SYLLABUS

Ph.D. Course Work Biochemistry

[Based on UGC Guidelines and Regulations, 2016]

Session: 2020-21

Ph.D. Course Work

Paper I : Research Methodology [For Life Sciences]

Total Credits : 4

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 resaerch design, features of good design, differentresearch designs and basic principles of experimental designs, design 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 usedin data collection, pilot study and pretests of tools, choice of data collection methods.

3. Data Processing and Analysis

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

4. Test of Signification

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 for Publication in Research Journals.

Reference Books*

1. Research Methodology: Methods and Techniques- C.R.Kothari, Nre Age Publishers.
2. Research Methodology- R.N.Trivedi and D.P.Shukla, College Book Depot, Jaipur
3. Research Methodology- D. Chakraborty, Lotus Press
4. Research Methodology for Life Sciences- N.Arumugam, Saras publications
5. Random Data Analysis and Measurement ProceduresBendat and Pcrsol, Wiley Interscience

6. Methods in Biostatistics- B.K.Mahajan, J.P.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 Francis.

***Latest Edition of the Books**

Ph.D. Course Work

Paper II : Computer Applications and Bioinformatics [For Life Sciences]

Total Credits : 3

1. Computer Fundamentals

Computer Basics and Terminology, Input and Output Devices, Computer memory, Computer generatioon and Classification, Types of Software, Operating System, Their Types, Basic Terms related to Windows OS, Computer Netwroks, LAN, MAN. WAN
Reserach Polishing Tools: 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, Dta Storing, Various Data Types, Use of Formula and Functions, Calculation, Manipulation and Analysis of Data, Preparing Charts, MS Power Point, Features and Functions, Creating Presentations, Animation, Customizing Presentation.

3. Introduction to Internet and Presentation

Introduction to Internet, WWW, Searching on Internet, Literature survey, Websites, Search Engines, Anti-Plagarism 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-PORT), Structure Database: Protein Data Bank.
Sequence Analysis: Biological Motivation of Sequence Analysis, omology, 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 methodsTree evaluation, Protein Structure Predictions: homology modeling, treading, 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 Bioinormatics: A Theoretical and Practical Approach- S.A.Krawetz & D.D.Womble
3. Bioinformatics: Genes, Proteins and Computer- C.A.Orengo, D.T. Jopnes, J.M. Thornton
4. Instant Notes on Bioinformatics- D.R.Westhead, J.M.Perish, R.M.Toyman
5. Essential Bioinformatics- Jin Xiong
6. An Introduction to Bioinformatics Algorithms- N.C. Jones, P. Pevzner
7. Bioinformatics: Sequence and Genome Analysis- D.W.Mount
8. Statistical Metods in Bioinformatics: An Introduction- S.Misener, S.A.Krawetz
9. Bioinformatics: Database and Algorithms- N.Gautham
10. Bioinformatics Technology: Yi-Ping PhoebeChen
11. Data Mining: Multimedia, SoftComputing and Bioinformatics: S.Mitra, T. Acharya

***Latest Edition of the Books**

Ph.D. Course Work

Paper III : Advances in Biochemistry

Total: 3 Credits

1. Advance Chromatography Techniques: Principle and Applications of LCMS, HPTLC, FPLC
2. Advance Microscopy Techniques: Electron Microscopy, Confocal Microscopy
3. Flow Cytometry: Basic Principle and Applications
4. Quantitative DNA Amplification: Basic Principle and Applications of Real Time PCR
5. Nanobiotechnoloy: Nanomaterials, types, methods of synthesis and characterization of nanoparticles, applications in diagnostics, therapy, agriculture etc.
6. Biosensors: Principle, types and applications
7. Probiotics: Probiotics in healthy food, functional food
8. Latest Techniques in Molecular Biology: Next generation DNA sequencing, CRYSPR
9. Bioethics: Ethical, legal and social issues related to biological research
10. Drug Discovery: Overview of Drug Discovery from natural products, drug development and pharmacokiteics, preclinical and clinical trials.
11. System Toxicology: Real worls applications and opportunities
12. Toxicogenomics: Introduction, scope, applications and limitations
13. Toxicokinetics/ Pharmacokinetics of drugs, toxins. Toxicants etc; Hazard evation and risk assessment, safety measures
14. Bioreactors: Principle of bioprocesses, design and types of fermenters, Nutrient media and growth optimization, downstream processes, analysis of different types of fermented products
15. Phytoactive compounds from plants: tupes and classification, their therapeutic significance
16. Animal models for life style disorders like diabetes melllitus, hepatic disorders rheumatoid arthritis etc. Role of toxicology, pharmacokinetics and preclinical studies in reference to these disorders.
17. Reproductive system: Basics, immunology of male and female reproductive systems
18. Fetus as allograft: Paradox of pregnancy, immunodiagnotics, immunology of reproduction
19. Infertility and foetal wastage, Intifertility vaccines

Note: The course will include lectures, discussions and seminars, There is no assigned text for the course. The information will be taught from examples of recent advancesreported in the current scientific letrature and/ or drawn frm various textbook/ internet sources.