UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN BOTANY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Course		**BIOSTATISTICS AND BIOINFORMATICS**					
Paper Number		**ELECTIVE--IV**					
Category	ELECTIVE	**Year**	I	**Credits**	2	**Course Code**	423E2F
		Semester	II				
Instructional Hours per week		**Lecture**		**Tutorial**	**Lab Practice**	**Total**	
		3		1	-	4	
Pre-requisite		Fundamental knowledge on using in statistical tools and basic knowledge in molecular biology.					
Learning Objectives:							
C1		To provide the student with a conceptual overview of statistical methods.					
C2		To understand and evaluate critically the acquisition of data and its representation.					
C3		To gain the knowledge about the probability and statistical inference are all topics that will be taught in order to obtain knowledge about the graphical representation of data.					
C4		To develop interdisciplinary skills in using computers in botany to learn about the biological database.					
C5		Students aware with the most recent technologies for sequencing and bioinformatics analysis and is able to apply them to the structural and functional genomics of plants.					

UNIT	CONTENTS
I	**INTRODUCTION TO STATISTICS** Introduction to biostatistics, basic principles, variables - Collection of data, sample collection and representation of Data - Primary and Secondary - Classification and tabulation of Data – Diagrams, graphs and presentation.
II	**DESCRIPTIVE STATISTICS AND PROBABILITY** Measures of central tendency (Mean, Median, Mode) and Standard deviation and standard errors, ANOVA. Probability basic principles-types, rules and patterns of distribution.
III	**HYPOTHESIS TESTING** Chi-square test for goodness of fit, Null hypothesis, level of significance - Degree of freedom. Student's distribution t' test.
IV	**Introduction to computers and Bioinformatics** Internet Basics - File Transfer Protocol-The World Wide Web, Using search engines. Biological Databases- Use of nucleic acid and protein data banks. NCBI, EMBL, DDBJ, SWISSPORT.

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V	**Structure and prediction of proteins and nucleic acids and sequence alignment** Protein prediction and Gene finding tools. Techniques in Bioinformatics- BLAST, FASTA, Multiple Sequence Analysis**.** Phylogenetic analysis**,** Drug targeting.

Course outcomes: CO	**On completion of this course, the students will be able to:**	**Programme outcomes**
CO1	Create and interpret visual representations of quantitative information, such as graphs or charts.	K5
CO2	Solve problems quantitatively using appropriate arithmetical, algebraic, or statistical methods	K3 & K5
CO3	To develop their competence in hypothesis testing and interpretation.	K2
CO4	Construct the phylogenetic trees for similar characteristic feature of plant genomes and study *de novo* drug design through synthetic biology.	K4
CO5	Interpret the features of local and multiple alignments.	K1

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this Course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Text:

1. Gurumani, N. 2005. Biostatistics, 2nd edn. MJP publications, India.
2. Pillai, R.S.N and Bagavathi, V.S. 2010. Statistics theory and practice. Chand & Co. Ltd, New Delhi.
3. Mahajan, B.K. 1984. Methods in Biostatistics for Medical students and Research works. Smt. Indu Mahajan, New Delhi.
4. Khan, I.D and Khanum, A. 2004. Fundamentals of Biostatistics, Ukazsz Publications, Hyderabad, India.
5. Gupta, S.C. 2013. Fundamentals of statistics, Himalaya Publishers, Mumbai.
6. Kothari, C.R and Garg, G. 2014. Research methodology –Method and techniques. New Age International (P) Ltd. New Delhi.
7. Kothekar, V and T.Nandi. 2009. An introduction to Bioinformatics. Panima publishing crop, New Delhi.
8. Mani, K and N. Vijayaraj. 2004. Bioinformatics – A Practical Approach.1st Edn. Aparna publication, Coimbatore.

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Reference books:

1. Milton, J.S. 1992. Statistical method in Biological and Health Sciences. McGraw Hill Inc., New York.
2. Spiegel, M.R. 1981. Theory and Problems of statistics, Schaum's Outline series McGraw-Hill International Book Co., Singapore.
3. Pillai, R.S.N and Bagawathi, V. 1987. Practical Statistics (For B.Com. and B.A., Students) S.Chand & Co. (Pvt.) Ltd., New York.
4. Zar, J.K. 2011. Biostatistical Analysis, Fourth Edition, Prantice-Hall International, New Jersey, USA.
5. Pevsner,J.2015.Bioinformaticsandfunctionalgenomics.Hoboken,NJ:Wiley-Blackwell.
6. Irfan Ali Khan and Attiya Khanum (eds.). 2004. Introductory Bioinformatics. Ukaaz Publications, Hyderabad.

Web resources:

1. nu.libguides.com/biostatistics
2. https://newonline courses.sciences.psu.edu/
3. https://bookauthority.org/books/beginner-biostatistics-ebooks
4. https://www.amazon.com/dp/1478638184?tag=uuid10-20
5. https://hastie.su.domains/ElemStatLearn/
1. https://link.springer.com/book/10.1007/978-3-540-72800-9.
2. https://www.amazon.in/Applied-Bioinformatics-Paul-Maria-Selzer-ebook/dp/B001AUOYY2.

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	1	3	3	3	3	1	3	1
CO 2	3	2	2	3	3	3	2	1	2	1
CO 3	3	1	2	3	3	3	3	2	2	2
CO 4	3	2	1	3	2	2	3	3	3	3
CO 5	3	2	3	3	3	3	3	1	3	1

S-Strong (3) **M-Medium (2)** **L-Low(1)**

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