



**JIWAJI UNIVERSITY, GWALIOR (M.P.)**

**SYLLABUS**

**FOR**

**School of Studies in Botany**

**Ph.D. (Botany)**

**SESSION**

**2023 Onwards**

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## Ph.D. Course Work (2023 onwards)

### Paper I : Research Methodology (For Life Sciences)

#### 1. Introduction to Research Design

Nature and objectives of research, Methods of research: Historical, descriptive and experimental, research process, research approaches, criteria for good research, meaning of research design, need of research design, features of good design, different research designs & basic principles of experimental designs, designs of experiments.

#### 2. Data collection and Analysis

Types of data, methods and techniques of data collection, primary and secondary data, meta analysis, historical methods content analysis, devices used in data collection, pilot study and pretest of tools, choice of data collection method.

#### 3. Data processing and Analysis

Measures of Central Tendency, Measures of Dispersion, Measures of Variation, Measures of Central Tendency vs Measures of Dispersion, Normal Distribution, Measures of Skewness and Interpretation, Correlation and Regression: Types and Applications.

#### 4. Test of Significance

Significance of difference in means: Standard deviation and standard error; Z-test, 't' test and Chi-square test: purpose and use, Analysis of variance.

#### 5. Paper Writing and report generation

Basic concept of paper/ thesis writing, and report generation, writing Research Abstract. Introduction, Review of Literature, Results, Conclusion, Concepts of Bibliography and References, significance of Report Writing, Types of Research Reports, Methods of presentation of Reports, Formats of publication in Research Journals.

#### Reference Books\*:

1. Research Methodology: Methods and Techniques – C.R. Kothari, New Age Publisher.
1. Research Methodology: R.N. Trivedi and D.P. Shukla, College Book Depot, Jaipur.
2. Research Methodology: D. Chakraborty, Lotus Press.
3. Research Methodology for Life Sciences: N. Arumugam, Saras Publication.
4. Random Data Analysis and Measurements Procedures: Bendat and Piersol, Wiley Interscience.
5. Research Methodology: Bin Taylor, G. Sinha and T. Ghoshal, Prentice Hall of India Pvt. Ltd.
6. Methods in Biostatistics: B.K. Mahajan, Jaypee Brothers Medical Publishers, N.Delhi, India.
7. Research Design: J.W. Creswell, Sage Publications, INC.
8. Principles of Biostatistics: Marcello Pagano, CRC Press, Taylor and Francels

\*Latest Editions of the Books



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**Ph.D. Course Work (2023 onwards)**

**Paper II : Computer Applications and Bioinformatics (For Life Sciences)**

**1. Computer Fundamentals**

Computer Basics and Terminology, Input and output devices, Computer memory, Computer generation and Classification, Types of software, Operating System, Their Types, Basic terms related to Windows OS, Computer Networks, LAN, MAN, WAN.  
Research Polishing Tool- MS Word, Creating, editing and saving a word document, Use of Autotext Tables related operations, graphics.

**2. Introduction to Spreadsheet and Presentation**

Introduction to Excel, use of Spreadsheet in Research, Data Storing, Various Data Types, Use of Formula and Functions, Calculate, Manipulate and Analyses of Data preparing charts.

M.S. Power Point, Features and Functions, Creating presentation, Animation, Customizing presentation.

**3. Introduction to Internet and Computer Applications**

Introduction to Internet, WWW, Searching on Internet, Literature survey, website, Search Engines, Anti- Plagiarism software, Viruses and its Types, Protection from Viruses.

Introduction of computers in Research: Literature Search using various Search Engines, Writing References, Software for Reference arrangement, Statistical Packages: Sigma plot etc.

**4. Bioinformatics**

Applications of Bioinformatics in Life Sciences, Biological Database: Primary, Secondary and Composite Database, Sequence Database: Nucleic acid (EMBL and GenBank), Protein Database (PIR and SWISS-PROT), Structure Database: Protein Data Bank.

Sequence Analysis: Biological Motivation of Sequence Analysis, Homology, Base Pair Alignment: Local, Global and Tools for Base Pair Alignment: BLAST and FASTA, Multiple Sequence Alignment: Methods.

**5. Phylogenetic Analysis, Protein Structure Prediction, Drug Designing**

Phylogenetic Analysis: Methods, character based and distance based methods, tree evaluation.

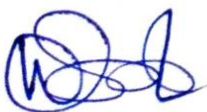
Protein Structure Predictions: homology modeling, threading, ab-initio methods.

Expression Sequence Tags (EST) and its Applications, Microarray Database and its Applications.

**Reference Books\*:**

1. An Introduction to Computational Biochemistry: C. Stan and T. Sal
2. Introduction to Bioinformatics: A Theoretical and Practical Approach: S.A Krawetz & D.D. Womble.
3. Bioinformatics, Genes, Proteins and Computers: C.a. Orengo, D.T. Jopnes, J.M. Thornton.

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4. Instant Notes on Bioinformatics, D.R. Westhead, J.H. Parish, R.M. Twyman  
Publisher: Taylor & Francis.
5. Essential Bioinformatics: Jin Xiong Publisher: Cambridge.
6. An introduction to Bioinformatics Algorithms: N.C. Jones, P.A. Pevzner..
7. Bioinformatics Sequences and Genome Analysis: D.W. Mount. Publisher: The M.I.  
press Cambridge.
8. Statistical Methods in Bioinformatics: An introduction S. Misener, S.A. Krawetz.  
Publisher: Humana press.
9. Bioinformatics Database and Algorithms: N. Gautham. Publisher: Alpha Science  
INTI Ltd.
10. Bioinformatics Technology: Yi-Ping Phoebe Chen. Publisher: Springer.
11. Data Mining: Multimedia, Soft Computing and Bioinformatics: S.Mitra, T.Acharya.  
Publisher: John Willey SI Sons, inc.

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**Ph.D. Course Work (2023 onwards)**

**Paper-III Advances in Botany**

*There will be a total of ten questions. All questions are long answer type questions without any internal choice and it shall cover the entire syllabus. Candidates will be required to attempt any five questions to all.*

**Max. Marks: 100**

**Time: 3 Hrs.**

- Bomb Calorimeter, Nitrogen Analyser.
- Advance chromatography technique: Principle and applications of GCMS, LCMS, HPTLC, FPLC
- Advance microscopy/ techniques: Electron microscopy confocal microscopy
- Quantitative DNA application: Basic principle and applications of real time PCR, droplet PCR
- Nanobiotechnology: Nanomaterials, types and applications
- Biosensors: Principle, types and applications
- Latest techniques in Molecular Biology: Next generation DNA sequencing.
- Bioethics: Ethical, legal, and social issues related to biological research
- Biodiversity: genetic, species and molecular diversity and taxonomy, DNA bar coding
- Ethnobotany: study of medicinal plants and their phytochemistry
- Climate change, carbon sequestration and impact on Biodiversity
- Ecological restoration: Remediation of degraded/ contaminated ecosystem by microbes/ plants
- Genetically modified plants for improved tolerance to biotic abiotic stress
- Principle of plant disease development and control (chemical, biological and integrated disease management) and role of biotechnology in plant disease control
- Plant cell culture, plant transformation technology & its applications.









