Program Outcomes

After successful completion of three year degree program in Chemistry a student should be able to

1. Perform the basic techniques related to screening, isolation and cultivation of microorganisms from various sources
2. Study the microorganism with regard to morphology, cultural and biochemical characters. It will help to classify the microbes to certain extent.
3. Follow the aseptic techniques and conduct the process of sterilization as well as perform the techniques to control the microorganism
4. Understand microorganisms and their relationship with the environment
5. Produce and analyze the microbial products at laboratory level
6. Conduct the basic research with these microorganisms and perform the diagnostic procedures required in food, milk and pharmaceutical industries.
7. Perform the quantitative/ qualitative analysis of Biomolecules and understand various biochemical pathways
8. Acquire knowledge and understanding the concepts of Microbial genetics, Molecular biology, Immunology, Enzymology.

Program Specific outcomes:

On completion of course, students will have basic knowledge of the

1. Techniques to study microorganisms.
2. Principles and working of laboratory instruments and basic staining techniques.
3. Basic bacteriology which includes taxonomy, bacterial structure, microbial nutrition and microbial control.
4. Cultivation and preservation of bacteria.
5. Microbial physiology by exploring the biomolecules, enzyme and microbial growth.
6. Soil and water microbiology and the microbial diversity
7. Microbial analysis of food and milk.
8. Molecular biology and genetics of bacteria.
9. Principal of immunology and medical microbiology
10. Fermentation technology and Environment Microbiology
11. Genetic engineering and biotechnology
12. Virology and mycology

Course outcomes: (SEM: I)

Course MI- 101 Introduction to Microbial world

On completion of the course, students are able to:

- Understand the development of Microbiology as a new discipline of Biological Science
- Know the microbial word with respect to distribution of microorganisms in nature, concept of prokaryotes and eukaryotes.
- Know the significance of Microbiology and understand the theoretical background of pure culture techniques.
- Know parts of microscope, type and its principal and Get the theoretical concepts of staining
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Course MI-102 (Practicals)

- On completion of the course, students are able to:
- Understand principles and working of laboratory instruments
- Cleaning and preparation of glassware for sterilization as well as Disposal of laboratory waste and cultures.
- Perform simple staining and Gram's staining.
- Prepare Nutrient media: Nutrient agar and Nutrient broth and its pH adjustment
- Isolation of bacteria by streak plate method

Course outcomes: (SEM: II)

Course MI 103 Basic Bacteriology

On completion of the course, students are able to:

- Understand the Taxonomy and cellular organization of Typical Prokaryotes
- Understand the Structure of typical bacterial cell which includes Surface appendages, Surface layers, cytoplasm and cell organelles
- Understand the nutritional diversity and principle of media formulation
- Know the general principle of microbial control along with the basic aspects of different types of physical and chemical agents of microbial control.

Course MI-104 (Practical)

On completion of the course, students are able to perform:

- Cultivation methods for bacteria
- Cultivation of anaerobic bacteria
- Preservation of microbial cultures
- Study of pigmented bacteria
- Study of bacterial structure by structural staining
- Use of special staining technique to study bacteria: *Spirocheates* by Fontana's method
- Study of effect of various physical agents on growth of bacteria

Course outcomes: (SEM: III)

Course MI 201 Microbial Physiology

On completion of the course, students are able to

- Develop fundamental knowledge about various biomolecules
- Understand the basic concepts related to enzymes
- Understand the concept of microbial metabolism and microbial nutrition
- Understand concepts of growth and reproduction of bacteria

Course MI- 202 Soil and Water Microbiology

On completion of the course, students are able to

- Understand the Physicochemical characteristics of soil, methods to study soil flora and Microbial interactions in soil
- Explain rotation of elements in nature and biogeochemical transformation
- Learn about the drinking water microbiology
- Learn about the waste water microbiology

Course MI-203 (Practical)

On completion of the course, students are able to:

- Understand the different types of microbial media
- Perform the qualitative analysis of carbohydrates.
- Evaluate the effect of antimicrobial compounds on growth of bacteria
- Perform various biochemical test
- Perform the Microbiological analysis of soil
- Perform the Microbiological analysis of drinking water
- Study the skin and air flora.

Course outcomes: (SEM: IV)

Course MI 204 Diversity of Bacteria

On completion of the course, students are able to

- Develop fundamental knowledge about Archea
- Understand the basic properties of Photosynthetic bacteria and chemolithotrophic bacteria.
- Understand the diversity of gram negative and obligatory parasites.
- Understand the diversity of gram positive, filamentous bacteria with complex morphology and bacteria with unusual morphology.

Course MI-205 Food and Dairy Microbiology

On completion of the course, students are able to

- Understand the basics of microbial food infection and poisoning.
- Explain the Microbial food spoilage and preservation
- Understand the concept of fermented food products and mushrooms.
- Explain the theory of microbiological analysis of food products.

Course MI-206 (Practical)

On completion of the course, students are able to perform

- Study of bacterial diversity in soil by using Winogradsky column
- Study of bacterial motility
- Measurement of bacterial yeast and fungal cell size using micrometer
- Pure culture study
- Isolation and cultivation of yeast
- SPC of food products
- Microbiological analysis of milk

Course outcomes: (SEM: V)

Course MI 301 Molecular Biology and Genetics of Prokaryotes

On completion of the course, students are able to

- Develop fundamental knowledge about structure of DNA and its replication.
- Understand fundamentals of transcription, translation and regulation of gene expression.
- Get insight of DNA mutation and repair mechanism.
- Understand the concept of gene transfer among bacteria by transformation, transduction and conjugation.

Course MI 302 Bacterial Metabolism

On completion of the course, students are able to

- Develop fundamental knowledge about metabolism which includes free energy, enzyme kinetics, metabolic regulation and biosynthesis.
- Understand fundamentals of fueling reaction to generate ATP and fermentation.
- Get insight of fueling reaction in chemolithotrophs and phototrophs
- Understand the concept of Anaplerotic reaction and glyoxylate pathway. Develop the basic knowledge of biosynthetic pathway of carbohydrate and assimilation of nitrogen.

Course MI 303 Principles of Immunology

On completion of the course, students are able to

- Develop fundamental knowledge about Cells and organs of the immune system, Immunity and its types and Immune response (IR)
- Understand fundamentals of antigen and antibody
- Get insight of mechanism of antigen antibody reaction and their types.
- Explore immune disorder and hematology.

COURSE MI-304 Fermentation Technology

On completion of the course, students are able to

- Develop fundamental knowledge about fermentation, component parts of fermentation, and range of fermentation.
- Understand theory of screening of industrial important microorganisms their improvement and preservation.
- Get insight of media formulation its sterilization and inoculums development.
- Understand the design of stirred tank fermentor and special purpose fermentor.

COURSE MI-305.1 Environmental Microbiology

On completion of the course, students are able to

- Develop fundamental knowledge about microbial ecosystem, habitat and environment.
- Understand theory behind microbiology of green house gases, role of microbes in soil fertility and acid mine drainage.
- Get insight of biological indicator of pollution, waste water treatment and biodegradation of environmental pollutant.
- Understand the role of microbial biotechnology using Microbially enhanced oil recovery, Bioremediation of petroleum hydrocarbons, Bioleaching of copper
- , Biofuels, Biodegradable polymers and Microbial pesticides.

COURSE MI-306 Practicals

On completion of the course, students are able to

- Isolate mutant using physical and chemical agents.
- Isolate DNA
- Estimate Glucose, protein and streptomycin.
- Perform agglutination reaction and precipitation reaction.
- Perform ELISA test
- Perform hematology test like blood grouping, estimation of hemoglobin, Total count of erythrocytes and leucocytes and Differential count of leucocytes.
- Screening of industrially important organisms
- Isolate, cultivate and microscopic identification of economically important fungi.

Course outcomes: (SEM: VI)

Course MI 307 Genetic Engineering

On completion of the course, students are able to

- Develop fundamental knowledge about recombinant DNA technology and cloning.
- Understand Principle, method and applications of techniques like Gene editing, PCR, Southern blotting ,Sanger's dideoxy chain termination method and DNA microarray
- Get insight of rDNA technology by understanding the concept of isolating desired DNA, ligation with vector, transformation and screening of desired mutant.
- Explain the Medical applications, Agricultural applications, Environmental applications of rDNA technology.

Course MI 308 Virology and Mycology

On completion of the course, students are able to

- Develop fundamental knowledge about general properties of virus, classification and cultivation of virus.
- Understand Principle of lytic and lysogenic cycle of bacterial virus.
- Get insight of General characters, cultivation and economic importance of fungi.
- Explain the reproduction and classification of fungi.

Course MI 309 Medical Microbiology

On completion of the course, students are able to

- Develop fundamental knowledge about general properties of virus, classification and cultivation of virus. Relationship between human body and microbe
- Understand Principle of lytic and lysogenic cycle of bacterial virus. Epidemiology of infectious disease and vaccines
- Get insight of Methods used for diagnosis and identification of pathogens
- Understand etiological agent, symptoms, transmission, diagnosis and control of Infectious diseases of human being like Tuberculosis, Swine flu, Typhoid, Hepatitis A, Syphilis, AIDS , Malaria, Dengue ,Rabies, Anthrax

Course MI 310 Bioprocess Technology

On completion of the course, students are able to

- Develop fundamental knowledge about modes of Fermenter operation and scale up
- Understand Principle of Downstream processing which includes Removal of microbial cells and suspended solids, Cell disruption methods, Product concentration and purification and drying.
- Get insight of Methods used for Detection and assay of fermentation products and fermentation economics.
- Understand typical fermentation process like Amylase, Penicillin, Citric acid, Ethanol and Lysine

Course MI 311.1 Biotechnology

On completion of the course, students are able to

- Develop fundamental knowledge about biotechnology as an interdisciplinary & multidisciplinary science, its Scope and importance of biotechnology education and research in Biotechnology in Gujarat & India.
- Understand Principle, method, and applications of UV-Vis spectroscopy , Centrifugation, Chromatography, Electrophoresis, Biosensors
- Understand the Principle, method and applications of Cellular & molecular techniques like Animal cell culture, Plant tissue culture: , Northern blotting ,CRISPR CAS 9
- Explore different areas of application of biotechnology and Introduction to IPR, & patents in biotechnology

COURSE MI-312 Practicals

On completion of the course, students are able to

- Perform paper chromatography and thin layer chromatography.
- Develop immobilization of cells.
- Use enzyme as an analytical tool.
- Isolate bacteriophage from sewage and Isolate yeasts from fruit.
- Identify some plant diseases caused by Virus and Fungi — Mosaic, red rot, rust, smut, wilt, leaf curl, powdery mildew, downy mildew.
- Perform Isolation, cultivation and identification of gram-negative bacteria
- Identify the sensitivity of clinical bacteria against available antibiotic using multidisc method.
- Peform physical and chemical analysis of urine.
- Carry out Estimation of blood urea by diacetyl monoxime method (DAM).
- Carry out Fermentative production of amylase and its activity check.
- Carry out sterility testing of pharmaceutical products.