JAI HIND COLLEGE

Basantsing Institute of Science & J. T. Lalvani College of Commerce.

And Sheila Gopal Raheja College of Management

Affiliated to University of Mumbai

Autonomous

Bachelor of Science (B.Sc in Microbiology)

Semester I

Course Code: SMIC101	Course Title: Fundamentals of Microbiology

Learning Objectives:

1. To train them about the structure and function of prokaryotic cells.
2. To make them aware about the scope of microbiology.
3. To sensitize them with basic safety measures to be adopted in a microbiology laboratory.

Learning Outcomes:

1. Describe the historical development and scope of microbiology.
2. Explain the structure and function of prokaryotic cells.
3. Compare Bacterial, Archaebacterial and Eukaryotic cells.

Semester I

Course Code: SMIC102	Course Title: Basics Techniques in Microbiology

Learning Objectives:

1. To train them about the principle, working and applications of Compound, Dark Field and Phase Contrast Microscope.
2. To make them aware of Gram's staining

3. To sensitize them with precaution of microbial experiment.

Learning Outcomes:

1. Explain the construction, principle, working and applications of Compound, Dark Field and Phase Contrast Microscope.
2. Classify different types of stains and staining methods.
3. Discuss the principle of Gram's staining and give significance of each step of the staining method.

Semester I

Course Code: SMIC1PR	Course Title: Practicals based on SMIC 101 and SMIC 102

Learning Objective:

1. To train them to Perform special staining to demonstrate the different structures of bacteria like cell wall, capsule, spore and metachromatic granules.
2. TO impart knowledge on Qualitatively detect the presence of carbohydrates, proteins, amino acids, nucleic acids using appropriate tests.
3. TO make them aware about Measure the cell dimensions using micrometry.

Learning Outcomes:

1. Perform special staining to demonstrate the different structures of bacteria like cell wall, capsule, spore and metachromatic granules.
2. Qualitatively detect the presence of carbohydrates, proteins, amino acids, nucleic acids using appropriate tests.
3. Measure the cell dimensions using micrometry.

Semester II

Course Code: SMIC201	Course Title: Microbial Diversity

Learning Objectives:

1. Train them to identify diversity of microbes in nature and to study their importance
2. To make them aware about the Use various methods to study growth of microorganisms
3. To make them learn how various environmental factors affect the growth of microorganisms

Learning Outcomes:

1. identify diversity of microbes in nature and to study their importance

2. Use various methods to study growth of microorganisms
\3.solve various environmental factors affect the growth of microorganisms

Semester II

Course Code: SMIC202	Course Title: Exploring Microbiology

Learning Objectives

1. To Make them Learn and understand the principle and applications of electron, confocal and fluorescence microscopes.
2. To Make them aware about competency in using Colorimeter and Spectrophotometer.
3. To make them learn about the concept of using buffers and to determine the pH of a solution using indicators and a pH meter

Learning Outcomes:

1. **Explain** microbial interactions and impact of microorganisms on human health.

2.develop skills in the use of basic instruments common to a biologist.

3. Handle Colorimeter and Spectrophotometer

Semester II

Course Code: SMIC2PR	Course Title: Practicals

Course Objectives

SMIC2PR

1. To Make them Study of Bacteriophages: Spot assay and (plaque assay of Bacteriophage -Demonstration)

2 To train them Isolation of Yeasts and Fungi on Sabouraud's agar

3 To familiarize with Fungi (Slide culture and Wet Mount - Study of Morphological

Outcome

1. Explain about Bacteriophages: Spot assay and (plaque assay of Bacteriophage -Demonstration)

2 Isolate Yeasts and Fungi on Sabouraud's agar

3 use Fungi (Slide culture and Wet Mount - Study of Morphology

Semester III

Course Code: SMIC301	Course Title: Essentials of Molecular Biology

Learning Objectives:

1. To make them understand genetics and the principles of inheritance of genetic traits To learn and apply the principles of molecular techniques based on DNA
2. To make them aware about the events occurring in both Prokaryotic and Eukaryotic DNA replication, with a focus on the involvement of proteins and enzymes at the cellular level
3. To sensitize them techniques of DNA (Process and extraction)

Learning Outcomes:

1. use genetics and the principles of inheritance of genetic traits To learn and apply the principles of molecular techniques based on DNA
2. Implement knowledge the events occurring in both Prokaryotic and Eukaryotic DNA replication, with a focus on the involvement of proteins and enzymes at the cellular level
3. Use techniques of DNA (Process and extraction)

Semester III

Course Code: SMIC302	Course Title: Research methodology, Biostatistics and Analytical techniques

Learning Objectives:

1. To make them understand the principle and applications of methods used for estimation of biomolecules
2. To make them learn analytical techniques To develop soft skills
3. To train with biostatistics in analysis of biology data'

Learning Outcomes:

1. Use of different Bioanalytical techniques
2. Do good research papers or doing good literature survey
3. Read and present a research paper on Biostatistical analysis

Semester III

Course Code: SMIC303	Course Title: Environmental and Applied Microbiology

Learning Objectives:

1.To make them learn the role of microorganisms in improving the environment. Study microbial flora of air and air sanitation methods

2.To help them to Explore the types of microorganisms present in freshwater, potable water and wastewater.

3. To make them Learn the methods to evaluate the water quality and processing of sewage

Learning Outcomes:

1. Implement knowledge to understand the role of microorganisms in improving the environment and Study microbial flora of air and air sanitation methods
2. Explore the types of microorganisms present in fresh water, potable water and waste water.
3. Checkthe water quality and processing of sewage

Semester III

Course Code: SMIC3PR	Course Title: Practicals based on SMIC 301 ,SMIC 302 ,SMIC 303

Learning Objectives:

1. To Make them Develop analytical skills, problem solving & critical thinking
2. To Train them to Gain knowledge of the principles & methods involved in estimation of biomolecules

3.To Make them Understand behaviour & activities of microorganisms in their natural environments

Learning Outcomes:

1.Work with nucleic acids
2.Carry out Quantitative analysis of sugar, protein and other biomolecules
3. Design an experiment and present research data

Semester IV

Course Code: SMIC401	Course Title: Microbial Biochemistry

Learning Objectives:

1. To make them aware about basic concepts of metabolism and bioenergetics
2. To make them understand the functioning of enzymes.
3. To help them to use knowledge of process of replication transcription and translation in cells

Learning Outcomes:

1. Use knowledge about metabolism in cells,properties and role of enzymes in metabolism and the molecular mechanisms of synthesis of RNA and proteins
2. Solve problems on enzymes
3. process of replication transcription and translation in cells

Semester IV

Course Code: SMIC402	Course Title: Basics in Immunology and Taxonomy

Learning Objectives:

1. TO make them Study human defense mechanism to infection
2. To make them Learn and understand the different types and approaches to clinical sample collection, maintenance and laboratory diagnosis

3.To train them with the science of taxonomy and its importance to classification

Learning Outcomes:

1. Use knowledge to learn about the immune defense mechanisms, diagnostic techniques and science of classification of microorganisms
2. Solve queries on human defense mechanism to infection
3. Implement knowledge on the different types and approaches to clinical sample collection, maintenance and laboratory diagnosis

Semester IV

Course Code: SMIC403	Course Title: Food and Industrial Microbiology

Learning Objectives:

1. To make them learn factors affecting growth of microorganisms in food,food spoilage by microorganism and foodpathogens
2. To make them understand dairymicrobiology
3. To train them to learn basic aspects of Fermentation, types of fermentation,fermenter design.

Learning Outcomes:

1.Use knowledge on the principles of food spoilage and its impact on human health

2.implement different techniques involved in food preservation and the criteria for checking food quality Microbiology of dairy products and the tests to check the quality of dairy products

3.Creat basic aspects of fermentation, types of fermentation, the basic design of a fermenter and the function of each part.

Semester IV

Course Code: SMIC4PR	Course Title: Semester IV – Practical

Learning Objectives:

1.Mak e them aware about Practical Aspects of Enzymology
2. Train them with Basic laboratory methods used for identification of Bacteria
3. Train them with Principle of different media and biochemical tests

Learning Outcomes

1.use practical knowledge on Practical Aspects of Enzymology
2. Solve problems with Basic laboratory methods used for identification of Bacteria
3. Use Principle of different media and biochemical tests

Semester V

Course Code: SMIC501	Course Title: Microbial Genetics and Cell Signaling

Learning Objectives:

Ø To make them understand basis of gene expression, central dogma and protein synthesis in prokaryotes and eukaryotes

Ø To make them study molecular basis and types of mutation, their cause,effect and DNA repair

Ø To train them to study various mechanisms of genetransfer and genetic recombination in bacteria.

Learning Outcomes:

On completion of the course, students will:

Ø Learn the Concept of central dogma of molecular biology and the process of transcription and translation

Ø use the concepts of mutations and screening of mutants

Ø summarize the mechanisms of DNA repair and recombination

Semester V

Course Code: SMIC502	Course Title: Medical Microbiology & Immunology: Part-I

Learning Objectives:

- Ø To sensitize them with a thorough Study of the virulence mechanisms of bacteria
- Ø To make them learn about respiratory tract,urinarytract,skin and GI tract infections
- Ø TO make them Understand the basic concepts of the immune system

Learning Outcomes:

- Ø Give details of the virulence factors of the pathogen and how it influences the pathogenesis and clinical features of a disease
- Ø Comment on the different pathogens and the disease caused by them wrt transmission, pathogenesis and clinical manifestation , Lab diagnostic procedures and prophylactic measures
- Ø Describe the serological methods used in diagnosis .

Semester V

Course Code: SMIC503	Course Title: Microbial Biochemistry: part-I

Learning Objectives:

Ø To make them study uptake, various intermediary metabolic processes and methods to study metabolism both in vitro
Ø To make them study carbohydrate metabolism and to understand the principles of energy generation by different physiological groups of organisms.
Ø To inculcate knowledge on the mechanisms of energy generation by using electron transport systems and gaining knowledge of energy conservation.

Learning Outcomes:

Ø summarize solute transport and energy metabolism

Ø use various biochemical pathway

Ø implement the concept of microbial metabolism
Learn Catabolism and anabolism of carbohydrates

Semester V

Course Code: SMIC504	Course Title: Bioprocess Technology: Part - I

Learning Objectives:

Ø To make them develop the learner's ability to study the techniques used in the different phases of industrial microbiology such as strain improvement, basic fermentation equipment & its sterilization aspects, different types of fermenters

Ø To make them study the principles and describes the main steps and processes in the industrial production of beverages and enzymes

Ø To train them with the details of production of important traditional fermentation products.

Learning Outcomes:

On completion of the course students will be able to :

Ø describe the role and methods of 'Strain improvement ' in industry

Ø Describe the design of bioreactors for different applications and its process parameters

Ø Explain the methods used in downstream processing

Semester V

Course Code: SMIC5PR1	Course Title: Practicals

Learning Objectives:

Ø To make them learn effect of mutagenic agents Physical and chemical on bacteria

Ø To train the techniques used for detection of mutants

Ø To make them learn diagnosis of diseases

Learning Outcomes:

Ø Perform the basic techniques related to screening and isolation of UV survivors and mutants

Ø Develop skills to carry out isolation and separation techniques for plasmid DNA

Ø Isolate and identify pathogens from pathological samples

Semester V

Course Code: SMIC5PR2	Course Title: Practicals

Learning Objectives:

1. To train them about the biochemical activities of microorganisms
2. To make them understand and implement industrial application of microorganisms
3. To sensitize them with industrial waste.

Learning Outcomes:

Upon completion of this course, the students will be able to:

Ø Isolate LAB based on their metabolism

Ø Perform the quantitative/ qualitative analysis of Biomolecules

Ø Carry out Enzyme production and determination of its activity

Learn Techniques used in industrial production of alcohol

Semester V

Course Code: SMIC5AC	Course Title: Food Production and Processing

Learning Objectives:

Ø To Make them Study the nutritional value of food and the nutritional disorders

Ø To train them to Understanding the traditional methods of food production

Ø To train them to Learning the various techniques of food processing and preservation

Learning Outcomes:

1. implement knowledge about nature, source and functions of nutrients in foods and the disorders due to them

2. use knowledge of the traditional methods of food production

3.Summarize with the methods of food processing and preservation

Semester V

Course Code: SMIC5ACPR	Course Title: Food Production and Processing Practical

Learning Objectives:

Ø To train them to Estimate the amount of nutrients in foods

Ø to train them to Prepare a diet chart

Ø to make them aware about Preserve foods by using heat and chemical preservatives

Learning Outcome:

Ø use methods to determine the amount of nutrients in foods

Ø Prepare a diet chart for different individuals

Ø Prepare Tomato ketchup and jam and check the method of preservation

Semester VI

Course Code: SMIC601	Course Title: rDNA Technology, Bioinformatics & Virology

Learning Objectives:

To make them study recombinant DNA technology and its applications

To make them understand plasmid and transposons and their role

To train them about role of bioinformatics in biology

Learning Outcomes:

1. Use knowledge study recombinant DNA technology and its applications

2.solve problem on plasmid and transposons and their role

3.summarize role of bioinformatics in biology

Semester VI

Course Code: SMIC602	Course Title: Medical Microbiology and Immunology Part - II

Learning Objectives:

To make them study Vector borne, STDs and CNS infections

To mak e them understand the principles of chemotherapy

Tohelp them to learn the role of T and B cells in generating adaptive immunityand s

No Outcomes

1. Solve problems Vector borne, STDs and CNS infections
2. Implement knowledge to understand the principles of chemotherapy
3. learn the role of T and B cells in generating adaptive immunity s

Semester VI

Course Code: SMIC603	Course Title: Microbial Biochemistry: Part - II

Learning Objectives:

1. To make them study metabolism of lipids, fatty acids, nucleotides and amino acids
2. To make them learn catabolism of proteins and aliphatic hydrocarbons
3. To train them understand metabolic regulation and photosynthesis

Learning Outcome:

1.study metabolism of lipids, fatty acids, nucleotides and amino acids

2. Solve problems on catabolism of proteins and aliphatic hydrocarbons

3. summarize metabolic regulation and photosynthesis

Semester VI

Course Code: SMIC604	Course Title: Bioprocess Technology: Part - I

Learning Objectives:

1. To help them to understand processes involved in fermentation of important products
2. To encourage them to gain knowledge of plant and animal tissue culture techniques
3. To train them to understand the salient features of quality management and regulatory procedures

No Outcomes

1. Elaborate the processes involved in fermentation of important products
2. Implement knowledge of plant and animal tissue culture techniques
3. describe the salient features of quality manage

Semester VI

Course Code: SMIC6PR1	Course Title: Practical - I

Learning Objectives:

1. To train them to Develop soft skills
2. To make them learn the practical aspects of immunohaematology
3. To train them hands on techniques and instruments used in immunohematology.

Learning outcome:

1. Practice soft skills in research communication.
2. Perform the practical on immunohaematology
3. Solve problem which are related to techniques and instruments used in immunohematology.

Semester VI

Course Code: SMIC6PR2	Course Title: Practical - II

Learning Objectives:

1. To make them learn estimations of biologically active compounds
2. To impart knowledge on Learning the principles of biocompounds
3. To impart knowledge on Learning theestimations of biocompounds

Learning Outcomes

1. Perform experiment on estimations of biologically active compounds

4. Use knowledge on Learning the principles of biocompounds
5. Summerize the estimations of biocompounds.

Semester VI

Course Code: SMIC6AC	Course Title: Food Production and Processing

Learning Objectives:

1. To Make them Understanding modern techniques involved in food production
2. To help them Learn the principles that underline food spoilage and the importance of food safety and quality assurance
3. To help them to Study the importance of packaging in food industry

Learning Outcomes:

1. Solve problems about genetically engineered plant and animal products, fermented foods and beverages, aspects of food

2.use knowledge on safety and food packaging.

3. Practice food safety.

Semester VI

Course Code: SMIC6ACPR	Course Title: Food Production and Processing Practical

Learning objective:

1.To train them with mushroom cultivation

2.To make them aware about significance of nanotechnology

3. To sensitize them use vitamins and iodine number.

Learning Outcomes:

1.practice mushroom cultivation

2. Summerize significance of nanotechnology

3. Use concept of vitamins and iodine number