

M. Phil Syllabus
Department of Biosciences
Saurashtra University

The M. Phil syllabus in this department, which was earlier in annual pattern, is now converted to semester system. There will be two semesters with one theory paper in each. Each theory paper shall be of 100 marks. The dissertation will be spread over the two semesters and account for 200 marks. This semester based M. Phil syllabus will be applicable from academic session 2005-06

M. Phil Syllabus: Semester – I
PAPER - I

M. Phil. Animal Sciences, Plant Sciences & Microbiology

Unit – 1. Environmental Science

- 1.1 Overview of Ecology and Environmental Science: The basics
- 1.2 Natural resources and their conservation
- 1.3 Biodiversity
- 1.4 Environmental management and planning
- 1.5 Environmental laws of India

Unit – 2. Cellular and Molecular Biology

- 2.1 Cell Membrane (An overview of cell membrane, arrangements of lipids and protein, function of membrane in transport, signal transduction, maintaining the shape of the cell and cell-cell interaction).
- 2.2 Chemical signaling in the body (Signaling molecule, release of signaling molecule, legend binding, membrane receptor mediated responses, signaling pathways, control of legend gated ion channels by extrinsic signals).
- 2.3 Garbage disposal units inside the cells (cellular garbage and its disposal by lysosomes and peroxysomes).
- 2.4 Gene transcription (Gene transcription in E. coli, gene transcription in eukaryotes, mechanism of gene transcription in eukaryotes and its control).
- 2.5 Protein synthesis (Essential basis of the process of protein synthesis, initiation of translation, elongation of peptide chain, termination of protein systhesis, delivery of newly synthesized proteins to their destinations).

Unit – 3. Biochemistry

- 3.1 Basics of cellular metabolism and metabolic pathways (an overview)
- 3.2 Proteins and functional proteins. Three-dimensional structure of protein. Enzyme and enzyme kinetics.
- 3.3 Enzyme mechanism.
- 3.4 Regulation of enzyme activities and metabolic pathways.
- 3.5 Biochemistry of membrane mediated processes.

Unit – 4. Recent Techniques

- 4.1 Separation techniques and principles of chromatography
- 4.2 Chromatographic techniques
- 4.3 Purification of macromolecules
- 4.4 Immunological techniques
- 4.5 Basic techniques of tissue culture

Unit – 5. Biostatistics and Computer Applications

- 5.1 Significance tests: Student's 't' test: Hypotheses, acceptance and rejections, significance levels.
- 5.2 Analysis of Variance: General principles, completely randomized and random-block design ANOVA.
- 5.3 Regression and correlation – bivariate analysis.
- 5.4 Computer applications in biological research

SEMESTER – II

M. Phil. Animal Science (Zoology) : PAPER - II

Unit – 1. Fisheries Biology

- 1.1 Brief account of major fisheries in India and Gujarat State. Freshwater and Marine fisheries.
- 1.2 Fisheries and Industry: Fish processing, methods of processing, fish related industries and fish product export related industries.
- 1.3 Fisheries Biotechnology: Fish preservation, its effects on nutritional and culinary characteristics, fish preservation and related problems and remedies.
- 1.4 Fish breeding and mass production: Induced breeding and transgenic breeding. Fish farming and culture.
- 1.5 Fisheries management and fisheries related marketing strategies.

Unit – 2. Wildlife: Fieldwork Processes

- 2.1 Wildlife, its importance, causes of its depletion, important reptiles, birds and mammals.
- 2.2 Sampling design for field research: a) Simple random sampling, b) Systematic sampling, c) Stratified random sampling, d) Cluster sampling, e) Point sampling, f) Plots along transects, g) Line transects, h) Load sampling.
- 2.3 Analysis of data: Graphics: Charts, graphs and tables, Estimating means Population mean, Regression: Simple linear regression, chemical immobilization of large mammals.
- 2.4 Estimating the number of animals in wildlife population: (a) Indices, (b) Estimates of abundance and density.

Unit – 3. Neurobiology

- 3.1. Comparative overview of nervous system in invertebrates.
- 3.2. Comparative overview of nervous system in vertebrates.
- 3.3. Chemical sense (common chemical sense, internal chemoreceptors of taste and smell).
- 3.4. Resting, equilibrium and action potentials, generation and measurement of signals, propagation of signals in myelinated and non-myelinated axons.
- 3.5. Recent advances in hypertension and hypertensive factors (brain and natriuretic factors and endothelial factors, role of CNS in blood pressure regulation).

Unit -4. Animal Physiology

- 4.1 Excretory mechanisms: Regulatory functions of kidney, selective reabsorption, tubular secretion.
- 4.2 The body temperature: Factors affecting body temperature, regulation, pyrexia (fever) and hypothermia, effects of exposure to high and low atmospheric temperature.
- 4.3 Cardio-vascular mechanism: Excitatory process in heart, ECG, blood flow and its regulation, disorders of cardiovascular system.
- 4.4 Vitamins: Types, vitamins acting on different tissues and systems, role on metabolism, antivitamin.
- 4.5 Diet and nutrition: Normal and balanced diet, regulation of diet, common dietetic and nutritional disorders.

Unit – 5. Endocrinology

- 5.1 Hormones: a) Local and Endocrine hormones, b) hormone as information carrier, c) site of hormone formation and rate of release, d) mechanism of hormone action and regulation.
- 5.2 Adeno-hypophysis and its hormone secretion, regulation and functions.
- 5.3 Neuro-hypophysis and its hormone secretion, regulation and functions.
- 5.4 Endocrine pancreas and its hormone secretion, regulation and functions.
- 5.5 Sex hormones, their hormone secretion, regulation and functions.

SEMESTER – II
M. Phil. Plant Science (Botany): PAPER – II

Unit – 1. Plant Ecology – I

- 1.1 Biological diversity
- 1.2 Nature of community
- 1.3 Community change
- 1.4 Community metabolism, Primary production
- 1.5 Habitat and niche

Unit – 2. Plant Ecology – II

- 2.1 Quantification of plant biodiversity
- 2.2 'k' and 'r' selection
- 2.3 Species interaction and keystone species
- 2.4 Extinction, rare and endangered species
- 2.5 Nutrient cycles

Unit – 3. Plant Physiology – I

- 3.1 Growth and development: Patterns of growth development, growth kinetics and growth indices.
- 3.2 Photomorphogenesis and plant development: Phytochrome forms and their functions.
- 3.3 Photoperiodism and physiology of flowering: Long day plants, short day plants, induction cycle, florigen concept.
- 3.4 Water relation to plants: The components of water potential, units of water potential and their measurements.
- 3.5 Mineral nutrition: Trace and tracer elements, nutrient deficiency symptoms and some function of essential elements.

Unit – 4. Plant Physiology – II

- 4.1. Energy input in plants: Principles of light absorption by plants, Emerson enhancement effect.
- 4.2. CO₂ fixation: C₃, C₄ and CAM pathways for CO₂ fixation.
- 4.3. Photosystems: Distribution of light energy between PS I and PS II.
- 4.4. Hormones and growth regulators: Types of hormones and their influence on growth and development.
- 4.5. Agricultural applications of plant growth hormones.

Unit – 5. Plant Technology

- 5.1 Selection criteria for explants.
- 5.2 Selection criteria for culture media.
- 5.3 Basic tissue culture techniques.
- 5.4 Applications of tissue culture in Horticulture.
- 5.5 Transgenic plants and their role in agriculture.

SEMESTER – II
M. Phil. Microbiology: PAPER – II

Unit – 1. Development in industrial fermentation

- 1.1 Screening and development of strains for newer products and applications.
- 1.2 Fermenter systems, scaling-up and *in situ* sterilization.
- 1.3 On line fermentation monitoring and control.
- 1.4 Process development with microbes from extreme environments.
- 1.5 Product recovery: Conventional and modern approaches.

Unit – 2. Protein Engineering

- 2.1 Protein architecture and structure and function relationship.
- 2.2 Protein modification: Chemical modification and site directed mutagenesis.
- 2.3 Gene shuffling and chimeric enzymes.
- 2.4 *In vitro* directed evolution of enzymes and other proteins.
- 2.5 Over expression and folding of proteins.

Unit – 3 Enzyme Technology

- 3.1 Biocatalysis applications in the pharmaceutical industries.
- 3.2 Unique industrial biocatalysis from extreme environments.
- 3.3 Molecular approaches in development, production and recovery of enzymes.
- 3.4 Biocatalytic desulfurization of fossil fuel.
- 3.5 Enzyme catalysis for polymer synthesis.

Unit – 4 Biosensors

- 4.1 Concept and development of biosensors: Historical perspective.
- 4.2 Market potential and limitations, new generation of biosensors.
- 4.3 Biosensors in medical diagnostics.
- 4.4 Industrial applications of biosensors.
- 4.5 Biosensors in agriculture and environmental monitoring.

Unit – 5 Environmental Biotechnology

- 5.1 Soil bioremediation.
- 5.2 Ground water bioremediation.
- 5.3 Surface aquatic systems.
- 5.4 *In situ* and *ex situ* bioremediation.
- 5.5 Legislation, regulation and policy of bioremediation.