

**DEPARTMENT OF ENVIRONMENTAL SCIENCES
MAHARSHI DAYANAND UNIVERSITY ROHTAK
(Jan,17 to Dec,17)
Scheme of Examination of Ph.D. (Course Work) Examination**

Paper No.	Nomenclature	Credits	Evaluation Scheme		
			Theory	IA*	Total Marks
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.

Syllabus for Ph.D. Course Work in Environmental Sciences

17ENVPC1: RESEARCH METHODOLOGY

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

17ENVPC2: BIostatistics AND COMPUTER APPLICATIONS

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

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, matrices 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.

17ENVPC3: TOOLS AND TECHNIQUES IN ENVIRONMENTAL SCIENCES

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 fluorescence microscopes, Scanning and Transmission electron microscopes.

UNIT - II

Chromatographic techniques (Paper chromatography, thin layer chromatography, ion exchange 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 spectroscopy.

UNIT - III

Electrophoresis, solid and liquid scintillation, X-ray fluorescence, X-ray diffraction. Flame photometry, 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