

Dr. D. Y. Patil Vidyapeeth, Pune
Pre-Ph.D. Course Syllabus- Bioinformatics

Structure of Pre-Ph.D. Course Work for Bioinformatics

Sr. No.	Paper	Title	Credits	Contact Hours	Marks
1	I	Research Methodology and Statistics (Section A and B)	04	60	50
2	II	Recent developments in concerned discipline	02	30	50
3	III	Advanced study of sub discipline	02	30	50
4	IV	Presentation and discussion	02	30	50
		TOTAL	10	150	200

Paper-I Research Methodology and Statistics (Section A and B) (4 credits, 60 hours)

Section A

S. N.	Topic	Sub topic	Contact Hours
1.	Introduction	An overview of research methodology Defining the research problem Selecting the	02
2.	Hypothesis	What is hypothesis Research hypothesis and Null hypothesis	02
3.	Research Design	Meaning of research, Objective of research, Motivation of research, Significance of	02
4.	How to prepare a research proposal	Literature survey for the proposed research Work	02
5.	How to conduct field	Sampling fundamentals Important sampling distributions	03
6.	Methods of data and information collection	Collection of primary data Observation method Interview method Method of data collection Collection of secondary data Selection of appropriate method for data collection	06
7.	Experimental designs	Design of experiments, completely Randomized and randomized block design. Factorial experiments, missing plot Technique Modelling and simulation	06
8.	Scientific writing and publication	Interpretation, technical Report writing and presentation (oral/poster), Overhead projector powerpoint slides, Journal selection, Impact factor	07
	Total		30

Section B

S. N.	Topic	Sub topic	Contact Hours
1.	How to conduct field	Sampling fundamentals Important sampling	03
2.	Processing and analysis of data	Basic statistical techniques Mean, Median, Mode etc. Analysis of variance, Chi-square test, ANOV A standard deviations, F- and t-test. Tabular and graphical presentation of data, Histogram, frequency polygon, pie chart. Parametric and Non parametric tests,	08
3.	Measurement and scaling	Refining Skills in Regression Analysis Advanced Multivariate Analysis	05
4.	Sampling errors	Theory of errors Errors and residuals, precision, measure of precision, Probable error of function, rejection of observation, DEA technique for decision making	06
5.	Computer aided statistical Analysis	Electronic data processing, operating system-common software available, Internet applications, database and bioinformatics. Use of statistical software packages-SPSS	08
	Total		30

Sr. No.	Topic	Details	Contact hours	Course Teacher
1	Biological Databases	Sequence Database (EMBL, GenBank, Structural Database (CATH, SCOP, PDB) Small Molecule Database (CSD, NCI)	03 03 02	Dr. Rachana Pandey
2	Sequence Alignment	Pair wise Sequence Alignment & Multiple Sequence Alignment Algorithms involved in Alignment	03 02	Dr. Shuchi Nagar
3	Systems Biology	Introduction Metabolic Databases & Importance	01 02	Visiting: Dr. Renu Vyas
4	Experimental Techniques	Mass Spectrometry Gel Electrophoresis Chromatography PCR	01 01 01 01	Dr. Feroz Khan
5	Drug Designing Techniques	QSAR Pharmacophore Homology Modeling Docking	03 02 01 01	Dr. Shuchi Nagar
6	Algorithms in Bioinformatics	Structure Generation Energy Minimization Molecular and Quantum Mechanics	02 01	Dr. Shuchi Nagar

Reference Books:

1. Introduction to Bioinformatics by T. K. Attawood & D.J. Parry-smit. Pearson Education Asia, Deli, India.2001.
2. Fundamental Concepts of Bioinformatics By Krane & Raymer.2002.
3. Molecular modeling: principles and applications, Leach.A.R. Pearson Publishers. 2001.
4. Cheminformatics Edited by Johann Gasteiger & Thomas Engel. Wiley-VCH, Weinheim, 2003.
5. Structural Bioinformatics Edited by Philip E. Bourne & Helge Weissig. WILEY-VCH VerlagPublishing. 2006 .
6. Bioinformatics by D. Srinivasa Rao. Biotech Pharma Publications.2010.

Sub-discipline 4: (2 Credits)

Sr. no	Topics	Duration (Hrs.)
1.	1.Introduction to Chemical structures (line notation, graph theory & connection tables) and file handling 2. Advanced methods for lead molecule design and development	05
2.	Data Analysis 1. DATA TYPES 2. Data Pre-processing and Machine Learning Techniques such as MLR, PCA, PLS, ANN, SVM, SVR, kNN, AI, Genetic Programming (GP) using sample data sets.	4+6
3.	Programming languages 1. Advanced Java, Bio-JAVA 2. C-Programming	05 05
4.	Database Creation and Management- MySQL, JDBC, ODBC	03
5.	Bioinformatics Algorithm Development (Sequence analysis, phylogenetic tree generation)	02
Total Hours		30

Reference Books

1. Chemoinformatics – A Textbook. Edited by Johann Gasteiger and Thomas Engel., Wiley-VCH
2. Handbook of Chemoinformatics – From Data to Knowledge. Edited by Johann Gasteiger Wiley-VCH
3. An Introduction to Bioinformatics Algorithms By Neil C. Jones, Pavel Pevzner
4. Algorithms in Bioinformatics: A Practical Introduction By Wing-Kin Sung
5. DataBase Systems, 3rd Edition, Thomas Connolly
6. Biojava: A Programming Guide by Kaladhar D.S.V.G.K Lambert Academic Publishing.
7. Java for Bioinformatics and Biomedical Applications. Authors: Harshawardhan Bal, Johnny Hujol. Springer Publications.
8. Expert C Programming. Author: Peter Van Der Linden. Pearson Publication

Paper IV: Presentation and Discussion

(02 Credits, 30 hours)

The presentation of the Research topic by the candidate will be evaluated by an Expert Committee. The candidate will be required to make a presentation under the following headings —

- (1) Need for Selection of the topic.
- (2) Aims & Objectives
- (3) Current Scenario (In relation to topic of research)
- (4) Detail study plan
- (5) Evaluation Parameters
- (6) Expected impact of study / Implications

He/She will also be required to provide a brief report (10 sets) of the contents of the presentation (not exceeding 10 pages) to the members of the Committee.

The Expert Committee will be constituted by the Vice-Chancellor on the recommendations of the Dean of the concerned faculty.

Evaluation:

Sr. No.	Paper	Title	Credits	Contact	Marks
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*The student should obtain a minimum of 55% marks in order to be declared successful at the Pre-Ph.D. examination.