

# **BHAGWANT UNIVERSITY**

**Sikar Road, Ajmer**

**Rajasthan**



## **Syllabus**

**Institute of Life Science & Applied Sciences**

**M. Phil I Semester**

**Zoology**

### Course Category

MZoo : M.Phil in Zoology

CCC: Compulsory Core Course

ECC: Elective Core Course

#### Contact Hours:

L: Lecture

T: Tutorial

P: Practical or Other

#### Marks Distribution :

IA: Internal Assessment (Test/Classroom Participation/Quiz/Presentation/Assignment etc.)

EoSE: End of Semester Examination

### **M. Phil (ZOOLOGY)**

#### **(Course Structure)**

Subject code	Subject Name	Teaching hours			Marks		
		L	T	P	External	Internal	Total
01MZOO101	<b>Research Methodology: Theory &amp; Techniques</b>	3	0	0	70	30	100
01MZoo102	<b>Environmental Biology</b>	3	0	0	70	30	100
01MZoo103	<b>Environmental Pollution And Eco-</b>	3	0	0	70	30	100

	<b>Toxicology</b>						
<b>01MZoo104</b>	<b>ANIMAL PHYSIOLOGY</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>100</b>		<b>100</b>
<b>Total</b>		<b>12</b>	<b>0</b>	<b>0</b>	<b>280</b>	<b>120</b>	<b>400</b>

**SEMESTER II**

<b>Subject code</b>	<b>Subject Name</b>	<b>Teaching hours</b>			<b>Marks</b>		
		<b>L</b>	<b>T</b>	<b>P</b>	<b>External</b>	<b>Internal</b>	<b>Total</b>
02MZOO101	<b>Advanced Research M ethodology</b>	3	0	0	70	30	100
02MZoo102	<b>Biodiversity</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>70</b>	<b>30</b>	<b>100</b>
02MZoo103	<b>Advanced Animal Physiology</b>	3	0	0	70	30	100
<b>01MZoo201</b>	<b>Dissertation</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>100</b>		<b>100</b>
<b>Total</b>		<b>12</b>	<b>0</b>	<b>0</b>	<b>280</b>	<b>120</b>	<b>400</b>

**Research Methodology Theory And Techniques**

**UNIT - I**

Research – Definition – Importance and Meaning of research – Characteristics of research – Types of Research – Steps in research – Identification, Selection and formulation of research problem – Research questions – Research design – Formulation of Hypothesis – Review of Literature.

## **UNIT – II**

Sampling techniques : Sampling theory – types of sampling – Steps in sampling – Sampling and Non-sampling error – Sample size – Advantages and limitations of sampling. Collection of Data : Primary Data – Meaning – Data Collection methods – Secondary data – Meaning – Relevances, limitations and cautions.

## **UNIT – III**

Statistics in Research – Measure of Central tendency – Dispersion – Skewness and Kurtosis in research. Hypothesis – Fundamentals of Hypothesis testing – Standard Error – Point and Interval estimates – Important Non-Parametric tests : Sign, Run, Kruskal – Wallis tests and Mann-Whitney test.

## **UNIT – IV**

Para metric tests : Testing of significance – mean, Proportion, Variance and Correlation – testing for Significance of difference between means, proportions, variances and correlation co-efficient. Chi-square tests – ANOVA – One-way and Two-way.

## **UNIT – V**

Research Report : Types of reports – contents – styles of reporting – Steps in drafting reports – Editing the final draft – Evaluating the final draft.

## **Reference Books**

1. Statistical Methods - S.P. Gupta
2. Research Methodology Methods and Techniques - C.R. Kothari
3. Statistics (Theory and Practice) - B.N. Gupta
4. Research Methodology Methods and Statistical Techniques - Santosh Gupta

## **Environmental Biology**

### **UNIT – I**

Environmental Biology – Introduction, Biotic and A biotic factors of environment – Relationship among organisms, Animal Biodiversity.

### **UNIT – II**

Ecosystem – Components, characteristics, Energy flow in ecosystem – Tropic levels. Chain, food web – Ecological Pyramids – Man and Biosphere – Environmental education.

### **UNIT – III**

Population ecology – Population characteristics – Population control – Community – Characteristics, components.

### **UNIT – IV**

Environmental pollution – In fresh water ecosystem – sources, assessment of pollution (BOD, COD) – In marine ecosystem – Sources, impact of pollution in fisheries – In terrestrial environment – Solid wastes and non-degradable wastes.

## **UNIT – V**

Management of pollution – Sewage treatment, industrial effluent treatment, solid waste, liquid wastes, organic recycling, Biogas production, fish culture, algae production, Bio-compost. Restoration habitat – remote sensing, afforestation – mangroves, Artificial roots.

### **Reference:**

1. Sharma, P.D. Ecology & Environment – Meerut: Rastogi Publications, Meerut, 1990.
2. Manivasakam, “Environmental Pollution”, New Delhi, Natural Book Trust of India, 1984.
3. Dara. S.S. - Text Book of Environmental chemistry & Pollution control. S.Chand & Company.
4. Biswarup Mukerjee. Environmental Biology.

## **Environmental Pollution And Eco-Toxicology**

### **UNIT – I**

Environmental Pollutants – Definition - Classification of pollutants – Causes for pollution – Types of pollution – Air Pollution: Definition – Air pollutants – Causes of Air pollution – Biological Indicators – Ecological effects of Air

Pollution – control of Air Pollution. Water Pollution: Definition – Water Pollutions – Causes of water pollution – Ecological effects of water pollution control of water pollution.

## **UNIT – II**

Land Pollution: Definition – Land pollutants – Causes of Land Pollution – Pesticides – Radio activity – Fallows – Radioactive elements – Radiation – Source of Radiation – Natural radiation of man made radiations – Types of Atom Bomb – Internal or external Emitters – Sources of Ionizing radiation – Biological effects of radiations – Control of radioactive pollution – Human Population as Explosion – Issues – Demography – Dispersal – Causes – environmental effect – Waste Management – Types – Solid – Bio remediation.

## **UNIT – III**

Noise Pollution: Definition – Causes of noise pollution – Ecological effects of noise pollution – Control of noise pollution. Thermal Pollution: Definition – Source of Thermal pollution: Definition – Source of thermal pollution – Ecological effects of thermal pollution – Control of thermal pollution. Pesticide Pollution: Classification – Sources – Impact – Control General Law of control in pollution – Super Bass – Sewage Treatment.

## **UNIT – IV ECO-TOXICOLOGY**

Introduction: Toxicology – Scope of toxicology – Basic division of toxicology – Goals of toxicology – Basic concepts of Toxicology – Factors that affect environmental concentration of Toxicants – Influence toxicity – chemical mixtures – Effect and response Dose – Response relationships – Margin of safety (slope). Toxicity testing.

Toxicants of Public Health Hazard: Black lists/ Toxic chemicals – Pesticides – Automobile emissions Heavy metals – Fertilisers – Food additives - Radioactive substances.

## **UNIT – V BIOLOGICAL MAGNIFICATION OF TOXIC MATERIALS:**

Pesticides – microcosms - compartment models. Absorption – Translocation and Excretion of chemicals (xenobiotics) – membranes permeability and mechanisms of chemical transfer Bio-transformation of xenobiotics – Selective toxicity – Reception sites – Types of – D.D.T – anti-dotal procedures in toxicology. Biomonitoring of Toxic chemicals – Monitoring Program Parameters of biomonitoring – Bio-Indicators and Environmental monitoring Bio assay and its applications in toxicology – Environmental Legislation and Chemical Safety Evaluation.

### **Reference:**

1. Environmental Health Publication of NEERI – Nagpur.
2. A. Arumugam – Saras Publication.
3. Dr. Tmt. Bernice Anantharaj – Chrisolite Publications – Ecology.
4. N.T. Krishna – Environmental Biology.
5. P.D. Sharma – Environmental Biology and Toxicology.
6. Shukia . Upadayan – Economic Zoology.

## **Paper IV ANIMAL PHYSIOLOGY**

### **Unit 1. Physiology**

1Excretory mechanisms: Regulatory functions of kidney, selective reabsorption, tubular secretion. The body temperature: Factors affecting body temperature, regulation, pyrexia (fever) and hypothermia, effects of exposure to high and low atmospheric temperature.

Cardiovascular mechanism: Excitatory process in heart, Special cardiac tissue and the mechanism of heart beat. O<sub>2</sub> and CO<sub>2</sub> transport



## **Unit 2: Physiology II**

Ultrastructure and functions of mammalian Malpighian Corpuscles, proximal and distal convoluted tubules, Hensen's loop. Physiology of Urine formation. Physiology of respiration: Detailed accounts of Ventilation, diffusion and Perfusion. Ear: Organ of Corti and the physiology of hearing. Eye: Rod and Cone cells, biosynthesis of visual pigments and the photochemical reaction. Receptor cells, physiology of the sense of smell and taste.

## **Unit 3**

Neurobiology Comparative overview of nervous system in invertebrates. Comparative overview of nervous system in vertebrates. Chemical sense (common chemical sense, internal chemoreceptors of taste and smell). Resting, equilibrium and action potentials, generation and measurement of signals, propagation of signals in myelinated and non myelinated axons.

## **Unit 4**

Recent advances in hypertension and hypertensive factors (brain and natriuretic factors and endothelial factors, role of CNS in blood pressure regulation).

## **Unit :5**

Endocrinology 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. Adenohypophysis and its hormone secretion, regulation and functions. Neurohypophysis and its hormone secretion, regulation and functions. Endocrine pancreas and its hormone secretion, regulation and functions. Sex hormones, their hormone secretion, regulation and functions.

## **SEMESTER II**

### **Advanced Research Methodology**

#### **UNIT 1**

##### **An Insight into Research**

What is Research?, Objectives of Research, Significance of Research, Research Techniques, Finding Research Materials, Scientific Writings, History of Scientific Writing, Writing a Review Paper and Thesis.

#### **UNIT 2**

##### **Biostatistics**

Samples and Population, Statistics and Parameters, Random Sampling, Statistical Inference, Testing Hypothesis, Estimation, Measurement of Central

Tendencies, Measures of Variations, Correlation, Regression, Testing Significance: Student 't' test, Chi Square test.

### **UNIT 3**

#### **Cell and Tissue Staining Techniques**

- a) Elements of microtomy- pre-microtomy processes, microtomy process, post microtomy process.
- b) In situ and histological staining techniques- Whole mount (In situ) staining techniques, microbial staining techniques.
- c) Histochemistry- General histochemistry, enzyme histochemistry, immunochemistry.
- d) Microscopy- Light microscopy, electron microscopy, three dimensional microscopy, camera lucida.

#### **Physiological and biochemical techniques**

- a) Hematological Techniques- Blood composition, hematological techniques.
- b) Biochemical methods- Centrifugation, spectroscopy, chromatography, electrophoresis.
- c) Detection of carbohydrates and lipids- Chemistry and classification, qualitative and quantitative detection.
- d) Detection of enzymes- Chemistry and classification, qualitative and quantitative detection.

### **UNIT 4**

#### **Recent trends in biotechniques**

- a) Nucleic acid biotechniques- Salient features, laboratory biotechniques.
- b) Immunological techniques- Elements of immunology, immune reaction, immunological techniques.
- c) Radioimmunoassay of hormones- Principle of radioimmunoassay, chemistry and classification of hormones, radioimmunoassay (RIA) techniques for hormones.
- d) Animal cell and tissue culture- Salient features, cell culture techniques, cell culture and immunocytochemistry.

### **UNIT 5**

#### **Computer applications**

- a) Applications of computer in Taxonomy and biodiversity study
- b) Use of computer in biostatistics
- c) Collection, preservation and maintenance of animals for biodiversity study
- d) Proteomics- proteomic analysis by mass spectrometry and genomics genome wide analysis of gene structure and expression.

#### **Recommended Reading:**

1. Thompson S.W. (1966) – Selected Histochemical and Histopathological Methods. Pub. C.C.T.I., USA.
2. Gabe M. (1976) – Histochemical techniques. Pub. Springer Verlag, New York.
3. De Robertis *et al.* - Cell Biology. Pub. W.B.S.C.P., London.
4. Stoward P.J. – Fixation in Histochemistry. Pub. Chapman and Hill, London.

5. Roe, Crabtree and Kahn – DNA Isolation and Sequencing. Wiley

## **Paper II – BIODIVERSITY.**

### **UNIT I**

**BIODIVERSITY SCIENCE :**Concept & definition, scope and constraints of biodiversity science. Evolution of biodiversity, factors promoting high diversity, global biodiversity.

**MEASURES OF BIODIVERSITY-**Diversity indices, information statistic indices, biodiversity values.

### **UNIT II**

**SPECIES DIVERSITY:** Species inventory, history and origin, species richness, future of species diversity studies, threats to species diversity.

Taxonomical, Biological, Ethological, Biochemical and Molecular Approches

**GENETIC DIVERSITY:** Nature and origin of genetic variation, methods based on DNA chromosomes and determinants of genetic diversity.

**ECOSYSTEM DIVERSITY :**Classification, Measuring ecosystem diversity, megabiodiversity centers, hot spots.

### **UNIT III**

**THREATS TO BIODIVERSITY:** Issues relating to threats to biodiversity, approaches to combat threats to biodiversity, values and uses of biodiversity, loss of biodiversity carbon dating

Biodiversity and adaptation : Morphological, Physiological, Molecular.

### **UNIT IV**

**BIODIVERSITY CONSERVATION:**Goals, In –situ and Ex-Situ conservation, role of universities and colleges in conservation, biodiversity awareness programmes,

### **UNIT V**

biodiversity education resources, media and sustainable development.

Recent Trends in insect biodiversity conservation, protection and utilization

### **Recommended readings:**

1. An advanced Textbook on Biodiversity by K.V.Krishnamurti.
2. Biodiversity and biotechnology by Ray and Ray.
3. Biodiversity by Mandal and Nandi
4. Advancement in insect biodiversity by Rajiv K.Gupta.2004.
5. Biotechnological approaches in Entomology by T.V. Sathe 2008.
6. Molecular Entomology by J.H. Law 1987.

## **PAPER III Comparative Animal Physiology**

### **Unit-I Nutrition for human Performance.**

- i) Carbohydrates, Fat and Proteins – Biochemical reaction and molecular interpretations
- ii) Vitamin, mineral and water.
- iii) Energy value, Energy transfer, Energy expenditure.
- iv) Energy expenditure during Hot and Physical activity.
- v) System of Energy delivery and Utilization.
- vi) Food and Nutrition relating to work exercise and Environmental Stress.
- vii) Diet Therapy

### **Unit-II Applied and Exercise Physiology**

- i) Energy for Exercise
- ii) Enhancement of Energy capacity- Aerobic and Anaerobic power.

- iii) Obesity
- iv) Muscular strength
- v) Fundamentals of Physical exercise
- vi) Responses of body to exercise
- vii) Recovery from exercise
- viii) Special aids to performance and conditioning.
- ix) Weight control through Exercise and Diet- Physiological and Molecular Approach.
- x) Physical fitness and Risk Factors.
- xi) Effect of Exercise on Health and Fitness.
- xii) Sport and Recreation
- xiii) Doping- Biochemical and Molecular Interpretation.

### **Unit-III Work performance and Environmental stress.**

- i) Exercise at medium to high altitude.
- ii) Exercise and physico-chemical stress.
- iii) Exercise and Biological stress.
- iv) Environmental factors: Biotic and Abiotic (with Biochemical and Molecular interpretation.

### **Unit-IV**

#### **Effect of physical Training**

- i) Physiological profiles, training and adoption.
- ii) Physiological and Biochemical changes.

### **Unit-V Ergonomics and Occupational Physiology.**

- i) Man- Machine and Environment.
  - ii) Man at work.
  - iii) Women at work.
  - iv) Aging Occupational stress.
- (Fundamental, Physiological, Biochemical and Molecular Approaches of above i-iv).

### **Recommended Reading:**

1. Elder k. and Dale B. 200. In vitro fertilization 2<sup>nd</sup> (ED), Cambridge University Press.
2. Guyton A.C. 1986. Textbook of Medical Physiology 7<sup>th</sup> (ED), W.B. Saunders Company Igaku / Saunders.
3. Guyton A.C. 1992. Human Physiology and Mechanism of Diseases 5<sup>th</sup> (ED), W.B. Saundes Company Igaku / Saunders.
4. Kessele R.G. 1998. Basic Medical Histology, Oxford University Press New York.
5. Mcardle W., Katch V. and Katch F. 1986. Exercise Physiology, Lean and febiger, Philadelphia.
6. Sherwood L., Klandorf H. and Yancey P. animal Physiology from Genes to Organisms, Thomson Learning Academic Resource Centre.
7. Tortora G. and Grabwski S. 1993. Principle of anatomy and Animal Physiology, Harper Collins College Publishers.