Syllabus and Evaluation Scheme

for

PhD Course Work

Department of Zoology
Chaudhary Bansi Lal University, Bhiwani
(A State University established under Haryana Act No. 25 of 2014)

(2019-20)

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Syllabus and evaluation scheme
PhD course work in Zoology

Summary

Programme	:	Pre PhD course work in Zoology
Duration	:	One Semester
Minimum Attendance Required	:	75% in individual course
Total Credits	:	**9**
Total Marks	:	**300**

Assessment/Evaluation of Theory examination:

Internal Evaluation:

Minor Test Marks	Attendance Marks	Assignment/ Quizzes Marks	Total Marks
10	5	5	20

Duration of Examination:

Minor Test	Major Test
1.5 hr	3 hr

Paper Code	Subjects	Credits	Internal assessment marks	Final Semester Exam Marks	Total
19ZOOPh 1001	Research Methodology	4	20	80	100
19ZOOPh 1002	Bio techniques	4	20	80	100
19ZOOPh 1003	Review writing and presentation/Seminar	1	-	-	50+50
	TOTAL	**9**	**40**	**160**	**300**

To qualify the course, a student is required to secure a minimum of 55% marks in aggregate including the internal evaluation and Major Test (End Semester Examination). For details please see the PhD ordinance of the University.

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PhD Course Work
Department of Zoology

19ZOOPh 1001
Research Methodology

Maximum Marks: 100
Theory Examination: 80
Internal Assessment: 20

Note: *There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks.*

Objectives and outcome of the course:
This course will develop scientific aptitude in the students. Here the student will learn the ways to identify problem and based on existing evidences they will be able to develop hypothesis, designing critical scientific methodology to find the solution and explanation to the problem.

Unit I

Identification and defining of the research problem: Familiarization of research areas; reading and interpretation of research papers; critical analyses of research problems; use of tools for searching literature through electronic databases; research design, sampling, patent search.

Unit II

Experimental approaches and methodology: Meaning, objectives, types and significance of research; necessity and techniques of defining research problem; formulation of research problem; objectives of research problem; features of good research design; types of research designs, basic principles of experimental designs, design of experiments; census and sample surveys; different types of sample designs; characteristics of good sample design; techniques of selecting a random sample.

Unit III

Ethics in biological research: Guidelines for biosafety and bioethics; institutional biosafety committee; handling of genetically modified organisms; institutional human and animal ethics committee; compliance, concerns and approvals; copyright, royalty, intellectual property rights and patent laws; reproduction of published material and plagiarism; citation and acknowledgements; reproducibility and accountability; conflict of interest; safety practices and disposal of bio-waste in the laboratory; radioactivity and safety precautions; handling and disposal of flammable and hazardous chemicals.

Unit IV

Presentation and publication skills: Skills for scientific writing and research presentation: term paper, research project, research report, thesis, research article and review; Use of electronic tools for bibliographic formatting and checking plagiarism; oral presentation skills.

Suggested Books:

- Research Methodology- G.R. Basotia and K.K. Sharma.
- Research Methodology- C.H. Chaudhary, RBSA Publication

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PhD Course work
Department of Zoology

19ZOOPh1002
Bio techniques

Maximum Marks: 100
Theory Examination: 80
Internal Assessment: 20

Note: *There shall be nine questions in all. Question no. 1 shall be compulsory, consisting of eight short answer type questions covering the entire syllabus. Two questions will be asked from each unit. Student will have to attempt one question from each unit. Each question shall carry equal marks. The evaluation will be carried internally by the department.*

Objectives and outcomes of the course:
This course will impart the advanced knowledge of fundamental research techniques which are essential for performing the research in Zoology.

Unit I

Scope in genetic engineering techniques, Basic cloning method: Cloning vectors, steps involved in gene cloning, Different enzymes and their Applications: DNA and RNA polymerase, reverse transcriptase, alkaline phosphatase, kinase, ligase, RNase, DNase, topoisomerase, Restriction endonucleases: R-M system, nomenclature of RE, Types and recognition, cleavage sites and application of endonucleases.

Unit II

Nucleic Acid Purification, cDNA Synthesis, Yield Analysis, agarose gel electrophoresis, PCR (DNA Amplification, primer designing and its Applications), Gene Cloning Vectors: Plasmids, lambda bacteriophage, yeast cloning vector, Artificial chromosome (YAC, BAC), Shuttle vector, expression vector. Cloning and expression of DNA in Plant, yeast, insect cells, mammalian cells.

Unit -III

Nucleic Acid Sequencing (Chain termination, chemical degradation, automated, pyrosequencing), Nucleic acid blotting and hybridization (Southern, Northern and dot blot hybridizations), Introduction to Microarray, molecular markers: RFLP, RAPD, AFLP, SNP

Unit -IV

Recombinant proteins: Purification of proteins and folding, characterization and stabilization. Protein analysis: SDS Page and Western blotting, T-DNA and Transposon Tagging, Gene therapy, Gene knockout and gene silencing.

Suggested Readings:

1. Genetic Engineering: Rastogi and Pathak, Oxford University Press.
2. Metzenberg, Stan. Working with DNA. Oxford: Taylor and Francis.
3. Brown, T.A. Gene Cloning and DNA Analysis: An Introduction. United Kingdom: Wiley-Blackwell.
4. Sambrook J., MacCallum P. and David Russell. Molecular Cloning: A Laboratory Manual (3rd edition, three-book set). New York, USA: CSHL Press.
5. Primrose S. B., Twyman R. M., Old R. W. Principles of Gene Manipulation. Wiley-Blackwell, 2001.

19ZOOPh1003
Review of Literature

50+50 Marks

Objectives and scope of the course:
This course will help the student to learn about the basic introduction and literature related to the area of research. The student will search the available literature and cited references to develop a background in the direction of pursuing the research. The search topic will be decided by the Department research committee (DRC). The student will deliver a mid semester seminar to the department. End semester report duly checked and verified for plagiarism by the available software at University website will also be submitted by the candidate. The acceptance of the plagiarism in the report will be as per the norms of PhD thesis guideline of the University. The plagiarism report will be appended with the submission. The progress report will be associated with a soft copy to DRC, seminar and viva voce.

The evaluation scheme will be following:

a. Attendance (Minimum attendance required 75%)

Total Attendance (%)	Marks Awarded (Max marks 5)
>75-80	02
>80-85	03
>85-90	04
>90	5

b. Mid semester seminar - 15 Marks
c. End semester reports - 50 Marks
End semester seminar - 30 Marks