (auto and microbial), Preservation methods- High and Low temperatures, Controlled atmosphere and Anerobiosis, Radiations and Asepsis, Chemical preservatives (Salt, sugar, organic acids, SO_2, NO_2). Food Toxicity – Mycotoxin (Aflatoxin), Exotoxin (*Staphylococcal*), Neurotoxin (Botulinum), Food borne illness- Shigellosis, Amoebiosis, Aspergillosis. **Fermentation economics** Contribution of various expense heads to a process (Recurring and non-recurring expenditure) citing any suitable example **Quality Assurance of fermentation product:** Detection and quantification of the product by physicochemical, biological and enzymatic methods, Sterility testing,		

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 **Term - I**

Name of Teacher – Miss. S.S. Rote **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. II	Molecular Biology II	**Unit I** Transcription in prokaryote and Eukaryote, Enzyme involved, Inhibitors of transcription, Post transcriptional modification, Genetic code, Wobble Hypothesis **Unit II** Translation in prokaryote and Eukaryote Initiation, Elongation, termination, Inhibitors of translation, Post- translation modifications Regulation of gene expression	**Unit I** Transcription in prokaryote and Eukaryote, Enzyme involved, Inhibitors of transcription, Post transcriptional modification, Genetic code, Wobble Hypothesis **Unit II** Translation in prokaryote and Eukaryote Initiation, Elongation, termination, Inhibitors of translation, Post- translation modifications Regulation of gene expression	---	Completed
I Sc. III	Advance in Genetic Engineering	**Unit I** Isolation of Gene, cDNA and genomic library, Screening of libraries, PCR and its application, Types of PCR and Applications molecular identification --16 s r RNA18 s r RNA, and Bar code **Unit II** Cloning methodologies, Construction of plasmid, Chemical methods, Physical methods, Screening of recombinants Application of r-DNA technology	**Unit I** Isolation of Gene, cDNA and genomic library, Screening of libraries, PCR and its application, Types of PCR and Applications molecular identification --16 s r RNA18 s r RNA, and Bar code **Unit II** Cloning methodologies, Construction of plasmid, Chemical methods, Physical methods, Screening of recombinants Application of r-DNA technology	---	Completed

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STATEMENT OF SYLLABUS COVERED

Year 2024-2025 Term - I

Name of Teacher – Miss. S. S. Rote **Department** – Biotechnology (Entire)

Class	Subject	Syllabus assigned	Syllabus Covered	Syllabus not to covered	Remark
B.Sc. III	Basics in Genetic Engineering	**Unit I** Introduction and Scope, Enzymes and its applications, Restriction enzymes- types, Cloning Vectors, Bacteriophage vectors, Animal vectors, Retroviral , Plant vector **Unit II** Nucleic Acid Hybridization, Probe Preparation, Methods of labeling probes, Radio labeling and Non Radiolabelling, DNA Sequencing and blotting technique	**Unit I** Introduction and Scope, Enzymes and its applications, Restriction enzymes- types. Cloning Vectors, Bacteriophage vectors, Animal vectors, Retroviral , Plant vector **Unit II** Nucleic Acid Hybridization, Probe Preparation, Methods of labeling probes, Radio labeling and Non Radiolabelling, DNA Sequencing and blotting technique	---	Completed
B.Sc. III	Bio safety, Bioethics and Intellectual Property Rights	**Unit I** Bioethics, National Regulations of Bioethics and International considerations, Regulatory bodies, Biosafety, Levels of Biosafety, Levels of Biosafety, Good Laboratory Practices **Unit II** Intellectual Property Rights, World Trade Organization and its related intellectual Property provisions, Budapest Treaty; , Protection of GMOs	**Unit I** Bioethics, National Regulations of Bioethics and International considerations, Regulatory bodies, Biosafety, Levels of Biosafety, Levels of Biosafety, Good Laboratory Practices **Unit II** Intellectual Property Rights, World Trade Organization and its related intellectual Property provisions, Budapest Treaty; , Protection of GMOs	---	Completed

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