Department of Environmental Sciences

Ph.D course work in Environmental Sciences

Program Specific Outcomes

PSO1 Students would be getting conceptual and theoretical knowledge in advanced research methodology and current areas of research.

PSO2 Students would be able to design, conduct and report research in various fields of Environmental sciences.

PSO3 Students would be well versed with the basic concepts related to advance techniques and sufficient information regarding their principle, instrumentation parts and applications in various fields of environmental sciences.

PSO4 Students would be familiarized with statistical tools and computer applications in designing, execution, analysing and reporting research.

PSO5 Students would come to know about the national funding agencies promoting research and sponsoring projects.

PSO6 Students would learn the organization of workshops/conferences/Seminars.

Scheme of Ph.D. (Course Work)

Paper No.	Nomenclature	Credits	Evaluation Scheme		
			Theory	**IA***	**Total**
17ENVPC1	Research methodology	4	80	20	100
17ENVPC2	Biostatistics and Computer Sciences	4	80	20	100
17ENVPC3	Tools and techniques in Environmental Sciences	4	80	20	100
17ENVPC4	Review Writing and Presentation/Seminar	1	-	-	50+50

Total Marks= 400

*Internal Assessment: Two assignments of 10 marks each.

Note: The candidate shall be required to present seminar related to the topic of research problem under the guidance of the Faculty member. The evaluation will be based on the presentation of the seminar jointly by the faculty members of the department.

PAPER: 17ENVPC1   RESEARCH METHODOLOGY

Course Outcomes

CO1 Students would be familiarized with the meaning and need of research in the field of biology especially Environmental Science.

CO2 Students would be able to formulate the objectives, research plan and apply the knowledge of research designs in planning and analysing research.

CO3 Students would be well versed with Research Proposal, Report and Research Paper writing.

CO4 Students would get an idea about the funding agencies as DST, DBT, ICMR, CSIR and UGC providing financial assistance to the research projects and organizing conferences, symposia, workshops etc.

CO5 Students would understand the role of Intellectual Property Rights in Research and development.

Max. Marks : 80

Time : 3 Hours

Note: 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus & compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt five in total, one question from each section.

UNIT I

Meaning of Research in Biological Sciences - Purpose, Characteristics and Types of Research - Process of Research -Formulation of objectives - Formulation of Hypotheses - Types of Hypotheses - Methods of testing Hypotheses -Research plan and its components - Methods of Research (Survey, Observation, case study, experimental, historical and comparative methods) - Difficulties in Biological research.

UNIT II

Identification and formation of research problem (Hypothesis). Elements in research methodology: Research design (CRD, RBD, LSD). Scientific database: Science Direct and Pubmed.

UNIT III

Ethical, legal, social and scientific issues in Biological Research. A brief idea about the funding agencies such as DST, DBT, ICMR, CSIR and UGC. Role of IPR in Research and Development.

UNIT IV

Writing of Research Proposal, Report and Research Paper: Meaning and types - Stages in preparation- Characteristics - Structure - Documentation: Footnotes and Bibliography - Editing the final draft. Evaluating the final draft- Checklist for a good proposal/report/research paper. Basic knowledge of organizing conferences, symposia, workshop, exhibition etc.

Books Recommended:

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

PAPER: 17ENVPC2   BIOSTATISTICSAND COMPUTER APPLICATIONS
Course Outcomes

CO1Students would develop competency and expertise in the application of statistical methods and tools in interpreting environmental data obtained from experiments during the research work.

CO2 Students would gain basic knowledge of computer and be able to compile their research work in form of report using the MS office, Excel and present their work using Power point.

CO3 Students would be able to use the statistical tools to analyse the data generated in their research work.

CO4 Students would be able to draw inferences in terms of probability from the experimental data.

Note: 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus & compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt five in total, one question from each section.

UNIT – I

Measurement of central tendency - mean (Geometric and Harmonic), median, mode, Measurement of dispersion moments, standard deviation, skewness and kurtosis. Correlation and linear regression of one independent variable, Basic laws and concepts of probability.

UNIT – II

Definition of random variable, density function, Basic concepts of binomial and normal distributions. Sampling measurement and distribution of attributes. Moments, matrics and simultaneous linear equations, tests of hypothesis and significance.

UNIT – III

Analysis of Variance: Meaning of analysis of variance with linear models. Analysis of variance for one-way classified data, analysis of variance for two-way classified data with one observations for cell, analysis of variance for two-way classified data with multiple but equal number of observation per cell (data analysis only).

UNIT – IV

Computer Basics : Course introduction, MS Windows basics, File management, E-mail (PINE, EUDORA, Internet mail), File Transfer (ftp, WSftp). Office Applications : MS Office 2000/XP including MS Word, MS Excel, MS PowerPoint.

References

- Elements of Biostatistics in Health Science- W. Daniell.
- Statistical Methods for Research: S. Singh et al (1988) Central Publishing, Ludhiana.
- Fundamental of Statistics – D. N. Enhance.
- Statistical Methods: S.P. Gupta. S. Chand Publication
- Fundamentals of Biostatistics- Khan and Khanna, Ukaz Publication
- Biostatistical analysis- Zerold and Jar.

PAPER: 17ENVPC3 TOOLS AND TECHNIQUES IN ENVIRONMENTAL SCIENCES

Course Outcomes

CO1 Students would learn how the bio molecules can be identified separated in the lab using molecular assays.

CO2 Students would be trained in a variety of techniques and their applications in analysis of various heavy metals, hydrocarbons and gaseous pollutants in environmental samples.

CO3 Students would learn the optimization of these techniques so as to fit in their research work.

CO4 Students would be able solve the troubleshooting during the analysis of the samples.

Max. Marks : 80

Time : 3 Hours.

Note : 1. Nine questions will be set in all.

2. Question No. 1 will be objective covering the entire syllabus & compulsory. The remaining eight questions will be set with two questions from each unit. The candidate will be required to attempt five in total, one question from each section.

UNIT – I

Principles and application of Spectrophotometry (UV-Visible spectrophotometry), Titrimetry, Gravimetry, Colourimetry, NMR, ESR, Microscopy-phase, light and flourscence microscopes, Scanning and Transmission electron microscopes.

UNIT - II

Chromatographic techniques (Paper chromatography, thin layer chromatography, ion bexchange chromatography, Column chromatography), Atomic absorption spectrophotometry, cytophotometry and flow cytometry, Fixation and staining, Principles and techniques of nucleic acid hybridization and Cot curves, Principle of biophysical method used for analysis of biopolymer structure, Hydrodynamics methods, Plasma emission spectorocopy.

UNIT - III

Electrophoresis, solid and liquid scintillation, X-ray florescence, X-ray diffraction. Flame photomtery, Gas-liquid chromatography, High pressure liquid chromatography – auto radiography, Ultracentrifugation.

UNIT – IV

Methods for measuring nucleic acid and protein interactions, DNA finger printing Molecular markers RFLP, AFLP, RAPD, Sequencing of proteins and nucleic acids, southern, northern, western blotting techniques, PCR polymerase chain reaction.

References

1. Principles of Biophysical chemistry - Uppadahay –Uppadahay - and Nath.

2. Analytical Techniques - S.K. Sahani