

**Ph.D. COURSE SYLLABUS**  
**2013 – 2014**  
**DEPARTMENT OF ZOOLOGY**



**School of Biological Sciences**  
**Dr. H. S. Gour University Sagar**  
**Sagar 470003 M.P.**

## Ph.D. Course

### Minimum Total Credits: 80

- Credits through course work each Semester Minimum = 24
- 4 Courses X 4 Credits = 16 Credits through course work  
+ 08 Credits from research work each semester

Total Course work Credits = 48 Credits in two semester

- Credits through Research (minimum) = 32 after two Semesters
- Minimum number of Courses = 06
- Minimum Residence = 5 Semester
- Maximum Duration = 6 years

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**DEPARTMENT OF ZOOLOGY**  
**SCHOOL OF BIOLOGICAL SCIENCES**  
**DR. H. S. GOUR UNIVERSITY SAGAR, 470003 (M.P.)**

**I Semester**

|            |                                          | Credits |
|------------|------------------------------------------|---------|
| Course I   | Code – Zoo C 141: Methodology            | 04      |
| Course II  | Code – Zoo C 142: Modern Instrumentation | 04      |
| Course III | Code – Zoo C 143: Research Techniques    | 04      |
| Course IV  | Code – Zoo C 144: Tissue Culture         | 04      |
|            | Research wok                             | 08      |

**II Semester**

Recent topics related to modern researches:

|            |                                         | Credits |
|------------|-----------------------------------------|---------|
| Course I   | Code – Zoo C 241: Cell Biology          | 04      |
| Course II  | Code – Zoo C 242: Entomology            | 04      |
| Course III | Code – Zoo C 243: Environmental Biology | 04      |
| Course IV  | Code – Zoo C 244: Fish & Fisheries      | 04      |
|            | Research wok                            | 08      |

**Total credits: 48 credits in two semesters**

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**I Semester**

**Course I**

**Code – Zoo C 141**

**Course Title: Methodology**

|   |   |   |   |
|---|---|---|---|
| L | T | P | C |
| 4 | 0 | 0 | 4 |

**Instructor In-Charge: Prof. M. Bhide**

**Lectures**

1. Procurement & Rearing of experimental animal according to animal ethics. 01
2. Toxicant & Toxicity. 01
3. Anatomy of selected invertebrates and vertebrates: Alimentary Canal, Excretory & Nervous system, Brain, Nerves – Spinal & cranial, Reproductive system – male & female. 01
4. Localization and structure of endocrine glands. 01
5. Experiments to decide sub lethal, lethal & lethal doses,  $KD_0$ ,  $KD_{50}$ ,  $KD_{100}$ ,  $ED_0$ ,  $ED_{50}$ ,  $ED_{100}$ ,  $LD_0$ ,  $LD_{50}$ ,  $LD_{100}$ ,  $LC_0$ ,  $LC_{50}$ ,  $LC_{100}$  doses. 01
6. Osmium ethyl gallate method for cytology. 01
7. Microtomy 01
  - a. Fixatives & preservatives
  - b. Preparation of paraffin blocks of tissue for microtomy
  - c. Section cutting & spreading etc.
8. Histological studies: Double staining (Haematoxylin & Eosin). 01
9. Histochemical studies.
  - a. Preparation of different types of stains and different staining methods: 01
    - i. Mercuric bromophenol blue: for detection of proteins in the tissue.
    - ii. Sudan Black 'B': for detection of lipid in tissue eg. Fat bodies & ovaries.
    - iii. Methyl green & Pyronin: to detect DNA & RNA in tissues.
  - b. Preparation for vital staining: 01
    - i. Janus green staining of Buccal epithelium for demonstration of mitochondria.

ii. Aceto carmine / aceto orcein staining for polytene chromosomes in salivary gland of Dipteran insects.

iii. Demonstration of mitosis in squash preparation

**10.** Observations & Results. 01

**11.** MicroPhotography & preparation of prints. 01

**Total Lectures =12**

**12 hours/month**

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**I Semester**

**Course II**

**Code – Zoo C 142**

**Course Title: Research Techniques**

|   |   |   |   |
|---|---|---|---|
| L | T | P | C |
| 4 | 0 | 0 | 4 |

**Instructor In-Charge: Prof. S. Banerjee**

**Lectures**

|                           |    |
|---------------------------|----|
| 1. pH determination       | 01 |
| 2. Spectrometry           | 01 |
| 3. Chromatography         | 01 |
| 4. Electrophoresis        | 01 |
| 5. NMR                    | 01 |
| 6. Centrifugation         | 01 |
| 7. Phase contrast optics  | 01 |
| 8. Microscopic techniques | 01 |
| 9. Blotting Techniques    | 01 |
| 10. ELISA                 | 01 |
| 11. Flow cytometry        | 02 |

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**12 hours/month**

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**I Semester**

**Course III      Code – Zoo C 143      Course Title: Techniques in Molecular Biology**

|   |   |   |   |
|---|---|---|---|
| L | T | P | C |
| 4 | 0 | 0 | 4 |

**Instructor In-Charge: Dr. S.K. Jain and Dr. V. Sharma**

**Lectures**

- |                                                                                |    |
|--------------------------------------------------------------------------------|----|
| 1. Extraction, purification and separation of: Proteins, DNA and RNA.          | 01 |
| 2. Quantitative analysis of Proteins, Sterols, DNA, Vitamins and Carbohydrate. | 01 |
| 3. Literature survey preparation of review articles and research paper.        | 03 |
| 4. Antisense and ribozyme technology.                                          | 01 |
| 5. Strategies for designing ribozymes.                                         | 01 |
| 6. Applications of antisense & ribozyme technology.                            | 01 |
| 7. Molecular mapping of genome.                                                | 01 |
| 8. In situ hybridization for genome analysis.                                  | 01 |
| 9. PCR: Amplification of gene.                                                 | 01 |
| 10. BLAST & FASTA.                                                             | 01 |

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**DR. H. S. GOUR UNIVERSITY SAGAR, 470003 (M.P.)**

**I Semester**

**Course IV**

**Code – Zoo C 144**

**Course Title: Tissue Culture**

|   |   |   |   |
|---|---|---|---|
| L | T | P | C |
| 4 | 0 | 0 | 4 |

**Instructor In-Charge: Dr. M. Sikdar**

**Lectures**

- |                                    |    |
|------------------------------------|----|
| 1. Bio – safety measures.          | 01 |
| 2. About lab and media.            | 01 |
| 3. Sterilization methods.          | 02 |
| 4. Bacterial culture.              | 01 |
| 5. Fungal culture.                 | 01 |
| 6. Plant cell and tissue culture.  | 02 |
| a. Primary culture.                |    |
| b. Secondary culture.              |    |
| 7. Animal cell and tissue culture. | 02 |
| a. Primary culture.                |    |
| b. Secondary culture.              |    |
| 8. Cryopreservation of cells.      | 02 |

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**DR. H. S. GOUR UNIVERSITY SAGAR, 470003 (M.P.)**

**II Semester**

**Course I**

**Code – Zoo C 241**

**Course Title: Cell Biology**

|   |   |   |   |
|---|---|---|---|
| L | T | P | C |
| 4 | 0 | 0 | 4 |

**Instructor In-Charge: Dr. S.K.Jain**

**Lectures**

1. Structure of prokaryotic and eukaryotic cells – isolation and growth of cells, cell wall and cell membrane synthesis. 01
2. Microscopic techniques for study of cells and Sub – cellular fractionation and criteria of functional integrity. 01
3. Transport of nutrients, ions and macromolecules across membranes. 01
4. Cellular response to environmental signals in plants and animals, mechanism of signal transduction. 01
5. Metabolite pathways and their regulation. 01
6. Cellular basis of differentiation and development, spatial and temporal regulation of gene expression. 01
7. Protein localization: Synthesis of secretory and membrane proteins, import into nucleus, mitochondria, chloroplast and peroxisomes, receptor mediated endocytosis. 01
8. Molecular mechanism of antisense molecules, inhibition of splicing, polyadenylation and translation, disruption of RNA structure and capping, biochemistry of ribozyme, Hammer-head, hairpin and other ribozyme. 01
9. Strategies for designing ribozymes and applications of antisense and ribozyme technologies.

10. Molecular mapping and map-based cloning, choice of mapping population, simple sequence repeat loci, Southern and fluorescence in situ hybridization for genome analysis, chromosome microdissection and microcloning, molecular markers in genome analysis: RFLP, RAPD and AFLP analysis. 02
11. Molecular markers linked to disease resistance genes, application of RFLP in forensic, disease prognosis, genetic counseling, pedigree varietal etc. Animal trafficking and poaching: Germplasm maintenance, taxonomy and biodiversity. 02

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**DR. H. S. GOUR UNIVERSITY SAGAR, 470003 (M.P.)**

**II Semester**

**Course II**

**Code – Zoo C 242**

**Course Title: Entomology**

|   |   |   |   |
|---|---|---|---|
| L | T | P | C |
| 4 | 0 | 0 | 4 |

**Instructor In-Charge: Prof. J. D. Ahi**

**Lectures**

- |                                                            |    |
|------------------------------------------------------------|----|
| 1. Insect taxonomy & Biodiversity.                         | 01 |
| 2. Insect physiology (Especially reproductive physiology). | 01 |
| 3. Insect biochemistry.                                    | 01 |
| 4. Insect neuroendocrine organs and insect hormones.       | 01 |
| 5. Insect immunology.                                      | 01 |
| 6. Insect haemolymph proteins.                             | 01 |
| 7. Insect pests.                                           | 02 |
| a. Vegetable pests.                                        |    |
| b. Stored grain pests.                                     |    |
| c. Fruit pests.                                            |    |
| 8. Insect pests managements & IPM                          | 01 |
| 9. Insect markers and forensic entomology.                 | 01 |
| 10. Forest entomology.                                     | 01 |
| 11. Insect hormones.                                       | 01 |

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**DR. H. S. GOUR UNIVERSITY SAGAR, 470003 (M.P.)**

**II Semester**

**Course III**

**Code – Zoo C 243**

**Course Title: Environmental Biology**

|   |   |   |   |
|---|---|---|---|
| L | T | P | C |
| 4 | 0 | 0 | 4 |

**Instructor In-Charge: Prof. U. S. Gupta**

**Lectures**

- |                                                                                  |    |
|----------------------------------------------------------------------------------|----|
| 1. Faunal diversity & population density.                                        | 01 |
| 2. Freshwater ecosystem:                                                         | 01 |
| a. Abiotic components.                                                           |    |
| b. Biotic components.                                                            |    |
| 3. Food chain, food webs, interaction, energy flow & pyramid.                    | 01 |
| 4. Productivity.                                                                 | 01 |
| 5. Toxicants & toxicity.                                                         | 01 |
| 6. Vermitechnology & vermicomposting.                                            | 01 |
| 7. Water analysis.                                                               | 01 |
| 8. Correlation of abiotic components with faunal diversity & population density. | 01 |
| 9. Adaptation.                                                                   | 01 |
| 10. Mathematical models in ecology.                                              | 01 |
| 11. Remote sensing.                                                              | 01 |
| 12. Waste water treatment.                                                       | 01 |

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**12 hours/month**

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**II Semester**

**Course IV**

**Code – Zoo C 244**

**Course Title: Fish & Fisheries**

|   |   |   |   |
|---|---|---|---|
| L | T | P | C |
| 4 | 0 | 0 | 4 |

**Instructor In-Charge: Prof. D. K. Saraf**

**Lectures**

- |                                                                                                                   |    |
|-------------------------------------------------------------------------------------------------------------------|----|
| 1. Outline of classification of fish.                                                                             | 01 |
| 2. Fish identification, purpose and importance of aquaculture.                                                    | 01 |
| 3. Basic consideration in the selection of species for culture, cultivable fresh water fishes.                    | 01 |
| 4. Cultivable fresh water fin fishes (food and feeding habits and biology of carps, air breathing and cat fishes) | 01 |
| 5. Food, feeding habits and factors influencing feeding, reproduction.                                            | 01 |
| 6. Artificial propagation.                                                                                        | 02 |
| a. Structure of ovary, maturity, stages of ovary.                                                                 |    |
| b. Structure of testes, maturity, stages of testes.                                                               |    |
| c. Fecundity.                                                                                                     |    |
| d. Relation between endocrine and reproduction.                                                                   |    |
| 7. Induced breeding.                                                                                              | 01 |
| 8. Genetic improvement of fish stock.                                                                             | 01 |
| 9. Hybridization, sex manipulation, chromosomal manipulation.                                                     | 01 |
| 10. Gene engineering, genetic marker, genetic conservation in fish.                                               | 01 |
| 11. Integrated fish culture.                                                                                      | 01 |

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**12 hours/month**