DEPARTMENT OF MICROBIOLOGY

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

SESSION-2015-16, 2016-17

COURSES: POST GRADUATION

CLASS	PAPER	NAME
M.Sc. PREVIOUS	PAPER-I	BACTERIOLOGY
	PAPER- II	BIOCHEMISTRY
	PAPER-III	MOLECULAR BIOLOGY
	PAPER- IV	ENVIRONMENTAL
		MICROBIOLOGY
	PRACTICAL-I,II	
M.Sc. FINAL	PAPER-I	FUNDAMENTALS OF
		IMMUNOLOGY
	PAPER –II	MEDICAL
		MICROBIOLOGY
	PAPER- III	MICROBIAL
		PHYSIOLOGY AND
		DEVELOPMENT
	PAPER-IV	MICROBIAL
		TECHNOLOGY
	PRACTICAL-I,II	

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)

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CLASS	PAPER	CODE	NAME
B.Sc. PART -I	PAPER-I	0819	GENERAL
			MICROBIOLOGY
	PAPER- II	0820	BIOCHEMISTRY AND
			IMMUNOLOGY
	LAB- I		
B.Sc. PART -II	PAPER- I	0869	MICROBIAL
			PHYSIOLOGY AND
			GENETICS
	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 .<u>Cognitive Knowledge</u>: To provide education that leads to comprehensive understanding of the principles and practices of microbiology.

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

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

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

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

PO. 6. <u>Professional Attitude</u>: 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

M.SC. PREVIOUS MICROBIOLOGY

PAPER-1

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.
- Different types of arrangement in bacterial cell.

PAPER-2

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.

PAPER-3

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 MICROBIOLOGY

- Brief account of air borne transmission of microbes.
- Understand the treatment and municipal and industrial effluents.
- Learn about aerosol, droplet nuclei.
- Explanation on air borne bacterial, fungal and viral diseases.
- Microbial pesticides- production and their significance.
- Microbes and their importance in maintenance of soil.

M.SC. FINAL MICROBIOLOGY

PAPER-1

FUNDAMENTALS OF 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 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

MICROBIAL PHYSIOLOGY AND DEVELOPMENT

- Explain the basic concept of bioenergetics.
- Explain brief account of photosynthetic and accessory pigments.
- Biosynthesis of carbohydrates.
- Fermentation of Carbohydrates.
- Biosynthesis of major amino acids..
- Multicellular organization of selected microbes.
- Synthesis of peptidoglycan.

PAPER-4

MICROBIAL TECHNOLOGY

- Large scale production using recombinant microorganisms.
- Industrial production of citric acid, enzymes, ethanol, acetic acid.
- Production of biofertilizers, biopesticides, bioremediation.
- Production of mushroom.
- Study on fermented food and beverages.
- Metabolite overproduction.
- Study of different types of fermenters, shale flask, stirred tank, airlift fermentor

MICROBIOLOGY UNDER GRADUATION (B.Sc.)

B.Sc. PART –I (COURSE OUT COMES)

PAPER-I

GENERAL MICROBIOLOGY

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 IMMUNOLOGY

- **CO1** Learn the classification and properties of amino acids.
- CO2• Understand bacterial photosynthesis and microbial metabolism.
- **CO3** Learn about the concept of immunity.
- 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 and lipids with examples.

CO8 • Study of the cells and organs of immune system.

CO9 .Understand humoral and cell mediated immunity.

CO10. Study about antibody and antigen structure and its types.

B.Sc. PART –II (COURSE OUT COMES)

PAPER- I

MICROBIAL PHYSIOLOGY AND GENETICS

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

PRINCIPALS OF BIOINSTRUMENTATION AND 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. Role of microbiology in Medicine.