



# SDGI GLOBAL UNIVERSITY (SGU)

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## Ph.D. ENTRANCE SYLLABUS FOR SCIENCES

### Unit 1

#### Molecular Biology and Genetic Engineering

DNA replication, transcription, and translation, Restriction enzymes, ligases, and molecular cloning, PCR, Gel electrophoresis, and Southern blotting, Gene editing technologies (CRISPR-Cas9), Plasmids, vectors, and selectable markers.

#### Bioprocess Engineering and Applications

Fermentation processes and bioreactors, Downstream processing, Industrial applications of biotechnology (agriculture, pharmaceuticals, environmental).

#### Recombinant DNA Technology

Cloning vectors, gene libraries, and cDNA synthesis, Expression of recombinant proteins, Genetic manipulation of organisms.

### Unit 2

#### Microbial Physiology and Genetics

Structure and function of prokaryotic and eukaryotic cells, Bacterial growth curves, metabolism, and nutrient cycles, Microbial genetics, plasmids, and conjugation.

#### Medical and Industrial Microbiology

Pathogenic bacteria, fungi, and viruses, Antibiotics and resistance mechanisms, Microbial fermentation and applications in industry, Nitrogen fixation and role of microbes in agriculture.

#### Microbial Techniques and Methods

Gram staining, culturing, and microbial identification, Use of selective and differential media, Techniques for microbial sampling and counting.

### Unit 3

#### Plant Physiology and Metabolism

Photosynthesis, respiration, and plant metabolism, Plant hormones and growth regulators, Water and mineral transport in plants, Plant reproductive biology.

#### Plant Diversity and Systematics

Classification and taxonomy of plants, Characteristics of major plant groups (Bryophytes, Pteridophytes, Gymnosperms, Angiosperms), Evolution and phylogeny of plants.

### Unit 4

#### Ecology and Ecosystems

Types of ecosystems and ecological succession. Energy flow, food webs, and trophic levels. Biodiversity, conservation, and ecological hotspots. Population ecology and dynamics.

#### Environmental Pollution and Mitigation

Sources and types of pollution (air, water, soil, noise), Impacts of pollution on health and environment, Pollution control methods and sustainable practices, Climate change, global warming, and greenhouse gases.