SARDAR PATEL UNIVERSITY
S.Y.B.Sc. – Bioinformatics
(To be effective from June 2003)

Course Structure fro B.Sc. Bioinformatics

Principle Subjects

Bioinformatics	BNF-201
Bioinformatics	BNF-202
Practicals	BNF-203

Allied Subjects

Molecular Biology	MB-201
Molecular Biology	MB-202
Practicals	MB-203

Supporting Subjects

Biostatistics	BS-211
Computer Science	CS-212
Practicals	CS-213

SARDAR PATEL UNIVERSITY
S.Y. B.Sc. (BIOINFORMATICS)
BNF:201 BIOFUNDAMENTALS
(3 credit, 3 periods/week)
(Effective from June 2007)
(Total Marks-120, Internal-40, External-80 marks)

Unit -1 :	**Introduction to Bioinformatics**: Historical overview and applications. Bioinformatics and Internet. Useful databases and websites on bioinformatics. Freeware and shareware softwares. Public and proprietary bioinformatics. Bioinformatics search engines.
Unit -2 :	**Databases (I):** Introduction and types of biological databases, Use of database in biology, NCBI data model. Nucleic acids sequence databank(Genbank,EMBL)
Unit 3 :	**Databases (II):** Protein sequence databank (SwissProt, PIR) Structural databank (PDB, MMDB), Structural classification of protein (CATH, SCOP), and File format for sequence databanks.
Unit – 4 :	**Sequence Analysis:** Pairwise alignment, Local and Global alignment, Gaps and their significance, scoring matrices, similarity and distance(Hamming distance), Edit operations, Significance of sequence alignment, Multiple sequence alignment.
Unit – 5 :	**Tools for sequence analysis**: Tools for pairwise alignment, Tools for Multiple alignment, Tools for database similarity search- BLAST, FASTA. Dynamic programming Algorithm-Needleman and Wunsch, Smith and Watermann.
Unit – 6:	**Protein Analysis** : Protein structure and function, Nature of chemicals bonds, protein motifs and their use in predicting function, Methods for secondary structure prediction.

References:

1. Bioinformatics instant notes- Westhead etal.
2. Introduction to bioinformatics- T.K Attarwood and Parry Smith.
3. Bioinformatics practical guide to analysis of gene and proteins- Andreas D.Baxevainis and Francis Ouellette.
4. Developing Bioinformatics computer skills – Cynthia Gibas.
5. Bioinformatics; Sequence, Structure and Databanks, a practical approach- Des Higgins and Willie Taylor.
6. Introduction to Bioinformatics- Arthur M. Lesk.
7. Bioinformatics : Genes, Proteins & Computer- C,A Orengo.

Sardar Patel University
S.Y.B.Sc. (Bioinformatics)
BNF-202 : Computer Fundamentals
Effective from June – 2003

Three periods per week : **External Marks : 80**
Internal Marks : 40
Total Marks : 120

Unit-I	**Computer Fundamentals** - Computer& its Characteristics - Block diagram of Computer System - CPU execution Cycle - Introduction to hardware and software - I/O devices & Storage devices - Machine level , Assembly level, High level Language - Generations and Classifications of Computer Systems
Unit-II	**Introduction to Operating Systems** - Introduction to Operating System & its functions - Introduction to popular Operating systems like DOS & WINDOWS XX - Directory and files of DOS - Internal commands : dir, cd, md, rd, copy, del / erase, rename, type - External commands : Format, Diskcopy - Introduction of UNIX/LINUX Operating System - Features of UNIX / LINUX - Organization of UNIX - File & Directories in UNIX - Commands of UNIX: login, logout, date, man, who, who am I, LS, pwd, mkdir, rmdir, cd, cat, touch, we, chmod, grep, c, mv, rm, rev, cut, paste, sort, file, file redirection, more, LP, cmp -
Unit-III	**Introduction to Network and Internet** - Concept of networking - Computer network - Advantages and disadvantages of computer - Use of computer networks - Types of computer networks : LAN, MAN, WAN - Topologies of computer networks : Star, Bus, Mesh, Ring, Tree, Hybrid - Introduction to Internet - Define: Internet, Intranet, Extranet - Importance of Internet - Introduction to Browser, WWW, URL, DNS, HTML - E-Mail and its Architecture & Its Services. - Introduction to Search Engine - Introduction to : * Firewall, * Encryption & Decryption (Character Level Encryption method) – Substitution & Transpositional * Introduction to VIRUS/ TROGEN HORSE

Unit-IV	**Basic concepts of Data Manipulation** - Terminology : Data, information, database, database file, record, field, DBMS, primary key, foreign key - Early Information System & its drawback - Advantages & Disadvantages of DBMS - Database Components - Database Organization Data Models like E-R Model, DNM, HDM, RDM with advantages and disadvantages. & example.
Unit-V	**Basic command of Database Management System** - Basic Idea of DBMS - Data Types Supported by Foxpro - **Commands** : Create, use, Clear , Quit, Append, Insert, List Display, Display Structure, Modify Structure, Goto, skip, locate, edit /change, browse, replace, delete, recall, pack, zap, display, status, display memory, ?, ?? , ??? - **File Utilities Command:** dir / display files / directory / list files , rename, erase, copy file, delete file, Run Variable , Store Command, all operators and expressions
Unit-VI	**Advance Features** - set talk, set status, set default, set century, set date, set printer, set alternate, set carry, set unique, set decimal, set path, set mark - Date Functions, String Functions, Numeric Functions - Sort command – Disadvantages of sorting - Introduction to Indexing - Compound index – structural & independent - Advantages of Indexing - Set Indexing, Set Order, ReIndex, Find, Seek - Introduction to Report; • Features of Report • Create Report, Modify report, Report from Commands - Introduction to labels: • Create Label • Modify label • Label from commands

Reference Books

1. Computer Fundamentals by Rajaraman
2. Structured Computer Organization by Tannenbaum
3. UNIX in Nutshell by Yashwant Kanetkar
4. Computer Networks by Andrew S. Tannenbaum
5. DBMS by Arun Majumdar
6. Foxpro 2.5 made simple By R.K.Taxali

Sardar Patel University
S.Y.B.Sc. (Bioinformatics)
BNF-203 : Practicals based on BNF-201 & BNF-202
Effective from June – 2003

Periods per week : 6 **External Marks : 80**
Internal Marks : 40
Total Marks : 120

Part A: Bio Practicals based on BNF- 202

1. Fundamental of bioinformatics
2. NCBI – Its important features (including Pubmed, Entrez, OMIM, Taxanomy)
3. Databases (Important features)
   - GenBank
   - EMBL
   - Swiss Prot
   - PDB
   - SCOP
4. Tools for sequence alignment- Lalign, Dotlet, CLUSTALW(from PIR), BLAST, T-Coffee
5. Predicting secondary stuctuer of Protein. PSI PRED.

Part B: Computer Practicals

1. Study of following Unix/ Linux commands
2. cat, cp, rm, mv, more, lp, file, wc, cmp, ls, grep, date, who etc
3. Browsing the internet and preparing report extracting information from various websites
4. Designing and creating database files for various applications
5. Manipulating the database file (adding/deleting/editing data)
6. Arranging data
7. Searching the required data
8. Preparing reports and labels
9. Practicals based on BNF-201

Sardar Patel University
S.Y.B.Sc. (Bioinformatics)
BS-211 : Biostatistics
Effective from June – 2003

Three periods per week : **External Marks : 80**
Internal Marks : 40
Total Marks : 120

Unit-I	- Variables in biology, collection, classification and tabulation of data - Graphical and diagrammatical representation of various type of data - Measures of central tendency – Mean (AM, GM, HM), Median, Mode, Quantities - Measures of Dispersion – Range, Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of variation, Skewness.
Unit-II	- Bivariate data, correlation, rank correlation and regression for two variables and their properties (without proof) - Principle of least squares - Fitting of polynomials (upto 2^{nd} degree) and exponential curves
Unit-III	- Elements of probability - Probability distributions: Binomials, Poisson and Normal, their means, variances, properties and applications - Fitting of Poisson and Normal Distributions
Unit-IV	- Tests of hypothesis: null and alternative - Two types of errors - Level of significance - Large sample tests for Population proportion, difference between proportion of 2 populations, population mean, difference between means of two populations - Chi-test for independence of 2 attributes in contingency table (upto 3*3), goodness of fit - Small Sample test : t-test for testing for mean of a normal population, difference of means of 2 normal populations
Unit-V	- F-test for testing equality of 2 variances - Use of F-test in analysis of variance for one and two way classifications - Methods of drawing a simple random sample from a finite population - Estimation of population mean and proportion - Determination of sample size (egs only)
Unit-VI	- Meaning and uses of vital statistics - Methods of obtaining vital statistics - Measures of mortality, crude death rate, standardized death rate, direct and indirect methods of standardization - Life table: description and meaning of various columns of a life table and relation between them, central mortality rate, force of mortality - Construction of a life table and assumptions involved in it - Uses of Life Tables

Reference Books:

1. B.K.Mahajan: Methods in Biostatistics
2. P.S.S. Sundar Rao and J. Richard: An Introduction to Biostatistics (third edition)

3. P.K. Gupta : Cytology genetics biotechnology and biostatistics
4. D. C. Sancheti & V. K. Kapoor: Statistics (Theory, methods, application)

Sardar Patel University
S.Y.B.Sc. (Bioinformatics)
CS-212: Programming Concepts for Bioinformatics
Effective from June – 2003

Three periods per week : **External Marks : 80**
Internal Marks : 40
Total Marks : 120

Unit-I	**Office Automation Tools** - Word Processor - Creating, saving, editing, formatting & printing Document - Spreadsheet : creating, saving, editing , formatting and printing worksheet, creating charts - Presentation Software - creating, saving, editing, formatting & printing presentation slides, slide show
Unit-II	**Introduction to Programming** - Algorithm & Flowchart - Introduction to various Programming languages/Packages/ Tools
Unit-III	**Concept of programming and its basic elements** - Program Structure - Variable & Constant - Expression and its Evaluation
Unit-IV	**I/O Statements and Branching** - I/O statements (printf, scanf, gets, puts, ptec, putc etc) - If-else - Switch statement
Unit-V	**Array & Iteration** - Array - For loop - Do-while loop - While loop
Unit-VI	**Function & Structure** - Function - Structure

Reference Books :

1. let us C by Y.P.Kanetkar
2. ANSI C by Balaguruswamy
3. PC Software Made simple by Taxali

Sardar Patel University
S.Y.B.Sc. (Bioinformatics)
CS-213 : Practicals based on CS-212 and BS-211
Effective from June – 2003

6 Hours per week : **External Marks : 80**
Internal Marks : 40
Total Marks : 120

Following is the partial list of programs that should be done under this course

1. Chi-square analysis
2. Practical on Histogram, Frequency, Polygon, Frequency Curve
3. T-test
4. F-test
5. Measure of central tendency
6. Measure of Dispersion
7. Z-test
8. Fitting of Polynomials
9. Regression Analysis
10. CDR & SDR
11. To find maximum/minimum from 3 nos.
12. Find simple interest or compound interest according to code.
13. Read 3 sides of a triangle and print whether it will form a triangle or not.
14. Find solution of a quadratic equation.
15. To accept an upper case character through keyboard and print it's equivalent lowercase character.
16. Find out N!
17. Find out Maximum/ minimum from N numbers.
18. Find whether given number is prime or not.
19. Sum of N terms of Fibonacci series.
20. Write a program to print the Prime +Fibo Numebr
21. Find out Sum of a integer number.
22. To print the Armstrong numbers
23. Write a program to reverse the number of inputed number.
24. Read a number. Check it is palindrome or not.
25. Read two integer numbers and find multiplication without * operator
26. Find out value of ${}^{n}C_{r}$
27. Check whether inputed number is binary or not.
28. Write a program to find the decimal to binary of given number.
29. Read a decimal number and convert it to its equivalent binary and octal number.
30. Read an octal number and find out its equivalent decimal number.
31. Read 2 binary numbers and find out its sum.
32. Write a program to find decimal to hexa of a given number
33. Write a program to find sum of given digits of a number
34. Find out sum of given 3 numbers using ternary operator
35. Find out sum of positive numbers upto 1000 which are divisible by 5 and 7.

Sum of following series

36. Sum = 1!- 2!+3!-4!+.....upto N terms.
37. Sum = 12+32+52+72+….. upto N terms
38. Sum = X-X3/3!+X5/5!-X7/7!+…upto N terms
39. Sum = 1+1+2+3+5+8+13+…… upto N terms
40. Read N real number, store them in array and print the array in reverse order.
41. Read a number and check whether it is present in array or not.
42. Read N numbers, store them in array. Interchange 1st and Nth, 2nd and (N-1)th … Print original and new array.
43. Find sum and product of two one dimensional array of N elements.
44. Read N observations of X and Y discrete data. Find and print Mean, Mode, Median, Standard deviation and coefficient of variance for each set and at the end also print which set is consistent.
45. Arrange and print elements of an array in ascending order.
46. Find and print total no. of zeroes, negative and positive number of an array of N elements.
47. Find out the difference between maximum and minimum number of an array of N elements.
48. Find out the frequency of each number from an array of N numbers.
49. Read N observations , number of classes , find and print frequency table, Mean, Median, Mode , Standard deviation and Coefficient of variance.
50. Find maximum and minimum of a matrix M*N. Interchange them, print original and new matrix.
51. Read a matrix of order M*N Check it is identity or not.
52. Find out trace of matrix.
53. Transpose, addition, multiplication of matrices.
54. Read length, breadth of a rectangle. Also read process code. If process code is equal to one then print out area of rectangle and if process code is 2 print out perimeter of rectangle.
55. Read length, breadth of a rectangle. Also read process code. If process code is equal to one then print out area of rectangle and if process code is 2 print out perimeter of rectangle else print the information “You have enter invalid process code”.
56. Read following information of SYBSc. Student of Sardar Patel University 1) Roll No. 2) Marks of CS-201, 3) Marks of CS-202, 4)Marks of CS-203. Then print Roll no, Marks of CS-201,CS-202, CS-203, Total Marks obtained by the student, percentage and result. If the student passes in all 3 papers then declare result as pass, else declare result as fail. Maximum marks of each paper is 120. Passing standard for each paper is 35%.
57. Read the following information of salesman. A) Salesman No. , b) Total sale amount. Calculate the commission using following rules. If the total amount is upto 1000 then commission is 10% of total amount sold. If total amount is upto 2000 then commission is 15% of total amount sold. If total amount is upto 3000 then commission is 20% of the total amount sold and else 25%.
58. Read the following information for N fix depositors of the bank of baroda, anand branch. A)Depositor No., b) Amount, c) No. of year. Calculate simple interest using the following rules.
    If No. of Years = 1, rate of interest = 13%
    If No. of Years = 2 rate of interest = 13.5%
    If No. of Years = 3rate of interest = 14%
    If No. of Years = 4 rate of interest = 14.5%

If No. of Years = 5 rate of interest = 15%

59. Read a integer no. N. Display the menu on the screen as follows.
    MENU
    For finding N!.
    For finding N is odd / even.
    For finding sum of first N integers.
    End
    Enter your choice: (1 – 4)
    Write a program and procedure according to given choice.
60. Maintain structure of students of class using structures
61. GCD
62. Factorial
63. Fibonacci series
64. MS OFFICE
    (MS-WORD,MSEXCEL, MS-POWERPOINT)