Department of Microbiology
Government Institute of Science,
Aurangabad (M.S.)

M. Sc. Microbiology Program and Course Outcome

[2017-18]

Program Outcomes

On completion of program students will be able to

1. **Get ability to apply the process of science by formulating hypotheses and design experiments based on the scientific method.**
2. **Analyze and interpret results from a variety of microbiological methods**
3. **Use quantitative reasoning by using mathematical calculations and graphing skills to solve problems in microbiology.**
4. **Communicate and collaborate with other disciplines by effectively communicating the fundamental concepts of microbiology in written and oral format.**
5. **Identify credible scientific sources to interpret and evaluate the evidences**
6. **Understand the relationship between science and society by recognizing and discussing logical, scientific and ethical issues in microbiology.**

Program specific outcomes

On completion of program students will be specifically able to

1. **Prepare and view specimens for examination using light microscopy**
2. **Use pure culture and selective techniques to isolate microorganisms. Identify microorganisms (media-based, molecular and serological).**
3. **Estimate the number of microorganisms in a sample by suitable enumeration technique**
4. **Use appropriate microbiological and molecular lab equipment and methods.**
5. **Practice safe microbiology, using appropriate protective, biosafety and emergency procedures.**
6. **Document and report on experimental protocols, results and conclusions.**

Course Outcomes

Course I BIOSTATISTICS COMPUTER APPLICATIONS AND RESEARCH METHODOLOGY

Course Objectives

- To understand various statistics terminologies and their significance in microbiology
- To get familiar with various computation tools of biostatistics
- To know-how about research methodology

Outcomes

After successful completion of this course, students will be able to:

- Apply the principles of statistics for designing microbiological experiment, statistical analysis, and interpretation of results
- Operate and solve exercise using computation statistics software
- Get acquitted with basic approach of research methodology

Course II BIOENERGETICS AND ENZYMOLOGY

Course Objectives

- To understand concepts of bioenergetics and metabolic pathways of microorganisms
- To study the metabolic pathways of industrially important fermentation product
- To know the properties, kinetics, and significance of microbial enzymes

Outcomes

After successful completion of this course, students will be able to:

- Elucidate the bioenergetics and microbial metabolic pathways
- Cognizant about the metabolic pathways of industrially important fermentation product
- Demonstrate the properties, kinetics, and significance of microbial enzymes

Course III BIOINSTRUMENTATION TECHNIQUES AND APPLICATIONS

Course Objectives

- To study the principles, need and care of laboratory instruments
- To understand theory, principles of chromatographic, electrophoretic, spectrophotometric and radioisotope techniques
- Get detail applications of various instrument and techniques in microbial field

Outcomes

After successful completion of this course, students will be able to:

- Explain the principles, need and SOP of laboratory instruments
- Pertain the theory, principles of chromatographic, electrophoretic, spectrophotometric and radioisotope techniques
- Demonstrate various instruments and techniques

Course IV INDUSTRIAL FOOD AND DAIRY MICROBIOLOGY

Course Objectives

• To understand concepts in milk microbiology
• To complement the students with the basic knowledge of food microbiology
• To acquaint the students with food preservation techniques

Outcomes

After successful completion of this course, students will be able to:
• Know the concepts related to popular milk products, milk examination and spoilage.
• Comprehend knowledge regarding fermented food products, food spoilage and infection
• Understand diverse strategies for food preservation

Course V RECENT TRENDS IN VIROLOGY

Course Objectives

- To aware the virus, classification, and their significance
- To understand the vail multiplication and pathogenic role of viruses
- To abreast about control of virus and newly emerging virus

Outcomes

After successful completion of this course, students will be able to:

- Explicate the virus, classification, and their significance
- Comprehend the vail multiplication and pathogenic role of viruses
- Realize about control of virus and newly emerging virus

Course VI MOLECULAR IMMUNOLOGY

Course Objectives

• To study the concepts related to antigen and antibody
• To study the various immune cells and organs functional in a body at molecular level
• To get knowledge of immunoassays and diagnostic tests

Outcomes

After successful completion of this course, students will be able to:

• Get acquainted with knowledge about immune system
• Know about the role of immune cells and organs and the functional mechanisms of each
• Demonstrate the immunoassay and diagnostic test

Course VII MICROBIAL PHYSIOLOGY.

Course Objectives

- To acquaint various life process like photosynthesis, respiration and fermentation, anaerobic respiration, and bacterial sporulation
- To understand bacterial membrane transport
- To understand the concept of chemolithotrophy and nitrogen metabolism

Outcomes

After successful completion of this course, students will be able to:

- Get well versed with various life process like photosynthesis, respiration and fermentation, anaerobic respiration, and bacterial sporulation
- Elucidate bacterial membrane transport
- Discuss the concept of chemolithotrophy and nitrogen metabolism

Course VIII MICROBIAL DIVERSITY AND EXTREMOPHILES.

Course Objectives

- To understand the microbial biodiversity
- To acquaint with ecology
- To understand the morphology, physiology, and significance of extremophilic microbes

Outcomes

After successful completion of this course, students will be able to:

- Comprehend the biodiversity
- Familiarize with various ecological niche and microbial interactions (positive and negative)
- Recognize the morphology, physiology, and significance of extremophilic microbes

Course IX ENZYME TECHNOLOGY

Course Objectives

- To study enzyme extraction and purification methods
- To understand the enzyme inhibition kinetics
- To acquaint with concepts -enzyme immobilization, enzyme engineering and clinical enzymology

Outcomes

After successful completion of this course, students will be able to:

- Demonstrate the enzyme extraction and purification methods
- Explain the enzyme inhibition kinetics
- Familiarize with concepts -enzyme immobilization, enzyme engineering and clinical enzymology

Course X BIOPROCESS ENGINEERING AND TECHNOLOGY.

Course Objectives

- To survey the scope, Principle and types of various bioprocess engineering and techniques
- To understand to features and types of bioreactor
- To understand the mass transfer, sterilization, and downstream processes

Outcomes

After successful completion of this course, students will be able to:

- Grasp the scope, Principle and types of various bioprocess engineering and techniques
- Demonstrate the features and types of bioreactor
- Explain the mass transfer, sterilization, upstream and downstream processes

Course XI MOLECULAR MICROBIAL GENETICS.

Course Objectives

- To understand the concepts in prokaryotic, eukaryotic, and viral genetics
- To study the central dogma of molecular biology (replication, transcription, and translation)
- To acquaint types of mutation, gene regulation and transposable element

Outcomes

After successful completion of this course, students will be able to:

- Acquaint with concepts in prokaryotic, eukaryotic, and viral genetics
- Explain central dogma of molecular biology (replication, transcription, and translation)
- Enlist and explain types of mutation, gene regulation and transposable element

Course XII ENVIRONMENTAL MICROBIAL TECHNOLOGY

Course Objectives

- To learn the environment, ecosystem, and eutrophication
- To understand bioremediation, xenobiotics, and effluent treatment methods
- To acquaint the students with global environmental problems

Outcomes

After successful completion of this course, students will be able to:

- Understand the environment, ecosystem, and eutrophication
- Explain bioremediation, xenobiotics, and effluent treatment methods
- Connect about global environmental problems

Course XIII RECOMBINANT DNA TECHNOLOGY

Course Objectives

- To learn about core technique of rDNA technology and enzyme required for it.
- To understand the tools and techniques used in rDNA technology
- To aware about various rDNA products in various field

Outcomes

After successful completion of this course, students will be able to:

- Explain about core technique of rDNA technology and enzyme required for it.
- Demonstrate the tools and techniques used in rDNA technology
- cognizant about various rDNA products in various field

Course XIV FERMENTATION TECHNOLOGY

Course Objectives

• To acquaint with various microbial fermentation processes
• To apply the concept of these processes for commercially valuable products
• To aware about IPR and patents

Outcomes

After successful completion of this course students will be able to:

- Understand the fermentation processes involved for various products and investigate the applications of various techniques for fermentation products
- Inculcate the salient features of quality management and regulatory processes
- informed about IPR and patents

Course XV	BIOINFORMATICS, MICROBIAL GENOMICS AND PROTEOMICS.
	Course Objectives • To understand basic and advanced tools of bioinformatics • To perform sequence and whole genome analysis • To learn various computational technique and online tools of bioinformatics
	Outcomes After successful completion of this course students will be able to: • Explain basic and advanced tools of bioinformatics • Demonstrate sequence and whole genome analysis • familiarize various computational technique and online tools of bioinformatics

Course XVI	PHARMACEUTICAL MICROBIOLOGY
	Course Objectives • To develop practical skills involved in interpretation of microbiological materials and data • To promote development of entrepreneurship and build up Professionals in Pharmaceutical Analysis, and R&D work • To understand quality assurance validation
	Outcomes After successful completion of this course, students are expected to: • Conversant in practical skills involved in interpretation of microbiological materials and data • Explain the development of entrepreneurship and build up Professionals in Pharmaceutical Analysis, and R&D work • Aware about quality assurance validation.

DISSERTATION COURSE (PROJECT WORK)

Course Objectives

- To develop research skills involved execution of microbiological proposal
- To use appropriate microbiological methods and lab equipment
- Aware about safe microbiology, using appropriate protective, biosafety, and emergency procedures.
- To prepare document and report on experimental protocols, results, and conclusions.

Outcomes

After successful completion of this course, students are expected to:

- Have research skills involved execution of microbiological proposal
- Make use of appropriate microbiological methods and lab equipment
- Abide by safe microbiology, using appropriate protective, biosafety, and emergency procedures.
- Create document and report on experimental protocols, results, and conclusions.