M.Phil/Ph. D. Course Work

PAPER I: BASIC RESEARCH METHODOLOGY

(Suggested syllabus-2018)

S.No.	Topic	#Lectures (2 hours each)
1	**Introduction** a) Researching a scientific problem; defining aims & objectives, hypothesis generation, validation and interpretation of data b) Basic and applied research problems, translational approach	 1 1 1 1
2	**Scientific literature** a) Reading and critical analysis of scientific literature b) Communicating research results in peer-reviewed journals. c) Acknowledgement of contributions, authorship issues; IPR, Scientific ethics, plagiarism**.**	 1 1 1
3	**Writing and presentation skills** a) Communication skills (Poster and oral) b) Review on a relevant research topic and presentation of the same in a seminar	 2 1 1
4	**Experimental design and data analysis** a) Philosophy of Rene Descartes Measurement; sensitivity, accuracy, precision and specificity. The limits and range of measurement in different systems b) Experimental design; single and double blind studies, placebo c) Maintenance and storage of data, Concept of sampling, Cloud computing d) Positive and negative controls, biological and technical replicates e) Biostatistics	 2 1 1 1 2 1
5	**Experimentation on animals** a) Animal handling and ethics b) Maintenance of animals c) Various routes of injections and sample collection d) CPCSEA guidelines; Institutional ethics committees **e)** Ethical consideration in research on human beings	 1 1 1 1 1
6	**Working in Laboratory** a) Good laboratory practice; Safety and bio- and radio-hazards, disposal of biological and chemical wastes b) Accuracy of liquid transfer c) Preparation of Reagents, chemicals, buffers d) General safety and precautions e) Handling of Instruments in the CIF	 2 1 1 2 2

Paper II: ADVANCED RESEARCH TOOLS AND TECHNIQUES

(Suggested syllabus-2018)

S.No.	Topic	#Lectures (2 hours each)
1	**Molecular Biology Techniques**	
	a. Cloning and sequencing of genes and genomics, PCR techniques	2
	b. Microarray and gene expression	1
	c. Metagenomics and Epigenomics	1
	d. Gene targeting and its applications	1
		1
2	**Microscopy and Image analysis**	
	a. Bright field; fluorescence; confocal	
	b. SEM and TEM	1
	c. Image acquisition and analysis	1
		1
3	**Bacterial and Animal cell culture**	
	a. Aseptic technique and preparation of media	
	b. Bacterial culture	1
	c. Types of cell culture	1
	d. Insect cell culture	1
	e. Applications of cell culture	1
		1
4	**Bioinformatics and its application**	
	a. Databases, sequences, sequence alignment-pairwise/ multiple, global/ local protein family, domain, sequence conservation	1 1
	b. Introduction to software used for proteomics data analysis	1 1
5	**Analytical Techniques and Instrumentation**	
	a. Colorimetry; Spectrophotometry	
	b. Preparative Centrifugation	1
	c. Chromatography; GC; FPLC; HPLC	1
	d. Electrophoresis; MALDI-TOF; LCMS(Mass spectrometry)	1 1
	e. Immmunological techniques	
	f. FACS	1 1
6	**Tracer Techniques**	
	a. Use of high energy radiation	
	b. Isotopic and non-isotopic Techniques	1 1
7.	**Model systems and model organisms:**	
	a. Pre-requisites of a model system; *in vitro* systems;	1 1
	b. Prokaryotic model organisms	1
	c. Eukaryotic model organisms	1 1 1

Paper III: RECENT TRENDS IN ZOOLOGY

In this paper students have to review the topics of their choice in "Recent Trends in Zoology" and will give presentation and their presentation will be evaluated by concern teachers allotted to them.