

Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Mr.S.G.Kulkarni

Semester: I Course Title: Biochemistry- I

Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total		
08	02	10	Origin of life: - Properties of water:	Basic concept, A.I. Oparin concept, Urey Miller's experiment, Introduction to Biomolecules - Carbohydrate, Protein, Lipid, Nucleic Acid Interactions in aqueous systems. Ionization of water, weak acid weak bases. Ionic Product of Water
Month August 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Biological Buffer Systems-	e.g. Phosphate, Bicarbonate, Haemoglobin buffer system, Protein buffer system
07	03	10		
Month September 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Nucleic acids	: Nucleosides, nucleotides, polynucleotide, DNA and its different forms with properties. (A, B, D, & Z), RNA and its types- m-RNA, t-RNA r-RNA Forces Stabilizing nucleic acid structure.
07	03	10		
Month October 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Carbohydrates:	Classification, glyceraldehydes, simple aldoses & ketoses ,open and Ring Structure of Aldoses and Ketoses, Confirmation of D-glucose, biological importance of carbohydrates, reactions of monosaccharide (Oxidation, reduction, Osazone), glycosidic bond, disaccharides (Sucrose, maltose, lactose), polysaccharides - homo polysaccharides, e.g. Starch, glycogen, Cellulose. Mutarotation of Glucose
08	03	11		

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Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Mr.S.G.Kulkarni

Semester-II

Course Title:-Biochemistry-II

December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total		
08		08	Protein:	Amino acid classification (Depending upon R group), structure of amino acids, single letter codes of amino acids, peptide bond, classification of protein based on composition Simple ,conjugate, derived. Determination of primary structure (Sanger's method, Edman's method, Dansylchloride), structural level organisation of proteins- Primary ,Secondary- forces stabilizing secondary structure types – α – helix, β -sheets, Ramachandran plot. Tertiary structure (Describe different bonds), w.r.t. Myoglobin. Quaternary structure w.r.t. Hemoglobin. Biological functions of Proteins.
January 2026			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Chromatography : Introduction, Theory, Principle and Mechanism and applications	Introduction, Theory, Principle and applications of Thin layer chromatography, paper chromatography, column chromatography, size exclusion chromatography, Ion exchange chromatography, Affinity
February 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Enzymes:	Introduction, IUB classification, active site, energy of activation, transition state hypothesis, lock and key hypothesis, Induced fit hypothesis, enzyme inhibition- types competitive, non-competitive, un-competitive. M-M equation, Line weaver- Burk plot
07		07		
March 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Vitamins and Co-enzymes:	Classification, water-soluble (Vitamin B complex Vitamin C) and fat-soluble vitamins (Vitamin A, E, D and K). Structure, dietary requirements, deficiency conditions, coenzyme forms and their mechanism.
08		08		

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Department of Biotechnology (Entire)
Academic Year 2025-26
Name of the teacher: Mr.S.G.Kulkarni
Semester: III

Course Title: Metabolic Pathways-I

Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Metabolism:-	Introduction to metabolism, anabolism & catabolism, catabolism & its three stages, types of metabolic reactions, Methods employed to study metabolism (by cell free extract, using auxotrophic mutants, radioisotopes), High energy compounds enlist some examples 5 to 6.
08		08		
Month August 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Carbohydrates Metabolism:-	Reactions and energetics of Glycolysis, Gluconeogenesis, TCA cycle, Glyoxylate cycle, HMP and its significance. Shuttle system- Malate Aspartate shuttle system, Glycerol 3 Phosphate shuttle system. Cori Cycle
07		07		
Month September 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Lipid Metabolism:	Biosynthesis of fatty acid with respect to Palmitic acid & degradation of fatty acid (β -oxidation) with respect to Palmitic acid.
07		07		
Month October 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Respiration:- Aerobic:- Respiration:- Anaerobic Respiration :- Alcoholic and Lactic acid fermentation.	Flow of electrons in ETC, Redox potential components of ETC, Mechanism of ATP generation- Chemiosmotic hypothesis, ATP synthase complex. Inhibitors of ETC Anaerobic
08		08		

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Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Mr.S.G.Kulkarni

Semester-IV Course Title: Metabolic Pathways-II

December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Plant Water Relation:-	Introduction, Absorption of water-Mechanism, Theories (Active and Passive), Translocation of water- Mechanism, Theories (Root pressure, Capillary), Transpiration.
08	02	08		
January 2026			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Photosynthesis:-	Ultra structure of chloroplast, Photosynthetic pigments, red drop and Emerson's enhancement effect, mechanism of photosynthesis, light reaction, dark reaction, C-3 pathway, C-4 pathway, CAM, photorespiration.
07	03	07		
February 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Nitrogen Metabolism: -	Role of nitrogen in plants, source of nitrogen, nitrogen fixation-symbiotic & Non-symbiotic, Mechanism of Nitrogen fixation, nif gene- concept and significance, transamination.
07	03	07		
March 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Introduction to Plant Hormones. Secondary metabolite: Concept: Photoperiodism and Vernalisation.	Biosynthesis of plant hormones- Auxin, Cytokinin, Gibberellin Introduction, Classification and its biological role Photoperiodism types of plants mechanism and Vernalisation. Process , mechanism and applications
08	03	08		

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Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Miss.V. N. More

Semester: I

Course Title: Sub code - MIN07BTE12 Microbiology-II (Techniques in Microbiology)

Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total		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)
08	02	10		
Month August 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Checking efficiency of Disinfection-	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
07	03	10		
Month September 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	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).
07	03	10		
Month October 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Stains and staining procedures	Definition of dye and 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
08	03	11		

V.N. More
(Ms. V.N. More)

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Academic Year 2025-26

Name of the teacher: Miss. V. N. More

Semester: II

Course Title: Microbiology-III (Bacterial Cytology and Cultivation)

Month November 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Cytology of Bacteria	Morphology and cytology of Bacteria Morphology of Bacteria Cytology of Bacteria
08	02	10		
Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Cytology of Bacteria	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 , PHE granules , metachromatic granules and glycogen bodies
07	02	09		
Month January 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Microbial nutrition Culture media and pure culture techniques	Nutritional requirements of microorganisms : Water; 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. Chemoautotrophs g. Photoheterotrophs, h. Chemoheterotrophs. 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),
07	03	10		
Month February 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Culture media and pure culture techniques Methods for isolation of pure culture Microbial growth	b) Non living media – i) Natural, ii) Synthetic, iii) Semisynthetic, iv) Differential, v) Enriched, vi) Enrichment, vii) Selective. i) Streak plate ii) Pour plate iii) Spread plate 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.
08	02	10		

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Academic Year 2025-26

Name of the teacher: Miss. V. N. More

Semester: III

Course Title: DSC – 134 iC- Microbial Genetics

Month June 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Mendel's law of Inheritance Deviations of Mendel laws Interaction of gene	Mendel's Experiment, Dominance and recessiveness, Principle of segregation, independent assortment, back and test cross. Incomplete dominance, codominance, multiple allele. Modifiers, suppressors, pleiotropic gene. Dominant and Recessive Epistasis.
08	02	10		
Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Linkage Crossing over Structural and numerical changes in chromosomes.	Definition, coupling and repulsion hypothesis, linkage groups. Mechanism and theory. Extra chromosomal or cytoplasmic or organellar inheritance- mitochondrial and plastid.
07	03	10		
Month August 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Mutation	Definition, Types (spontaneous and Induced) Mechanism of Mutagenesis- Base analogue, Nitrous acid, hydroxyl amine, alkylation agent, Acridine dyes, U.V. Light. Plasmid - Types, Structure, properties and applications.
07	03	10		
Month September 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Genetic recombination in bacteria Genetics Disease	Definition, fate of exogenote in recipient cell, transformation, conjugation, transduction Autosomal and Sex Linked
08	03	11		

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Academic Year 2025-26

Name of the teacher: Miss. V. N. More

Semester: IV

Course Title: DSC – 1345 D Immunology

Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	1. 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.
08	02	10		
Month January 2026			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Introduction to cells and organs of immune system-	Organs of immune system-primary and secondary lymphoid organs structure 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)
07	03	10		
Month February 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	2. 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,
07	03	10		
Month March 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	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) i. Bacteriophages – T4 phage (Lytic), Lambda phage (Lytic and lysogeny) ii. Plant viruses – TMV iii. Animal viruses – HIV, nCoV, HPV
08	03	11		

V.N. More
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Academic Year 2025-26

Name of the teacher: Miss. V.N. Arekar

Semester: I

Course Title: Biotechnology I- Biotechnology for Human Welfare I

Month June 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	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
08	00	08		
Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Production of Biofertilizer and biopesticide	Production of Biofertilizer- <i>Azotobacter</i> , <i>Rhizobium</i> , <i>Azospirillum</i> Biopesticide : <i>Trichoderma</i> , <i>BT</i>
07	00	07		
Month August 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Health Biotechnology	Gene Therapy, Vaccines- concept, types of vaccines, Stem Cells
07	00	07		
Month September 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Forensic science	Global history and development of forensic science, Sir Alec Jeffrey's Important Contribution, Divisions of FSL, Techniques and tools in Forensic labs
08	00	08		


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Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Miss. V. N. Arekar

Semester: II

Course Title: Ecology

Month November 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Ecosystem, Productivity	Kinds of productivity, Food chain, Ecological pyramids, Energy flow in ecosystem, Biogeochemical cycle: Carbon, Nitrogen, Sulphur, Phosphorus cycle
08	00	08		
Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Biodiversity	Conservation & importance of biodiversity, Hot Spots
07	00	07		
Month January 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Population Ecology	population characteristics & growth curve
07	00	07		
Month February 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Evolution	Lamarckism, Darwinism, Modern synthetic & mutational theory, Hardy-Weinberg law and Equation
08	00	08		

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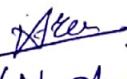
Academic Year 2025-26

Name of the teacher: Miss. V.N. Arekar

Semester: III

Course Title: Environmental Microbiology

Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Water Pollution	Hardness, Water softening methods, COD and BOD, Purification of water,
08	02	10		
Month August 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Air Pollution Soil Pollution	London and LA Smog, Greenhouse Effect, Ozone Depletion, Role of pesticide
07	02	09		
Month September 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Environmental Toxicology	Pesticide Toxicity –Mode of action of toxicants (Metals, organophosphates, carbamates and mutagens)
07	03	10		
Month October 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Environmental Impact Assessment, Bioremediation	Concept and types, Agricultural bioremediation, Biofuel production
08	03	11		


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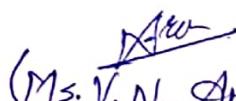
Academic Year 2025-26

Name of the teacher: Miss. V. N. Arekar

Semester: VI

Course Title: Plant Tissue Culture

Month November 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Introduction to PTC and aseptic techniques	
08	02	10		History, cellular totipotency, surface sterilization, media sterilization
Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Culture media, Micropropagation, Organ culture	
07	03	10		Preparation of media, different pathways of micro propagation, ovary culture, ovule culture, anther and pollen culture
Month January 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Callus culture techniques, somatic embryogenesis, Organogenesis	
07	03	10		Introduction, principle, protocol, factors affecting, applications
Month February 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Suspension culture techniques, somaclonal variations, protoplast culture	
08	02	10		Introduction, principle, protocol, factors affecting, applications Commercial applications of PTC


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Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Miss. A.S. Kale

Semester: I

Course Title: Bioinstrumentation I

Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Methods of cell disruption Centrifugation and Types of centrifuge	Blenders, Sonication, Salt participation, Dialysis, Ultra-filtration, Types of centrifugation, Svedberg's constant
08	02	10		
Month August 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Basic laboratory instrumentation	Electrophoresis, PAGE, SDS- PAGE, Supporting media, pH meter, autoclave, Laminar air flow
07	03	10		
Month September 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Microscopy Principle, working & application of Types of Microscopy	History, Introduction, Bright Field microscopy Dark Field microscopy Florescence Microscopy Phase Contrast Microscopy
07	03	10		
Month October 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Colorimeter UV-Visible Spectroscopy	Introduction, Lamberts- Beers law, Introduction to spectroscopy, Electromagnetic spectrum, Application of UV-Visible and Visible spectroscopy
08	03	11		

A. S. Kale
 (Miss. A. S. Kale)
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Academic Year 2025-26
Name of the teacher: Miss. A.S. Kale
Semester: II

Course Title: Basic in cell biology

Month November 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total		
08	02	10	Cell Structure Organization of cell	Discovery of Cell, Cell theory -Definition, discovery, three assumptions of cell theory, exceptions, organismal theory, protoplasm theory, Organization of Prokaryotic cell. Organization of Prokaryotic cell, Organization of Eukaryotic cell (plant and animal cell), Ultra structure & functions of cell organelles Mitochondria, Chloroplast, E.R., Golgi apparatus ,Lysosome, Peroxisome, Ribosomes.
Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total		
07	03	10	Cell membrane & Membrane transport	Cell membrane -components, Molecular models of cell membrane-Unit membrane model, Protein, crystal model, fluid mosaic model, Types of membrane transport, Passive transport-simple diffusion, facilitated diffusion, osmosis. Active transport-primary and secondary transport, Sodium pump, Na ⁺ -K ⁺ ATPase pump, Bulk transport-endocytosis and exocytosis
Month January 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total		
07	03	10	Nucleus	Introduction, morphology, occurrence, shape, size, number, position Ultra structure of nucleus-Nuclear membrane, nucleoplasm, nucleo pore complex, nucleus. Chromosome structure - introduction, General features of Prokaryotic chromosome. General features of Eukaryotic chromosome-. Chromosome number, size, Chromosomal nomenclature & General structure
Month February 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total		
08	03	10	Cytoskeleton assembly	Introduction, Cytoskeleton elements, Microtubules-occurrence, structure, chemical composition, microtubule associated proteins, functions, Microfilaments- occurrence, structure, chemical composition, functions, Intermediate filaments(IF) - occurrence, structure, chemical composition, types of IF, functions Organization of cilia and flagella

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(Miss. A.S. Kale)
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Department of Biotechnology (Entire)
Academic Year 2025-26
Name of the teacher: Miss. A.S. Kale
Semester: IV
Course Title: Advance in cell biology

Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Module/Unit: I	
08	-	08	Secretary pathway and protein trafficking	
Month January 2026			Sub-units planned	
Lectures	Practical	Total	Cell signalling Cell surface receptor proteins-	
07	-	07	Introduction, general principles of cell signalling. Types of cell signalling-contact dependent signalling, autocrine, paracrine, synaptic, endocrine, gap junctions, combinatorial signalling. Cell surface receptor proteins- Ion channel linked receptors, G-protein linked receptors and enzyme linked receptors. Signaling through G-protein coupled receptors	
Month February 2026			Module/Unit: II	
Lectures	Practical	Total	Sub-units planned	
07	-	07	Cell division cycle	
Month March 2026			Sub-units planned	
Lecture	Practical	Total	Module/Unit: II	
08	-	08	Cell division	

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Academic Year 2025-26

Name of the teacher: Ms. A. S. Kale

Semester: V Course Code: DSC-XII-DSCEBTE51

Course Title : Research and methodology

Month June 2025			Module/Unit:	Sub-units planned	
Lectures	Practical	Total		Introduction to Research	
07	-	07			
				Definition, The concept of research, characteristics of good research, Approach of research, Application of research, Research hypothesis, Review of Literature. Sampling, data collection – Concept of Sampling, Primary and Secondary Data	
Month July 2025			Module/Unit:	Sub-units planned	
Lectures	Practical	Total		Web search	
08	-	08			
				Web search – Introduction to Internet, Use of Internet and WWW, Using Search engines and advanced search tools. Report writing - Types of Report, Different steps in report writing Writing tools – Grammerly, Chat Gpt, Quill boat. Result analysis tools - Graphpad prism, Origin Plagirism - Introduction, Ourcuit, Turnitin and Scribbr	
Month August 2025			Module/Unit:	Sub-units planned	
07	-	07		Spectroscopic method	
				Principle, Instrumentation and Applications of: a) NMR spectroscopy b) Infra- red spectroscopy c) ESR spectroscopy d) Atomic absorption spectroscopy e) Mass spectroscopy	
Month September 2025			Module/Unit:	Sub-units planned	
08	-	08		Tracer techniques	
				Introduction, Radioactivity, radioisotopes Types of radiation (α , β , γ), half-life period of the radioisotope Methods of measurement of radioactivity - Gas ionization (Geiger- Muller Counters), solvent excitation (Liquid scintillation counter), Autoradiography Application of radioisotopes in biological system.	

(miss. A. S. Kale)
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Annual Teaching Plan
Vivekanand College, Kolhapur (An Empowered Autonomous Institute)
Department of Biotechnology (Entire)
Academic Year 2025-26
Name of the teacher: Miss. A.S Kale
Semester: VI

Course Title: Bio safety, Bioethics and Intellectual Property Rights

Month November 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Bioethics	Basic Principles of Bioethics; Overview of National Regulations of Bioethics and International considerations. Regulatory bodies for Bioethics in India, Role of Institutional Ethical Committee, Role of Institutional Ethical Committee, Bioethics in Plants, Animals and Microbial Genetic engineering
08	-	08		
Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Biosafety	Introduction to Biosafety, Concepts, symbols and significance in experimental biological sciences. International laws on Biosafety, Levels of Biosafety (BSL-1 to 3) for Specific microorganisms, Introduction to Biological Safety Cabinets, and Introduction to the concept of containment level and Good Laboratory Practices (GLP).
07	-	07		
Month January 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Intellectual Property Rights	Introduction to Intellectual Property Rights (IPR) and Indian Patent Law. World Trade Organization and its related intellectual Property provisions, Intellectual property and its legal protection in research
07	-	07		
Month February 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Significance of IPR in Biotechnology;	Budapest Treaty; , Protection of GMOs, Tools of IPR and terminologies in IPR-Patent, Copyright, Trademarks and Trade secrets, Geographical Indications
08	-	08		

A.S.Kale
(Miss. A.S.Kale)
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Annual Teaching Plan
Vivekanand College, Kolhapur (An Empowered Autonomous Institute)
Department of Biotechnology (Entire)
Academic Year 2025-26
Name of the teacher: Miss. T. S. Vagavekar.

Semester: I

Course Title: Microbiology-I (Introduction to Microbial world)

Month June 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total		
08	02	10	Development of microbiology as a discipline	Abiogenesis. Ubiquitous nature of microbial life. Development from simple to complex life form. A. Early contributions Robert Hook, Anton Van Leeuwenhoek, Louis Pasteur, Robert Koch, John Tyndall.
			Significance of Scientific contributions in development in Microbiology as a discipline	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
Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Significance of Scientific contributions in development in Microbiology as a discipline Beneficial and harmful activities of microorganisms	iv. Microbial Genetics – Watson and Crick, Hargobind Khorana, Griffith, Avery, McCarty, and MacLeod. Medical, Environmental, Food, Agriculture, Industrial microbiology Applied branches of Microbiology and major microbiological institutes in India.
Month August 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Diversity of Microbial World A. Systematic of Classification Bacterial taxonomy	Binomial nomenclature, three kingdom, five kingdom classification and utility. General principles of bacterial nomenclature - a) Taxonomic ranks, b) Common or Vernacular name, c) Scientific or International name,
Month September 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Bacterial taxonomy B. Differences in Cellular and Acellular microorganisms C. Different groups of microorganisms	Criteria for bacterial classification- Morphological, cultural, biochemical & serological characters, Concept of bacterial species & strain. Introduction to Bergey's manual of systematic bacteriology. Differences in prokaryotic and eukaryotic (Occurrence, morphology, mode of reproduction and economic importance) Bacteria, Yeast, Fungi, Actinomycetes, Algae, Viruses, Protozoa, Viroids and Prions


Ms. T. S. Vagavekar
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Academic Year 2025-26

Name of the teacher: Miss. T. S. Vagavekar.

Semester: V

Course Title: DSC-X DSCO7BTE52 - Industrial Biotechnology

Month June 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	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.
08	01	09		
Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	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).
07	02	09		
Month August 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	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 producers, Scale up of fermentations, Strain improvement- concept and methods - mutation, genetic recombination. Maintenance and preservation of industrially important cultures. Microbiological assay
07	03	10		
Month September 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Downstream Process and Product Recovery, Industrial Production and Recovery process	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. Vitamins (Vitamin B ₁₂), Amino acids (L- Asparagine), Antibiotics(Streptomycin), Organic acids (Citric acid), Brewing (Wine), Enzyme (Amylase)
08	-	08		

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Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Miss. T. S. Vagavekar.

Semester: II

Course Title: MIN07BTE22 Microbiology –IV (Virology)

Month November 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	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 – Icosohedral and 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
08	02	10		
Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Classification & nomenclature of viruses	i. ICTV nomenclature ii. Baltimore classification
07	03	10		
Month January 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	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
07	03	10		
Month February 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	B. Replication of viruses:	i. Bacteriophages – T4 phage (Lytic), Lambda phage (Lytic and lysogeny) ii. Plant viruses – TMV iii. Animal viruses – HIV, nCoV, HPV
08	03	11		


(Ms. T. S. Vagavekar)

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Academic Year 2025-26

Name of the teacher: Miss. T. S. Vagavekar.

Semester: VI

Course Title: DSC –XIV DSC07BTE62 Application of Biotechnology in Agriculture

Month November 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Methods for crop Improvement Plant breeding markers	Introduction and Acclimatization, Breeding for self and cross pollinated plants and vegetative reproducing plants, selection (clonal pure line and mass), Hybridization and Mutation breeding. RAPD, RFLP, AFLP
08	02	10		
Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Somatic hybridization Germplasm Conservation	Definition, protoplast, fusion technique, selection of hybrids, symmetric and asymmetric hybrids, cybrid production Introduction, <i>In-situ</i> conservation, <i>Ex-situ</i> conservation, cryopreservation, Techniques of Cryopreservation, applications, limitations.
07	01	08		
Month January 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Transgenic Plants	Herbicide resistant – Glyphosate resistance, Phosphinothricin resistance, Fungal and Bacterial disease resistance approaches- PR proteins, Chitinase, Glucanase, RIPs protein, Virus resistance –Virus coat proteins, Movement proteins ,Transmission proteins ,Satellite RNAs, Antisense RNAs, Ribozyme, Insect resistance approaches – Bt protein (Bt Cotton, Bt-Brinjal) , Non Bt protein, Transgenic plant with improved nutrition - Golden Rice, Molecular farming, GM Foods, ethical & socio-economic, legal and environmental issues. Forms of protection -IPR and IPP- Patents, copyright, trademark, trade secret and PBR
07	02	09		
Month February 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Biofertilizer Biopesticide	Definition ,Principle , Mass production and field application – <i>Rhizobium</i> , <i>Azotobacter</i> , <i>Azospirillum</i> , <i>Acetobacter</i> , <i>Azolla</i> , <i>Cyanobacteria</i> , PSB, VAM. Carrier Based Inoculum types Definition, production and applications of Bacterial, fungal, viral and Plant origin Biopesticides
08	01	09		



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Vivekanand College, Kolhapur (An Empowered Autonomous Institute)

Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Ms. P. C. Wakarekar

Semester: V Course code & Title: Animal Tissue Culture DSE-I-DSE07BTE51

Month June 2025			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Introduction to Animal Tissue Culture	History and Introduction of Animal Tissue culture- History of animal cell culture. Laboratory design and layout-Construction and services, layout of aseptic room Requirements of Animal Tissue culture- Characteristics of animal cell in culture, substrate for cell growth, Equipment's required for animal cell culture (Laminar air flow, CO ₂ incubator, Centrifuge, Inverted microscope)
07	-	07		
Month July 2025			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Culture Media and Characters of Cultured cells	Culture media- Natural media, synthetic media Cultured cells- Biology and Characterization- Characteristics of cultured cells, cell adhesion, cell proliferation, cell differentiation, and metabolism of cultured cells. Measurement of growth parameters of cultured cells- Growth cycle of cultured cells, plating efficiency of cultured cells Cell synchronization- Cell separation by physical means, cell separation by chemical blockade
08	-	08		
Month August 2025			Module/Unit:	Sub-units planned
07	-	07	Basic techniques and Scale up in ATC	Basic technique of mammalian cell culture- Isolation of tissue, disaggregation of tissue, measurement of viability, primary cell culture, Cell lines, Maintenance of cell culture, Subculture, Stem cell cultures Scale up of Animal Tissue culture-Scale up in suspension-stirrer culture, continuous flow culture, Airlift fermenter culture, Scale up in monolayer..
Month September 2025			Module/Unit:	Sub-units planned
08	-	08	Contamination and applications in ATC	Contamination- Concept and Sources of contamination, types of microbial contamination, eradication of contamination. Applications of cell culture-In transplantation, and tissue engineering, monoclonal antibodies, culture based vaccine, valuable recombinant product, cloning, ethics and morality. Stem Cell technology: General introduction and applications.

Name and Signature of Teacher
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Semester: II

Course Title: DSC07BTE21 Biotechnology -III (Biotechnology for Human Welfare-II)

Month November 2025			Module/Unit:	Sub-units planned
Lectures	Practical	Total		
07	-	07	Agriculture Biotechnology Genetically Modified Crop	Biotechnology in crop improvement, selection of crop for biotic- abiotic stress resistance, Metabolite engineering, Genetically Modified Crop - Golden rice, herbicide resistance, insect resistance, disease resistance, bio-fortification and nutrition enhancement, bio energy crops
Month December 2025			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Cell Culture	Animal cell culture – Introduction, history and requirement for ATC lab, characteristics of animal cell growth in culture, sterilization and types of media, Applications. Plant cell culture –introduction, history and requirement for PTC lab, sterilization and types of media, Micro propagation – stages of micro propagation Applications.
Month January 2026			Module/Unit:	Sub-units planned
07	-	07	Applied biotechnology	Environment –Bioremediation- degradation of hydrocarbons and agriculture waste, Phyto remediation, Bioleaching, bio sorption. Conservation Biotechnology – Role of biotechnology in conservation, need for conservation, use of genetically modified organism, DNA hybridization, bar-coding and its use in identification and conservation, antipoaching
Month February 2026			Module/Unit:	Sub-units planned
08	-	08	FOOD biotechnology	Single cell protein (SCP) – <i>Spirullina</i> Concept of probiotics – history, mechanism of action, types, probiotics products in India, global scenario of probiotics, caution about probiotics. Prebiotics, synbiotics. Mushroom cultivation.

Name and Signature of Teacher

(Ms. P. C. Wakarekar)



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Semester: VI

Course Title: DSC-XVI DSC07BTE64 Bioinformatics

Month November 2025			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Introduction to Bioinformatics	History of bioinformatics: Multidisciplinary approach of bioinformatics, Computers in Biology and Medicines, Internet, and related programs; Networking HTTP, HTML, WAN, LAN, MAN, applications in communication. Introduction to Genomics: Introduction, Databases, Data, Nucleic acid sequence database, Gene Bank, EMBL, DDBJ, Sequence retrieval system (SRS): Entrez, DBGet, Human Genome Project (HGP), Goal and applications, final draft of HGP (complete information resources covered).
07	03	10		
Month December 2025			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Literature Database & Introduction to Proteomics	Literature Database: Pub Med and Pub Med central Introduction to Proteomics: Primary Protein sequences databases, Secondary sequences Databases, Structural Databases related to proteins (PDB, MMDB, CATH, SCOP)
Month January 2026			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Sequence Alignment and Phylogenetic analysis	Sequence Alignment: Pair wise sequence alignment, Multiple sequence alignment, Local and Global sequence alignment. Phylogenetic analysis: Introduction: Definition of phylogenetic tree, nodes, internodes, root, tree, styles; cladogram, phenogram, curvogram, Steps involved in construction of phylogenetic tree Phylogenetic analysis tools: ClustalW
Month February 2026			Module/Unit:	Sub-units planned
Lectures	Practical	Total	Drug designing	Structure-based drug designing: Introduction; Structure-based drug designing approaches, Target Identification and Validation, homology modeling, active site analysis and pharmacophore mapping, and Molecular Docking. Ligand-based drug designing: Introduction; Ligand-based drug designing approaches, Lead Designing, combinatorial chemistry, High Throughput Screening (HTS), Chemical libraries, ADME property.

Name and Signature of Teacher
 (Ms. P. C. Wakarekar)



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Annual Teaching Plan
Vivekanand College, Kolhapur (An Empowered Autonomous Institute)
Department of Biotechnology (Entire)
Academic Year 2024-25
Name of the teacher: Miss. S.S. Rote
Semester: V

Course Title:Basics in Genetic Engineering

Month November 2024			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Enzymes in r-DNA technology	
08	-	08		
Month December 2024			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Cloning Vectors	
07	-	07		
Month January 2024			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Nucleic Acid Hybridization	
07	-	07		
Month February 2024			Module/Unit: II	Sub-units planned
Lecture	Practical	Total		
08	-	08		

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Annual Teaching Plan
Vivekanand College, Kolhapur (An Empowered Autonomous Institute)
Department of Biotechnology (Entire)
Academic Year 2025-26
Name of the teacher: Miss. S.S. Kakade
Semester: V

Course Title: Enzymology

Month June 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Nature of enzymes	Protein and non-protein (ribozyme). Cofactor and prosthetic group, apoenzyme, holoenzyme. IUBMB classification of enzymes. Unit of enzyme activity – definition of IU, enzyme turn over number and nature of non-enzymatic and enzymatic catalysis. Specific activity. Enzyme specificity. Concept of active site, ES complex, specificity.
08	-	08		
Month July 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Features of enzyme catalysis	Factors affecting the rate of chemical reactions, collision theory, Catalytic power and specificity of enzymes (concept of active site), Fischer's lock and key hypothesis, Koshland's induced fit hypothesis.
07	-	07		
Month August 2025			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Characterization, Mechanism of action of enzymes	Effect of enzyme concentration, substrate concentration, pH and temperature. Michaelis – Menten equation. Lineweaver – Burk (L-B) plot, General features - proximity and orientation, strain and distortion, acid base and covalent catalysis (chymotrypsin, lysozyme). Metal activated enzymes and metalloenzymes, transition state analogues.
07	-	07		
Month September 2025			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Isoenzymes	Nature, importance. Lactate dehydrogenase as an example. Multi enzyme complex – Pyruvate dehydrogenase complex. – Composition, subunits, assembly, enzymatic reaction functions. RNA as an enzyme. (Ribozymes). Industrial and medical application of enzymes.
08	-	08		

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Department of Biotechnology (Entire)

Academic Year 2025-26

Name of the teacher: Miss. S.S. Kakade

Semester: VI

Course Title: Advance in Genetic Engineering

Month November 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	Isolation of Gene	Isolation desired gene from DNA, Isolation of specific gene with PCR, cDNA and genomic library. Screening of libraries- immunological screening and colony or plaque hybridization
08	02	10		
Month December 2025			Module/Unit: I	Sub-units planned
Lectures	Practical	Total	PCR and its application	Primer designing, Fidelity of thermostable enzymes. Steps in PCR reaction, Types of PCR – RT-PCR, real time PCR, touchdown PCR, hot start PCR, colony PCR, Applications- site directed mutagenesis, Molecular diagnostics, viral and bacterial detection Introduction to molecular identification --16 s r RNA 18 s r RNA, and Bar code.
07	03	10		
Month January 2026			Module/Unit: II	Sub-units planned
Lectures	Practical	Total	Cloning methodologies	Construction of plasmid – e. g. Somatostatin, Insertion of foreign DNA into host cells, Agrobacterium mediated gene transfer, Transformation, Transfection. Chemical methods - CaCl ₂ precipitation, poly cation mediated gene transfer. Physical methods - Liposome, microinjection, electroporation, and biolistic transfer.
07	03	10		
Month February 2026			Module/Unit: II	Sub-units planned
Lecture	Practical	Total	Screening of recombinants Application of r-DNA technology	Direct selection, Insertional inactivation selection, Blue white selection, Expression based screening (HART) Fluorescent Activated Cell Sorter, Human Recombinant Proteins- Erythropoietin and HGH. Production of transgenic- knockout mice, In medicines – Insulin and Somatostatin, Introduction to Gene Silencing, Principle of Si-RNA and Si- RNA technology Molecular Markers Introduction – Morphological, Biochemical, Molecular Markers- RFLP, RAPD, AFLP.
08	02	10		

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