

**Shri Shivaji Science and Arts College, Chikhli.**  
**Department of Microbiology**  
**Program Outcome, Program Specific Outcome and Course Outcome**

### **PROGRAM OUTCOME**

- At the end of the B.Sc. Programme, graduates will be able to
- Understood the basic concepts, fundamental principles, and scientific theories related to various scientific phenomena and their relevance in routine life.
- To inculcate Scientific Aptitude among the students.
- To make them aware of Environment and living things.
- To make them to use scientific logics and Soft Skills.
- Developed various communication skills such as reading, listing, speaking, etc., which will help in expressing ideas and views clearly and effectively.
- Acquired skills in handling scientific instruments, planning and performing laboratory experiments noting down the observations and drawing logical inferences from them.

### **PROGRAM SPECIFIC OUTCOME**

- Identify and become familiar with the scope, methodology and application of Microbiology and learn to appreciate its ability to explain various aspects.
- Understand theoretical and practical concepts of instruments that are commonly used in practical of Microbiology.
- Design and carry out scientific experiments and record the results of such experiments.
- Understand safety use of instruments like Autoclave, Laminar air flow, Centrifuge, Photoelectric colorimeter etc., and how they are applicable in Microbiological study in various fields.

- It explains how Microbiology and Microorganisms are useful for social, economic and environmental problems and issues facing our society regarding pollution, toxic food, energy, medicine and health etc.

## **COURSE OUTCOME**

### **B. Sc. I (Semester- I)**

#### CO I

- Get an idea about the historical events in microbiology.
- Understand the diversity in microbiology.
- Know the scope of Microbiology.

#### CO II

- Know parts of microscope, type and its principal.
- Get the theoretical concepts of related stain.
- Understand different methods of staining techniques.

#### CO III

- Understand taxonomic Classification of Microorganisms.
- Understand diversity of Microorganisms.

#### CO IV

- Understand cells and its types.
- Understand shape, size and arrangement of bacteria.
- Understand structural organization of bacterial cell and its importance.
- Understand anatomy of Prokaryotic cell.

#### CO V

- Understand basic nutritional requirements of microorganisms.
- Acquainted with various sterilization techniques.
- Know various methods of pure culture isolation.
- Know the methods of preservation of pure culture.

#### CO VI

- Understand concept of growth and reproduction of Bacteria.
- Know the Synchronous culture and Continuous culture methods.
- Understand factors influencing growth of bacteria.

#### Practical

#### CO VII

- Understand the parts of Microscope, types of Microscopes and its Principles.
- Understand different equipment's used in microbiology lab and their operation.
- Develop basic skill of Aseptic technique.
- Cultivate bacteria from soil, water, Air, milk and skin.
- Perform staining by different methods.
- Demonstrate motility of bacteria.

- Isolate pure culture of bacteria.

## **B. Sc. I (Semester- II)**

### **CO I**

- Understand structural organization of viruses.
- Understand replication of viruses.
- Understand concept of virus cultivation.

### **CO II**

- Understand basic skill of Aseptic technique.
- Understand various methods to control microorganisms.
- Understand various mechanisms of cell injury.
- Acquainted with knowledge of antibiotics and its mechanism of action.

### **CO III**

- Understand the role of microorganisms in various fields.
- Understand role of microorganisms in bio-fertilizers and bio-pesticides production.
- Understand role of microorganisms in antibiotic and vaccine production.
- Understand role of microorganisms in biodegradation and bioleaching of metals from ores.

### **CO IV**

- Understand structure and function of various biomolecules and its importance in living cell.
- Understand structure and function of Nucleic acids.

### **CO V**

- Understand basic concept of biostatistics.
- Understand s types of Central tendencies.
- Know the concept of Correlation and Regression.
- Understand concept of hypothesis testing.

### **CO VI**

- Understand basic concept of computers and its peripherals.
- Know the concept of Computer memory.
- Use of computer in preparation of presentations, Seminars.
- Use of MS-Word and MS- Power Point in routine.

- Use of Internet in searching information related to subject.

### **Practical**

### **CO VII**

- Cultivate viruses by plaque formation method.
- Study the factors affecting growth of bacteria.
- Demonstrate microbiostatic effect of heavy metals.
- Cultivate anaerobic bacteria.
- Perform antibiotic sensitivity of bacteria.
- Use Yeast for Alcohol production and Bread making.

### **B. Sc. II (Semester- III)**

### **CO I**

- Get an idea about the gene and its parts.
- Understand the concept of Split genes and Overlapping genes.
- Understand the concept of DNA replication in prokaryotes and different models of DNA replication.
- Get an idea about DNA repair mechanisms.
- Understand concept of Genetic Code and its importance.
- Understand the process of protein synthesis.

### **CO II**

- Understand different operons in bacteria and its importance.
- Know the concept of mutation and its types.
- Understand various mutagenic agents and their effects.

### **CO III**

- Understand process of gene recombination in prokaryotic cell.
- Acquainted with various mechanisms of gene recombination in bacteria.

### **CO IV**

- Acquainted with basic technique of genetic engineering.
- Understand uses of different enzymes in genetic engineering.
- Know about various vectors used in genetic engineering.

### **CO V**

- Understand methods for isolation of DNA.
- Acquainted with methods such as DNA sequencing, Polymerase Chain Reaction.
- Understand the method for identification of transformed cells.
- Understand the concept of Gene Library.

## **CO VI**

- Understand concept of recombinant Insulin and its production in large amount.
- Understand about Recombinant Vaccine.
- Understand the concept of Gene Therapy.
- Understand the concept of DNA Probes in diagnosis of disease.
- Understand how transgenic plants are produce nowadays.
- Understand about genetically modified microorganisms which control pollution.

## **Practical**

## **CO VII**

- Develop skill of Isolation of DNA from bacteria.
- Perform Agarose Gel Electrophoresis.
- Isolate Mutant strains of bacteria.
- Detect DNA and RNA from the sample.
- Carryout Transformation by using Chemical agents.

## **B. Sc. II (Semester- IV)**

## **CO I**

- Understand concept of epidemiology.
- Understand the types of infection and transmission of disease.
- Know the normal flora of human body and its importance.
- Understand how to control communicable diseases.

## **CO II**

- Concept of cells and organs related to immune system.
- Immune response and Immune mechanisms.
- Immunity and its types.
- Concept related to Hypersensitivity.

## **CO III**

- Antigens, its types and bacterial antigens.
- Antibodies, its types and importance.
- Antigen – Antibody reactions, its types and applications in serological diagnosis of disease.

## **CO IV**

- Understand various bacterial disease, their causative agents, modes of transmission, Epidemiology, Treatments, Laboratory diagnosis and Prophylaxis.

## **CO V**

- Understand Various Viral diseases, their causative agents, modes of transmission, Epidemiology, Treatments, Laboratory diagnosis and Prophylaxis.
- Aquatinted Rickettsial diseases, their causative agents, modes of transmission, Epidemiology, Treatments, Laboratory diagnosis and Prophylaxis.
- Understand various fungal diseases, their causative agents, modes of transmission, Epidemiology, Treatments, Laboratory diagnosis and Prophylaxis.
- Understand various Protozoal diseases, their causative agents, modes of transmission, Epidemiology, Treatments, Laboratory diagnosis and Prophylaxis.

#### CO VI

- Understand chemotherapeutic agents.
- Antibacterial antibiotics, their mode of action and uses.
- Antiviral agents, their mode of action and uses.
- Antifungal antibiotics, their mode of action and uses.
- Basic mechanism of antibiotic action.
- Understand various methods of Antibiotic sensitivity testing.

#### Practical

#### CO VII

- Demonstrate the activity of various enzymes such as Oxidase, Urease and Coagulase.
- Isolate and identify bacteria from clinical samples.
- Perform serological tests like Widal test, VDRL test and Pregnancy test.
- Determine blood group and Hemoglobin.
- Perform antibiotic sensitivity of bacteria.
- Determine Carbohydrate and Proteins from Urine.
- Estimate blood glucose and cholesterol.
- Perform Total Leukocyte Count and Differential Leukocyte Count of Blood.

#### B. Sc. III (Semester – V)

#### CO I

- Understand microbial interactions present in natural habitat.
- Understand atmosphere and its composition.
- Understand different types of microbes present in Air.
- Understand about Air- borne disease.
- Understand about how to control air borne disease.

#### CO II

- Understand presence of microorganisms in soil.
- Understand formation of process of humus.
- Understand concept of biological Nitrogen fixation.
- Understand different Biogeochemical cycling of elements.
- Understand biofertilizers, its competition and its importance in Agriculture.

#### CO III

- Microorganisms present in water, their growth requirements.
- Planktons and their importance.
- How to control problems created by planktons.
- Understand concept, Process and control of Eutrophication.

#### CO IV

- Collect water sample from natural sources for testing.
- Perform bacteriological analysis of water.
- Get knowledge about indicators of excretal pollution of water.
- Perform Multiple Tube Dilution technique and Most Probable Number technique for testing water potability.
- Get knowledge about ICMR and WHO standards of drinking water quality.

#### CO V

- Understand Self-purification of water.
- Understand process of Treatment of water
- Construction of Slow Sand Filters and Rapid Sand Filters.
- Acquainted about Chlorination of water.
- Understand Treatment of sewage.
- Understand Construction of Municipal Sewage treatment plant.
- Understand Secondary treatment of sewage.
- Understand Construction of Domestic Sewage treatment plant.
- Understand Concept of Chemical Oxygen Demand and Biological Oxygen Demand.
- Understand Construction of Biogas production plant.

#### CO VI

- Understands UV – Visible Spectroscopy.
- Understand Paper and Gel Electrophoresis.
- Understand Chromatography, its different types and its importance.
- Acquainted with concept of Isotopes and its use in Biological field.

#### Practical

#### CO VII

- Able to perform bacteriological analysis of water by Standard Plate Count Method, Multiple Tube Dilution Technique and Membrane Filter technique.
- Able to estimate Biochemical Oxygen Demand of Water.
- Understand how to estimate Chlorine demand and Residual chlorine of water.
- Able enumerate bacterial count of soil.
- Able to Isolate Symbiotic and Non – symbiotic Nitrogen fixing bacteria.
- Able to isolate Antibiotic producing organisms from soil.

### **B. Sc. III (Semester- VI)**

#### **CO I**

- Understand Industrial importance of microorganisms.
- Understand Process of fermentation.
- Understand Production strain.
- Understand Scale-up process.
- Understand Layout of fermentation plant.
- Understand Raw materials used in fermentation.
- Understand Antifoam agents used in fermentation process.
- Understand Sterilization of fermentation medium.

#### **CO II**

- Understand Industrial production of Ethanol, Beer, Wine, Citric acid, Vinegar and Acetone- Butanol.

#### **CO III**

- Understand Industrial Production of Baker's yeast, Single Cell Proteins.
- Understand Industrial Production of Penicillin, Amylase, and Vitamin B12.

#### **CO IV**

- Understand Composition of milk.
- Understand Sources of contamination of milk.
- Understand methods of Pasteurization.
- Understand Testing of milk for its quality.
- Understand Preparation of various milk products.

#### **CO V**

- Understand food spoilage.
- Understand how to preserve food.
- Know preparation of various fermented food products like Idli, Pickels, and Sauerkraut.
- Understand concept of food poisoning and food intoxication.

#### **CO VI**

- Understand enzymes and its classification.
- Understand EMP pathway and TCA cycle of metabolism.
- Understand about Electron Transport Chain.

#### **Practical**

#### **CO VII**

- Able to perform milk testing by Phosphatase and Methylene Blue Reduction test.
- Able to enumerate bacteria in milk.
- Able to perform test for adulteration of milk.
- Able to produce Ethyl alcohol, Citric acid, and Amylase from raw materials.
- Able to Immobilized enzymes.

- Able to produce Pickels, and Cheese.
- Able to produce wine from grapes and other raw materials.