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COLLEGE OF COMPUTER & BUSINESS STUDIES
(Affiliated to Savitribai Phule Pune University)
AISHE CODE: C-41976 PUNCODE: CAAP014520

COURSE OUTCOME (UG)

Name of the Department: B.Sc. Microbiology

(19 PATTERN)

Class	Course Code	Course Name	Course Outcome
F.Y.B.Sc **SEM-I**	MB-111	Introduction to Microbial world	**CO 1:** Introduce students about development of microbiology. **CO2:** Have developed a good knowledge of the development of the discipline of Microbiology and the contributions made by prominent scientists in this field. **CO 3:** Develop and understand the vast diversity and characteristics of microbial world. **CO4:** Provides an information about how to classify cellular microorganisms based on their general characteristics. **CO 5:** Introducing the student about morphological, structural characterization of microorganisms
	MB-112	Basic techniques in Microbiology	**CO 1:** Introduction of the standard operating procedures in Microbiology **CO 2:** Introduce the student to different laboratory instruments. **CO 3:** Introduction of students to different staining techniques **CO 4:** Enable the student to understand basic techniques in laboratory. **CO 5:** To acquire the knowledge of different methods of disinfection and sterilization.

	MB-113	Practical Course based on MB-111 & MB-112	**CO 1:** Enabling the students to perform good laboratory practices. **CO 2:** Developing the student's ability to handle laboratory instruments. **CO 3:** Enabling the student to perform staining techniques. **CO4:** Develop the keen observational skill using different microscopy techniques and staining techniques. **CO5:** Gain knowledge about common laboratory glass wares. **CO6:** Students will able to observe motility of bacteria
F.Y.B.Sc **SEM-II**	MB-121	Bacterial cell and Biochemistry	**CO 1:** To understand the bacterial cell structure. **CO 2:** Helps student to learn different bacterial cell organelles **CO 3:** To understand the biochemical characterization of components of microorganisms. **CO4**: Describe characteristics of bacterial cells, cell organelles, cell wall composition and various appendages like capsules, flagella or pilli. **CO5:** To learn about ICTV classification of viruses. **CO6:** Acquainted with chemical and molecular structures of biomolecules.
	MB-122	Microbial Cultivation and Growth	**CO 1:**To understand the different nutritional requirement of microorganisms. **CO 2 :** Help the student to learn different methods of cultivation of microorganism. **CO 3 :** To understand the concept of bacterial growth.

			CO 4: Enable the students to understand the methods of bacterial growth measurements. **CO 5:** To gain the knowledge of different methods of measurements of bacterial growth. **CO 6:** To gain the knowledge of different factors affecting bacterial growth.
	MB-123	Practical Course based on MB-121 & MB-122	**CO 1:** Enable the students to prepare laboratory media. **CO 2:** Enable the students to isolate bacteria for different sources. **CO 3:** Students are able to study practically the effect of different environmental factors on growth of microorganisms. **CO4:** Students will gain the knowledge about preservation of cultures in laboratory. **CO5:** Students will able to check sterilization efficiency of autoclave. **CO6:** Enable the students to perform special staining techniques.

Class	Course Code	Course Name	Course Outcome
S.Y.B.Sc **SEM-III**	MB-211	Medical Microbiology and Immunology	**CO1**: To inculcate knowledge in relationship between human diseases and microorganisms. **CO2**: Help student to understand different concepts in medical microbiology. **CO3:** Give the student knowledge about various chemotherapeutic agent and their mode of action. **CO 4:** Develop the knowledge about human immune response towards microorganism concept related to cells and organs of immune system, immune response and immune mechanism **CO 5**: To acquaint with human pathogens & normal flora of the human body systems.
	MB-212	Bacterial physiology and Fermentation Technology	**CO 1**: To develop fundamental knowledge about various biomolecules. **CO2**: Understand the basic concept related to enzyme. **CO 3**: To understand various biochemical pathways. **CO4**: Student will be able to define various modes and techniques of fermentation. **CO 5**: Enable the student to get sufficient knowledge about development of industrially important strains. **CO6**: Students will able to understand commercial application of microorganism to produce commercially important product on large scale.
	MB-213	Practical course based on	**CO 1**: The aim is to deliver practical knowledge about implementation of the concept studied.

		MB-211 &MB-212	**CO2** :It enable the students to perform lab diagnostic techniques like blood grouping, various biochemical reactions and to screen industrially important microorganisms **CO3**: To get acquainted with measurement of cell dimensions using micrometry. **CO4**: Practicing screening of industrially important microorganisms. **CO5**: To implement fundamentals of Medical Microbiology in determining Pathogenesis & Lab diagnosis.
S.Y.B.Sc **SEM-IV**	MB-221	Bacterial genetics	**CO 1**: Enable the student to get sufficient knowledge about concept of genes, chromosomes & mutations. **CO 2**: Help the student to understand deciphering of genetic code. **CO3**: Developing interest by studying history of genetics. **CO4**: Paraphrasing central dogma of life. **CO5**: Analysing different mutagens and their mechanism. **CO6**: Basic understanding of plasmid genetics and eventually plasmid as one of the tools in genetic engineering
	MB-222	Air, Water & Soil microbiology	**CO 1**: To inoculate knowledge about micro flora of air, water and soil. **CO 2**: To introduce method of air sanitization water purification and sewage treatment. **CO3**: Able to check the potability of water by using appropriate tests.

			CO4: Students will acquire a fairly good understanding about rhizospheric microorganisms. **CO5**: A brief review on composting and humus formation. **CO6**: Students will get the knowledge about biogeochemical recycling, nitrogen fixing and use as biofertilizers. **CO7**: Students will understand the significance of various texts involving use of enumerating fecal *E. coli* for assessing quality of water
	MB-223	Practical course based on MB-221 &MB-222	**CO1**: Enable the students to calculate the air flora. **CO2**: Enable the student to test potability of water to prepare bio-inoculant and to apply it. **CO3**: Students are able to isolate mutants by suitable method. **CO4**: Determination of settling velocity, & diversity of air flora. **CO5**: Learn to perform staining of cell organelles.

Class	Course Code	Course Name	Course Outcome
T.Y.B.Sc SEM-V	MB-351	Medical Microbiology-I	**CO 1:** To analyse the human anatomy & pathogen associated with disease. **CO 2 :** Acquire knowledge of principles underlying establishment of pathogens in human body. **CO 3:** Comprehend of pathogenesis of specific pathogens causing microbial diseases. **CO 4:** Assess epidemiological patterns of microbial disease transmission by various modes, intensity at local and global level. **CO 5:** Gain Knowledge principles of chemotherapy of microbial diseases and development of drug resistance among pathogens and strategies to mitigate
	MB-352	Immunology- I	**CO 1:** Understand the importance of primary lymphoid organs in immune system. **CO 2 :** Detailed study about structure and functioning of the its secondary lymphoid organ **CO 3:** Students should be aware about cellular components of the immune system. **CO 4:** Students will learn the Concepts of complement system. **CO 5:** Educating the students about the peculiar and key concepts falls under the Allograft rejection mechanism. & its prevention

			CO 6: Comprehending & Exemplifying Immune complexes by the means of diverse techniques such as ELISPOT, RIA.
	MB-353	Enzymology	**CO 1:** To understand methods of active site determination, role of enzymes and its cofactor in microbial physiology. **CO 2 :** To learn to perform enzyme assay, purification and quantification of enzymes activity, enzyme kinetics in terms of initial, final velocity, mathematical expression of enzyme kinetic parameters. **CO 3 :** To correlate regulation of metabolism at enzymatic levels and apply, methodology **CO4:** To get acquainted with mechanism of allosteric enzymes, enzyme inhibition, feedback inhibition. **CO5:**To get good knowledge of different methods of immobilization of enzyme and its industrial applications. **CO6:**To learn about zymogens and their activation, isozymes
	MB-354	Genetics	**CO 1:** To exhibit a knowledge base in Genetics and Molecular Biology **CO 2 :** To understand the central dogma of Molecular Biology **CO 3 :** To construct genetic map of bacteria and fungi **CO 4:** To get introduced to concept of recombination and bacteriophage Genetics **CO 5:** To understand the concept cloning in bacteria **CO 6:** To demonstrate the knowledge of common and advanced laboratory practices in Molecular Biology

	MB-355	Fermentation Technology– I	**CO 1:** Student's will be able to define various modes and techniques of fermentation **CO 2 :** Isolate, identify and develop the microbial inoculum for industrial processing. **CO 3 :** Students will be able to give examples of industrially important microorganisms and their applications. **CO 4:** Student's will grasp about fermentation economics,parent ability and validation of process. **CO 5:** Students will learn about upstream and downstream processes. **CO 6:** Student's will attain the knowledge about fundamentals of Intellectual Property Rights (IPR), Parent designs. **CO 7:** Students will get the information of different methods for quality assurance of fermentation products. **CO 8:** Students will learn strain improvement strategies,media optimization methods for production of various valuable products
	MB-356	Agricultural Microbiology	**CO 1:**To understand plant growth improvement with respect to disease resistance, environment tolerance. **CO 2 :**To correlate stages of plant disease development, epidemiology, symptom based classification, control methods. **CO 3 :**To understand the importance of microorganisms in sustainable

	MB-357	Diagnostic Microbiology and Immunology	**CO 1:** Application of identification systems for microbial disease diagnosis, disease treatment and preventives measures. **CO 2:** Students can develop strategies for diagnosis of diseases based on antigen and antibody reactions with emphasis on prevailing communicable diseases. **CO 3 :** Graduates can perform different hemato-pathological tests. **CO 4 :** To get acquaint to the epidemiological survey and its questionnaire preparation. **CO 5:** estimation and interpretation of the different hematological indices
	MB-358	Enzymology and Genetics	**CO 1:** Students can prepare buffers and able to calibrate pH meter. **CO 2**: Students can perform qualitative analytical tests using flow charts for Proteins. **CO3:** Students are able to separate and identify sugars from mixtures. **CO4:** Students will able to do isolation of genomic DNA from bacteria. **CO5:** Practicing quantitative estimation of DNA by Diphenylamine method. **CO6:** Students can perform quantitative estimation of carbohydrates
	MB-359	Fermentation Technology- I and Agricultural Microbiology	**CO 1:** Experimenting isolation of Aspergillus niger from black rot of onion.

			CO 2 : Performing and determining the outcomes MIC & MBC of antibacterial compounds. **CO 3 :** Detecting the sterility of Pharmaceuticals as test culture given as per IP Guidelines **CO 4 :** Validation of commercial formulation of bioinoculants based on BIS Standards. **CO 5 :** Executing the standard methodology to perform antibiotic assay.
	MB-3510	Marine Microbiology	**CO 1:**Help the students to impart the awareness of unseen and unexplored niche of marine ecosystem of microbes. **CO 2 :** Student acquire advances in the knowledge of marine microbes and marine ecology.
	MB-3511	Dairy Microbiology	**CO 1:** Students acquire skills of processing of milk and dairy products. **CO 2 :**Students are able to assess quality control in dairy industry.
T.Y.B.Sc **SEM-VI**	MB-361	Medical Microbiology II	**CO 1:** To get acquainted with different drug for designing of effective treatment. **CO 2 :** To gain knowledge of development of drug resistance among pathogens & strategies to mitigate. **CO 3 :** To become familiar with the various routs of drug administration. **CO 4 :** Graduates acquire knowledge about cultivation of viruses and viral as well as fungal diseases of humans and animals.

			CO 5: To get acquainted with establishment human viral pathogens, animal viral pathogens , fungal & protozoal pathogens . **CO 6 :** To establish preventive measures to cope with transmission & treatment of viral, fungal & protozoal diseases
	MB-362	Immunology– II	**CO 1:** Highlighting the properties, attributes and Biological functions of cytokines. **CO 2 :**Tweeting about social values in vaccination programs. **CO 3 :** Extending the basic knowledge about Antigen processing and presentation. **CO 4 :** Assimilation of basic ideas behind the immune response against tumors. **CO 5:** Thorough overview of key concepts lies in general principles of different types of hypersensitivity reactions .
	MB-363	Metabolism	**CO 1:** To learn mechanisms of transport of solutes across the membrane. **CO 2 :**To get acquainted with mechanism of biosynthesis and degradation of biomolecules. **CO 3 :** To comprehend basic concept of autotrophic mode of metabolism of prokaryotes. **CO4:** To learn laws thermodynamics, free energy, entropy, enthalpy. **CO5:** To get knowledge of electron transport chain. **CO6:** Protein metabolism, role of urea cycle.

	MB-364	Molecular Biology	**CO 1:** Graduates get introduced to concept of recombination and bacteriophage Genetics **CO 2 :**To understand the concept cloning in bacteria **CO 3 :** To demonstrate the knowledge of common and advanced laboratory practices in Molecular Biology **CO 4:** Understanding of phage life cycle and its application in genetic engineering. **CO 5:** Applications of tools of genetic engineering. **CO 6:** Basic understanding of techniques used in recombinant DNA technology
	MB-365	Fermentation Technology – II	**CO 1:** Students will be able to describe each step required for successful fermentation and note any potential problems so they can be resolved. **CO 2 :**Students will get knowledge about large Scale production of milk and milk products. **CO 3 :** Students will aquire knowledge of production of primary metabolite & secondary metabolites. **CO 4 :** Students will gets introduced to microbial transformation of Steroids. **CO 5:** Studente will get aquainted with the concept of Immune sera. **CO 6 :** Student's will learn about the industrial production of Alcohol, beer, wine etc.

	MB-366	Food Microbiology	**CO 1:**Enable the student to get sufficient knowledge in relationship between food and microbes, techniques used in food microbiology and food processing. **CO 2 :**Introduce the graduates about preservation technique used in food industries, **CO 3 :** Aware the students about microbial food borne illnesses. **CO 4 :** Introduction of concept of prebiotic and probiotic.
	MB-367	Diagnostic Microbiology and Immunology	**CO 1:** Students are able to identify and differentiate different fungal and parasitic pathogens. **CO 2:** Can perform antibiotic sensitivity testing of the bacterial pathogens. **CO 3:** Students get acquainted to different immune-haematological techniques. **CO 4:** Graduates will practically study different blood components. **CO 5:** To get acquainted with the egg inoculation techniques required for cultivation of viruses. **CO 6:** To know importance of cross matching useful in blood transfusion.
	MB-368	Metabolism and Molecular Biology	**CO 1:** Students will implement knowledge of biochemistry to detect the different bio-elements in the blood and serum. **CO 2:** Students will acquire the

			knowledge of large scale production of enzyme its purification, quantification and immobilization. **CO 3:** Students are able to isolate and enumerate the bacteriophage. **CO4:** Student will able to observe mitotic cell division**.** **CO5:** Students are able to isolate plasmid DNA.
	MB-369	Fermentation Technology- II and Food Microbiology	**CO 1:** Lab scale production and estimation of ethanol. **CO 2 :** Understanding the solid state fermentation with taking reference of mushroom cultivation. **CO 3 :** students will get acquainted with different guidelines of with HACCP (Hazard Analysis and critical control point) for food industry. **CO 4:** Students will get the knowledge about isolation and Identification of probiotic microflora and health benefits associated with it. **CO 5:** Examining the values TDP and TDT. **CO 6:** Testing the Aflatoxin using UV trans-illuminator.
	MB-3610	Waste Management	**CO 1:** To learn the design and working of treatment plants and methods used for liquid and solid waste treatment. **CO 2 :**To impart the understanding of kinetics of biological systems used in waste treatment. **CO 3 :** To learn the standards of waste management and competent authorities involved at National and international level

	MB-3611	Nano-biotechnology	**CO 1:**To learn fundamentals of nanotechnology as to Synthesis and characterization techniques of nanoparticles. **CO 2 :**To acquire knowledge of applications of nanomaterials in different disciplines of human life. **CO 3 :** To compare the merits of using nanotechnology with existing technologies.