Progressive Education Society's
Modern College of Arts, Science and Commerce, Ganeshkhind, Pune-16
Department Name: Zoology

Extra credits Certificate Course of 4 Credits for UG students

Course Title: Recent trend in Life Science Research

Module I: Molecular Taxonomy and Bioinformatics

No of Lectures: 10 (1 hour each)

Objectives:

1. To enrich students' knowledge about bioinformatics
2. To introduce the concepts of BLAST FASTA Tools with practical explanation
3. To introduce the concepts of molecular taxonomy and how it is analysed.

Syllabus

Serial No.	Topic	Hours
1	Introduction to bioinformatics	1
2	Introduction to biological databases and retrieving the information • NCBI, EMBL, DDBJ • PDB, SCOP, CATH	2
3	Practical • Introduction of sequence alignment: • Introduction to pairwise sequence • Alignment: Use of BLAST and FASTA tools for • Pairwise sequence alignment.	2
4	Origin of Phylogeny Tree building	1
5	Methods of Phylogeny Tree building using DNA Sequence data I	2
6	Methods of Phylogeny Tree building using DNA Sequence data II	1
7	Significance of Phylogenetic tree	1
	TOTAL	10

Evaluation Pattern: For each credit the evaluation will be of 25 marks and in the form of continuous assessment and end of course assessment (MCQ test, Assignment/Seminar/Group Discussion). Passing at 40%

Course Credit Outcomes: At the end of the credit and course, the students should able to:

1. List the types of different databases with major components
2. Explain the methods of BLAST FASTA
3. Retrieve information from databases.
4. Have basic understanding of Phylogenetic

References:

1. Bioinformatics - Concepts, Skills, and Applications; S.C. Rastogi& others; CBS Publishing; 2003.
2. Bioinformatics - A practical guide to analysis of Genes & Proteins; Andreas D Baxevanis& B F Francis; John Wiley; 2000.
3. Introduction to Bioinformatics; 1st Edition; T K Attwood, D J parrySmith; Pearson Education, 11th Reprint; 2005.
4. Bioinformatics; 1st Edition; C S V Murthy; Himalaya Publishing House; 2003
5. Bioinformatics sequence and genome analysis; David W. Mount; Cold spring harbor laboratory press; 2004
6. Basic Bioinformatics; S. Ignacimuthu, S.J.; Narosa Publishing House; 1995

Module II: Animal Tissue Culture and Introduction to Biostatistics
No of Lectures: 10 (1 hour each)

Objectives:

1. To expose the students to the need for animal tissue culture
2. To introduce them to biostatistics.
3. To explain the importance, examples and methods for determination of activities of animal tissue culture
4. To introduce the students to the method for statistical analysis.

Syllabus

Serial No.	Topic	Hours
1.	Introduction to Biostatistics	1
2.	Concept of Mean Mode Median Standard deviation	1

3.	Chi square test (Histogram, Pie-Diagram, Ogive-Curve)	1
4.	Shannon Simpson index for animal diversity	2
5.	Introduction and History of Animal Tissue culture	1
6.	Basic concepts in ATC and Types of culture in ATC and Supplements □ Primary culture □ Cell lines □ Concept of monolayer and suspension culture □ Initiation of primary culture(methods) □ Media	3
7.	Equipment and Facilities Required in Animal Cell Culture □ Biosafety cabinets □ Lab wares and instruments □ Maintenance of aseptic conditions	1

Evaluation Pattern: For each credit the evaluation will be of 25 marks and in the form of continuous assessment and end of course assessment (MCQ test, Assignment/Seminar/Group Discussion). Passing at 40%

Course Outcomes: At the end of the credit and course, students should be able to:

1. Explain the need for biostatistics
2. Enlist the types of tests in biostats
3. Explain the method for animal tissue culture

References:

1. Principles and Practice of Biostatistics: Dr J.V. Dixit

2. Statistical Methods: Snedecor G.W. & Cochran W.G.

3. Statistical Methods: Dixon W.S. and Massey

4. Biostatistics for the Biological and Health Sciences, 2nd Edition by Marc M. Triola, Mario F. Triola, Jason Roy,Published by Pearson Copyright © 2018

5. Biostatistics: Basic Concepts and Methodology for the Health Sciences, 10ed, ISV by Wayne W. Daniel, Wiley Publication

Module III: Blotting techniques and Toxicology

No of Lectures: 10 (1 hour each)

Objectives of Course:-

- To acquaint the students with knowledge on blotting techniques
- To acquaint them with tools of blotting
- To develop scientific temperament in students.
- To impart knowledge of toxicological analysis
- To impart knowledge for acquiring job opportunities.

Syllabus

Sr. No.	Name of topics	Theory (No. of Lectures)
1	Introduction to Blotting	**1**
2	Southern blot	**1**
3	Northern Blot	**1**
4	Western Blot	**1**
5	Dot Blot	**1**
6	Introduction to Toxicology	**1**
7	Parameters of Toxicological Analysis	**2**
8	LC50 LD50 analysis	**1**
9	Application of Toxicology in Research	**1**
Total		**10**

Evaluation Pattern: For each credit the evaluation will be of 25 marks and in the form of continuous assessment and end of course assessment (MCQ test, Assignment/Seminar/Group Discussion). Passing at 40%

Course outcomes: At the end of this course, Students will –

1. Understand basic concepts in blotting and its scope.
2. Learn about toxicological analysis

Reference Books:

1. Southern EM. Detection of specific sequences among DNA fragments separated by gel electrophoresis. *J Mol Biol.* 1975 Nov 5;98(3):503–517. [PubMed] [Google Scholar]

2. Thomas PS. Hybridization of denatured RNA and small DNA fragments transferred to nitrocellulose. *Proc Natl Acad Sci U S A.* 1980 Sep;77(9):5201–5205. [PMC free article] [PubMed] [Google Scholar]

3. Towbin H, Staehelin T, Gordon J. Electrophoretic transfer of proteins from polyacrylamide gels to nitrocellulose sheets: procedure and some applications. *Proc Natl Acad Sci U S A.* 1979 Sep;76(9):4350–4354. [PMC free article] [PubMed] [Google Scholar]

4. Alwine JC, Kemp DJ, Parker BA, Reiser J, Renart J, Stark GR, Wahl GM. Detection of specific RNAs or specific fragments of DNA by fractionation in gels and transfer to diazobenzyloxymethyl paper. *Methods Enzymol.* 1979;68:220–242. [PubMed] [Google Scholar]

5. Bittner M, Kupferer P, Morris CF. Electrophoretic transfer of proteins and nucleic acids from slab gels to diazobenzyloxymethyl cellulose or nitrocellulose sheets. *Anal Biochem.* 1980 Mar 1;102(2):459–471. [PubMed] [Google Scholar]

6. Gershoni JM, Palade GE. Electrophoretic transfer of proteins from sodium dodecyl sulfate-polyacrylamide gels to a positively charged membrane filter. *Anal Biochem.* 1982 Aug;124(2):396–405. [PubMed] [Google Scholar]

7. Towbin H, Gordon J. Immunoblotting and dot immunobinding--current status and outlook. *J Immunol Methods.* 1984 Sep 4;72(2):313–340. [PubMed] [Google Scholar]

8. Botstein D, White RL, Skolnick M, Davis RW. Construction of a genetic linkage map in man using restriction fragment length polymorphisms. *Am J Hum Genet.* 1980 May;32(3):314–331. [PMC free article] [PubMed] [Google Scholar]

9. Hayes JD, Stockman PK. Electrophoresis of proteins and nucleic acids: II--Techniques and applications. *BMJ.* 1989 Oct 7;299(6704):907–910. [PMC free article] [PubMed] [Google Scholar]

10. Kan YW, Dozy AM. Polymorphism of DNA sequence adjacent to human beta-globin structural gene: relationship to sickle mutation. *Proc Natl Acad Sci U S A.* 1978 Nov;75(11):5631–5635. [PMC free article] [PubMed] [Google Scholar]

11. Gusella JF, Wexler NS, Conneally PM, Naylor SL, Anderson MA, Tanzi RE, Watkins PC, Ottina K, Wallace MR, Sakaguchi AY, et al. A polymorphic DNA marker genetically linked to Huntington's disease. *Nature.* 1983 Nov 17;306(5940):234–238. [PubMed] [Google Scholar]

12. Orkin SH. Prenatal diagnosis of hemoglobin disorders by DNA analysis. *Blood.* 1984 Feb;63(2):249–253. [PubMed] [Google Scholar]

13. Reeders ST, Breuning MH, Davies KE, Nicholls RD, Jarman AP, Higgs DR, Pearson PL, Weatherall DJ. A highly polymorphic DNA marker linked to adult

polycystic kidney disease on chromosome 16. *Nature.* 1985 Oct 10;317(6037):542–544. [PubMed] [Google Scholar]

14. White R, Woodward S, Leppert M, O'Connell P, Hoff M, Herbst J, Lalouel JM, Dean M, Vande Woude G. A closely linked genetic marker for cystic fibrosis. *Nature.* 318(6044):382–384. [PubMed] [Google Scholar]

15. Zuckerman AJ, Harrison TJ. Hepatitis B virus chronic liver disease and hepatocellular carcinoma. *Postgrad Med J.* 1987;63 (Suppl 2):13–19. [PMC free article] [PubMed] [Google Scholar]

16. Curt GA, Carney DN, Cowan KH, Jolivet J, Bailey BD, Drake JC, Chien Song KS, Minna JD, Chabner BA. Unstable methotrexate resistance in human small-cell carcinoma associated with double minute chromosomes. *N Engl J Med.* 1983 Jan 27;308(4):199–202. [PubMed] [Google Scholar]

17. Werner A, Staszewski S, Helm EB, Stille W, Weber K, Kurth R. HIV-2 (West Germany, 1984) *Lancet.* 1987 Apr 11;1(8537):868–869. [PubMed] [Google Scholar]

18. Nzilambi N, De Cock KM, Forthal DN, Francis H, Ryder RW, Malebe I, Getchell J, Laga M, Piot P, McCormick JB. The prevalence of infection with human immunodeficiency virus over a 10-year period in rural Zaire. *N Engl J Med.* 1988 Feb 4;318(5):276–279. [PubMed] [Google Scholar]

Module IV: Advanced biostatistics with R Software.
No of Lectures: 10 (1 hour each)

Objectives:

1. To introduce the students to the method for statistical analysis.
2. To Expose them to advances in Statistics
3. To enable Students to make use of Statistical analysis in their project/Research work

Syllabus:

Sr. No.	Topic	Hours
1	• Fundamentals of R: Creating vector using C and Scan function. • Creating a data frame using R command. • Importing CSV /txt/ Excel file using read. table/read.csv command.	1
2	Representing Data Graphically/Diagrammatically using R- Command.	1
3	Measures of Central Tendency and Dispersion Using R. Command	1
4	Introduction to Testing of Hypothesis.	1
5	Testing of hypothesis using : i)Shapiro test (For Checking Normality)	1

	ii)F Test iii) t test iv) Chi-Square test (For Independence of Two Attributes and Goodness of Fit)	
6	Non-Parametric test: i)Kolmogorov-Smirnov Test ii)Sign Test iii) Wilcoxon's Signed Rank Test iv)Mann-Whitney test	1
7	Introduction to Correlation and Computation of Correlation and Interpretation using R command.	1
8	Introduction to Regression, Representation of data using Scatter diagram and computation of Regression and Interpretation using R command.	1
9	Introduction to ANOVA and ANOVA: One way	1
10	ANOVA: Two way	1

Evaluation Pattern: For each credit the evaluation will be of 25 marks and in the form of continuous assessment and end of course assessment (MCQ test, Assignment/Seminar/Group Discussion). Passing at 40%

Course Outcomes: At the end of the credit and course, students should be able to:

1. Explain the need for biostatistics
2. Use some tests of Statistics
3. Understand concept of Regression, Correlation and ANNOVA

References :

1. Principles and Practice of Biostatistics: Dr J.V. Dixit
2. Statistical Methods: Snedecor G.W. & Cochran W.G.
3. Statistical Methods: Dixon W.S. and Massey
4. Biostatistics for the Biological and Health Sciences, 2nd Edition by Marc M. Triola, Mario F. Triola, Jason Roy,Published by Pearson Copyright © 2018
5. Biostatistics: Basic Concepts and Methodology for the Health Sciences, 10ed, ISV by Wayne W. Daniel, Wiley Publication

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