Chanda Shikshan Prasarak Mandal's

Janata Mahavidyalaya, Chandrapur

Department of Microbiology

Program Specific Outcomes

After completion of B.Sc. with Microbiology, students will be able to-

PSO1: Communicate scientific information effectively specially relating to microbiological organisms and the roles of microbial organisms in ecosystem functions and health related issues.

PSO2: Develop proficiency in the quantitative skills necessary to analyze biological problems with the knowledge of specialized techniques used in microbiology.

PSO3: Collect, analyze and interpret scientific data, thus developing familiarity with microbiology laboratory technique and safety procedures.

PSO4: Describe unique microbial genetic systems, i.e. prokaryotic and viral genomes, lateral gene transfer, plasmid structure and functions.

PSO5: Asses and interrogate the primary scientific literature and develop awareness about leading journals in the field of microbiology.

PSO6: gain familiarity with the role of microbes, human disease, in issues of international health and the human immune response to microbial infections and can develop pathological consciousness.

Course Outcomes

B.Sc. Semester I (Paper I): Fundamentals of Microbiology.

Course code: - USMBT01: Credits: - 2

After completion of this course, the students will be able to –

CO1: Understand the fundamentals of microbial world.

CO2: Understand the history and development of Microbial world.

CO3: Understand the scope of Microbiology and understand the future aspect of Microbiology.

CO4: Understand structure, function of prokaryotes and eukaryotes.

CO5: Understand the evolutionary aspect of microbial world through taxonomy and classification.

CO6: Understand the nature, symmetry and life cycle of the viruses. Simultaneously students will be able to understand the techniques of cultivation of viruses.

B.Sc. Semester – I (Paper II): Microbial Techniques.

Course code: USMBT02: Credits: 2

After completion of this course, the students will be able to –

CO1: Understand about the various microbial technique used during study of microbes.

CO2: Understand the principle, working mechanism of microscopy. Students will be able to use, handling and care of microscope.

CO3: Understand about morphology of microbes.

CO4: Understand the various staining technique and learn about morphological aspect of bacteria.

CO5: Understand the various technique used for the cultivation of bacteria.

CO6: Understand the Nutritional requirement for the cultivation and growth bacteria.

CO7: understand the various methods of isolation and preservation of microbial Culture.

CO8: Understand the various techniques of sterilization and disinfection processes and students will be able to understand the use of disinfectant in Microbial control.

Practical – Semester I: Course code: USMBP01: Credits: 2

After completion of this course the students will be able to –

CO1: Understand the rules and laboratory practices to follow in the laboratory, understand the biosafety in the microbiology lab.

CO2: Use, care and handle the instruments used in microbiology laboratory .skills and application of instruments will help students in their future.

CO3: Gain knowledge of various staining technique and bacterial structure.

CO4: Prepare and use various nutrient medium for growth and cultivation of microorganism. Students will be able to select specific nutrient media for cultivation specific microorganism. Students will be able to understand composition, preparation of selective nutrient medium.

CO5: Use the different isolation technique. They will able to isolate microbial pure by performing various isolation techniques.

CO7: Understand the fungal isolation and identification technique. learn about morphology of fungi and understand about nutrient requirement for the growth of fungi.

CO8: Understand and test the effect of antibiotics and heavy metal on the growth of bacteria, by doing this students will be able to test the antibiotics sensitivity of microbes that will help in industrial work and research.

B. SC. – I (Semester II): Paper I – General Biochemistry.

Course code: USMBTO3

After completion of this course the students will be able to –

CO1: understand the fundamental of chemical microbiology.

CO2: understand some bio chemical principal used in the study of biomolecules

CO3: understand study about structure, classification and types of protein biomolecules and also understand the biological significance of protein

CO4: understand structure function types and classification of carbohydrate and lipids to understand these biological importance of these biomolecules i.e. carbohydrate and lipids

CO5: understand structure of nucleic acid (DNA /RNA) different forms of DNA and It's composition and understand structure of RNA function and it's types

B. Sc. –I (Semester II): Paper II– Applied Microbiology.

Course code: USMBT04. Credits: 2

After completion of this course students will be able to:

CO1: Understand and gain awareness about environmental, cleanliness, health and hygiene.

CO2: Understand the sources of microorganism in air .Understand different methods used to enumerate the microorganism present in air. Gain awareness about air borne disease and its control by various techniques. Become aware about the technique like radiation, fumigation, laminar air flow technique used in controlling the microorganism present in air.

CO3: understand the different technique used in bacteriological analysis of water. By that they will be able to understand about potable and polluted water and understand the important significance of water pollution. e.g : fecal and non fecal coliforms.

CO4: understand the various method of water treatment to make the water potable.

PRACTICAL - SEMESTER II: Course code: USMBP02: Credits: 2

After completion of this course students will be able to:

CO1: understand the quantitative estimation of carbohydrates, proteins and lipids.

CO2: understand the estimation of proteins by Lowery method, sugar by DNS method, DNA by DPA method and RNA by Orcinol method.

CO3: understand the bacteriological analysis of water by using various methods.

CO4: understand the potability of water and make them to understand the difference between faceal and non- faceal coliform bacteria.

CO5: Gain awareness about the determination of quality of milk and simultaneously make them to perform milk testing for the completion of pasteurization of milk.

CO6: understand the potability and water pollution by determining the Biological Oxygen Demand and Dissolved Oxygen content of water.

CO7: understand the Chlorination process used for disinfection of water.

CO8: Gain awareness and perform the various techniques for isolation of air micro flora.

B.Sc.II (Semester III): Paper - I: Microbial Physiology and Metabolism.

Course Code: USMBT05. Credits-2

After completion of this course students will be able to:

CO1: understand the Fundamental of Physiological and metabolic pathways.

CO2: understand the Bacterial growth along with the Growth factors and growth phases.

CO3: understand various methods for measuring growth Bacteria.

CO4: understand the enzymes & their classification, specificity and interactions.

CO5: understand the kinetics & immobilization of enzymes and also factors affecting their activity.

CO6: understand different metabolic pathways necessary for Bacterial survival.

CO7: understand pathways for microbial fermentations.

B.Sc. II (Semester III): Paper II: Food, soil Microbiology and Microbial ecology

Course Code: USMBTO6: Credits: 2

After completion of this course students will be able to

CO1: understand the fundamentals of Microbial ecology.

CO2 : understand the sources of contamination of food, their examinations, significations and preservations of food.

CO3: understand the composition and types of soil with the signification of microbes in it.

CO4: understand the elemental transformations occur in environment.

CO5: understand the Microbial ecology and various microbial associations in the environment.

CO6: understand about the Environmental Biotechnology.

Practical: B.Sc. II: Semester III: Credits - 2: Course code: USMBPO3

After Completion of this course students will be able to-

CO1: understand and perform to demonstrate enzyme activity viz,; catalase, Lecithin's (lipase) Amylase, caseinase (protease), Urease.

CO2: understand the technique used in the isolation of Rhizobium from root nodules and Azotobacter from soil.

CO3: understand &perform to demonstration the symbiotic associations like synergism, Antibiosis and syntrophism.

CO4: understand about the Bacteriological examination of food by SPC & MPN.

CO5: understand production of amylase enzyme & its assay by using bacterial Strain.

CO6: understand how the cellulose degrades and also the solubilization of phosphate by mycorhizal

CO7: understand the method of preparation of Rhizobium Bio fertilizers and its application.

B.Sc. II (Semester IV): Paper I: Industrial Microbiology.

Course code: USMBT07. Credits-2

After completion of this course work students will be able to -

CO1: Understand the fundamentals of industrial process and the mechanism involved in fermentation process.

CO2: Understand about various fermentation processes, its mechanism. Gain awareness about different types of fermentation and good manufacturing practices to be applied in the industrial product formation.

CO3: isolate and identify the microbes which has important role in industrial fermentation process. Gain awareness about maintenance of this industrially important microorganism.

CO4: understand various processes, steps involved in product formation, recovery and purification of product and also understand to test the sterility of product.

CO5: understand the fermentation process used to obtained desired product .To understand the strain, fermentation, media, condition during fermentation process and metabolic pathway involved in specific fermentation process.

B.Sc. II (Semester IV): Paper II: Paper – II: Microbial Genetics and molecular biology. Course code – USMBT08. Credits: 2.

After completion of this course students will be able to understand–

CO1: Fundamentals of technique of genetic and genetic engineering.

CO2: Microbial DNA as genetic material and replication of DNA. Understand the RNA **as** viral genetic material.

CO3: Mutation, types of mutation and type of mutagenic agents in microbial genetics.

CO4: the mechanism of RNA synthesis, processing and translation.

CO5: Bacterial recombination and perspective of genetics .Concept and mechanism of different genetic process like transformation, conjugation and transduction and transposable genetic elements.

CO6: Structure and genetics of bacterial chromosome and bacterial plasmid and screening Nucleic acid by using mass spectrometry.

B.Sc. II: (Semester IV) Practical: Course code: USMBPO4: Credit: 2

Out comes: After completion of this course work-

CO1: Student will be able to understand the technique and procedure used in industrial fermentation and microbial genetics

CO2: Students will be able to understand the primary screening of antibiotics producers' amylase producer and organic acid producers.

CO3: Student will be able to understand the production of wine, ethanol, citric acid, penicillin by fermentation

CO4: Students will be able to understand the extraction and purification of RNA form yeast.

CO5: Students will be able to understand the extraction of bacterial plasmid DNA by Agarose gel method.

CO6: Students will be able to understand the digestion of DNA by using restriction enzyme.

CO7: Students will be able to understand the demonstration of bacterial conjugation and transformation.

B. Sc. III (Semester V): Paper I: Medical Microbiology:

Course Code: USMBT09

Outcomes: After completion of this course-

CO1: Students will be able to understand the fundamentals of diseases, causative agent and their preventions.

CO2: Students will be able to understand various dynamics of Disease Transmission.

CO3: Students will be able to understand the portals of entry and exit for microbes in body and also the host stability.

CO4: Students will be able to understand Mechanism of pathogenecity and virulence

CO5: Students will to understand virulence determining factors along with in infectivity, invasiveness, toxicity, vaccine, toxoid and their types.

CO6: Students will able to understand the Microbial diseases of Humans viz. bacterial, viral, protozooal and fungal diseases.

Practical B.Sc. III: Semester V: Credits: 2: Course code: USMBTO5

After completion of this course-

CO1: Students will be able to understand the morphology, cultural and bio chemical characteristic of some organism viz . *S. Typhi , S. aureus , V. cholerae and E. coli* by using isolation and identification technique.

CO2: Students will be able to understand normal flora of skin and oral cavity

CO3: Students will be able to understand detection of malaria parasite, chikengunia and dengue

CO4: Students will be able to understand the technique of determination of minimum inhibitory concentration(MIC) of antibiotics.

CO5: Students will be able to understand estimation of blood sugar by GOD-POD method.

CO6: Students will be able to understand the detection of Liver functioning by SGOT-SGPT method.

CO7: : Students will be able to understand the detection Kidney function test and estimation of blood cholesterol.

B.Sc .III (Semester V): Paper II: Bioinstrumentation

Course code: USMBT10

After completion of this course-

CO1: Students will be able to understand the fundamentals of analytical tools and technique

CO2: Students will be able to understand basic analytical technique in microbiology like colorimetry and spectrophotometry.

CO3: Students we will be able to understand the different chromatographic techniques

CO4: Students will be able to understand the principle and procedure of different electrophoresis technique

CO5: Students will be able to understand Basic concept, principle and types of centrifuge.

CO6: Students will be able to understand the modern analytical technique like radioisotopes, scintillation counter, radioactive labeling and autoradiography.

Practical B.Sc. III: Semester V: Bioinstrumentation

Credits: 2: Course code: USMBPO6

After completion of this course-

CO1: Students will be able to understand the separation of Amino acid/Sugars by Paper Chromatography.

CO2: Students will be able to understand the separation of lipid/amino acids by TLC.

CO3: Students will be able to understand separation of components by paper electrophoresis.

CO4: Students will be able to understand column packing in any form of column chromatography.

CO5: Students will be able to understand separation of protein mixture by any form of chromatography.

CO6: Students will be able to understand separation of protein by SDS-PAGE.

B.Sc .III (Semester V): Paper III: Virology(DSE-3)

Course code: USMBT-11, Credits:2

After completion of this course-

CO1: Students will be able to understand the fundamental of virology, nature and properties of viruses

CO2: Students will be able to understand cultivation of viruses, isolation and purification of viruses

CO3: Students we will be able to understand the taxonomy, bacteriophage and virus replication

CO4: Students will be able to understand the oncogenic virus and application of virology

CO5: Students will be able to understand prevention and control of viral disease

CO6: Students will be able to understand the application of virology.

Practical B.Sc. III: Semester V: Virology

Credits: 2: Course code: USMBPO7

After completion of this course-

CO1: Students will be able to understand the structure of animal virus using electron microscopy.

CO2: Students will be able to understand the isolation of animal virus by chick embryo technique.

CO3: Students will be able to understand cytopathic effects of viruses using photograph.

CO4: Students will be able to understand local lesion technique for assaying plant viruses.

CO5: Students will be able to understand the structure of important plant virus.

CO6: Students will be able to understand important bacterial viruses.

CO7**:** Students will be able to understand isolation of bacteriophage from water.

B.Sc .III (Semester VI): Paper IV: Pharmaceutical Microbiology (DSE-4). Course code: USMBT12, Credits:2

After completion of this course-

CO1: Students will be able to understand phytopharmaceticals

CO2: Students will be able to understand the drug development.

CO3: Students will be able to understand antimicrobial activity.

CO4: Students will be able to understand gene therapy and vaccine.

CO5: Students will be able to understand probiotics and neutrachemical.

Practical B.Sc. III: Semester V: Pharmaceutical Microbiology

Credits: 2: Course code: USMBPO7

After completion of this course-

CO1: Students will be able to understand the preparation of medical plant extract.

CO2: Students will be able to understand the sterility testing of vaccines and injections.

CO3: Students will be able to understand the antibacterial activity of antibiotic preparations.

CO4: Students will be able to understand antifungal test

CO5: Students will be able to understand the estimation of thymine, riboflavin, ascorbic acid content of multivitamin formulations.

CO6: Students will be able to understand proteolytic digestion of antibiotics.

B.Sc.III (SEMESTER V): SKILL ENHANCEMENT COURSES (SEC) (Any one)

PAPER I: MICROBIAL DIAGNOSIS IN HEALTH CLINICS

COURSE CODE- USMBSEC-01, CREDITS: 2

After completion of this course-

CO1: Students will be able to understand common diseases and collection of clinical sample.

CO2: Students will be able to understand steps involved in the diagnosis of disease.

CO3: Students will be able to understand the technique in the serological test.

CO4: Students will be able to study the rapid diagnosis test and kits- HIV, Dengue kit Swine flu kit.

CO5: Students will be able to understand the action of antibiotics.

CO6: Students will be able to understand methods involved in the antibiotic sensitivity and resistance detection.

B.Sc.III (SEMESTER V): PAPER I: PRACTICAL for SKILL ENHANCEMENT COURSES (SEC-1)

After completion of this course

CO1: Students will be able to understand technique of detection of malaria parasite from blood sample.

CO2: Students will be able to understand rapid disease diagnosis test and kit for HIV.

CO3: Students will be able to understand technique of determination of MIC of given antibiotics against the clinical isolates.

B.Sc.III (SEMESTER V): SKILL ENHANCEMENT COURSES (SEC-2)

PAPER II: FERMENTED FOOD AND MICROBIAL QUALITY CONTROL IN FOOD COURSE CODE- USMBSEC-02, CREDITS:2

CO1: Students will be able to understand fermented food and probiotic food

CO2: Students will be able to understand types of fermented food

CO3: Students will be able to understand microbial analysis of food

standard for drinking water and food.

CO4: Students will be able to understand food safety and microbial standard.

CO5: Students will be able to understand microbial

B.Sc.III (SEMESTER V): PAPER II: PRACTICAL for SKILL ENHANCEMENT COURSES (SEC-2)

After completion of this course

CO1: Students will be able to understand technique of preparation of fermented food-pickle/dahi/idli at laboratory level.

CO2: Students will be able to perform MPN (most probable number) for determination of colliform in food material.

CO3: Students will be able to perform MBRT for detection of quality of milk.

CO4: Students will be able to performrapid detection method of microbiological quality at milk collection center..

CO5: Students will be able to understand food industry.

B.Sc .III (Semester VI): Paper I: Recombinant DNA technology (DSE-1).

Course code: USMBT13

After completion of this course-

CO1: Students will be able to understand fundamental tools of genetic engineering

CO2: Students will be able to understand the techniques of genetic engineering

CO3: Students will be able to understand the amplification and sequence analysis of DNA.

CO4: Students will be able to understand the detection of DNA sequences by DNA finger printing and microarray.

CO5: Students will be able to understand the application of genetic engineering in medical field, agricultural field and medicine field. They will also able to understand about molecular farming.

B.Sc -Practical (Semester VI): Recombinant DNA Technology .

Course code: USMBP09. Credits-2

After completion of this course-

CO1: Students will be able to understand the isolation of plasmid DNA.

CO2: Students will be able to understand the isolation of genomic DNA by gel electrophoresis.

CO3: Students will be able to understand the digestion of DNA by using restrictions enzymes.

CO4: Students will be able to understand the ligation of digested DNA fragments.

CO5: Students will be able to understand DNA amplification by PCR.

CO6: Students will be able to understand the cloning of GFP gene.

B.Sc III (Semester VI) Paper II: Immunology (DSE- 2)

Course Code: USMBT14 : Credits: 2

After completion of this course students will be able to:

CO1: understand the fundamentals of Immunology.

CO2: understand structure and functions of immune system.

CO3: understand the mechanism and applications of Antigen & antibody reaction and their applications in serology.

CO4: understand the General properties and structure of Antigens and antibodies.

CO5: understand the hypersensitivity and Allergy and its mechanism and classification.

CO6: understand the Mechanism of hypersensitivity and concept of auto immunity and auto immune disorders.

Practical (semester VI): Immunology: Course code: USMBP10

After completion of this course-

CO1: Students will be able to understand the detection of blood group and Rh factor

CO2: Students will be able to understand hematology (TLC, DLC and Hb %)

CO3: Students will be able to understand detection of diseases by serological test (Widal, VDRL and HCG)

CO4: Students will be able to understand ELISA technique

CO5: Students will be able to understand test for rheumatoid arthritis (RA)

CO6: Students will be able to understand estimation of antigen by RIA method

B.Sc III (Semester VI) Paper III: Bioinformatics (DSE- 3)

Course Code: USMBT15 : Credits: 2

After completion of this course students will be able to:

CO1: understand the introduction to the computer, bioinformatics and biological databases

CO2: understand sequence alignments, phylogeny and phylogenetic tree.

CO3: understand the genome organization and analysis.

CO4: understand the viral prokaryotic and eukaryotic gemones.

CO5: understand protein structure prediction.

Practical (semester VI): BIOINFORMATICS. Course code: USMBP11

After completion of this course-

CO1: Students will be able to understand different operation system UNIX, LINUX and windows

CO2: Students will be able to understand bioinformatics database NCBI/PDB/DDBI, Uniport

CO3: Students will be able to understand sequence retrieval using BLAST.

CO4: Students will be able to understand sequence alignment and phylogenetic analyasis using clustalW and phylip.

CO5: Students will be able to understand procedure of picking out a given gene from genomes using Genscan or other software.

CO6: Students will be able to understand technique of protein structure prediction.

CO7: Students will be able to understand prediction of drfferent feature of a functional gene.

B.Sc III (Semester VI) Paper IV: MICROBES IN SUSTAINABLE AGRICULTURAL AND DEVELOPMENT (DSE- 4)

Course Code: USMBT16 : Credits: 2

After completion of this course students will be able to:

CO1: Students will be able to understand soil microbiology.

CO2: Students will be able to understand microbial activity in soil and green house gases.

CO3: Students will be able to understand the concept of biofertilizer, Phytostimulation, Bioinsecticides.

CO4: Students will be able to understand secondary agricultural biotechnology.

CO5: Students will be able to understand genetically modified crops.

Practical (semester VI): Microbes in sustainable agriculture and development. Course code: USMBP12

After completion of this course-

CO1: Students will be able to study soil profile.

CO2: Students will be able to study microflora of different type of soils.

CO3: Students will be able to understand technique of Rhizobium as soil inoculants characteristics and field application.

CO4: Students will be able to understand technique of Azatobacter as soil inoculants characteristics and field application.

CO5: Students will be able to understand design and functioning of a biogas plant.

CO6: Students will be able to understand isolation of cellulose degrading organism.

B.Sc.III (SEMESTER VI): SKILL ENHANCEMENT COURSES (SEC-03) (Any one)

PAPER I: BIOFERTILIZER AND BIOPESTICIDES.

COURSE CODE- USMBSEC-03 CREDITS:2

After completion of this course students will be able to:

CO1: Students will be able to understand microbes use as fertilizers.

CO2: Students will be able to understand symbiotic nitrogen fixation.

CO3: Students will be able to understand non symbiotic nitrogen fixation.

CO4: Students will be able to study the phosphate solubilizing microbes.

CO5: Students will be able to study the mycorrhizal biofertilizer.

CO5: Students will be able to study microbes used as bioinsecticides.

B.Sc. III (SEMESTER VI): PRACTICAL: PAPER I: BIOFERTILIZER AND BIOPESTICIDES COURSE CODE- USMBSEC-03 CREDITS:2

After completion of this course students will be able to:

CO1: Students will be able to understand Spawn preparation of mushroom.

CO2: Students will be able to understand lab scale cultivation of button mushroom.

CO3: Students will be able to understand disease in mushroom.

CO4: Students will be able to understand the technique of preparation of mushroom powder.

CO5: Students will be able to study the morphology of spirullina and lab scale production.

B.Sc.III (SEMESTER VI): PAPER II: MUSHROOM AND SPIRULLINA CULTIVATION.(SEC-04)

COUSE CODE- USMBSEC-04, CREDITS: 2

CO1: Students will be able to understand edible and non-edible mushroom and cultivation of mushroom

CO2: Students will be able to understand economics of mushroom cultivation and precaution of mushroom.

CO3: Students will be able to understand production of SCP.

CO4: Students will be able to understand the microbial standards of mushroom and spirullina cultivation and effect of light and pH in spirullina cultivation

B.Sc.III (SEMESTER VI): PRACTICAL: PAPER II: MUSHROOM AND SPIRULLINA CULTIVATION.(SEC-04)

CO1: Students will be able to understand spawn preparation and lab scale cultivation of button mushroom.

CO2: Students will be able to prepare mushroom powder.

CO3: Students will be able to understand lab scale production of spirullina.

CO4: Students will be able to understand the set up of mushroom and spirullia cultivation plant after the visit of respective plants.