DEPARTMENT OF MICROBIOLOGY

C.M.DUBEY POST GRADUATE COLLEGE, BILASPUR (C.G.)

SESSION-2017-18, 2018-19,2019-20

COURSES: POST GRADUATION

SEMESTER	PAPER	CODE	NAME
SEMESTER- I	FIRST	MB 101	GENERAL MICROBIOLOGY AND BACTERIOLOGY
	SECOND	MB 102	VIROLOGY
	THIRD	MB 103	PHYCOLOGY, MYCOLOGY AND PROTO-ZOOLOGY
	FOURTH	MB104	BIOCHEMISTRY
	LAB-I		BASED ON PAPER I AND II
	LAB-II		BASED ON PAPER III AND IV
SEMESTER- II	FIRST	MB201	BIOINSTRUMENTATION AND BIOCHEMICAL TECHNIQUES
	SECOND	MB 201	CELL BIOLOGY AND MICROBIAL PHYSIOLOGY
	THIRD	MB 201	MICROBIAL GENETICS AND MOLECULAR BIOLOGY
	FOURTH	MB 201	ENVIRONMENTAL AND AGRICULTURE MICROBIOLOGY
	LAB- I		BASED ON PAPER I AND II
	LAB-II		BASED ON PAPER III AND IV
SEMESTER -III	FIRST	MB 301	IMMUNOLOGY
	SECOND	MB302	MEDICAL AND VETERINARY MICROBIOLOGY
	THIRD	MB 303	BIOSTATICS AND BIOINFORMATICS
	FOURTH	MB 304	ENZYMOLOGY AND

			INDUSTRIAL MICROBIOLOGY
	LAB- I		BASED ON PAPER I AND II
	LAB-II		BASED ON PAPER III AND IV
SEMESTER - IV	FIRST	MB 401	PLANT PATHOLOGY AND DISEASE MANAGEMENT
	SECOND	MB402	FOOD MICROBIOLOGY
	THIRD	MB403	MICROBIAL ECOLOGY AND FOREST MICROBIOLOGY
	FOURTH	MB404	COMPUTER FUNDAMENTALS AND RESEARCH TECHNIQUES
	LAB- I		BASED ON PAPER I,II AND III
	LAB-II		PROJECT WORK (MINOR) AT LOCAL LEVEL

PROGRAMME OUTCOMES

To make our students competent in the field of Microbiology and its allied areas. To inculcate the capability to work as entrepreneurs and techno managers with strong ethics and communication skills. To equip the students to pursue higher education and research in reputed institutes at national and international level. To develop a working knowledge of microbiology product and processes.

PROGRAMME OUTCOMES

Programme Outcomes are:

PO.1. Explain and properly apply the scientific method by developing valid hypotheses, designing experiments, gathering relevant data using current technology, and interpreting quantitative and qualitative data.

PO. 2. Prepare written and oral scientific communications that use tables and graphs to report results, that describe detailed experimental procedures, and that clearly explain conclusions.

PO .3. Critically evaluate contributions to science reported in all forms of media, and be able to identify valid approaches to scientific problem solving and reporting.

PO .4. Exhibit growth in academic performance and personal and professional responsibility.

PO. 5. Exhibit an ability to work independently and collaboratively.

PO. 6. Demonstrate proficiency in basic laboratory skills common to clinical and non-clinical research laboratories, including aseptic technique, making accurate and precise measurements using balances and macro- and micro-pipetting, using a microscope, preparing solutions, operating current instrumentation, preparing samples for various analyses, and maintaining a proper scientific laboratory notebook.

PO .7. Design, perform, and analyze results of experiments using basic molecular biology methodologies and recombinant DNA techniques, including agarose and polyacrylamide gel electrophoresis, restriction enzyme digestion, bacterial transformations, plasmid DNA protein expression, PCR, and tissue culture.

PO .8. Apply the fundamentals of molecular biology theories, methodologies, and techniques by critically analyzing, interpreting, and presenting a recent and relevant scientific research paper that has been published in a refereed scientific journal.

PO .9. Understand the foundational concepts of molecular biology, and how these impact biotechnology research and development in the diverse fields that span healthcare and agriculture.

PROGRAMME SPECIFIC OUTCOMES

PSO1. Acquire knowledge on the fundamentals of microbiology for sound and solid base which enables them to understand the emerging and advanced engineering concepts in life sciences.

PSO 2. Acquire knowledge in domain of microbiology enabling their applications in industry and research.

PSO 3. Empower the students to acquire technological knowhow by connecting disciplinary and interdisciplinary aspects of biotechnology

PROGRAMME OUTCOMES……(**UNDER GRADUATION**)

CLASS	PAPER	CODE	NAME
B.Sc. PART -I	PAPER-I	0819	GENERAL MICROBIOLOGY & BASIC TECHNIQUE
	PAPER- II	0820	BIOCHEMISTRY AND PHYSIOLOGY
	LAB- I		
B.Sc. PART -II	PAPER- I	0869	MOLECULAR BIOLOGY AND GENETIC ENGINEERING
	PAPER- II	0870	PRINCIPLES OF BIOINSTRUMENTATION AND TECHNIQUES
	LAB-I		
B.Sc. PART -III	PAPER –I	0923	MOLECULAR BIOLOGY AND GENETIC ENGINEERING
	PAPER- II	0924	ENVIRONMENTAL AND MEDICAL MICROBIOLOGY
	LAB-I		

PROGRAMMED OUT COMES ARE

PO1 .Cognitive Knowledge: To provide education that leads to comprehensive understanding of the principles and practices of microbiology.

PO 2. Information and Computer Literacy: To educate and make them up to date with the current scientific literature, computer programs and web information.

PO 3. Experimental Skills: To provide broad based training in technical skills in methods of microbiology.

PO 4. Critical Thinking: To empower students with the ability to think and solve problems in the field of microbiology.

PO 5. Scientific Communication: To ensure students are able to effectively communicate with microbiology and other interdisciplinary professionals.

PO. 6. Professional Attitude: To produce responsible microbiologists that can work within the interdisciplinary framework of biotechnology and related fields.

PO .7. Students will be able to demonstrate their knowledge of microbiology concepts.

PO .8. Students will possess the technical background knowledge needed to support microbiology research activity.

PO .9. Students will possess hands-on technical skills necessary for supporting microbiology research activity.

PO .10. Students will show understanding of their knowledge of industrial regulations and the regulatory environment in the microbiology industry.

PO .11. Students will be able to demonstrate the ability to apply research strategies to solve microbiology problems.

PO .12. Students will be able to demonstrate the ability to communicate effectively with appropriate audiences with regard to field of microbiology.

Program Specific outcomes

- Understand the principles and the applications of molecular biology methods with an emphasis on the application of recombinant DNA technology to animals, plants and microbial organisms.

- To gain knowledge about the application of various types of Microscopy.

- To classify and explain the structure and general characteristics of microorganisms.

- To explain the microbial degradation of pesticides, bioremediation and bio fertilizers.

- The course descries the use of genetically engineered products to solve environmental problems and cure human diseases.

- Understand the applications of microbiology and advances in the different areas like medical, microbial, environmental, bioremediation, agricultural, plant, animal and forensic sciences.

- Learn the concept and applications of monoclonal antibody technology

- Learn how to use mammalian cells for the production of pharmaceutical products

- Explain the general principles of generating transgenic plants, animals and microbes.

- Students will possess hands-on technical skills necessary to support micrology research activity.

- Have hands-on experience of basic techniques like agarose and poly acrylamide gel.

Course outcome

MICROBIOLOGY SEMESTER- I

PAPER-1

GENERAL MICROBIOLOGY AND BACTERIOLOGY

- Understand the history of microbiology.
- Study the contributions of eminent scientists : Anton van Leewenhoek, Louis Pasteur, Robert Koch, and Alexander Fleming.
- Study the scope of Microbiology.
- Concept of microbial species.
- Classification of bacteria based on morphology.
- Study of the ultrastructure of bacterial cell wall, endospore and capsule Eukaryotic microorganism.
- General characters of major groups of Eubacteria and Archaebacteria.

PAPER-2

VIROLOGY

- Discover the ultrastructure of viruses.
- Differentiate plant and animal viruses.
- Explain viral genome, their types and structure.
- Common viral diseases caused by plant viruses such as Tobacco, Paddy, Tomato, Bhindi and Sugarcane.
- Nomenclature and classification of Animal viruses. Retroviruses and Oncogenic viruses.
- Important human diseases: Smallpox, Chickenpox, AIDS, Influenza, Pneumonia.
- Classification , morphology and ultrastructure of Bacterial viruses.

PAPER-3

PHYCOLOGY, MYCOLOGY AND PROTO-ZOOLOGY

- General concept of Algae, Fungi and Protozoans.
- General concept of Phycology.
- General features , structure, nutrition, reproduction of Fungi.
- Structure and reproduction of important protozoas – Entamoeba, Giardia, Trichomonas, Plasmodium , Leishmania.
- Important plant diseases caused by fungi and protozoans.

PAPER-4

BIOCHEMISTRY

- Learn the classification of proteins based on structure and functions.
- Understand primary, secondary and tertiary structure of proteins.
- Study the classification of enzymes and enzyme kinetics.
- Concept of Bioenergetics.
- Understand the structure and classification of Carbohydrates with examples.
- Understand the structure, properties and classification of lipids.

MICROBIOLOGY SEMESTER- II

PAPER-1

BIOINSTRUMENTATION AND BIOCHEMICAL TECHNIQUES

- This paper focuses on various analytical instrumentation tools and techniques.
- Construction and working principles of different types of Microscopes mainly compound, dark field, phase contrast , fluorescence and electron microscopes.
- Understand the principle and working of basic laboratory instruments such as Autoclave, Incubator, Laminar Air Flow, Centrifuge.
- Basic principles and application of Spectrophotometry and Electrophoresis.
- Extraction, purification, application and analysis of proteins, carbohydrates and lipids.

PAPER-2

CELL BIOLOGY AND MICROBIAL PHYSIOLOGY

- Cell as basic unit of living system
- Discover the ultrastructure of prokaryotic and Eukaryotic cell.

- Explain the structure and functions of cell organelles- Endoplasmic reticulum, Golgi complex, Mitochondria, chloroplast, ribosomes, lysosomes, peroxisomes, nucleus and vacuole.
- Understand single stranded, multi-stranded, folded fibre and nucleosome models of chromosomes.
- Understand mitosis and meiosis and Cell cycle and programmed cell death.
- Explain Bacterial photosynthesis and chemolithotropy.
- Oxidation of molecular hydrogen by Hydrogenomonas species.

PAPER-3

MICROBIAL GENETICS AND MOLECULAR BIOLOGY

- Explain the structure and functions of DNA and its types
- Explain the structure and functions of different types of RNA-m RNA, t RNA and r RNA.
- Central dogma of molecular biology.
- Protein synthesis in prokaryotes and eukaryotes.
- Post translational modification of proteins.
- Operon concept , negative and positive regulation.

PAPER-4

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

- Brief account of air borne transmission of microbes.
- Understand the treatment and municipal and industrial effluents.
- Learn about biofertilizers , symbiotic and non-symbiotic nitrogen fixing bacteria in enrichment of soil ,VAM and fungal biofertilizers.
- Microbial pesticides- production and their significance.
- Microbes and their importance in maintenance of soil.

MICROBIOLOGY SEMESTER- III

PAPER-1

IMMUNOLOGY

- Understand basic immunology, immunity and its types.
- Learn active and passive immunity.

- Study cells and organs of immune system.
- Study the primary and secondary lymphoid organs.
- Understand humoral and cell mediated immunity.
- Learn about antigens and its types.
- Study about antibody structure and its types.
- Learn different antigen-antibody reactions.
- Study about complements, its pathways, properties and functions.
- Learn about different types of hypersensitivity.

PAPER-2

MEDICAL AND VETERINARY MICROBIOLOGY-

- Role of microbiology in Medicine.
- Understand definition, types, stages and process of infection.
- Role of aggressions and depolymerizing enzymes.
- Morphological characteristics, pathogenesis and laboratory diagnosis of pathogenic bacteria.
- General description of mycotic pathogens, diagnosis and prevention.
- General concept of veterinary microbiology, impact of diseases on poultry industry.

PAPER-3

BIOSTATICS AND BIOINFORMATICS

- This paper is of importance as it acquaints the scholar with the various types of statistical packages, softwares and use of statistics in research.
- It imparts knowledge on the use of computers for bioinformatics, a science that is gaining importance day by day.
- Explanation of Measure of central tendency-Mean, Mode and Median.
- Test of Significance – Chi square test, t-test and f-test.
- Understand Probability and Correlation.
- Types of Biological Database

PAPER-4

ENZYMOLOGY AND INDUSTRIAL MICROBIOLOGY

- Learn about basic concepts of enzyme.
- Enzyme engineering and applications of microbial enzymes.
- Enzyme sensors for clinical processes and environmental analysis.

- Study on Industrial fermentation products such as Ethanol, Methane, Streptomycin, Biopolymers, Biofertilizers.
- Understand large scale production using Recombinant DNA technology.

MICROBIOLOGY SEMESTER- IV

PAPER-1

PLANT PATHOLOGY AND DISEASE MANAGEMENT

- Definition, classification and symptoms of plant diseases.
- Contributions of eminent Indian plant pathologists.
- Host-Parasite relationship.
- Role of enzymes and toxins in plant disease development.
- Important fungal, bacterial, viral and mycoplasmal plant diseases.
- Principle of plant disease control.

PAPER-2

FOOD MICROBIOLOGY

- Microbial spoilage of vegetables, fruits, meat, eggs, milk, butter, bread and canned food.
- Physical and chemical methods of food preservation.
- Fermented food and its importance.
- Dairy starter cultures and fermented dairy products.
- Food borne diseases, their causative agents, foods involved, symptoms and preventive measures.
- Food sanitation and control.
- HACCP

PAPER-3

MICROBIOLOGY ECOLOGY AND FOREST MICROBIOLOGY

- Microbes in different strata of Atmosphere.
- Soil as a natural habitat of microorganisms.
- Microbe-Microbe interactions.

- Role of microbes in Ruminants.
- Microorganisms in various forest ecosystems.
- Composting and Methanogenesis.
- Role of Mycorrhizae in mobilization of macro and micronutrients.
- Types of Biofertilizers

PAPER-4

COMPUTER FUNDAMENTALS AND RESEARCH TECHNIQUES

- Concept of Computer hardware and software.
- Introduction to spreadsheet applications.
- Presentation tools: Power point presentation.
- Introduction to Internet.
- Measures of Central tendency
- Parametric and Non parametric statistics.
- Definition and kinds of scientific document.
- Enzyme activity and specific activity determination.

MICROBIOLOGY UNDER GRADUATION (B.Sc.)

B.Sc. PART –I (COURSE OUT COMES)

PAPER-I

MICROBIOLOGY AND BASIC TECHNIQUES.

CO1. Students will know about the cell and its biology, which will help the students to understand the origins of cells and the generation of cell diversity, as well as the common features of cellular structure and function – how they obtain energy, synthesize new molecules, communicate, proliferate and survive.

CO2. Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.

CO3. Student will understand the diversified branches of microbiology .

CO4. Student will know the theoretical and practical aspects of microbial growth and physiology. Students will learn about the morphology and physiological characteristics of different groups of microorganisms.

CO5. This course will make the students to understand virus cultivation, phages and bacterial, algal and protozoal genetics.

PAPER – II

BIOCHEMISTRY AND PHYSIOLOGY

CO1• Learn the classification and properties of amino acids.

CO2• Understand bacterial photosynthesis and microbial metabolism.

CO3 • Learn the classification of proteins based on structure and functions.

CO4 • Understand primary, secondary and tertiary structure of proteins.

CO5• Study the classification of enzymes and enzyme kinetics.

CO6 • Study the factors influencing enzyme activity, coenzymes and cofactors.

CO7 • Understand the structure and classification of Carbohydrates with examples.

CO8 • Understand the structure, properties and classification of lipids.

B.Sc. PART –II (COURSE OUT COMES)

PAPER- I

MOLECULAR BIOLOGY AND GENETIC ENGINEERING.

CO1. The course teaches the students about genes at molecular level.

CO2. They learn about DNA, RNA and their replication, mutations, DNA repair mechanism.

CO3. The course outcome is to train the students in understanding genetics and relate modern DNA technology for disease diagnostics and therapy.

CO4. The course teaches the students about genes at molecular level.

CO5. The course outcome is to give knowledge about operon concept.

PAPER- II

BIOINSTRUMENTATION AND BIOCHEMICAL TECHNIQUES

CO1. This paper focuses on various analytical instrumentation tools and techniques.

CO2. Construction and working principles of different types of Microscopes mainly compound, dark field, phase contrast , fluorescence and electron microscopes.

CO3. Understand the principle and working of basic laboratory instruments such as Autoclave, Incubator, Laminar Air Flow, Centrifuge.

CO4. Basic principles and application of Spectrophotometry and Electrophoresis.

CO5. Study on different tissue culture techniques.

B.Sc PART – III (COURSE OUT COMES)

PAPER-I

MOLECULAR BIOLOGY AND GENETIC ENGINEERING.

CO1. The course teaches the students about genes at molecular level.

CO2. They learn about DNA, RNA and their replication, mutations, DNA repair mechanism.

CO3. The course outcome is to train the students in understanding genetics and relate modern DNA technology for disease diagnostics and therapy.

CO4. The course teaches the students about genes at molecular level.

CO5. The course outcome is to give knowledge about operon concept.

PAPER-II

ENVIRONMENTAL AND MEDICAL MICROBIOLOGY)

CO1.Learn about air borne diseases caused by bacteria, virus and fungi.

CO 2 Learn bioremediation of soil, water and degradation of pesticides using microbes.

CO 3. Understand the treatment and municipal and industrial effluents.

CO 4. Learn about biofertilizers ,symbiotic and non-symbiotic nitrogen fixing bacteria in enrichment of soil.

CO 5. Understand about food spoilage and food borne infections.