

Department of Microbiology, Akal College of Basic Sciences

B.Sc. (Hons.) Microbiology

(Three Year Degree Programme)

Program Objectives	<ol style="list-style-type: none"> 1. To impart in-depth understanding of various aspects of microbiology and to prepare the students for a successful career in basic and applied areas of microbiology in academics/higher education, medical research, biological research, public health, scientific writing, environmental organizations and biopharmaceutical industries, diagnostic labs, quality control, food production, healthcare sector, bioinformatics and biotechnology. 2. Prepare the learners to understand, analyse and solve real-life problems based on the knowledge of microbial sciences with the ultimate goal of creating informed citizens exhibiting professionalism, ethical attitude, sensitivity towards societal issues and excellent communication skills.
Program Outcomes	<ol style="list-style-type: none"> 1. Students of this programme will learn and explore an array of subjects covering basic microbiology such as Bacteriology, Virology, Microbial Metabolism, Immunology, Cell Biology, Molecular Biology, Biochemistry and Environmental Science. Learners will get aware of applied microbiology fields viz. Industrial Microbiology, Food and Dairy Microbiology, Environmental Microbiology and Medical & Diagnostic Microbiology, Vaccination, Industrial Microbiology and Bioprocess & Microbial Technology. 2. The learners will be able to apply the knowledge of microbiology acquired during this program to solve various problems related to human health, sustainable agricultural development, food production, human nutrition, waste management and biocontrol. 3. Learners will be able to plan, perform, analyze and interpret the experimental data for exploring various problems in microbiology and its sub-disciplines.
Program Specific Outcomes	<ol style="list-style-type: none"> 1. On completion of this program, learners will be able to understand the basic and applied concepts of microbiology viz. biochemistry, cell biology, biotechnology, bioinformatics, biostatistics, infections, microbial diseases, industrial fermentation, biodegradation, bioremediation, food & dairy microbiology, plant pathology, soil microbiology, microbial ecology, biofertilizers and system biology. 2. Learners will develop independent thinking and competence to carry out microbiological testing, quality control, microbial production, biopharmaceutical production, epidemiological work, diagnostic assays, research work, phylogenetic analysis, academic jobs and administrative responsibilities at various levels.

Course Specific Outcomes	
On completion of a specific course, the learners will be able to:	
General Microbiology	Understand the contributions of eminent scientists in the field of microbiology, various groups of microbial cells viz. bacteria, archaea, algae, fungi, protozoa, protists, viruses, prions; prokaryotic vs eukaryotic cells and microbial classification.
Bacteriology	Learn about bacterial cells, organelles, bacterial phyla, important genera/species and importance of bacteria in health, food, environment and industries.

Virology	Learn the structure and life cycle of viruses, nomenclature & classification, cultivation & detection methods and viral diseases of humans, animals and plants.
Microbial Metabolism	Understand the mechanism, process and types of metabolic pathways occurring in microbial cells related to ATP generation, respiration, fermentation, photosynthesis, anabolism, catabolism, enzyme kinetics, bioenergetics and DNA metabolism.
Immunology	Understand the structure, function and roles/applications of immune system, antigens, immunoglobulins, APCs, humoral & cellular immunity, MHC molecules, TCR, BCR, CD4, CD8, monoclonal antibodies, transplantation, complement system, hypersensitivities, immunodeficiencies, cancer, autoimmune disorders and vaccines.
Environmental Microbiology	Learn the concepts of biodegradation, bioremediation, wastewater treatment, solid waste treatment, bio-composting, biomining, biogeochemical cycles and symbiosis.
Food Microbiology	Acquire knowledge of types of foods, importance of microbes in food production, fermented foods, food spoilages, Pasteurization, preservation methods, food infections, food intoxication, MAP, HACCP, food certification, water quality analysis, coliforms, aseptic packaging and public health.
Industrial Microbiology	Understand the scope of industrial microbiology, strain improvement, commercial production of alcoholic beverages, dairy products, bakery products, vitamins, colours, flavouring agents, antibiotics, steroids, microbial enzymes, bioethanol, biofuels, bioplastics, microbial construction materials, polysaccharides, upstream & downstream processing, Lyophilization, intellectual property rights and patents.
Fermentation & bioprocess Technology	Understand fermentations processes, design & types of bioreactors/fermenters, downstream processing, product separation techniques, microbial growth characteristics, biofactories, bio-refinery and animal cell culture.
Medical Microbiology	Learn about the normal microbiota, pathogenic microbes, infectious diseases, pandemic, epidemic, pathogenesis, laboratory diagnosis, blood culture systems, antibiotics, antimicrobial agents, drug susceptibility testing, biopharmaceuticals, disease transmission, public health, ESKAPE, NTDs and drug resistance.
Molecular Biology	Understand structure & functions of DNA, RNA, proteins; replication, transcription, translation, PTMs, cloning vectors, gene libraries, recombinant DNA, gene regulation, PCR, blotting techniques, DNA fingerprinting, genetic engineering, GMOs and recombinant products.