VIDYABHARTI SANSTHA, WARDHA.
DR. R. G. BHOYAR ARTS, COMMERCE & SCIENCE COLLEGE
MOHANAPUR, TH-SELOO DIST-WARDHA 442104
(FORMERLY VIDYABHARTI COLLEGE)
Affiliated To Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.
NAAC Accredited with B+ Grade
College Index : (Sr.-699) (Jr.07.08.006)

PROGRAM OUTCOME FOR B. SC. MICROBIOLOGY

Program Outcomes	**PO1:** Demonstrate laboratory skills applicable toMicrobiological and Clinical methods including laboratorysafety. **PO2:** Acquire skills for accurately reporting observations and findings through oral, written and digital formats. **PO3:** Apply the knowledge of microbiology from multiple fields to critically analyse and evaluate microbiological, environmental and health related issues and to create awareness and impact of microbiology outside the science community. **PO4:** Practice flexible professional skills needed for careers in microbiology & related professional and scientific fields like- Health sector, medical laboratory technology (MLT), Water testing labs, Dairy and food Industry as quality assurance and quality control professional etc, can opt for either post graduate study program, research, or for variouscompetitive exams and professional courses. Exposure provided to the students during the add-on bioinformatics certificate course would help students gain awareness of career options in the software industry too. **PO5:** Students will be able to expand their learning horizons through use of multidimensional learning resources to keep themselves at par with the pace of scientific and research development worldwide.

PROGRAM SPECIFIC OUTCOMES FOR B. SC. MICROBIOLOGY

Program Specific Outcomes	**PSO1:** The subject helps to gain knowledge about all types of microbial world, living as well as non-living, its harmful & useful interactions with human, animals, plants, bacteria and the environment **PSO2:** Students will be able to recognize structural & functional relationship of all living beings at molecular & cellular level. **PSO3:** They will get acquainted with importance of microorganisms as model systems in Genetics & Molecular Biology. **PSO4:** Students will be able to demonstrate basic microbiological techniques & acquire experimental and quantitative skills encompassing preparation of laboratory reagents, media, conducting experiments, handling different instruments, analyzing samples& interpreting results.

Course Outcomes B. Sc. Microbiology

B. Sc. Semester-I

Paper-I: FUNDAMENTALS OF MICROBIOLOGY	**CO1:** Get knowledge about basic branches of microbiology, they will understand the contribution of eminent scientists in the development of microbiology. **CO2:** Acquainted with the ultrastructure of bacterial cell, concepts of prokaryotic and eukaryotic cell's, their differences with examples. **CO3:** They will acquire the knowledge about nutritional requirements, classification of bacteria on the basis of nutritional habits. **CO4:** Learn about the growth of microbes, cell cycle and reproduction processes, various environmental parameters affecting their growth & different techniques used for their detection & quantification.
Paper-II: BASIC TECHNIQUES IN MICROBIOLOGY	**CO1:** Understand the basic principles and applications of various types of microscopic techniques. **CO2:** The students learn different techniques of Cultivation and preservation of bacteria, yeast and fungi. They are acquainted with various culture collection centres in India and abroad. **CO3:** Understand different staining techniques, role of reagent and dyes principles involved in these staining techniques. **CO4:** Get acquainted with various disinfectants, antiseptic and antimicrobial agents used in microbial control. They come to know about its mode of action and mechanism involved in microbial control.
Lab Work:	• Trained for handling various basic as well as advanced instruments used in microbiology laboratory. • Know about preparations of different types of media and methods to cultivate the microbes. • Able to demonstrate different staining procedures, stains & reagents used and microscopic observations of various types of bacteria. • Able to isolate different types of bacteria from samplesof milk, water, soil etc. Able to demonstrate sensitivity of bacteria to antibiotics, and UV radiation effect.

B. Sc. Semester-II

Paper-I: MICROBIAL DIVERSITY	**CO1:** Know about the Prokaryotic microbial diversity with examples, general characters & their life cycle. **CO2:** Get acquainted with Eukaryotic microbial diversity with examples, general characters & their life cycle. **CO3:** Understand the general characters, morphology and classification of viruses, mode of replication and methods of cultivation. **CO4:** Conceptualize various kind of positive and negative microbial interactions
Paper-II: FOOD MICROBIOLOGY & MILK MICROBIOLOGY **Lab Work:**	**CO1:** Get acquainted with various food and milk products, their production techniques, various diseases caused, prevention of spoilage and its preservation. **CO2:** Gain knowledge about food safety and food standards. • Demonstrate Slide culture techniques for the cultivation and study of mould. • Get Acquainted with SPC method to determine quality of food. • Learn to visualize under Microscope different characteristics of Fungi (*Aspergillus, Penicillium* and *Mucor*) Protozoa *(Plasmodium vivax, Trypanosoma* and *Amoeba*) & Algae (*Spirullina, Anabena* and *Euglena*), *Mycoplasma, Rickettsia* and *Chlamydia*. • Know the method of Coliform detection in food as per BIS. • Enumeration of total aerobic viable count from raw and pasteurized milk by serial dilution method. • Can demonstrate MBRT and Phosphatase test. • Know the technique to study the Effect of salt and sugaron microbial growth. • Demonstrate to find out MIC of preservative compound.

B. Sc. Semester-III

Paper-I: **CHEMISTRY OF ORGANIC CONSTITUENTS AND ENZYMOLOGY**	**CO1:** Acquire knowledge about classification of organic compounds like Carbohydrates and lipids and get acquainted with their structures and various bonds involved in them. **CO2:** Understand classification & structures of amino acids& proteins. **CO3:** Concept building about classification, structures and functions of enzymes, their mode of action and reaction mechanism. Understand steady state kinetics. **CO4:** Gain knowledge about nucleic acids, structures and their differences. Can describe importance ofvitamins to human body and their deficiency syndrome.
Paper-II: **INDUSTRIAL MICROBIOLOGY**	**CO1:** Know the scope of industrial microbiology and screening methods used for isolation of industrially important microbes. **CO2:** Gain knowledge about different Fermenter configurations& designs. **CO3:** Scale up and DSP. **CO4:** Concept building about industrial production of SCP, Baker's yeast, ethanol, penicillin and semisynthetic penicillin, citric acid, Vit B12, beer and wine.
Lab Work:	• Demonstrate and Identify carbohydrates and lipidsfrom unknown samples. • Demonstrate enzyme activity by bacteria (amylase, catalase, gelatinase, lipase) • Estimate proteins, DNA and RNA by spectrophotometric method • Get knowledge and hands on training on- productionof ethanol and methods of estimation. • Get acquainted with the isolation procedure of amylase producer from soil. Demonstrate Leavening capacity of yeast andImmobilization of yeast for invertase activity.

B. Sc. Semester-IV

Paper-I: METABOLISM	**CO1:** Understand the general strategy of metabolism and conceptualize various metabolic processes operating in living cells. **CO2:** Gain knowledge about methods of DNA replication, models of replication, enzymes involved and Prokaryotic transcription process and mechanism. **CO3:** Acquainted with deamination processes, Urea cycle, glucogenic and ketogenic amino acids Genetic code and Prokaryotic translation **CO4:** Understand the mechanism by which energy is generated.
Paper-II: APPLIED MICROBIOLOGY **Lab Work:**	**CO1:** Get acquainted with multiple tube dilution technique, IMViC classification and understand the significance of bacteriological analysis of drinking water. **CO2:** Gain knowledge about various methods applied for treatment of water and waste water & understand the importance of disposal of industrial wastes and techniques used in its disposal. **CO3:** Understand the techniques of air analysis, varioussamplers used & methods involved. Know the role of soil microbes and methods involved in biofertilizer & biopesticide productions. Conceptualize PSB, mycorrhiza & microbial leaching process. **CO4:** Gain knowledge about Food spoilage, pathogens involved and methods of preservations. Food bornediseases and food intoxications. • Demonstrate the techniques to isolate microbes from water and waste water. • Know the techniques to find out MPN, DO, COD,BOD, alkalinity of water and IMViC tests. • Understand the methods of chlorination of water and Chlorine demand. • Hands on knowledge about MBRT and Phosphatase test.

B. Sc. Semester-V

Paper-I: MEDICAL MICROBIOLOGY	**CO1:** Concept building about various epidemiological concepts and definitions. Various modes by which infections spread in community, portal of entry& exit and their control. **CO2:** Microbial mechanism of Pathogenicity and virulence, exaltation and attenuation methods, MID, MLD, ID50, LD50. **CO3:** Acquire knowledge about methods used in isolation and identification of various pathogenic organisms, based on

	their morphology, cultural characteristics, biochemical characteristics, serology and labdiagnosis. **CO4:** Understand the Basic principles of drug designing, the role of these drugs and antimetabolites in disease control.
Paper-II: **MOLECULAR BIOLOGY AND BIO-INSTRUMENTATION** **Lab Work**:	**CO1:** Acquainted with various concepts – related to gene, different types of mutation and its regulation. **CO2:** Concept building about various processes by which gene transfer occurs amongst microbes **CO3:** Understand the principles, methodology and application of various bio instruments like spectrophotometer, electrophoresis, chromatography, centrifuge etc **CO4:** Get acquainted with Isotopic tracer technique and its applications. • Demonstrate bacterial and plasmid DNA isolation techniques. • Gain knowledge and hands on training on restriction digestion technique. • Demonstrate spectrophotometrically creatinine estimation. • Demonstrate gel filtration, paper chromatography and TLC • .Knowledge and hands on training on isolation and identification of pathogenic bacteria (*E coli, S aureus, Salmonella, Proteus*).

B. Sc. Semester-VI

Paper-I: **IMMUNOLOGY**	**CO1:** Concept building about defensive mechanism of host against diseases, various terminologies used and definitions of epidemic, endemic, pandemic, nosocomial infection, zoonotic infection, vector, types and role of vectors, portal of entry portal of exit of pathogens. **CO2:** Knowledge about Haematopoiesis, Cells of immune system, general characters of B and T cells, cellular and humoral immunity. **CO3:** Understand the structures, properties, types and importance of Antigens and Immunoglobulins, Ag-Ab reactions in Diagnostic immunology. **CO4:** Gain knowledge about ELISA test, its application and various Hypersensitivity reactions and their types.

Paper-II: **BIOTECHNOLOGY**	**CO1:** Know the tools and techniques of genetic engineering **CO2:** Knowledge about DNA, fingerprinting and its application in forensic science **CO3:** Acquainted with the methods of production of insulin, interferon. Vaccines, monoclonal antibody. Understand the applications of biotechnology in agriculture **CO4:** Acquire knowledge about the advantages/disadvantages of genetic engineering for humans & comprehend the production and importance of genetically modified foods and animals, know about the ethics to be followed.
Lab Work:	• Demonstrate VDRL test, Widal test, immunodiffusion technique And Western blot technique. • Perform PCR • Development of spheroplast. • Get the knowledge of lab production of biofertilizer and soya sauce.