



॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

**ARTS, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC (3rd Cycle - CGPA 3.61)

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Department of Biotechnology Course Outcomes for B.Sc. Biotechnology

SEMESTER – I

After Completion of the course the learner will be able to;

Course (Paper) Name and No.- Fundamentals of Biotechnology [Major I]

CO1	Explain Branches and scope of Biotechnology.
CO2	Enlist the industries and institutions dealing with Biotechnology.
CO3	Justify the role of microbes in biotechnological processes like fermentation and bioremediation.

Course (Paper) Name and No.- Cell Biology and Genetics [Major II]

CO1	Explain the ultrastructure and function of organelles in prokaryotic and eukaryotic cells.
CO2	Illustrate principles of Mendelian genetics, gene interaction, sex determination and mechanisms of genetic exchange in bacteria.

Course (Paper) Name and No.- Mushroom Cultivation- I (Skill Enhancement Course)

CO1	Identify edible and wild type mushrooms.
CO2	Apply the steps involved in Mushroom production and compost preparation.
CO3	Evaluate the importance of different types of Mushrooms and their cultivation.

Course (Paper) Name and No.- Basic tools and Techniques in Biotechnology (Vocational Skill Course I)

CO1	Solve the numerical problems related to practical.
CO2	Interpret the results and experimental data.
CO3	Demonstrate the use of basic instruments used in Biotechnology.

Course (Paper) Name and No.- Wonders of Curcuma and Neem (Indian Knowledge System)

CO1	Identify the various applications of Curcuma and Neem.
CO2	Apply the traditional knowledge to make many commercial products.
CO3	Enlist the importance of controversial patent cases in context to Neem and turmeric.



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Course (Paper) Name and No.- Introduction to Human Health and Nutrition (Open Electives 1)	
CO1	Explain nutrition and functions of various nutrients.
CO2	Identify different meal plans as per the age and therapeutic conditions.
CO3	Apply food sanitation and hygiene.
Course (Paper) Name and No.- Agro-tourism (Open Electives 2)	
CO1	Explain the basic principles and advantages of Agrotourism.
CO2	Enlist the places suitable for Agrotourism.
CO3	Apply their knowledge in management of travels, accommodation and food services during Agrotourism.
Course (Paper) Name and No.- Practicals of Fundamentals of Biotechnology & Cell Biology and Genetics	
CO1	Develop hands-on proficiency in fundamental biotechnology techniques.
CO2	Develop hands-on proficiency in media preparation and sterilization, preservation and enumeration of microorganisms
CO3	Demonstrate different type of staining technique.
CO4	Show different gene transfer mechanisms like conjugation and transformation.
Course (Paper) Name and No.- Practicals of Basic tools and Techniques in Biotechnology	
CO1	Illustrate the use of basic biotechnology tools, including micropipettes, centrifuges, and spectrophotometers.
CO2	Discuss different fundamental techniques such as qualitative analysis of amino acids, carbohydrates and lipids.
Course (Paper) Name and No.- Practicals of Mushroom Cultivation	
CO1	Develop the skills in mushroom cultivation techniques, including substrate preparation, inoculation, and harvesting.
CO2	Analyze the nutritional value of mushroom.
SEMESTER – II	
After completing the course, Student will able to;	
Course (Paper) Name and No.- Bioorganic Chemistry [Major-I]	
CO1	Explain Isomerism in context to Biomolecules.
CO2	Differentiate between chiral and achiral molecules and different enantiomers.



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CO3	Develop skills towards use of titrimetric and gravimetric analysis.
Course (Paper) Name and No.- Molecular Biology-I [Major-II]	
CO1	Compare the replication in prokaryotes and eukaryotes.
CO2	Classify the different types of mutations.
CO3	Illustrate different DNA repair mechanisms.
Course (Paper) Name and No.- Bio-business in Mushroom Cultivation (Skill Enhancement Course -01)	
CO1	Apply the methods of making value added mushroom products.
CO2	Analyze nutritive values of mushroom products and its cost.
CO3	Design a business plan of Mushroom Cultivation.
Course (Paper) Name and No.- Plant Tissue Culture Techniques (Vocational Skill Course)	
CO1	Explain the basic Principles of Plant Tissue culture.
CO2	Design a Plant Tissue Culture lab.
CO3	Apply various in-vitro culture techniques for plant /crop improvement.
Course (Paper) Name and No.- Basic Microbiology [Minor-1]	
CO1	Build skill towards use of microscopy and staining techniques.
CO2	Explain the concepts of sterilization and the mechanism of disinfection.
Course (Paper) Name and No.- Organic Farming (Open Elective 3)	
CO1	Apply knowledge of organic farming under crop cultivation.
CO2	Explain methods of Composting, Vermicomposting and Biofertilizer.
Course (Paper) Name and No.- Biobusiness and Bioentrepreneurship (Open Elective 4)	
CO1	Explain the concept of Bio-entrepreneurship.
CO2	Identify the different sectors for the Bio-business.



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Course (Paper) Name and No.- Practicals of Bioorganic Chemistry	
CO1	Demonstrate the practical knowledge of titrimetric analysis.
CO2	Apply the techniques in gravimetry.
Course (Paper) Name and No.- Practicals of Molecular Biology	
CO1	Demonstrate hands-on experience with molecular biology techniques, including genomic DNA extraction and agarose gel electrophoresis etc.
CO2	Develop skills in quantitative estimation and study the effect of mutagen on nucleic acids.
Course (Paper) Name and No.- Practicals of Basic Microbiology	
CO1	Apply acquired hands-on skills in basic microbiology techniques, including monochrome, differential and special staining.
CO2	Develop skills in enumeration by Breed's count method.
Course (Paper) Name and No.- Practicals of Plant Tissue Culture Techniques	
CO1	Organise hands-on experience in plant tissue culture techniques, including media preparation, sterilization, and micropropagation.
CO2	Develops the ability to synthesize artificial seeds.
Course (Paper) Name and No.- Practicals of Bio-business in Mushroom cultivation	
CO1	Design business plans for mushroom cultivation, including market analysis, cost estimation etc.
CO2	Apply the skills related to preparations of value-added products of mushroom and its nutritional analysis.
SEMESTER – III	
After completing the course, Student will able to;	
Course (Paper) Name and No.- Bioanalytical Techniques [Paper-I]	
CO1	Develop an understanding of the different aspects of classical as well as advanced biophysical techniques.
CO2	Infer the principles and applications of various Immuno-techniques.
CO3	Relate principles of Electrophoretic Techniques and its application in biology.



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Course (Paper) Name and No.- Applied Chemistry-I [Paper-II]

CO1	Develop an understanding of basic principles and techniques in Organic and Green Chemistry.
CO2	Discuss the synthesis of organic compounds and their corresponding role in biotechnology.
CO3	Explain the role of Green Chemistry and its application in Industrial biotechnology.

Course (Paper) Name and No.- Immunology [Paper-III]

CO1	Recall the definition and functions of Effector Molecules in the Immune response.
CO2	Explain the role of Effector Molecules and their mechanism in Immune response.
CO3	Explain the generation of different types of cells and their respective roles in Adaptive Immune response.
CO4	Classify various vaccines and learn regarding their production via hybridoma technology.

Course (Paper) Name and No.- Cell Biology and Cytogenetics [Paper-IV]

CO1	Discuss types and major functions of cytoskeleton.
CO2	Elaborate the principles underlying Genetic Linkage, DNA recombination and chromosomal mapping.
CO3	Develop an understanding regarding population genetics and its role in evolutionary biology.

Course (Paper) Name and No.- Molecular Biology [Paper-V]

CO1	Discuss the mechanisms associated with Gene Expression at the level of Prokaryotic Transcription.
CO2	Outline the mechanisms associated with Gene Expression at the level of Eukaryotic Transcription.
CO3	Explain the mechanism of the Translation process.

Course (Paper) Name and No.- Bioprocess Technology [Paper-VI]

CO1	Outline on different types of industrially important microorganisms and their methods for preservation.
CO2	Explain principles underlying design of Fermenter and Fermentation Process.
CO3	Summaries In-vivo and In-vitro Assay of Industrial Products.



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Course (Paper) Name and No.- Research Methodology [Paper-VII]	
CO1	Elaborate the basic principles of Research Methodology, research design and identify a Research Problem.
CO2	Outline the process of Scientific Writing and scientific interpretation.
CO3	Identify the overall Process of Designing a Research Study and research ethics.
Course (Paper) Name and No.- Greenhouse Technology [Paper-VIII]	
CO1	Classify different types of greenhouses.
CO2	Illustrate different greenhouse management system.
Course (Paper) Name and No.- Practicals of Bioanalytical Techniques Applied Chemistry-I	
CO1	Build skill of bioanalytical techniques and applied chemistry methods, including spectroscopic analysis and electrophoretic separation.
CO2	Develop skills in purification and estimation of organic compounds.
Course (Paper) Name and No.- Practicals of Immunology Cell Biology and Cytogenetics	
CO1	Acquire practical skills in immunology techniques like - RA Factor Test, ELISA.
CO2	Acquire practical skills in vaccine preparation and pedigree analysis.
Course (Paper) Name and No.- Practicals of Molecular Biology and Bioprocess Technology	
CO1	Build skill in key molecular biology techniques, including DNA extraction, gel electrophoresis, gene expression etc.
CO2	Develop practical skills in production, purification and estimation of alcohol and antibiotics.
SEMESTER – IV	
After completing the course, Student will able to;	
Course (Paper) Name and No.- Biochemistry [Paper- I]	
CO1	Discuss the Metabolic Pathways of Carbohydrates, Amino Acids, Lipids and Nucleotides.
CO2	Explain the Role of Energy Rich Molecules in Metabolism.



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CO3	Elaborate the lipid metabolism, energy yield and metabolic disorders of biomolecules.
Course (Paper) Name and No.- Applied Chemistry- II [Paper- II]	
CO1	Develop an understanding of the different aspects of Sampling and Separation techniques.
CO2	Identify natural products as well as extraction and separation techniques.
CO3	Discuss basic concepts in Polymer Chemistry and Nanomaterials.
Course (Paper) Name and No.- Medical Microbiology [Paper- III]	
CO1	Summarize the factors playing a role in causing a disease.
CO2	Discuss the various aspects of Systemic Infections including Causative Agents, symptoms and Prophylaxis.
CO3	Explain different causative organisms involved in GI, STD and Nosocomial infections.
Course (Paper) Name and No.- Environmental Biotechnology [Paper- IV]	
CO1	Illustrate air and soil microbiology.
CO2	Develop the understanding of waste water treatment and pollution control.
CO3	Explain the bioremediation technologies and its application.
Course (Paper) Name and No.- Biostatistics and Bioinformatics [Paper- V]	
CO1	Adapt the basic concepts of Bioinformatics.
CO2	Construct a thorough understanding of fundamental biological principles, beginning with genetics, molecular biology, genomics, and evolutionary biology.
CO3	Apply the various statistical tools for analysis of biological data.
Course (Paper) Name and No.- Molecular Diagnostics [Paper- VI]	
CO1	Develop the basic understanding for Principles used in Molecular Diagnosis.
CO2	Build analytical skills to understand new Diagnostic Methods.
CO3	Apply the knowledge and skills gained in the course should be useful in developing new Diagnostic Kits.



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Course (Paper) Name and No.- Entrepreneurship Development [Paper- VII]	
CO1	Develop an understanding of the systematic process and to select and screen a business idea.
CO2	Design strategies for successful implementation of ideas.
CO3	Create a Business Plan for an innovative bio business.
CO4	Build the insights and knowledge in Marketing and Business management.
Course (Paper) Name and No.- Nutraceuticals and Functional Food [Paper- VIII]	
CO1	Explain nutraceuticals properties and their functions.
CO2	Value functional food as remedies.
Course (Paper) Name and No.- Practicals of Biochemistry and Applied Chemistry-II	
CO1	Analyze experiments related to biochemical techniques to check organ functioning, enzyme assays and metabolic analysis.
CO2	Develop skills in analysis and interpretation of results of bioanalytical techniques like HPLC, GC as well as nanoparticles synthesis and their characterization etc.
Course (Paper) Name and No.- Practicals of Medical microbiology and Environmental Biotechnology	
CO1	Demonstrate different medical microbiology techniques, including pathogen identification.
CO2	Develop skills in applying environmental biotechnology methods for bioremediation, analysis of potable water.
Course (Paper) Name and No.- Practicals of Biostatistics and Bioinformatics and Molecular Diagnostics	
CO1	Develop hands-on skills in molecular diagnostic technique.
CO2	Apply statistical techniques for analyzing biological data in biostatistics and bioinformatics.



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SEMESTER – V

After completing the course, Student will able to;

**Course (Paper) Name and No.- Cell Biology and Animal Tissue Culture
[Paper-I]**

CO1	Discuss the major groups of intracellular-and membrane-bound receptors, be able to give examples of such receptors.
CO2	Explain different types of cancer, its diagnosis, treatment and preventive measures.
CO3	Explain design, layout of ATC Lab along with equipment used in tissue culture.
CO4	Identify media constituents and media formulation strategies and techniques for mammalian cell culture.

**Course (Paper) Name and No.- Medical Microbiology & Instrumentation
[Paper II]**

CO1	Compare and contrast replication mechanisms used by viruses along with their cultivation, purification techniques.
CO2	Explain the role of different types of vaccines in their prevention.
CO3	Identify various common and new emerging diseases of humans, different diagnostic techniques and various methods involved in infection control.
CO4	Demonstrate the mechanism of action of different antimicrobial agents and analyse the importance of appropriate drug therapy by learning the mechanisms of development of drug resistance.
CO5	Comparands apply different separation techniques & use them in research work.

**Course (Paper) Name and No.- Genomes and Molecular Biology
[Paper III]**

CO1	Elaborate on the gene transfer methods in plants by physical, chemical methods as well as plasmid derived vector systems.
CO2	Summarize the animal transfection methods and applications of transgenic animals.
CO3	Explain tools and techniques used in molecular biology.
CO4	Discuss various gene editing methods and regulations of prokaryotic gene.



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**Course (Paper) Name and No.- Marine Biotechnology and
Developmental Biology [Paper IV]**

CO1	Apply knowledge of marine ecosystems and the principles of biotechnology, the importance of biotechnology in exploring and conserving marine biodiversity.
CO2	Identify and evaluate specific marine biotechnological applications, demonstrating their understanding of the real-world uses and implications of biotechnology in marine-related industries and research.
CO3	Elaborate the stages of animal development & mechanism of differentiation.
CO4	Demonstrate the features and stages of plant development with model organism & Stem cell biology.

**Course (Paper) Name and No.- Applied Component: Biosafety
[Paper V]**

CO1	Develop an understanding about Biosafety, Biological risk assessment and Hazardous Characteristics of an Agent.
CO2	Explain an overview regarding regulatory biosafety guidelines and various roles of Competent authorities.
CO3	Apply Microbiological testing in pharmaceuticals & common microbial contaminants.
CO4	Explain the concepts of biosafety in biotechnology and its regulations.

**Course (Paper) Name and No.- Practicals of Cell biology,
Medical Microbiology and Instrumentation**

CO1	Demonstrate different antibiotic sensitivity tests.
CO2	Identify antigen, prepare and sterilize vaccines etc.

**Course (Paper) Name and No.- Practicals of Genomes and Molecular Biology
and Marine Biotechnology and Developmental Biology**

CO1	Determine genomic analysis and choose appropriate molecular biology techniques such as transformation, conjugation etc.
CO2	Demonstrate genomic DNA extraction and estimate gelatine and collagen from marine sources.



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Course (Paper) Name and No.- Practicals of Applied Component: Biosafety	
CO1	Demonstrate essential biosafety protocols to handle biological materials safely in a laboratory setting.
CO2	Develop the ability to conduct risk assessments and implement safety measures to prevent laboratory hazards.
SEMESTER – VI	
After completing the course, Student will able to;	
Course (Paper) Name and No.- Biochemistry [Paper I]	
CO1	Explain the quaternary protein ligand interactions, protein folding and degradation.
CO2	Explain metabolic pathways and to learn their importance.
CO3	To classify the hormones and their functions.
CO4	Identify the diseases associated with hormones.
Course (Paper) Name and No.- Industrial Microbiology [Paper II]	
CO1	Explain different productions in dairy industry.
CO2	Elaborate on bacterial and fungal inoculum development.
CO3	Examine outline of Down-streaming processing and understand various methods applied in solvent recovery, cell disruption & separation.
CO4	Demonstrate regarding requirements of GMP, QA-QC along with various documentation, validation of methods and Audit reports.
Course (Paper) Name and No.- Pharmacology and Neurochemistry [Paper III]	
CO1	Students will be able to Summarize the basic concept of mechanism of drug action.
CO2	Elaborate drugs and their poisonous effect if the administered for longer period of time.
CO3	Outline the basic concept of toxicology and their types.
CO4	Explain the basic neurochemistry and action of specific drugs on the Central Nervous System.



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Course (Paper) Name and No.- Environmental Biotechnology [Paper IV]	
CO1	Apply renewable energy sources for both domestic and industrial application.
CO2	Explain the current applications of biotechnology to environmental quality evaluation, monitoring and remediation of contaminated environments.
CO3	Identify the most common techniques for preventing, minimizing, recycling, disposing and treatment of waste and their application on site remediation.
CO4	Discuss various treatment methodologies for hazardous waste management.
Course (Paper) Name and No.- Applied component: Agribiotechnology [Paper VI]	
CO1	Apply greenhouse technology and its uses.
CO2	Explain the methods of plant improvement and use of microbes as bio-fertilizers, PGPRs, bio-pesticides, Microbial Inoculants,
CO3	Illustrate the Inoculate formulations, biocontrol and Polymicrobial Inoculant Formulations.
CO4	Discuss genetic and molecular markers in plant breeding.
Course (Paper) Name and No.- Practicals of Biochemistry and Industrial Microbiology	
CO1	Develop hands-on proficiency in biochemical techniques, such as protein separation by salting out, dialysis, and size exclusion chromatography etc.
CO2	Develop practical skills in industrial microbiology through microbial analysis, production of fermented products and its analysis.
Course (Paper) Name and No.- Practicals of Pharmacology - Neurochemistry and Environmental Biotechnology and Project Work	
CO1	Organise hands-on experience and practical skills in evaluating pharmacological parameters such as LD50 and ED50 using suitable models.
CO2	Develop proficiency in environmental biotechnology methods, including the study of heavy metal effects on bacterial growth, physico-chemical analysis of industrial effluents.
Course (Paper) Name and No.- Practical of Applied Component: Agribiotechnology	
CO1	Develop hands-on experience in isolating beneficial microbes and in preparing and evaluating the effects of bio-fertilizers on plant growth.
CO2	Develop practical skills in conducting rapid screening tests for abiotic stress tolerance, estimating proline content in salt-stressed plants, preparing synthetic seeds etc.



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Department of Biotechnology

Course Outcomes for M.Sc. Biotechnology

Semester I

After completing the course, Student will able to;

Course (Paper) Name and No.- Biochemistry (Course-1)

CO1	Illustrate major metabolic pathways with Principles of Metabolic regulations.
CO2	Discuss protein structure, folding pathways and diseases within the context.
CO3	Justify the role of amino-acid and nucleic acid metabolic pathways in various disease pathologies.
CO4	Importance of different adaptations in plants with respect to carbon assimilation.

Course (Paper) Name and No.- Cell Biology and Genetics (Course-2)

CO1	Outline the concept of regulation of cell cycle and cell death.
CO2	Discuss cell-cell interactions, transport and trafficking in the maintenance of cellular integrity and functions.
CO3	Explain chromatin structure and organization of chromosomes.
CO4	Elaborate on karyotyping and mapping of the genome.

Course (Paper) Name and No.- Molecular Biology (Course-3)

CO1	Compare the mechanism of replication in prokaryotes and eukaryotes.
CO2	Elaborate on transcription in Prokaryotes & Eukaryotes.
CO3	Explain the different DNA damage and repair systems.
CO4	Discuss the mechanism of translation, gene expression and transposition.

Course (Paper) Name and No.- (Practical of Course Biochemistry and Molecular Biology) (Course-4)

CO1	Estimate the concentrations of different biomolecules.
CO2	Conduct Experiments related to Molecular Biology.



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Course (Paper) Name and No.- Nutraceutical and Nutrigenomics (Elective-1)	
CO1	Estimate the concentrations of different biomolecules.
CO2	Conduct Experiments related to Molecular Biology.
Course (Paper) Name and No.- Nutraceutical and Nutrigenomics (Elective-1)	
CO1	Explain characteristics features, classification and application of nutraceuticals.
CO2	Elaborate on significance of nutraceuticals and nutrigenomics for health management
Course (Paper) Name and No.- (Practical of Cell Biology and Genetics and Nutraceutical and Nutrigenomics)	
CO1	Conduct Experiments related to Cell Biology.
CO2	Analyse the nutritive value and functional food.
Course (Paper) Name and No.-Research Methodology (Minor-1)	
CO1	Explain various scientific research and methodology.
CO2	Elaborate on different academic databases, search engines and research metrics.
CO3	Outline the different modes of scientific communication.
CO4	Discuss various research ethics and scientific misconduct.
Semester II	
After completing the course, Student will able to;	
Course (Paper) Name and No.-Immunology and Medical Microbiology (Course-5)	
CO1	Discuss structural features of components of the immune system as well as their function.
CO2	Explain the concept of cytokines, hypersensitivity reactions and Autoimmunity.
CO3	Elaborate the concept of tumor immunology, immunodeficiency and Transplantation.
CO4	Explain the Types of Vaccine, concept of Vaccine technology, disease specific vaccine design.
Course (Paper) Name and No.- Advanced Techniques in Biotechnology (Course-6)	
CO1	Illustrate the principle, instrumentation and applications of various advanced spectroscopic techniques.
CO2	Elaborate on emerging techniques in Genomics & Transcriptomics



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CO3	Discuss the advanced techniques used in molecular cytogenetics
CO4	Illustrate the principle underlying various advance microscopy & spectroscopy and proteomics techniques
Course (Paper) Name and No.- Bioinformatics and Biostatistics (Course-7)	
CO1	Explain types of databases and sequence analysis
CO2	Discuss various methods for protein modeling and sequence analysis and alignment.
CO3	Solve problems based on central tendency, dispersion, parametric and non-parametric tests
CO4	Apply the various statistical tools like ANOVA, correlation, regression and probability for analysis of biological data.
Course (Paper) Name and No.- (Practical of Immunology and Medical Microbiology and Bioinformatics and Biostatistics)	
CO1	Apply the immunological Techniques.
CO2	Make use of Bioinformatics tools in Biotechnology.
Course (Paper) Name and No.- Nanobiotechnology (Elective-2)	
CO1	Explain different nanomaterials synthesis and its characterization.
CO2	Elaborate on application of nanomaterials and mechanism of nanotoxicity.
Course (Paper) Name and No.(Practical of Advanced Techniques in Biotechnology and Nanobiotechnology)	
CO1	Apply advanced techniques such as 2D PAGE, affinity chromatography, SDS-PAGE, and immunoassays.
CO2	Develop expertise in techniques of nanobiotechnology such as, synthesis and characterization of nanoparticles, antimicrobial testing.



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Semester III

After completing the course, Student will able to;

Course (Paper) Name and No.- Applied Virology & Microbiology (Paper I)

CO1	Discuss different pandemic diseases and its causative agent.
CO2	Apply epidemiological principles in prevention, control and management of pandemic disease.
CO3	Elaborate different Emerging Infections caused by pathogens.
CO4	Explain different aspects of biofilm and their management.

Course (Paper) Name and No.-Trends in Environmental Biotechnology (Paper II)

CO1	Discuss on air pollution management in urban and rural areas.
CO2	Apply different methodologies for treatment of soil pollution.
CO3	Elaborate on different monitoring methods used for biodiversity and environmental sustainability.
CO4	Outline on different Biodiversity & Environment Monitoring methods.

Course (Paper) Name and No.- Agriculture and Animal Biotechnology (Paper III)

CO1	To explain the various methods of the crop improvements such as micropropagation, somatic embryogenesis and, synthetic seed and germplasm conservation
CO2	To contrast the conventional and modern crop improvement techniques such as metabolic engineering of plant and GM crop technology
CO3	To identify the scope and applications of stem cell tissue engineering in modern clinical sciences.
CO4	To summarize the method of animal cloning technology and application of animal biotechnology in production of regenerative medicines and vaccines.

Course (Paper) Name and No.- Enzyme Technology and Bioentrepreneurship (Paper IV)

CO1	Explain enzyme production and its purification.
CO2	Elaborate on trends in Enzymology and its application.
CO3	Build entrepreneurial skills, by understanding the various operations involved in venture creation.
CO4	Design business plans by understanding bio marketing.



॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR

**ARTS, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC (3rd Cycle - CGPA 3.61)
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Course (Paper) Name and No.- (Practical of Applied Virology & Microbiology and Trends in Environmental Biotechnology) PRACTICAL- I	
CO1	Develop skills in virology and microbiology techniques, including viral titring via plaque assays, immunoassays for virus detection, and antibiotic susceptibility testing.
CO2	Evaluate various parameters related to soil, water and compost quality.
Course (Paper) Name and No.- (Practical of Agriculture and Animal Biotechnology and Enzyme Technology and Bioentrepreneurship) PRACTICAL- II	
CO1	Develop skills in agriculture and animal biotechnology, including media preparation for plant tissue culture, micropropagation, synthetic seed preparation, and animal cell culture techniques.
CO2	Develop expertise in enzyme technology, including screening enzyme producing microorganisms, partial purification, and activity, as well as preparing business plans for marketing biopharmaceuticals or bio-agricultural products.
Semester IV	
After completing the course, Student will able to;	
Course (Paper) Name and No.- Nanobiotechnology and Food Biotechnology (Paper I)	
CO1	Classify the different types of nanomaterials and method for synthesis of nanomaterial
CO2	Explain various applications of Nanomaterials and principles of Nano toxicology
CO3	Outline steps involved in food processing, preservation and packaging
CO4	Justify the role of nutraceuticals in management of health and disease.
Course (Paper) Name and No.-OMICS & Bioinformatics (Paper II)	
CO1	Explain OMICS technologies to contribute to different databases.
CO2	Compare the techniques involved in Genomics, Proteomics, transcriptomics, Lipidomics and Metabolomics.
CO3	Apply methods like DNA microarray, Proteomics etc.
CO4	Elaborate on applications of Bioinformatics in various fields.



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Course (Paper) Name and No.-Approaches to Drug discovery and Biologics (Paper III)	
CO1	Explain drug and Clinical Research Informatics in Drug Discovery.
CO2	Experiment with protocols/techniques required for characterization of the Biosimilars relative to the Reference Biologic.
CO3	Elaborate on the basic concepts of production and significance of Biologics/Biosimilar.
CO4	Discuss scope, purpose and process of Pharmacovigilance
Course (Paper) Name and No.- Biostatistics & Intellectual Property Rights (Paper IV)	
CO1	Solve problems based on central tendency, dispersion, p value, correlation, regression
CO2	Apply the various statistical tools for analysis of biological data.
CO3	Classify intellectual property rights and legal forms of protection.
CO4	Discuss ethical issues posed by biotechnological research and ethical implications of biotechnological products and techniques.
Course (Paper) Name and No.- (Practical of Nanobiotechnology and Food Biotechnology, OMICS & Bioinformatics, Approaches to Drug discovery and Biologics, Biostatistics & Intellectual Property Rights) PRACTICAL- I	
CO1	Explain synthesis and characterizing nanoparticles and Investigating bio-burden and antioxidant properties of various food products.
CO2	Develop expertise in bioinformatics techniques, including BLAST, ClustalW, and structure prediction databases, and will learn to perform phylogenetic analysis and utilize web resources like NCBI and Uniprot for biological data interpretation.
Course (Paper) Name and No.- Project Dissertation PRACTICAL- II	
CO1	Identify and investigate a research problem.
CO2	Apply an appropriate research design and extend it with appropriate methods.
CO3	Appraise the ethics of research.
CO4	Interpret the results drawing conclusions and justify the significance of the findings for educational practice and research. Organize the research work and Report writing.