



**List of Courses Focus on Employability/ Entrepreneurship/  
Skill Development**

**Department : Zoology**

**Programme Name : Pre- Ph.D. course work**

**Academic Year : 2024-25**

**List of Courses Focus on Employability/ Entrepreneurship/Skill**

Sr. No.	Course Code	Name of the Course
01.	LS/ZOO/PPCW 102	Analytical and Instrumentation Training
02.	LS/ZOO/PPCW 103 (A)	Aquaculture and Fisheries

*(S) 18/08/2020*

*Bhatnagar 18/8/2020*  
*S.K. 18.08.20*

*18/08/2020*



## Scheme and Syllabus

Session: 2019-2020

### SYLLABUS FOR PRE-Ph. D. COURSE WORK (ZOOLOGY)

Department of Zoology  
Guru Ghasidas Vishwavidyalaya, Bilaspur, CG

#### Scheme

SNo	Type of Course	Course code / Title of the Course	No. of credits	Total Marks
1	Compulsory Paper	LS/ ZOO/ PPCW 101 Research Methodology and Ethics in Research	4	100
2	Compulsory Paper	LS/ ZOO/ PPCW 102 Analytical and Instrumentation Training	4	100
3	Elective Paper	LS/ ZOO/ PPCW 103 (A) Aquaculture and Fisheries	4	100
		LS/ ZOO/ PPCW 103 (B) Biochemistry and Molecular Biology	4	100
		LS/ ZOO/ PPCW 103 (C) Endocrinology	4	100
		LS/ ZOO/ PPCW 103 (D) Molecular and Genetic Epidemiology	4	100
		LS/ ZOO/ PPCW 103 (E) Neuroscience	4	100
		LS/ ZOO/ PPCW 103 (F) Toxicology	4	100
4	Compulsory Paper	LS/ ZOO/ PPCW 104 * Seminar/ Presentation	--	100

Note: Seminar presentation.....

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LS/ ZOO/ PPCW 102: ANALYTICAL AND INSTRUMENTATION TRAINING

**Unit 1: Centrifugation**

Principle, types and applications of Centrifugation, differential and density gradient centrifugation, analytical ultracentrifugation, separation of DNA/RNA using ultracentrifugation technique, determination of molecular weight and Sedimentation coefficient.

**Unit 2: Electrophoretic techniques**

General principles; support media; Electrophoresis of nucleic acids; Agarose gel electrophoresis, polyacrylamide gel electrophoresis (native and SDS), 2D electrophoresis, Blotting: Southern, western and northern blotting.

**Unit 3: Chromatography**

Chromatography: principle, types and applications of thin layer, gas, gel filtration, ion exchange, HPLC, FPLC and affinity chromatography.

**Unit 4: Spectroscopy**

Electromagnetic spectrum, Lambert Beers's Law, Photometry, UV/VIS Spectrophotometry, Atomic absorption spectroscopy, ESR and NMR spectroscopy, Mass spectroscopy (LC-MS, GC-MS), Fluorescent spectroscopy.

**Unit 5: Microscopy**

Basic principle, constituents and biological applications of Bright-field microscope, Dark-field microscope, Phase contrast microscope, Differential interference contrast microscope, Fluorescence microscope, Confocal microscope, Atomic force microscopy, Transmission and scanning electron microscope.

**Unit 6: Molecular biology techniques**

Genotyping techniques- Introduction; theory and practice; RFLP; RAPD; southern hybridization; DNA Sequencing, DHPLC, TaqMan assay, Array CGH, microarray; Primer designing, polymerase chain reaction; Thermal cycler, Gradient PCR, quantitative PCR; TaqMan probes, Syber green, primer qualities.

**Suggested readings**

1. Wilson and Walker: Principles of Biochemical and Molecular Biological Techniques (6<sup>th</sup> Ed. 2006, Cambridge University Press)
2. Boyer: Modern Experimental Biochemistry and Molecular biology (2<sup>nd</sup> Ed. 1993, Benjamin/Cumin)
3. Lodish et al: Molecular Cell Biology (2007, Freeman)
4. Freifelder: Physical Biochemistry (2<sup>nd</sup> Ed. 1982, Freeman)
5. Plummer: An Introduction to Practical Biochemistry (3<sup>rd</sup> Ed. 1990, Tata-McGraw Hill)

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LS/ ZOO/ PPCW 103 (A): AQUACULTURE AND FISHERIES

**Unit 1: Introduction to aquaculture and fishery resources**

Basics of aquaculture; Fin and shell fishes; India and world aquaculture-Role, status and importance of aquaculture; Major inland capture fishery resources in India- Lake and Reservoir fisheries; Nursery system in Estuaries and brackish water; Major and minor marine fishery resources in India.

**Unit 2: Culture systems**

Monoculture; Polyculture; Extensive and intensive culture; Integrated fish farming- Paddy cum fish culture; Fish and prawn culture in fresh water ponds; Fin fish and shell fish culture in brackish water ponds; Ornamental fish culture; Culture and Nutritional value of Rotifers, Artemia, Copepods and Daphnia

**Unit 3: Induced breeding and genetic improvement**

Factors responsible for induced breeding; Hypophysation; Use of different synthetic and natural hormones, their formulation and mechanism of action; Bandh breeding; Multiple breeding of carps; Hybridization in fishes; Chromosomal manipulation: Androgenesis and Gynogenesis, Polyploidy.

**Unit 4: Techniques in aquaculture and fish biotechnology**

Recent techniques in Aquaculture; Cryopreservation technique for life feeds, Bio-enrichment technique; Regulation of vitellogenesis in shell and fin fishes; Application of biotechnology in aquaculture and fisheries; Molecular markers used in fisheries and aquaculture.

**Unit 5: Aquatic pollution and ecotoxicology**

Eutrophication and their impact on aquaculture; Impact of environmental toxicant on fish health; Detoxification; Waster water treatment methods; Aerobic and anaerobic treatment of water; Water recycling and utilization in aquaculture; Prevention and control of aquatic pollution; Waste disposal systems in India.

Unit 6: Topics relevant to their area of research, literature review and analysis for the given research topic.

**Suggested readings**

1. Chakroff: Freshwater Fish Pond Culture and Management (1987, Scientific Publishers)
2. Jhingran: Fish and Fisheries of India (1985, Hindustan Publishing Corporation)
3. Lagler, Bardach, Miller and May Passino: Ichthyology (2003, John Wiley)
4. Gupta and Gupta: General and applied Ichthyology (Fish and Fisheries) S Chand 2006.
5. Kreuzer, R: Fishery products, FAO, Fishing News (Books) Ltd., England, 1974.
6. Evans: The Physiology of Fishes (2006, CRC Press)
7. Gopakumar, Singh and Chitranishi: Fifty Years of Fisheries Research in India (2000), Fisheries Division Indian Council of Agricultural Research)
8. Hall: Ponds and Fish Culture (1994, Agro Botanical Publishers)
9. Huet: Textbook of Fish Culture, Breeding and Cultivation of Fish, Fishing News (1989)

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