Vels University, Pallavaram, Chennai 600 117

School of Life Sciences
Departmet of Bioinformatics

B.Sc. BIOCOMPUTING

PROGRAM OUTCOME:

Science graduates develop a range of skills and attributes with the capability in applying the knowledge at different situations

PO-1: Students understand the nature, practice and apply the science knowledge acquired in at least one specialized area of science in an advanced level.

PO-2: Students acquire disciplines from personality development to individuality in their career option.

PO-3: Effective communication would be developed in both oral and visual presentations as well as basic mannerism in behavior with the society would be developed.

PO-4: Capable to collect, organize, analyze and interpret data in a meaningful way and potentiality to develop an efficient and quantitative literacy.

PO-5: Proficient in using a range of sources in order to attain the desired information and be clever in evaluating the quality of information obtained to enhance the work.

PO-6: Critical thinking of a student would be developed and their intelligence quotient (IQ) will be expanded therefore to apply the acquired knowledge in analyzing, facing challenges posed and even to find effective solutions.

PO-7: Awareness in regard to ethical, social, occupational, health and safety issues will be developed and build up a strong intellect in appreciating the role of science in society.

PO-8: Skills for self-esteem in their own performance and managing ability to carry out a task in collaborations, in individual efficiency as well as in team.

BSC BIOCOMPUTING

Program Specific Outcome

PSO-1: The primary goal is to make the students to understand biological concepts.

PSO-2: To acquire knowledge on the basics of computer and the principles of programming languages.

PSO-3: To understand the levels of programming language and its application in various fields of biology.

PSO-4: To be well versed in handling the biological data from the different database available online at present.

PSO-5: To obtain the knowledge on basics in designing the webpage for a database as well as online tools and softwares.

PSO-6: To gain a sound knowledge on the application of computer techniques in the field of chemistry, plants, microbes, etc.

PSO-7: To implement the computer programming knowledge in the design and maintenance of database to utilize the complex form of biological data in a simpler format.

PSO-8: To utilize the bioinformatics skill to venture in development of fields like pharmaceutical and biotechnological concerns.

Department of Bioinformatics

Board of Studies Members

B.Sc Biocomputing

S.No	Name	Post	Contact address	Designation
1.	Dr.Radha Mahendran	Associate Professor/ Head Dept of Bioinformatics	VISTAS P.V. Vaithiyalingam Road Pallavaram Chennai - 600 117 Mobile no: 09003237145	Chairman
2.	Mrs. Suganya.J	Asst Professor/ Dept of Bioinformatics	VISTAS P.V. Vaithiyalingam Road Pallavaram Chennai - 600 117 Mobile no: 09042112221	Internal Members
3.	Dr. M.N Ponnusamy	Emeritus professor, Dept of Crystallography and biophysics	University of Madras, Guindy Campus, Chennai 600 025 Phone: 044 – 22300122 Email: mspy@hotmail.com	External expert
4.	Dr.J.Senthil Kumar	Associate Professor Dept of computer science	D.B. Jain College. Thoraipakkam, Chennai – 600 119	External expert

B.Sc.

BIOCOMPUTING

Curriculum and Syllabus

(Based on Choice Based Credit System)

Effective from the Academic year

2015-2016

Department of Bioinformatics

School of Life Sciences

BSC BIOCOMPUTING

CURRICULUM

Total No of Credits: 140

SEMESTER I						
Category	**Code**	**Title of the Course**	**Hours / Week**			**Credit**
			Lecture	**Tutorial**	**Practical**	
AECC		LANGUAGE I (TAMIL / HINDI / FRENCH)	5	0	0	4
Core	15LEN001	FOUNDATION COURSE ENGLISH I	5	0	0	4
Core	15BBI001	FUNDAMENTALS OF COMPUTERS AND STATISTICAL ANALYSIS	6	0	0	4
Core	15BBI002	BASIC CONCEPTS IN COMPUTER – PRACTICAL	0	0	4	2
DSE	----------	DISCIPLINE SPECIFIC ELECTIVE I	6	0	0	4
DSE	----------	DISCIPLINE SPECIFIC ELECTIVE II	0	0	4	2
		Total	**22**	**0**	**8**	**20**

SEMESTER II						
Category	**Code**	**Title of the Course**	**Hours / Week**			**Credit**
			Lecture	**Tutorial**	**Practical**	
AECC		LANGUAGE II (TAMIL / HINDI / FRENCH)	5	0	0	4
Core	15LEN002	FOUNDATION COURSE ENGLISH II	5	0	0	4
Core	15BBI003	PROGRAMMING IN C	5	0	0	4
Core	15BBI004	PROGRAMMING IN C – PRACTICAL	0	0	4	2
DSE	----------	DISCIPLINE SPECIFIC ELECTIVE III	5	0	0	4
DSE	----------	DISCIPLINE SPECIFIC ELECTIVE IV	0	0	4	2
SEC	----------	SKILL ENHANCEMENT COURSE I	2	0	0	2
		Total	**22**	**0**	**8**	**22**

SEMESTER III						
Category	**Code**	**Title of the Course**	**Hours / Week**			**Credit**
			Lecture	**Tutorial**	**Practical**	
AECC		LANGUAGE I (TAMIL / HINDI / FRENCH)	5	0	0	4
Core	15LEN003	FOUNDATION COURSE ENGLISH III	5	0	0	4
Core	15BBI005	PROGRAMMING WITH C++ AND DATA STRUCTURE	4	0	0	4
Core	15BBI006	PROGRAMMING WITH C++ AND DATA STRUCTURE – PRACTICAL	0	0	3	2
Core	15BBI007	COMPUTER NETWORKS	3	0	0	3
DSE	----------	DISCIPLINE SPECIFIC ELECTIVE V	4	0	0	4
DSE	----------	DISCIPLINE SPECIFIC ELECTIVE VI	0	0	4	2
GE	----------	GENERIC ELECTIVE I	2	0	0	2
		Total	**23**	**0**	**7**	**25**

SEMESTER IV						
Category	**Code**	**Title of the Course**	**Hours / Week**			**Credit**
			Lecture	**Tutorial**	**Practical**	
AECC		LANGUAGE IV (TAMIL / HINDI / FRENCH)	5	0	0	4
AECC	15EVS201	ENVIRONMENTAL STUDIES	2	0	0	2
Core	15LEN004	FOUNDATION COURSE ENGLISH IV	5	0	0	4
Core	15BBI008	PROGRAMMING WITH VISUAL BASIC AND RDBMS	3	0	0	3
Core	15BBI009	PROGRAMMING WITH VISUAL BASIC AND RDBMS – PRACTICAL	0	0	2	1
Core	15BBI010	OPERATING SYSTEMS	3	0	0	3
DSE	----------	DISCIPLINE SPECIFIC ELECTIVE VII	4	0	0	4
DSE	----------	DISCIPLINE SPECIFIC ELECTIVE VIII	0	0	4	2
GE	----------	GENERIC ELECTIVE II	2	0	0	2
		Total	**24**	**0**	**6**	**25**

SEMESTER V						
Category	**Code**	**Title of the Course**	**Hours / Week**			**Credit**
			Lecture	**Tutorial**	**Practical**	
Core	15BBI011	PROGRAMMING WITH JAVA	5	0	0	4
Core	15BBI012	PROGRAMMING WITH JAVA – PRACTICAL	0	0	3	2
Core	15BBI013	INTRODUCTION TO PERL, BIOPERL AND CGI	3	0	0	3
Core	15BBI014	INTRODUCTION TO PERL, BIOPERL AND CGI – PRACTICAL	0	0	3	2
Core	15BBI015	INTRODUCTION TO BIOINFORMATICS ALGORITHMS	5	0	0	4
Core	15BBI016	INTRODUCTION TO BIOINFORMATICS – PRACTICAL	0	0	3	2
Core	15BBI017	GENOMICS AND PROTEOMICS	4	0	0	3
GE	----------	GENERIC ELECTIVE III	2	0	0	2
SEC	----------	SKILL ENHANCEMENT COURSE II	2	0	0	2
		Total	**21**	**0**	**9**	**24**

SEMESTER VI						
Category	**Code**	**Title of the Course**	**Hours / Week**			**Credit**
			Lecture	**Tutorial**	**Practical**	
Core	15BBI018	PYTHON FOR BIOINFORMATICS	4	0	0	4
Core	15BBI019	PYTHON FOR BIOINFORMATICS – PRACTICAL	0	0	3	2
Core	15BBI020	MOLECULAR BIOLOGY DATABASES	4	0	0	3
Core	15BBI021	SEQUENCE ANALYSIS – PRACTICAL	0	0	3	2
Core	15BBI022	INTRODUCTION TO MEDICAL TRANSCRIPTION AND CODING	4	0	0	3
Core	15BBI023	ENZYMES AND METABOLISM	3	0	0	3
Core	15BBI024	BIODIVERSITY BASICS	3	0	0	3
Core	15BBI025	PROJECT WORK	0	0	4	2
GE	----------	GENERIC ELECTIVE IV	2	0	0	2
		Total	**20**	**0**	**10**	**24**

DISCIPLINE SPECIFIC ELECTIVES

1. 15BBI101 FUNDAMENTALS OF MOLECULAR CELL BIOLOGY AND BIOCHEMISTRY
2. 15BBI102 ALLIED BIOCHEMISTRY PRACTICAL
3. 15BBI103 MICROBIOLOGY AND IMMUNOLOGY
4. 15BBI104 INTRODUCTION TO MICROBIALINFORMATICS – PRACTICAL
5. 15BBI105 FUNDAMENTALS OF PLANT BIOINFORMATICS
6. 15BBI106 PLANT BIOINFORMATICS TECHNIQUES – PRACTICAL
7. 15BBI107 CHEMINFORMATICS
8. 15BBI108 CHEMINFORMATICS - PRACTICAL
9. 15BBI109 ALLIED MATHEMATICS
10. 15BBI110 MATHEMATICS FOR BIOINFORMATICS
11. 15BBI111 VIROLOGY
12. 15BBI112 BIOPHYSICAL CHEMISTRY
13. 15BBI113 CLOUD COMPUTING BASICS
14. 15BBI114 RECOMBINANT DNA TECHNOLOGY
15. 15BBI115 DATA WAREHOUSING AND DATA MINING

ABILITY ENHANCEMENT COMPULSORY COURSES

1. 15LTA001 TAMIL I
2. 15LTA002 TAMIL II
3. 15LTA003 TAMIL III
4. 15LTA004 TAMIL IV
5. 15LHN001 HINDI I
6. 15LHN002 HINDI II
7. 15LHN003 HINDI III
8. 15LHN004 HINDI IV
9. 15LFR001 FRENCH I
10. 15LFR002 FRENCH II
11. 15LFR003 FRENCH III
12. 15LFR004 FRENCH IV

GENERIC ELECTIVES

1. 15BBI151 INTRODUCTION TO BIOINFORMATICS
2. 15BBI152 CHEMINFORMATICS
3. 15BBI153 MOLECULAR MODELING AND DRUG DESIGNING
4. 15BBI154 STRUCTURAL BIOINFORMATICS
5. 15BBI155 PROGRAMMING IN PERL AND BIOPERL
6. 15BBI156 PYTHON FOR BIOINFORMATICS

SKILL ENHANCEMENT COURSES

1. 15NSS255 NSS PAPER 1
2. 15NSS256 NSS PAPER 2
3. 15NSS257 NSS PAPER 3
4. 15NSS258 NSS PAPER 4
5. 15NSS259 NSS PAPER 5
6. 15NSS260 NSS PAPER 6
7. 15BPD251 PERSONALITY DEVELOPMENT PAPER I

SYLLABUS

15BBI001 Fundamentals of Computers and Statistical Analysis 6 0 0 4

Course Outcome

CO-1: To gain basic knowledge on history of computers and generations.

CO-2: To know the basic parts of computers and its uses.

CO-3:To acquire the basics of computer hardware, software and operating systems.

CO-4: To understand the usage of internet, e-mail and Microsoft utilities.

CO-5:To understand the concepts of statistics in the data collection, maintenance and interpretation.

CO-6: To understand the role of questionnaire and the techniques to be followed in the field of data management.

CO-7: To gain information about the classification of data and its importance.

CO-8: To understand the usage of various representations of data includes diagrammatic and tabular form.

CO-9: To be well versed with the mathematical derivations of mean and average.

CO-10: To acquire knowledge on computing the median, mode and deviation.

UNIT I INTRODUCTION TO COMPUTERS 10

History of computer - Computer Generations, Types of computer, Computer components – CPU – I/P Devices and O/P devices, Functionalities of a Computer, Advantages and disadvantages, Applications of computer. Memory and memory types RAM and RAM types, ROM and ROM types, Mother Board, Memory Units, Ports,

UNIT II COMPUTER HARDWARE AND SOFTWARE 12

Hardware – Types – Working methods, Software – System software and application software (MS Word, Excel and PowerPoint), Operating system, Example of Operating System. Microsoft Word , Microsoft Excel, Microsoft PowerPoint , Introduction to Internet, Working of Internet, Internet Services, Internet addressing, E-Mail Basics- Web Development Tools, Introduction TO HTML

UNIT III INTRODUCTION TO STATISTICS 18

Statistical method- Definition and Limitations of Statistics, Misuses. Collection of Data- Purpose of Inquiry, Scope of Inquiry, Sources of information, Sources of Secondary Data, Collection of Primary Data, Direct Personal Investigation, Information through correspondents, Questionnaire by Mail, schedule sent through Investigators, Techniques to be followed by Field Investigators, Precautions for preparing Questionnaire, Statistical unit, Standard of Accuracy, Sample Questionnaire.

UNIT IV STATISTICAL CLASSIFICATION 15

Classification- Quantitative Classification, Geographical Classification, Chronological Classification ,Tabulation, Frequency, Distribution, Diagrammatic Representation- Bar diagram, Percentage Bar Diagram, Pie Diagram, Pictogram, Graphical representation, Frequency curve , Cumulative Frequency (Ogive), Ogive,Lorenz Curve.

UNIT V MEAN, MEDIAN AND MODE 20

Measures of Averages- Introduction, Arithmetic Mean, Weighted Arithmetic Mean, Formula for calculating AM in a frequency distribution, Properties of AM, Combined Mean, Geometric Mean Harmonic Mean , Merits and Demerits of AM, GM, HM, Median, Quartiles and Deciles, Mode , Its Merits and Demerits- mean, Median & Mode. Measures of Dispersion Introduction, Range, Its Merits and Demerits , Quartile Deviation , Its Merits and Demerits , Mean Deviation , Definition, Relative Measures, Its Merits and Demerits, standard Deviation, Formula for calculating SD , Merits and Demerits of SD, Relative Measure , combined Mean and SD

Total: 75 Hours

Text Books:

1. Anita Goel, "Computer Fundamentals", Pearson Education India, 2010
2. P.R.Vittal., "Mathematical Statistics", Margham Publication 3 edition, 2012

References:

1. Sanghera Kamaljeet, "Fundamentals of Computing", Kendall Hunt Publishing Company, 2007
2. Introduction To Computers And Information Technology By Anurag Seetha, Ram Prasad, McGraw Hill 2011
3. S.K.Basandra, "Computers Today", Galgotia Publications, 2006
4. Alexis Leon & Mathews Leon, "Fundamentals Of Information Technology", Vikas Publishing House, New Delhi, 2009.

15BBI002 BASIC CONCEPTS IN COMPUTER - PRACTICAL 0 0 4 2

Course Outcome

CO-1: To gain basic practical knowledge on computers.

CO-2: To know the basics of operating systems and browsers.

CO-3: To understand the mode of surfing internet and search engines options.

CO-4: To understand the usage of email and the various options.

CO-5: To know the steps of windows installation and error debugging.

CO-6: To understand the basics of word processing by knowing notepad and MS word options.

CO-7: To gain information on spreadsheet applications using MS Excel.

CO-8: To understand the usage of MS PowerPoint and its usage in presentation.

CO-9: To be well versed with the web page creation using HTML.

CO-10: To acquire knowledge on dynamic web page creation by using advance tags of HTML.

1. **Hands-On experience:** - Regular Usage – Utilities of Windows (XP) – Browsers (I.E., Chrome, Mozilla Firefox) – Surfing the Internet – Search Engines – E-Mail (Sending and Receiving mail,attaching folders on mail) **5**
2. **Downloading and installing software/plug-ins on Windows** – Searching / Surfing on the WWW. **5**
3. **Word Processing (Notepad and MS Word)** **10**
    - Creating, Saving & Opening a document
    - Editing, Inserting, Deleting, Formatting, Moving & Copying Text
    - Find & Replace, Spell Checker & Grammar Checker (Thesaurus), Document Enhancement (Borders, Shading, Header, Footer), Printing document (page layout, Margins)
    - Introduction to the use of Wizards & Templates, Working with Graphics (Word Art), working with Tables & Charts, Inserting pictures and files.

4. **Spreadsheet Applications (MS Excel)** **15**
    - Worksheet Basics - Entering information in a worksheet, Saving & Opening a worksheet, Editing, Copying & Moving data, Inserting, Deleting & Moving Columns & Rows, Clearing Cells & Formatting cells
    - Working with workbooks, Working with formulae and functions, Printing worksheets
    - An introduction to the use of advanced spreadsheet concepts, sorting records, Finding records, Adding & Deleting records, Filtering records in a worksheet.
    - Working with Macros, Creating and using multiple worksheets.
5. **Presentation Applications (MS PowerPoint)** **10**
    - Creation of slides, Rapid Presentation design using wizards
    - Inserting graphs & charts Action buttons
    - Transitions, Build and Animation effects.
6. **HTML BASICS** **15**

- Creating Sample HTML page using **Editors, Basic, Elements, Attributes, Headings and Paragraphs.** Creating Sample HTML page using **Styles, Formatting, Quotations and Comments.** Creating Sample HTML page using **Links, Images, Tables and Lists.**

Total: 60Hours

Text Book:

Anita Goel, "Computer Fundamentals", Pearson Education India, 2010

Reference Books:

1. Sanghera Kamaljeet - Fundamentals of Computing –. Kendall Hunt Publishing Company, 2007
2. Introduction To Computers And Information Technology By Anurag Seetha, Ram Prasad , McGraw Hill 2011.

15BBI003 PROGRAMMING IN C 5 0 0 4

Course Outcome

CO-1: To understand the fundamentals of C programming.

CO-2: To understand the basic terminology used in computer programming.

CO-3: To write, compile and debug programs in C language.

CO-4: To use different data types in a computer program.

CO-5: To design programs involving decision structures, loops and functions.

CO-6: To choose the loops and decision making statements to solve the problem.

CO-7: To implement different Operations on arrays.

CO-8: To use functions to solve the given problem and to understand the dynamics of memoryby the use of pointers.

CO - 9: To understand pointers, structures and unions.

CO -10:To use different data structures and create/update basic data files.

UNIT I FUNDAMENTALS OF C 10

Introduction:History of C Language, C Programming structures and building blocks. Fundamentals:Character set, Tokens, Keywords, Identifiers, Data Types - Integer, float, character and double, Variables , Constant, Comments – Single line comment and multiline comment.

UNIT II` INTRODUCTION TO PROGRAMMING 15

Operators and Build in Functions:Arithmetic, Unary, Relational and logical, Assignment and Conditional Operators, precedence and Associative - Library functions - Data input and output functions. Writing C Programs:Declarations - Expressions – Statements - Simple C programs

UNIT III CONTROL STRUCTURES 15

Control Structures:Flow of control –Decision making, loop control - if, if-else, while, do-while, for loop, Nested control structures – switch, break and continue, go to statements – comma operator. Solving Problems:Problem solving concepts and techniques - Steps in problem solving - Algorithms and flowcharts – Examples.

UNIT IV FUNCTIONS, ARRAYS, STRUCTURES AND UNIONS 20

Functions:Basic types of function, Declaration and definition, Function call, Types of function, Parameter passing, Call by value, Call by reference, Scope of variable, Storage classes, Recursion. Arrays:Arrays- Defining and processing- Passing arrays to functions- Multi Dimensional Arrays- Arrays and Strings. Structures and Unions:User Defined data types- Passing structures to functions- Unions- Bit wise operations.

UNIT V POINTERS AND FILES 15

Pointers:Declarations, Pointer Variables, Passing Pointers to functions- Operation on Pointers- Pointer and Arrays- Arrays of Pointers- Pointer Structures. Files:File Input / Output - Creating, Reading and Writing files, processing, opening and closing file data.

Total: 75Hours

Text Book:

E. Balagurusamy, Programming in ANSI C, 6th Edition, Tata Mc-Graw Hill, 2015.

References:

1. Kanetkar Y., Let us C, BPB Publication, New Delhi, 1999.
2. H. Schildt, C: The Complete Reference, 4th Edition, TMH Edition, 2000
3. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education, 2006

15BBI004 PROGRAMMING IN C - PRACTICAL 0 0 4 2

Course Outcome

CO-1: To understand computer programming and its roles in problem solving.

CO-2: To understand and develop well-structured programs using C language.

CO-3: To learn the basic data structures through its implementation in C language.

CO-4: Problem solving through computer programming and to understand the basic terminology used in computer programming.

CO-5: To implement different Operations on arrays.

CO-6: To familiarity of programming environment in Linux/Ubuntu operating system.

CO-7: Ability to use different memory allocation methods and to deal with different input/output methods.

CO-8: Ability to use different data structures.

CO-9: To use functions to solve the given problem.

CO-10: To understand the dynamics of memory by the use of pointers.

1. **Simple Arithmetic Calculation** **7**
    a) Program to demonstrate the Simple Arithmetic Calculation
    b) Program to find the Simple Interest
2. **If Control** **7**
    a) Program to find even/odd number and leap year using ‘if’ and ‘if else’
    b) Program to find the digit of given number using ‘else-if ladder’.
3. **While and Do While** **7**
    a) Program to find the factorial value of given number using while.
    b) Program to find the Fibonacci series for given number using do-while.

4. **Arrays and For control** **7**
    a) Program to find the number of alphabets in given word sequence.
    b) Program to find the frequency of Nucleotides in given DNA sequence.
    c) Program to find the G-C content value of given DNA sequence.
5. **Switch and Functions** **7**
    a) Program to find the complement and reverse complement of given DNA sequence using functions.
    b) Program to find the Amino Acid to the given DNA codon using switch statement.
6. **Structures and Unions:** **7**
    a) Program to create student data using Structures/Unions.
    b) Program to create ‘cm – feet’ converter using Structures/Unions.
    c) Program to concatenate the two DNA sequences using Structures/Unions.
7. **Pointers:** **9**
    a) Arithmetic operations using pointers.
    b) Adding two 2 X 2 matrices using pointers.
8. **Files:** **9**
    a) Sample Program to read and write an external file.
    b) Retrieve the Nucleotide sequence from GenBank and convert the retrieved sequence into protein sequence.

Total: 60 Hours

Text Book:

E. Balagurusamy, Programming in ANSI C, 6th Edition, Tata Mc-Graw Hill, 2015.

References:

1. Kanetkar Y., Let us C, BPB Publication, New Delhi, 1999.
2. H. Schildt, C: The Complete Reference, 4th Edition, TMH Edition, 2000
3. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education, 2006

15BBI005 PROGRAMMING WITH C++ AND DATA STRUCTURE 4 0 0 4

Course Outcome

CO-1: To gain a better understanding of Object Oriented design and program implementation using OOPS language features.

CO-2: To be able to develop, design and implement simple computer programs.

CO-3: To understand the functions and parameter passing.

CO-4: To be able to understand the difference between object oriented programming and procedural oriented language and data types in C++.

CO-5: To familiarize the students with language environment.

CO-6: To understand the features of C++ supporting object oriented programming.

CO-7: To understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism.

CO-8: To understand the relative merits of C++ as an object oriented programming language.

CO-9: To design, introduce and develop various techniques for representation of data in the real world.

CO-10: To course may serve as a foundation for further studies in Computer Science.

UNIT I INTRODUCTION TO C++ 10

Introduction: Basic Elements of C++ Programming, I/O Streams. Control Structures: Control and Looping Statements. Functions: Function Prototyping, Call and Return by Reference, Inline Function, Default and Const Arguments, Function Overloading, Arrays.

UNIT II OBJECT ORIENTED METHODOLOGY 10

Object Oriented Methodology: Basic Concepts/Characteristics of OOP. Advantages and Application of OOPs, Procedural Programming Vs OOP. Classes and Objects: Specifying a Class, Creating Objects, Private & Public Data Members and Member Functions, Defining Inline Member Functions, Static Data Members and Member Functions. Arrays within Class, Arrays of Objects.

UNIT III CONSTRUCTORSAND OPERATOR OVERLOADING 15

Constructors and Destructors: Introduction Parameterized Constructors, Multiple Constructors in A Class, Constructors With Default Arguments, Dynamic Initialization of Objects, Copy Constructors, Dynamic Constructors, Const Objects, and Destructors. **Operators Overloading:** Definition, Unary and Binary Overloading, Rules for Operator Overloading.

UNIT IV INHERITANCE AND FILES 10

Inheritance: Defining Derived Classes, Types of Inheritance, Constructors and Destructors in Derived Classes. **Files:** Opening, Closing a File, File Modes, File Pointers and their Manipulation. Updating a File, Random Access, and Error Handling During File Operations, Command Line Arguments.

UNIT V DATA STRUCTURES 15

Introduction to Stacks and Queues **Linked List:** Single Linked List – Insertion, Searching, Deletion, Traversing the list; Double Linked List – Insertion, Deletion. **Binary Search Tree:** Insertion, Searching, Deletion, Finding parent of a given node, reference to a node, finding smallest and largest values in the binary search tree. **Heap:** Insertion, Deletion, Searching and Traversal **Queues:** Standard Queue, Priority Queue and Double Ended Queue. **Sorting:** Bubble sort, Quick sort and Insertion Sort.

Total: 60Hours

Text Book:

1. E Balagurusamy, "Object Oriented Programming with C++ ", 6th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2013

Reference:

1. K.R.Venugopal, Rajkumar, T. Ravishankar, "Mastering C++", Tata McGraw Hill, New Delhi, 1999: 25th Reprint, 2006
2. D. Ravichandran, "Programming with C++", Third Edition, Tata McGraw Hill, 2010.
3. Horowitz, Sahni & Mehta, "Fundamentals of Data Structures in C++", 2nd Edition, Silicon Press, 2006

15BBI006 Programming With C++ And Data Structure – Practical 0 0 3

Course Outcome

CO-1: To apply C++ features to program design and implementation.

CO-2: Explain object-oriented concepts and describe how they are supported by C++.

CO-3: To use C++ to demonstrate practical experience in developing object-oriented solutions.

CO-4: To design and implement programs using C++.

CO-5: To analyze problem description.

CO-6:To design and build object-oriented software using good coding practices and techniques.

CO-7: To implement an achievable practical application.

CO-8: To analyze issues related to object-oriented techniques in the C++ programming language.

CO-9: To use common software patterns in object-oriented design for problem solving.

CO-10: To recognize their applicability to other software development contexts.

1. Program to implement classes; create object and member functions. **5**
2. Program to implement the concept of function overloading. **5**
3. Program to implement the concept of Operator overloading. **5**
4. Program to implement the concept of Inheritance. **5**
5. Program to implement file handling concepts. **5**
6. Implement PUSH, POP operations of stack using Arrays. **4**
7. Implement add, delete operations of a queue using Arrays. **4**
8. Creation, insertion, and deletion in singly linked list. **4**
9. Binary Search tree traversals using Recursion. **4**
10. Sorting-Quick sorting. **4**

Total: 45Hours

Text Book:

E Balagurusamy, "Object Oriented Programming with C++ ", 6th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2013.

Reference:

1. K.R.Venugopal, Rajkumar, T. Ravishankar, "Mastering C++", Tata McGraw Hill, New Delhi, 1999: 25th Reprint, 2006
2. D. Ravichandran, "Programming with C++", Third Edition, Tata McGraw Hill, 2010.
3. Horowitz, Sahni & Mehta, "Fundamentals of Data Structures in C++", 2nd Edition, Silicon Press, 2006

15BBI007 COMPUTER NETWORKS 3 0 0 3

Course Outcome

CO-1: To acquire sound knowledge on computer networks and role of LAN, WAN and MAN.

CO-2: To understand the basics of Internet, Ethernet and reference models.

CO-3: To know the basics in communication media and also the role of computer networks in communication.

CO-4: To acquire knowledge on the working principle of communication satellite and telephone.

CO-5: To understand the application of computer networks in the data link layer of vast communication.

CO - 6: To understand the architecture of various protocol in data link layer.

CO - 7: To acquire the knowledge on network layer and its uses.

CO - 8: To understand the transport layer and its importance.

CO - 9: To be well versed with the application layer and uses of networks. .

CO - 10: To acquire knowledge on accessing the e-mail and websites.

UNIT I INTRODUCTION TO COMPUTER NETWORKS 8

Introduction: Computer Networks Definition, advantages of computer networks, Client and Server, Network hardware and software, LAN, WAN, MAN. Reference Models: OSI and TCP/IP Models. Example Networks: Internet, ATM, Ethernet and Wireless LANs.

UNIT II COMMUNICATION MEDIA 8

Communication Media: Definitions, Data communications and Networking, Theoretical basis for data communication, guided transmission media, Wireless transmission, Communication Satellites. Telephones structure: Definition, local loop, trunks and multiplexing, switching.

UNIT III DATA LINK LAYER 10

Data Link Layer: Logical Link Control, Media Access Control, Services of DLL – framing – flow control – error control – Error detection codes – Error correction codes – Multi Access. DLL Protocol: – Stop and Wait protocol –sliding window protocol - DLL in the internet.

UNIT IV NETWORK LAYER 10

Network Layer: Services of network layer - routing – shortest path routing - Network layer in the internet – IP protocol –IP address – subnets – internet control protocol. Transportation Layer: services of transportation layer – addressing – flow control – buffering –Multiplexing.

UNIT V APPLICATION LAYER 9

Application layer: Definition, Application Data and Information, Application Layer Protocols, DNS – name space – resource – records – name Servers - Email – architecture and services – user agent – message Format and transfer. WWW client and Server sides – locating information on the web.

Total: 45 Hours

Text Book:

Andrew S. Tanenbaum, “Computer Networks”, Fourth Edition, Pearson Education, 2003.

Reference Books:

1. Behrouz A Forousan, “Computer Networks: A Top Down Approach”, Tata McGraw Hill, 2012.
2. Larry L. Peterson, “Computer Networks: A System Approach”, Morgan Kaufmann Publications, 2010
3. Andrew S. Tanenbaum, “Computer Networks”, Third Edition, Eastern Economy Publication, 1996

15BBI008PROGRAMMING WITH VISUAL BASIC AND RDBMS 3 0 0 3

Course Outcome

CO-1: To demonstrate fundamental skills in utilizing the tools of a visual environment in terms of the set of available command menus and toolbars.

CO-2: To explain and use of delegates and events for producing event-driven application.

CO-3: To apply visual programming knowledge for software development by designing projects with menus and submenus.

CO-4: To use visual programming environment to create simple visual applications.

CO-5: To describe basic concepts of database system.

CO-6: To design a data model and schemas in RDBMS.

CO-7: To use RDBMS's for developing industry applications.

CO-8: To be competent in use of Structured Query Language (SQL).

CO-9: To analyze functional dependencies for designing a robust database.

CO-10: To implement transactions, concurrency control and be able to do database recovery and query optimization.

UNIT I INTRODUCTION TO VISUAL BASIC 10

Introduction to Visual Basic: IDE, working with forms, developing an application, variables, datatypes and modules, procedures and control structures, arrays in VB. Working with VB Controls: Creating and using controls, working with control arrays - ODBC and Data Access Objects.

UNIT II USER INTERFACES 8

Menus Events and Dialog Boxes: Menu and Events definition, Event model in VB, Menu Interfaces, Mouse Events, Dialog Boxes: Definition, Types of Dialog Boxes, Applying dialog. Graphics, MDI and FlexGrid: Graphics for application, Multiple Document Interface and Using the FlexGrid Control

UNIT III VB CLASSES AND OBJECTS 8

Classes: Definition, advantages of classes, class methods. Objects: Definition and methodology. Introduction to VB Classes and Objects, Creating various forms, Objects and projects. Working with objects, Classes and class modules, Creating VB objects.

UNIT IV INTRODUCTION TO DBMS 10

Advantages and Components of a Database Management Systems - Feasibility Study - Class Diagrams - Data Types - Events - Normal Forms - Integrity - Converting Class Diagrams to Normalized Tables - Data Dictionary. Query Basics - Computation Using Queries - Subtotals and GROUP BY Command - Queries with Multiple Tables Subqueries – Joins, Testing Queries.

UNIT V INTRODUCTION TO ORACLE 9

ORACLE - Introduction to Oracle, Data definition languages - Data Manipulation language, Data Control Language, Data types in Oracle. Constraints in Oracle, Data and String Functions, Union and Intersect operator, Sub queries, Introduction to PL / SQL, Simple PL / SQL programs.

Total: 45 Hours

Text Book:

1. Steven Holzner, “Visual Basic 6 Programming: Black Book”, Dreamtech Press, 2000. ISBN:13: 9788177220537
2. C. J. Date, A. Kannan, “Database Systems”, Pearson Education Publication, 2006

References:

1. Noel Jerke, “Visual Basic 6: The Complete Reference”, Tata McGraw Hill, 1999. ISBN:139780074636664
2. Kevin Loney, George Kuch, “Oracle – The complete Reference”, Tata McGraw Hill Publication, 2005
3. C. J. Date, “Database Systems”, Addison Wesley Publication, 1990.

15BBI009 PROGRAMMING WITH VB AND RDBMS – PRACTICAL 0 0 2 1

Course Outcome

CO-1: To learn basics for creating simple application in arithmetic calculations and biologicalconcepts.

CO-2: To gain basic knowledge for creating applications using variables, data types and control structures.

CO-3: To be able to solve computational problems for creating factorial GC-content calculator.

CO-4: To be well versed in objects and its usage.

CO-5: To understand how to convert the reverse of given sequence.

CO-6: To be able to implement multiple programs using objects in octal, decimal, hexadecimal calculation.

CO-7: To understand the exception handling mechanism and to handle exceptions while programming.

CO-8: To overcome and eradicate the errors occur while executing programs.

CO-9: To be able to demonstrate programs on creating application forms using menus and mouse Events.

CO-10: To acquire knowledgeto run programs using theapplications and to apply it in the biological sequences.

VB

1. Creating Simple application forms in Visual Basic. **2**

    a) Creating a form for simple Arithmetic Calculations

    b) Creating a form for simple Biological applications

2. Creating application forms using Variables, Data Types and Control structures. **3**

    a) Creating Factorial Calculator

    b) Creating GC – Content Calculator

3. Creating application forms using different types of "Objects" in VB. **2**

a) Creating form to find,

i) Leap Year,

ii) Currency Exchange,

iii) Octal, Decimal, Hexadecimal Calculation

iv) Scroll Bar

b) Creating form to find

i) The Complement of given sequence

ii) The reverse of given sequence

iii) The frequency of Nucleotides.

4. Creating application forms using Menus, Mouse Events. **3**

5. Creating applications forms using Graphics in VB. **3**

ORACLE, PL/SQL

1. a) Creation of student information records containing Roll number, Name, Subject Code Marks etc., **1**

b) Finding the total and average marks, result for each student table. **1**

c)Record Manipulations such as Deletion, Modification, Addition and Counting the Record. **1**

2. Creating table that demonstrates simple biological applications. **2**
3. Creating table to demonstrate applications with biological sequences. **2**

DATABASE CREATION USING VB WITH RDBMS

1. a) Create a database that demonstrates "Library Information System" with VB forms and Query language (User Interface with VB). **3**
   b) Create a database that stores and retrieves simple biological applications. (User Interface with VB) **3**

2. a) Create a database for "Railway Reservation System". (User Interface with VB) **2**
   b) Create a database that stores and retrieves biological sequences and to find the similarities between two sequences. (User Interface with VB) **2**

Total Hours: 30

Text Book:

3. Steven Holzner, "Visual Basic 6 Programming: Black Book", Dreamtech Press, 2000. ISBN:13: 9788177220537
4. C. J. Date, A. Kannan, "Database Systems", Pearson Education Publication, 2006

References:

4. Noel Jerke, "Visual Basic 6: The Complete Reference", Tata McGraw Hill, 1999. ISBN:139780074636664
5. Kevin Loney, George Kuch, "Oracle – The complete Reference", Tata McGraw Hill Publication, 2005
6. C. J. Date, "Database Systems", Addison Wesley Publication, 1990.

15BBI010 OPERATING SYSTEMS 3 0 0 3

Course Outcome

CO-1: To acquire sound knowledge on the basics of operating system and architecture.

CO-2: To understand the types of operating system and its uses.

CO-3: To obtain the knowledge on process management and various concepts.

CO-4: To understand the basis of scheduling, algorithm and its types.

CO-5: To understand the memory management and the concepts related to allocation, paging and segmentation.

CO-6: To gain knowledge about the virtual memory management related to allocation and assessment.

CO-7: To acquire the knowledge on file system, mounting, allocation and protection.

CO-8: To understand the usage of Linux and Unix.

CO-9: To be well versed with the I/O systems.

CO-10: To acquire knowledge on storage devices and concepts related to storage.

UNIT I OPERATING SYSTEMS INTRODUCTION 8

Introduction - Views- Goals - types of operating systems – Operating System Structure – Components of Operating System - Operating System services - system calls and system programs, Development of Operating Systems, Uses of Operating Systems, Types of Operating Systems, .

UNIT II PROCESS MANAGEMENT AND PROCESS SCHEDULING 10

Process management - Process concepts - process scheduling - operation on process Inter process communication - CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-

processor scheduling – Real time scheduling – Algorithm Evaluation. Case study: Process scheduling in Linux.

UNIT III STORAGE MANAGEMENT 10

Memory Management - Single and multiple partitioned allocation – paging - segmentation - internal & External Fragmentation. Non-Contiguous Allocation: Paging and Segmentation Schemes - Implementation - Hardware-Protection - Sharing – Fragmentation. Virtual Memory Management - Demand paging and Page Replacement Algorithms, Information management - File concept - Access methods - Directory structure - allocation methods - free space management - disk scheduling.

UNIT IV FILE SYSTEM 9

File-System Interface: File concept – Access methods – Directory structure – File system mounting – Protection. File-System Implementation: Directory implementation – Allocation methods – Free-space management – efficiency and performance – recovery – log-structured file systems. Case studies: File system in Linux – file system in Windows.

UNIT V I / O SYSTEMS 8

I/O Systems – I/O Hardware – Application I/O interface – kernel I/O subsystem – streams – performance. Mass-Storage Structure: Disk scheduling – Disk management – Swap-space management – RAID – disk attachment – stable storage – tertiary storage.

Total: 45 Hours

Text Book:

Andrew S. Tanenbaum, “Modern Operating Systems”, Second Edition, Pearson Education, 2004

References:

1. Davis Rajkumar, “Operating System: A Systematic View”, Pearson Education, 2007
2. H. M. Deitel, “Operating System”, Second Edition, Pearson Education, 1990.
3. Harvery M. Deitel, Paul J. Deitel, “Operating System”, Third Education, Pearson Education, 2004

15BBI011 PROGRAMMING WITH JAVA 5 0 0 4

Course Outcome

CO-1: To understand the object oriented programming concepts.

CO-2: To learn basics of Java such as tokens, data types and expressions.

CO-3: To able to solve computational problems using basic constructs like if-else, and control structures.

CO-4: To be well versed in array, and strings.

CO-5: To understand how to define class and create objects.

CO-6: To able to implement multiple inheritance through interfaces and develop packages.

CO-7: To understand the exception handling mechanism and to handle exceptions while programming.

CO-8: To overcome all the errors while executing programs.

CO-9: To able to demonstrate programs on multithreading.

CO-10: To able to demonstrate programs using applets.

UNIT I FUNDAMENTALS OF JAVA 15

Fundamentals of Object – Oriented Programming:- Introduction, Object-Oriented Paradigm, Basic Concepts of Object-Oriented Programming, Benefits of OOP, Applications of OOP, Java Evolution:- Java History, Java Features, Java and C/C++, Java and Internet, Java and WWW, Java Environment, Overview of Java Language:- Simple java Program, java Program Structure, Java Tokens, Java Statements, Java Virtual Machine, command Line Arguments, Constants, variables and Data Types in Java.

UNIT II OPERATORS AND DECISION MAKING 20

Operators and Expressions:- Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Conditional, Bitwise and Special operators, Arithmetic Expressions, Evaluation of Expressions, Arithmetic operator Precedence, Mathematical Functions. Decision Making and

Branching:- if, if…Else, nesting of if…else, else if ladder and Switch statement, the ?: operator, Decision Making and Looping:- while, Do While and For statements, Jumps in Loops and Labeled Loops, Classes, Objects and Methods:- Defining a Class, fields declaration, methods declaration, creating objects, accessing class members, Constructors, methods overloading, Extending a Class (Inheritance), Overriding Methods, final variables and methods, final classes.

UNIT III ARRAYS AND PACKAGES 20

Arrays, Strings and Vectors:- Introduction, One-dimensional Arrays, Creating an Array, Two-Dimensional Arrays, Strings, Vectors, Wrapper Classes, Enumerated Types, Strings and Regular Expressions:- Java's Regular Expression API, Introduction to Regular Expressions, Sorting Array of Strings, Ignore Case Difference When Sorting, Replacing Substrings with case difference ignorance, Splitting a String using split(), Multiple Inheritance:- Defining Interfaces, extending interfaces, implementing interfaces, Accessing interface Variables, Packages:- Java API packages, using system packages, Naming conventions, creating packages, accessing a package, using a package, hiding classes.

UNIT IV ERRORS AND MULTITHREAD PROGRMMING 12

Errors and Exceptions:- Types of errors, Exceptions, Syntax of Exception Handling code, Multiple Catch Statements, Using Finally Statement, Throwing Exceptions, Exceptions for Debugging, **File Handling:-** Overview of File Handling, Reading characters from a file, Writing characters to a file, Read and write Random-Access files, Obtaining File Attributes, **Formatting Data:-** Overview of Formatter, NumberFormat and DateFormat – Four Simple Numeric Formatting Techniques using formatter, Format Time and Date Using formatter, **Multithreaded Programming:-** Introduction, Creating Threads, Extending the thread class, Stopping and Blocking a Thread, Life Cycle of a thread.

UNIT V APPLET PROGRAMMING 8

Applet Programming:- Introduction, preparing to Write Applets, Building Applet Code, Applet Life Cycle, Creating an Executable Applet, Designing a Web Page, Applet Tag, Applet to HTML, running the Applet, Graphics Programming:- Graphics class, Lines and Rectangles,

Circles and Ellipses, Drawing Arcs, Drawing Polygons, Drawing Graphs, Using Control Loops in Applets.

Total Hours: 75

Text Book:

E Balagurusamy, "Programming with Java: A Primer", Fourth Edition, Tata McGraw Hill, 2010

References:

1. P. Naughton and H.Schildt- Java2 (The Complete Reference) - Third Edn.TMH 1999.
2. Deital & Deital, "How to Program Java", Pearson Education, 1999.
3. Cays Horstmann, Gary Cornell, "Core Java 2: Advanced Features", Sun Micro System, 2007

15BBI012 PROGRAMMING WITH JAVA– PRACTICAL 0 0 3 2

Course Outcome

CO-1: To gain basic knowledge on programming skills in Java and Biojava.

CO-2: To know how to implement operators and expressions in Java programming.

CO-3: To use various packages in java.

CO-4: To know the basics of formatting data, looping and branching in java.

CO-5: To implement java programming in sort an array of strings in reverse order.

CO-6: To split DNA sequence into pieces by using split.

CO-7: To use java applets in the programming.

CO-8: To compare two sequences using java.

CO-9: To use biojava to parse PDB file.

CO-10: To create web page using JSP.

1) Operators and Expressions **3**
2) Branching and Looping **3**

3) Classes and Objects **3**

4) Packages **3**

5) Formatting Data **3**

6) Sort an Array of Strings in Reverse Order **4**

7) Implementing Case Differences Ignorance **4**

8) Applet Example **5**

9) Drawing Circle, rectangle using Java Graphics. **4**

10) Reading or writing Fasta files using Biojava? **5**

11) Comparing two Sequences. **4**

12) Translating DNA sequence into Protein sequence in Java **4**

Total: 45Hours

Text Book:

E Balagurusamy, "Programming with Java: A Primer", Fourth Edition, Tata McGraw Hill, 2010

References:

1. P. Naughton and H.Schildt- Java2 (The Complete Reference) - Third Edn.TMH 1999.
2. Deital & Deital, "How to Program Java", Pearson Education, 1999.
3. Cays Horstmann, Gary Cornell, "Core Java 2: Advanced Features", Sun Micro System, 2007

15BBI013 INTRODUCTION TO PERL, BIOPERL AND CGI 3 0 0 3

Course Outcome

CO-1: To acquire sound knowledge on basics in perl and more on usage of scalar, arrays and hashes.

CO-2: To understand the concepts of subroutines in perl.

CO-3: To acquire knowledge on file handling and file management in perl.

CO-4: To understand the role of regular expressions concepts in perl and its major role in bioinformatics.

CO-5: To understand the basics of control structures in perl.

CO-6: To understand the importance of perl modules in the advance programming skills.

CO-7: To acquire the knowledge on BioPerl and its modules.

CO-8: To understand the usage of BioPerl in Bioinformatics research.

CO-9: To gain knowledge on common gateway interface (CGI) and methods.

CO-10: To acquire knowledge on CGI connecting HTML and webpages.

UNIT I INTRODUCTION TO PERL 8

Introduction:- Scalar Data- Numbers, Strings, Scalar Variables, Output with print, Getting User Input, The chomp operator, undef Value, defined function, The if and while control structures, Lists and Arrays:- Accessing elements of an array, Special Array indices, List Literals, List Assignment, Subroutines:- Defining a subroutine, Invoking a subroutine, Return values, Arguments, Private variables in subroutines, the return operator.

UNIT II EXPRESSIONS AND FILES 8

Input and Output:- Input from Standard Input, Input from the diamond operator, Invocation arguments, Output to Standard Output, Filehandles, Opening a Filehandle, Hashes:- Hash Element Access, Hash Functions, Regular Expressions, Matching with Regular Expressions:- Matches with m//, Option Modifiers, Anchors, The Binding operator, =~, Interpolating into Patterns, The match Variables, General Quantifiers. Processing Text with Regular Expressions:- Substitutions with s///, The split Operator, The join Function, m// in List context, More Powerful Regular Expressions.

UNIT III CONTROL STRUCTURES AND PERL MODULES 10

Control Structures:- The unless Control Structure, The until Control Structure, Expression Modifiers, The Naked Block Control Structure, The elsif Clause, Autoincrement and Autodecrement, The for Control Structure, Loop Controls, Logical Operators, File Tests:- File Test Operators, The stat and lstat functions, The localtime function, Bitwise Operators, Using the Special Underscore Filehandle, Strings and Sorting:- Finding a Substring with index, Manipulating a Substring with substr, Formatting Data with sprint, Advanced Sorting, Perl Modules:- Finding Modules, Installing Modules, Using Simple Modules.

UNIT IV INTRODUCTION TO BIOPERL 9

Bioperl:- Introduction, Installing Bioperl, General Bioperl Classes, Sequences (Bio::Seq Class, Sequence Manipulation), Features and Location Classes (Extracting CDS), Alignments (AlignIO), Analysis (Blast, Genscan), Databases (Database Classes, Accessing a local database), Implementing REBASE.

UNIT V COMMON GATEWAY INTERFACE 10

Common Gateway Interface:- Web Servers and Browsers, HTML tags, table, frames, form elements, GET, POST & HEAD Method, URL Encoding, CGI Environment Variables, Handling forms, Accessing form Input, Extra Path Information, CGI.pm Module, Passing Parameters via CGI, Less Typing, Sever Side Includes, Debugging CGI programs, Stepping through programs, Breakpoints, Line Action **Total: 45 Hours**

Text Book:

Martin C Brown, "Perl The Complete Reference", Second Edition, Tata McGraw Hill, 2001

References:

1. Erick Storm, "Perl CGI Programming", BPB Publication, 1998.
2. Steven Holzner, "Per: Black Book", Second Edition, Dreamtech Publication, 2007.
3. Ed Peschko & Michele Dewolf, "Perl Developer's Guide", Tata McGraw Hill, 2000.

15BBI014 INTRODUCTION TO PERL, BIOPERL AND CGI – PRACTICAL 0 0 3 2

Course Outcome

CO-1: To gain basic knowledge on programming skills in PERL.

CO-2: To know how to calculate the length of the sequence using perl program.

CO-3: To perform the reverse of the given sequence using Rev List.

CO-4: To perform concatenation of the given sequence by using dot operator.

CO-5: To find the complement and reverse complement of the given sequence by using Tr operator.

CO-6: To know the GC content of the given DNA sequence in order to evaluate the stability of DNA. .

CO-7: To convert DNA to protein sequence by using perl program and be used in the translation process.

CO-8: To know the basics and implement bioperl modules in the perl program.

CO-9: To retrieve DNA sequence from the database and translate it using bioperl modules.

CO-10: To parse PDB and FASTA file using bioperl.

1) Calculating the true length of a Sequence? **5**

2) Program to find the length of the given sequence? **5**

3) Program to reverse and concatenation of the given sequence? **5**

4) Program to complement and reverse complement of DNA sequence? **5**

5) Program to calculate GC content in the given DNA sequence? **5**

6) Program to translate DNA into Protein Sequence? **4**

7) Program to Implement BioPerl **4**

8) Retrieving DNA Sequence from the Database and Translating it into Protein Sequence using Perl and BioPerl. **8**

9) Parsing PDB and FASTA file using BioPerl? **4**

Total: 45Hours

Text Book:

Martin C Brown, "Perl The Complete Reference", Second Edition, Tata McGraw Hill, 2001

References:

1. Erick Storm, "Perl CGI Programming", BPB Publication, 1998.
2. Steven Holzner, "Per: Black Book", Second Edition, Dreamtech Publication, 2007.
3. Ed Peschko & Michele Dewolf, "Perl Developer's Guide", Tata McGraw Hill, 2000.

15BBI015 INTRODUCTION TO BIOINFORMATICS ALGORITHMS 5 0 0 4

Course Outcome

CO-1: To acquire the skill of constructing algorithms and there by determining the computational complexity of algorithms by knowing the basic biological information.

CO-2: To provide the necessary biological (Gene and protein) background which are required solve the problem that arise during the designing of algorithm.

CO-3: To map an unknown segment of DNA by breaking it into pieces and then by identifying the locations of the breakpoints in the gene.

CO-4: To follow the problem solving heuristic of making the locally optimal choice at each stages with the hope of finding a global optimum.

CO-5: To solve many different types of complex problem by breaking down into a collection of simpler sub biological problems and by solving each of those biological problems one by one until expected solutions arrived.

CO-6: To analyze the previously solved sub problems and combine their solutions along with the achieved result to give the best solution for the given biological problem

CO-7: To divide the given problem, at least into 2 sub-problems and the combination of the results arrived by sub problem is much more easier than finding the solution of the initial problem directly

CO-8: To prove an algorithm for the given biological problem is often necessary to replace the original problem with a more complicated problem in order to initialize the recursion.

CO-9: Mathematical approach to solving certain types of biological problem like sequence alignment, gene detection, structure prediction, data-mining literature

CO-10:The problem is not directly noticeable, but the output of the problem dependent on the result predicted by the probability distribution.

UNIT I INTRODUCTION TO ALGORITHMS 20

Algorithms and Complexity:- What Is an Algorithm?, Biological Algorithms versus Computer Algorithms, The Change Problem, Correct versus Incorrect Algorithms, Recursive Algorithms, Iterative versus Recursive Algorithms, Big-O Notation, **Molecular Biology Primer:-** What Is Life Made Of?, the Genetic Material, What Do Genes Do?, Molecule Codes for Genes?, Structure of DNA, How Are Proteins Made?, **Analyzing DNA:-** Copying DNA, Cutting and Pasting DNA, Measuring DNA Length, Probing DNA. Anatomy of Proteins- Primary sequences, Secondary structure, Motifs, Domains, Tertiary and quaternary structures.

UNIT II MAPPING ALGORITHMS 15

Exhaustive Search:- Restriction Mapping, Impractical Restriction Mapping Algorithms, A Practical Restriction Mapping Algorithm, Regulatory Motifs in DNA Sequences, Profiles, The Motif Finding Problem, Search Trees, Finding Motifs, Greedy Algorithms:- History of Genome Rearrangements, Sorting by Reversals, Approximation Algorithms, A Greedy Approach to Motif Finding.

UNIT III DYNAMIC PROGRAMMING ALGORITHM 15

Dynamic Programming Algorithms:- Sequences- The Power of DNA Sequence Comparison, The Manhattan Tourist Problem, Homology, similarity- Sequence alignment- Pair wise sequence alignment- Global alignment- Local alignment- Multiple Sequence alignment- Multiple alignment programs, Scoring Alignments, Gene Prediction, Similarity-Based Approaches to Gene Prediction, Spliced Alignment.

UNIT IV DIVIDE AND CONQUER, PATTERN MATCHING 15

Divide-and-Conquer Algorithms:- Divide-and-Conquer Approach to Sorting, Space-Efficient Sequence Alignment, Block Alignment and the Four-Russians Speedup, Constructing Alignments in Subquadratic Time, Combinatorial Pattern Matching:- Repeat Finding, Hash Tables, Exact Pattern Matching, Keyword Trees, Suffix Trees, BLAST: Comparing a Sequence against a Database.

UNIT V HIDDEN MARKOV MODELS 10

Hidden Markov Models:- History, Architecture , Inference, A Concrete Example, Learning, The Fair Bet Casino And Hidden Markov Models, Types, Extensions, Decoding Algorithm, HMM Parameter Estimation, Profile HMM Alignment Applications, Randomized Algorithms:- History, Motivation, Computational complexity, The Sorting Problem Revisited, Gibbs Sampling, Random Projections, Examples, Derandomization.

Total: 75Hours

Text Book:

Ignacimuthu, S, "Basic Bioinformatics", 1st Edition, Narosa Publishing House, New Delhi, India. 2005

Reference:

1. István Miklós, "Introduction to algorithms in bioinformatics", Rényi Institute, Spring, 2010.
2. Krane, DE; Raymer, ML, "Fundamental concepts of Bioinformatics", Benjamin Cummings, 2003
3. Lesk, A.M. "Introduction to Bioinformatics:, 1st Edition, Oxford University Press, Oxford, UK, 2002
4. N. Gautham, "Bioinformatics", Narosa Publishing Company, New Delhi, 2006.

15BBI016 INTRODUCTION TO BIOINFORMATICS - PRACTICAL 0 0 3 2

Course outcome

CO-1: To acquire skills to use different approaches for Retrieval of DNA Sequence.

CO-2: To develop the skills to Retrieval of protein Sequence from the protein databases. .

CO-3: To determine the three dimensional structure of protein

CO-4: To develop the knowledge to retrieve the particular information from the specialized databases.

CO-5: To achieve knowledge for the visualization of the Protein 3D Structure.

CO-6: To determine the functional information of the protein using functional databases

CO-7: To predict the classification of the protein based on its structural alignment.

CO-8: To retrieve the particular family information in which the specific protein belongs to.

CO-9: To identified the domain region for the known protein

CO-10: To develop the skill for retrieving the gene information.

1. Retrieval of Protein Sequence using Sequence Databases: UNIPROT, Tr-EMBL. **7**
2. Retrieval of DNA Sequence using Sequence Databases: NCBI, DDBJ, Genbank . **7**
3. Retrieval of Protein Structural information using Structure Databases: SCOP, CATH. **7**
4. Retrieval of 3D Protein Structure Using Protein Data Bank. **7**
5. Specialized Databases:BEST(Database for Expressed Sequence Tags),DBSTS(Database of Sequence Tagged Sites) **7**
6. Data retrieval tools: SRS (Sequence retrieval System) **8**
7. Biological data retrieval system using Entrez. **8**
8. Retrieve the file formats of Sequence: Fasta Format, GCG Format. **4**
9. Molecular visualization Of Protein Structure Using Pymol, Rasmol. **5**
10. Protein function prediction Tools. **5**
11. Gene prediction using GenScan tool. **5**
12. Accessing Genome databases. **5**

Total: 45Hours

Text Book:

V.R.Srinivas “Bioinformatics: Sequences and genomics analysis” cold Spring Harbor Laboratory press,Cold Spring harbor,USA, 2005.

References:

1. N.Gautham, “Bioinformatocs” Narosa Publishing Company, New Delhi, 2006.
2. D.Higgins and W.Taylor, ’Bioinformatics: Sequences, Structures and databanks’oxford University Press, Oxford, UK, 2008.

15BBI017 GENOMICS AND PROTEOMICS 4 0 0 3

Course Outcome

CO-1: To learn about the overview of genome, composition and evolution.

CO-2: To gain knowledge in gene predictions.

CO-3: To understand the location of genes in the chromosomes using mapping techniques.

CO-4: To learn the markers and types of maps in locating the genes in the chromosome.

CO-5: To know about the fundamentals of proteomics.

CO-6: To enlighten about gene expression, codon bias and protein levels.

CO-7:To learn the analytical techniques and instrumentations for protein identification, separation.

CO-8: To know about the algorithms for mining specific features of tandem MS data.

CO-9: To enrich the knowledge on Proteomic tools.

CO-10:To learn about the mining proteomes with its applications.

Unit I Introduction to Genes 12

Introduction to genetics,Definition of gene, History of genetics genome and genome sequencing overview of genome, genome composition & genome evolution. Inheritance in biology - Genes and inheritance, Inherited diseases, Working of gene - Genes make proteins, Genes are copied.Finding Specific Genes.Gene prediction in prokaryotes, Gene prediction in eukaryotes.

Unit II Types of Mapping 12

Genetic Mapping, Physical Mapping, Types of Genome maps and their uses, Genetic linkage mapping,, High and low-resolution map, Polymorphic markers, Line, sine, Restriction Fragment Length Polymorphism,(RFLP), single nucleotide polymorphism(SNP). Types of maps: Cytogenetic, Transcript map, Comparative map, integrated map.Completing Maps and Sequences

Unit III Proteome 12

Proteomics and new biology: The New Biology, Protein Chemistry, Gene Expression, Proteomics :an analytical challenge, Proteome and the Genome, The Life and Death of a Protein life cycle of protein, protein as the modullar structure, functional protein families, deducing proteome from genome, Gene Expression, Codon Bias, and Protein Levels, Significance and overview of analytical proteomics.

Unit IV Proteomics Tools 12

Analytical protein and peptide separation - .Extracting Proteins from Biological Samples, Protein Separations Before Digestion, After Digestion, One-Dimensional & Two-Dimensional SDS-PAGE, Protein digestion techniques, Mass spectrometers for protein and peptide analysis-MALDI-TOF MS Instruments, Protein identification by peptide mass fingerprinting - Analytical Approach, An Algorithm for Mining Specific Features of Tandem MS Data - SALSA.

Unit V Proteomic Applications 12

Mining Proteomes - 2D-SDS-PAGE & MALDI-TOF MS, Multidimensional Peptide Chromatography and LC-Tandem MS Analysis.Protein Expression Profiling - Comparative

Proteomics with 2D Gels, LC-MS and Isotope Tags, , Identifying Protein – Protein Interaction and Protein complexes, Mapping protein modifications - Mining MS-MS Data, New Direction in Proteomics- Automation and Robotics, Micro- and Nanoscale Instrumentation, Protein Arrays.

Total: 60Hours

Text Book:

David W. Mount, "Bioinformatics Sequence and Genome Analysis", Cold Spring Harbor Laboratory Press.

2001.

References:

1. Ann Gibbons, "Comparative genetics", *Science*. 281: 1432 – 1434, 1998
2. Baxevanis A.D., "The Molecular Biology Database Collection: updated compilations of Biological database resources", *Nucleic Acids Research*.29 p 1-10, 2001
3. Jeremy D. Peterson et al., The Comprehensive Microbial Resource. *Nucleic Acids Research*. 29: 123 – 125, 2001
4. S.R.Pennigton and M.J.Dunn, "Proteomics", Viva Books Private Limited. New Delhi, 2002

15BBI156 PYTHON FOR BIOINFORMATICS 2 0 0 2

Course outcome:

CO-1: To understand script and the contributions of scripting languages.

CO-2: To understand Python especially toward object-oriented concepts

CO-3: To understand the built-in objects of Python

CO-4: To implement a given biological algorithm as a computer program using Python scripts

CO-5: To adapt and combine standard python algorithms to solve a given biological problem (incudes numerical as well as non-numerical algorithms)

CO-6: To use standard python programming for biological constructs of algorithm using repetition, selection, functions, composition, modules, aggregated data (arrays, lists, etc.)

CO-7: To identify and to repair coding errors in a biological program

CO-8: To understand and use object based software concepts to solve the gene coding problem

CO-9: To use library software for building a graphical user interface, web application, mathematical software

CO-10: To build new Python based software and tools for life science research.

UNIT I INTRODUCTION TO PYTHON 6

Introduction to Python, History of Python, Python Features, Python Development Tools, Writing Python Program, Values and Variables:- Numeric Values, Variables and Assignment, Identifiers, Control codes within Structure, Controlling the print Function

UNIT II EXPRESSION 6

Expressions and Arithmetic:- Operator Precedence and Associativity, Comments, Errors (Syntax, Run-time errors, Logic Errors), Arithmetic Examples, Conditional Execution:- Simple if Statement, if/else statement, Compound Boolean Expressions, Nested Conditionals, Multi-way Decision Statements, Conditional Expressions.

UNIT III CONDITIONAL EXECUTION 6

Conditional Execution:- What is conditional statement in Python, Simple if Statement, if/else statement, nested if condition, else – if ladder, Compound Boolean Expressions, Nested Conditionals, Multi-way Decision Statements, Conditional Expressions.

UNIT IV ITERATION 6

Iteration:- While Statement, For Statement, Nested Loops, the break statement, the continue statement, Infinite Loops, Computing Square roots, Drawing a Tree, Using Functions – mathematical functions – time Functions, reading the files from existing database using Python.

UNIT V SEQUENCE ANALYSIS THROUGH PYTHON 6

Sequence Alignment:- Alphabets, Matching Sequences – Perfect Matches – Insertions and Deletions – Rearrangements – Global Versus Local Alignments – Sequence Length, Simple Alignment (Direct Alignment), Statistics:- Simple Statistics, Distributions, Normalizations, Multivariate Statistics, Probabilities, Odds.

Text Book:

1. Jason Kinser, "Python for Bioinformatics", Jones and Bartlett Publishers, Sudbury, Massachusetts 2009

References:

1. Richard L., Halterman, "Learning to Program With Python", 2011
2. Kent D. Lee, "Python Programming Fundamentals: Second Edition", Springer, 2010
3. Cody Jackson, "Learning to Program Using Python", Second Edition, 2013
4. Mark Lutz, "Learning Python", Third Edition, O'Reilly, 2007

15BBI019 PHYTHON FOR BIOINFORMATICS - PRACTICAL 0 0 3 2

Course outcome

CO-1: To determine complement and reverse complement for DNA Sequence using python

CO-2: To write the python program to evaluate the composition of amino acids for the given protein sequence

CO-3: To develop the python algorithm for translating the DNA sequence into protein sequence

CO-4: To compute the script for finding the similarities between the two known sequences.

CO-5: To develop the coding to extract the protein information from the genbank databases.

CO-6: To compute the bio python program to readspecific sequence from the given multiple sequences.

CO-7: To script the bio python program to find the exact location of genes in the cells.

CO-8: To develop the program to retrieve the two protein structure from protein databank, compare it structures.

CO-9: To read a script for the extracting the nucleotide information from the NCBI databases.

CO-10: To compute the bio python program to read the biological information in Genbank file

1. Program to find complement and reverse complement for given DNA Sequence. **3**
2. Program to find Frequency of amino acids in the given protein sequence. **3**
3. Program to translate the given DNA sequence into protein sequence. **3**
4. Program to find the simple similarities between the given two DNA or Protein Sequences. **3**
5. Program to compute the sum of the given two matrices. **3**
6. Program to compute transpose of a matrix. **3**
7. Extract the author from the Genbank file using Biopython. **3**
8. Extract the accession number from the Genbank file using BioPython. **3**
9. Program to find the given sequence in the existing sequence. **3**
10. Program to implement the various math operations. **3**
11. Program to find the Gene Location **3**
12. Program to read the Genbank file. **4**
13. Program to read DNA sequence from the Genbank file and make complement it and save the complemented sequence in separate file. **4**
14. Program to find two Protein sequence from PDB and compare it. **4**

Total: 45Hours

Text Book:

Jason Kinser, "Python for Bioinformatics", Jones and Bartlett Publishers, Sudbury, Massachusetts 2009

References:

1. Richard L., Halterman, "Learning to Program With Python", 2011
2. Kent D. Lee, "Python Programming Fundamentals: Second Edition", Springer, 2010
3. Cody Jackson, "Learning to Program Using Python", Second Edition, 2013
4. Mark Lutz, "Learning Python", Third Edition, O'Reilly, 2007

15BBI020 MOLECULAR BIOLOGY DATABASES 4 0 0 3

Course Outcome

CO-1: To get an idea of basic database concepts, types, advantages and disadvantages.

CO-2:To understand the management of database and also concepts to improve database integrity in the case of biological data.

CO-3: To be aware of the types of biological molecules and its current resources.

CO-4: To explore the available data to analyze and interpret the innovative concepts in order to improve the understanding through computational means.

CO-5: To acquire the knowledge on the primary features of databases and the database exist relevant to biological molecules.

CO-6:To explore the primary information of the biological data to process with the bioinformatics tools and software.

CO-7: To get an idea of specialized genome databases developed for the model organisms in order to compare the species related evolution.

CO-8: To get an insight into the gene expression product and to understand the structural and functional properties of protein at secondary level.

CO-9: To access and retrieve the protein structure to understand the mechanism of disease.

CO-10: To have an exposure to databases other than protein and genes to utilize in drug discovery and designing.

UNIT I DATABASE CONCEPTS 12

Database in general – definitions and examples – Computerized databases – advantages and disadvantages – need for database models and systems – examples of logical models – hierarchical, network and relation models – RDBMS – objected oriented models – primary and secondary (derived)database – structure and sequences database – growth of databases, Gene Ontology classifications

UNIT II MOLECULAR BIOLOGY DATA TYPES 12

Brief descriptions of the various types of data used in modern Molecular Biology and how they are obtained, stored, represented and retrieved – organisms – genome maps – DNA,RNA and protein sequences – RNA secondary structure – protein secondary and tertiary structure – DNA and protein sequence motifs – protein and RNA structure motifs – RNA and protein-protein interaction data – mutations and polymorphiosms in sequences and structures – tissues and cells – populations.

UNIT III PRIMARY SEQUENCES DATABASES 12

DNA sequence databases – GenBank, EMBl, DDBJ – details of structure of GenBank – Difference with and links to other databases – protein sequence databases – Swissprot, PIR – details of arrangement of data in Swissprot – differences and links to other databases – TrEMBL database

UNIT IV DERIVED SEQUENCE DATABASE 12

Subcollections of data – Flybase – AceDB, Wormbase – comprehensive microbial genome, omniome – organelle genome database, GOBASE – eukaryotic promoter database – Codon usage table database – Exon-Intron database – examples of protein sequence sub collections – GPCR sequence database – human unidentified gene – encoded large protein sequence database; HUGE – CluSTr and COGS – database of protein sequence patterns and motifs - PRINTS,ROSITE,Pfam,ProDom.

UNIT V STRUCTURAL DATABASE 12

Nature of structural data – coordinate systems – primary structure database – PDB,CSD – details of arrangement of data in PDB with examples – access to PDB and CSD – derived structure database, NDB – structural patterns and motifs – SCOP – CATH – FSSP – PALI – DSSP, Drug bank, ligand depot, Querying chemical database.

Total: 60Hours

Text Book:

D.Higgins and W.Taylor.(eds), 'Bioinformatics: Sequences, Structues and databanks'oxford University Press, Oxford, UK. 2008.

References Books:

1. N.Gautham, "Bioinformatocs" Narosa Publishing Company, New Delhi, 2006
2. V.R.Srinivas, "Bioinformatics: Sequences and genomics analysis" cold Spring Harbor Laboratory press,Cold Spring harbor,USA, 2005

15BBI021 SEQUENCE ANALYSIS - PRACTICAL 0 0 3 2

Course Outcome

CO-1: To retrieve the sequences of both nucleotide and protein from NCBI database.

CO-2: To explore the BLAST tool in identifying the sequence similarity available at NCBI.

CO-3: To analyze the protein sequences using several websites available at ExPASy.

CO-4: To perform sequence alignment to predict the conserved region of either protein or nucleotide.

CO-5: To explore Clustal tool to perform multiple sequence alignment for more than two nucleotides.

CO-6: To undertake EMBOSS or GCG Wisconsin package to analyze the sequences.

CO-7: To explore bioinformatics tools to understand the protein and nucleic acid sequences.

CO-8: To determine the coding region in the prokaryotic nucleic acid sequences.

CO-9: To calculate several properties of DNA using computational techniques.

CO-10: To observe the 3D structures of the biological molecules in different representations and visualization.

1. Sequence similarity searching (NCBI BLAST). **6**
2. Protein sequence analysis (ExPASy proteomics tools). **6**
3. Multiple sequence alignment (Clustal). **6**
4. Molecular phylogeny (PHYLIP). **5**
5. Analysis of protein and nucleic acids sequences. **5**
6. Sequence analysis using EMBOSS or GCG Wisconsin Package. **5**
7. Development of programs in the analysis of nucleic acid sequences – such as protein coding regions in prokaryotes. **6**
8. Programs to calculate potential energy of regular structures such as Collagen triple helix, DNA double helix, and their visualization in wire and stick model as well as space filling model. **6**

Total: 45Hours

Text Book:

D.Higgins and W.Taylor.(eds), 'Bioinformatics: Sequences, Structues and databanks'oxford University Press, Oxford, UK. 2008.

References Books:

1. Nucleic Acids Research (January 2008) NUMBER 1.Database Issue, this issue is available online for free and open access at the following url http://nar.oxfordjournals.org/content/vol34/suppl_1/index.dtl)
2. N.Gautham(2006)"Bioinformatocs" Narosa Publishing Company, New Delhi.
3. V.R.Srinivas (2005)"bioinformatics: Sequences and genomics analysis" cold Spring Harbor Laboratory press,Cold Spring harbor,USA

15BBI022 INTRODUCTION TO MEDICAL TRANSCRIPTION AND CODING 4 0 0 3

Course Outcome

CO-1: To study the anatomy, physiology of human body function and general health management of diseases and injuries across the lifespan

CO-2: Application of basic coding rules, principles, guidelines and conventions in health care.

CO-3: Introduction to health IT standards, health-related data structures, software applications, and enterprise architecture in health care and public health.

CO-4: To understand the basics of Introduction to systems and processes for collecting, maintaining, and disseminating primary as well as secondary health-related information including content of health record, documentation requirements, registries, indices, licensing, regulatory agencies, forms and screens

CO-5: To understand the principles, procedures and regulations involving legal and ethical relationships among physicians, patients and medical assistants in ambulatory care settings.

CO-6: To obtain knowledge on current ethical issues and risk management as they relate to the practice of medicine and fiduciary responsibilities.

CO-7: To benefits those who work or want to work in the medical field whether it be as a medical biller, medical coder, medical collector or medical office administrator.

CO-8: To gain knowledge on coding scenarios are provided to help the student continue his/her knowledge in the field of medical coding.

CO-9: To be able to analyze the CPT and ICD-10- CM manuals for medicalreimbursement.

CO-10: To acquire knowledge in interpreting the elements and characteristics of the CPT andICD-10-CM manuals.

UNIT I INTRODUCTION TO HUMAN ANATOMY 12

Anatomy Structure of the human body to increase your understanding. Physiology How the human body functions. Medical definitions and terminology Includes pronunciation and use of medical prefixes. Coding medical procedures What to code and how to prepare the forms.

UNIT II CLAIM INFORMATION 12

Professional claim information How to set up medical claims for Medicare, Medicaid, private insurance companies, HMOs, PPOs, workers' compensation and personal injury cases. The World of Health Care, Introduction to Medical Terminology: Word Parts, Medical Terminology: Dividing and Combining Terms, Abbreviations, Symbols and Special Terms

UNIT III MEDICAL RECORDS 12

Documenting Medical Records: The role medical records play in a coding specialist's job. The importance of documentation in medical records and to recognize the various types of dictation formats and manage medical records. Medical Ethics Concepts of ethics, compliance, fraud and abuse. The importance of confidentiality when dealing with medical records and insurance audits and the legal concepts involved.

UNIT IV CPT CODES 12

CPT Coding: CPT Coding from the Integumentary System, from the Reproductive Systems to the Operating Microscope, for Radiology, Pathology, Medicine and Anesthesia, Evaluation and Management Services, Comprehensive CPT Evaluation and Management, Surgery Coding, Digestive System Coding, Urology system coding, Cardiovascular coding.

UNIT V DIAGNOSTIC CODES 12

Diagnostic Coding - ICD-9-CM Coding Manual Introduction, Diagnosis Coding: Guidelines and Rules, from Infections to Blood Diseases, from Mental Disorders to the Respiratory System ,from the Digestive System to Pregnancy, from the Skin to Conditions of the Perinatal Period, from Symptoms to Complications, V Codes, E Codes and ICD-9-CM Coding Practicum.

Total: 60Hours

Text Book:

Beth A.Rich , "Medical Coding: A Journey", Prentice Hall, 2013. ISBN – 13: 9780132541770

References:

1. Karen Smiley, "Medical Coding And Billing for Dummies", Second Edition, 2012

15BBI023 ENZYMES AND METABOLISM 3 0 0 3

CO-1: To acquire sound knowledge on fundamentals and regulation of enzymes with its activities, chemical kinetics and inhibition of enzyme reactions.

CO-2: To understand the basics of regulatory enzymes and immobilized enzymes.

CO-3: To know the overview of anabolic and catabolic metabolism as well as pathways involving carbohydrates, proteins and lipids.

CO-4: To understand the clinical correlation of purine and pyrimidine metabolism.

CO-5: To understand the steps involve in the digestion and absorption of carbohydrates.

CO-6: To acquire knowledge about the biochemical pathways involved in metabolism function.

CO-7: To acquire the knowledgeon lipid metabolism, β-Oxidation of fatty acids, Ketogenesis. Biosynthesis of fatty acids, Triacylglycerols and prostaglandins. Metabolism of phospholipids, glycolipids and cholesterolits uses.

CO-8: To understand the transport channel and its importance in addition about Triacylglycerols and prostaglandins.

CO-9: To attain complete knowledge on metabolism of lipids and its uses.

CO-10: To acquire sound knowledge on basic protein metabolism, clinical correlation of proteins and integration of metabolisms.

UNIT I INTRODUCTION TO ENZYMES 10

Introduction to enzymes, nomenclature, classification, riboenzyme, general characteristics of theories of enzyme catalysis, substrate specificity, isozymes, coenzymes, cofactors, regulation of enzyme activity, chemical kinetics and enzyme kinetics, Michaelis-Menten equation, effect of various factors on rate of reactions, inhibition of enzymatic reactions and kinetics, multienzyme

system and bisubstrate reactions, catalytic mechanisms, regulatory enzymes and immobilised enzyme.

UNIT II INTRODUCTION TO METABOLISM 10

Introduction to metabolism- Overview of anabolic and catabolic pathways of carbohydrates, proteins and lipids. Role of ATP, NAD, FAD and CoA in metabolism. Nucleic Acid Metabolism:Biosynthesis and degradation of purines and pyramidines, neucleosides and nucleotides. Clinical correlation of purine and pyrimidine metabolism. Nucleotides as coenzymes.

UNIT III CARBOHYDRATE METABOLISM 8

Digestion and absorption of carbohydrates. Glycolysis and its significance, Fermentation, Fate of pyruvate, Citric acid cycle, Gluconeogenesis, Cori cycle, Glycogenesis, Glycogenolysis Glycogen storage diseases. HMP shunt, Uronic acid pathway, Metabolism of hexoses other than glucose, Regulation of glycogen metabolism, Glyoxylate pathway, Biosynthesis of oligosaccharides and glycoproteins,

UNIT IV LIPID METABOLISM 8

Digestion and absorption of lipids. Introduction to lipid metabolism, β-Oxidation of fatty acids, Ketogenesis. Biosynthesis of fatty acids, Triacylglycerols and prostaglandins. Metabolism of phospholipids, glycolipids and cholesterol. Lipoproteins: Metabolism of HDL, Disorder of Plasma Lipoproteins, Fatty liver, Obesity, Atherosclerosis, Tay – Sachs disease, Gaucher's disease, Niemann – Pick disease.

UNIT V PROTEIN METABOLISM 9

Digestion and absorption of proteins. General aspects of amino acids metabolism; deaminaton, transamination, transmethylation, transpeptidation, and decarboxylation. Metabolism of ammonia: urea cycle and its regulation, Nitrogen balance, biosynthesis of non-essential amino acids. Metabolic breakdown of individual amino acids. Clinical correlations of protein metabolism. Integration of metabolism.

Total Hours: 45

Text Book

Lehninger, A. L. 1984. Principles of Biochemistry. CBS publishers and distributors, New Delhi, India

Reference books:

1. C. K. Mathews, K. E. Van Holde, & K.G. Ahern, "Biochemistry", Third Edition, Prentice Hall, 1999.
2. Shanmughavel P, "Principles of Bioinformatics", Pointer Publishers, Jaipur, India. 2005.

15BBI024 BIODIVERSITY BASICS 3 0 0 3

Course Outcome

CO-1: To get an idea of basic concepts of biodiversity distribution.

CO-2: To understand the management, measuring and distribution of species.

CO-3: To be aware of the types of biological molecules and its current resources.

CO-4: To explore the available data in global patterns of biodiversity, species richness, biogeography, and importance of distribution patterns.

CO-5: To acquire the knowledge on the primary features affecting the biodiversity and improvement in conservation.

CO-6: To study the primary common factors and patterns of over exploitation.

CO-7: To get an idea of exotic species and how to converse it.

CO-8: To get an insight intothe biodiversity in India.

CO-9: To gain knowledge in terminology of biodiversity.

CO-10: To gain a practical exposure regarding the biodiversity ethics in conservation.

UNIT I INTRODUCTION TO BIODIVERSITY 9

Definitions, Basic Concept Of Biodiversity Distribution - Latitudinal Gradients, Hotspots, Evolution And History - Evolutionary Diversification, Biodiversity And Ecosystem Services - The Balance Of Evidence, Biodiversity And Agriculture, Biodiversity And Human Health, Biodiversity, Business And Industry, Biodiversity, Leisure, Cultural And Aesthetic Value, Biodiversity And Ecological Services

UNIT II PATTERNS OF BIODIVERSITY 9

Global Patterns Of Biodiversity – Measuring Biodiversity, Cataloging And Discovering Species, Geographical Patterns Of Species Richness, Biogeography, Importance Of Distribution Patterns(Local Endemics, Sparsely Distributed Species, Migratory Species), GAP Analysis. Why Should We Conserve It, Elements of Biodiversity - Ecosystem Diversity, Genetic Diversity, Species Abundance & Diversity, Patterns Of Species Diversity,

UNIT III BIODIVERSITY CONSERVATION 9

Biodiversity & Conservation – Overexploitation Threatening Living Species, International Trade, Animals Threatened By International Trade, Controlling International Trade (Enforcement, Reservations, Illegal Trade), Free Trade & The Environment, Free Trade & Conservation, Common Patterns Of Overexploitation, Number Of Species, Species Loss Rates, Resource Allocation, Analytical Limits - Taxonomic And Size Relationships.

UNIT IV EXOTIC SPECIES 9

Exotic Species – Plants, Invertebrates, Fishes, Amphibians, Reptiles, Birds, Mammals, Detrimental. Effects of Exotic Species. Endangered Species Conservation – The US Endangered Species Act, State Endangered Species Acts Successes And Failures Of The Endangered Species Act, Role Of ESA In Habitat Protection, Critical Habitat. Biodiversity In India.

UNIT V ETHICS OF CONSERVATION 9

Introduction of Biodiversity, Terminology of Biodiversity, Practice of Biodiversity Ethics of Conservation – Values of Biodiversity, Biopiracy, Hybridized plants, GM crops (benefits & criticism), Economic Value of Biodiversity & Legal issues related to uses of biodiversity, Ethical

issues related to uses of biodiversity and Conservation issues related to uses of biodiversity, Global Conservation Issues.

Total Hours: 45

Text Book:

1. James Maclaurin and Kim Sterelny, "What is Biodiversity?", University of Chicago Press, 2008. ISBN:9780226500812

References:

1. John Spicer. Biodiversity. Oneworld Publications 2009 ISBN: 1851684719
2. Prakash Chandra. India Biodiversity & Wildlife Sanctuaries Neha Publishers & Distributors 2010. **ISBN:** 9789350531860.
3. Balakishan , Biodiversity Conservation. Neha Publishers & Distributor 2004 **ISBN:** 9789350531860
4. Pullaiah, T. and Reddy, K. Jaganmohan, "Biodiversity in India: Volume 6", ASTRAL Publishers, 2013.

15EVS201 ENVIRONMENTAL STUDIES 2 0 0 2

Course Outcome

CO-1: To develop the knowledge towards environmental pollution, control, management and protection

CO-2: To understand the definition, scope and importance of environmental studies

CO-3: To acquire knowledge on the different types of resources

CO-4: To make them clear about the importance of natural resources and the required conservation steps to be carried out in order to protect it from non-existence as well as contamination for future generations.

CO-5: To understand clearly about the pollution types, cause of pollution and its dangerous effect.

CO-6: To acquire the basic knowledge to manage and control the pollution caused by different measures.

CO-7: To bring an awareness for the students regarding the social issues and incorporate methods for environment development.

CO-8: To make the students recognize the importance of water and its conservation measures to solve the problems arise in urban areas.

CO-9: To bring an alertness among the students about theclimatic changes due to global warming, ozone layer depletion, etc.

CO-10: Toattain the knowledge regarding the awareness program and environment protection act for forest, wildlife conservation, etc.

UNIT I ENVIRONMENTAL AWARENESS 6

Definition, scope and importance of environmental studies. Public awareness regarding environment.

UNIT II ENERGY RESOURCES 6

Renewable and non-renewable energy sources. Forest resources, water resources, mineral resources, food resources, energy and land resources. Conservation of natural resources.

UNIT III POLLUTION AND CONTROL 6

Environmental pollution-Definition, causes, effects and control measures of air, water, soil, marine, noise and nuclear pollution. Solid waste management and disaster management.

UNIT IV ENVIRONMENTAL MANAGEMENT 6

Social issues and the environment-unsustainable and sustainable development. Urban problems related to energy. Water conservation, rain water, and harvesting and watershed management.

UNIT V ENVIRONMENTAL PROTECTION 6

Climate change-Global warming, acid rains, ozone layer depletion, nuclear accidents, waste land reclamation and maintenance. Environment protection act, wildlife, forest conservation act.

Text Book:

Subramaniam.V.. Text Book in environmental Science, Narosa. 2002

References:

1. Subramaniam.V.. Text Book in environmental Science, Narosa. 2002
2. Balu.V, Environmental Studies, Srivenkateshwara.2004
3. Moo Young. M. et al. Environmental biotechnology, Principles and application, Springer. 1996
4. Bharucha, E. Text Book of environmental Studies for undergraduates, University Press (India) Pvt. Ltd. 2005.
5. Sinha and Saradha , Text Book of Environmental Studies, AITBS Publication. 2005
6. Vijaya Ramesh K. Environmental Microbiology. MJP Publication.2004
7. Demain, A.L. Manual of Industrial Microbiology, ASM. 2004
8. RajanMisra, A Text Book on environmental Studies. University Science Press. New Delhi. 2009
9. Mohapatra P.K. Text Book of Environmental biotechnology. I.K. International Publishing House Pvt.Ltd. 2006

DISCIPLINE SPECIFIC ELECTIVES

15BBI101 FUNDAMENTALS OF MOLECULAR CELL BIOLOGY AND BIOCHEMISTRY **4 0 0 4**

Course outcome:

CO-1: To develop the knowledge towards functional accept of the cells present in our body

CO-2: To understand the working of the different types of tissues present in the human body

CO-3: To determine biological importance of carbohydrates in living organisms

CO-4: To acquire the basic information about the structure, function of DNA and RNA

CO-5: To obtained the overall information about the vitamins especially its metabolic function and daily requirement.

CO-6: To develop the knowledge towards the amino acid which play an important role in protein formation.

CO-7: To understand the biological importance of protein that are responsible for some biological processes.

CO-8: To achieve knowledge about metabolic pathways that are involved for the production of energy

CO-9: To acquire the skill to separate and purify the biomolecules by three key analytical and purification methods (electrophoresis chromatography centrifugation).

CO-10: To develop the skill for detecting and characterizing biomolecules using electrophoresis chromatography centrifugation techniques.

UNIT I CELL & TISSUE 12

Cell: Introduction To cell, Types of cell, Shape of Cell, Anatomy of cells Prokaryotic cells & Eukaryotic cells, Component of cell and its functionalities. Tissue: Introduction To tissues, Types of tissues, Animal tissues (Connective tissue, Muscle tissue, Nervous tissue, epithelial tissue, Mineralized tissue), Plant tissues (Meristematic tissues & Permanent tissues)

UNIT II CARBOHYDRATES & NUCLEOTIDE 10

Carbohydrates: Definition, classification, structure, Properties, occurrence and biological importance of Monosaccharides, Disaccharides, Oligosaccharides, Polysaccharides,Nucleotide: Structure of Nucleotides & Nucleoside, Function of Nucleotides, Synthesis of Nucleotides. Types of Nucleoside – DNA (deoxyribonucleic acid,) , RNA (Ribonucleic acid,)

UNIT III VITAMIN & AMINO ACIDS 10

Vitamin : Source, Metabolic Function, daily Recommendation, Deficiency, drug, structure for Fat Soluble(Vitamin A, D,E, K) and Water soluble vitamin(Vitamin C & B Complex) Amino acids: Definition, composition, structure, properties, stability and biological importance of Amino Acid, Formation Peptide bond, Identification of C and N terminal residues of amino acids

UNIT IV PROTEIN & METABOLIC PATHWAYS 16

Protein: Definition, classification, composition, structure, properties, occurrence and biological importance of Protein, Metabolic Pathways: Glycolysis – Location, Pathway, Energy Produced, Function, TCA cycle – Location, Pathway, Energy Produced, Function, Pentose Phosphate Shunt – Location, Pathway, Energy Produced, Function. Gluconeogenesis – Location, Pathway, Energy Produced, Function, Urea Cycle- Location, Pathway, Energy Produced, Function.

UNIT V PROTEIN IDENTIFICATION TECHNIQUE 12

Electrophoresis – Basic techniques of Electrophoresis, Types, Working & Application, Advantages and disadvantages. Centrifugation- Basic principles, Types, Molecular weight determination. & Application, Advantages and disadvantages Chromatography- Overview of Centrifugation, Types, Principles, Working & Application, Advantages and disadvantages

Total: 60 Hours

Text Book:

Albert's, B; Johnson, A; Lewis, J; Raff, M; Bray.D; Hopkin,K; Roberts, K; Walter, P, "Essential Cell Biology" ,2nd edition, Garland Science, Taylor & Francis Group,USA, 2003

References:

1. Becker WM, Kleinsmith LJ, Hardin J "World of the Cell"6Th edition, Benjamin Cummings, 2005.
2. Voet, D., and J.G. Voet. "Biochemistry" 3rd edition. Hoboken, NJ: Wiley. 2004.
3. Horton, R, Moran, L, Scrinmgeour, G, Perry, M, Ravon, D "Principles of Biocehmistry", 4th edition, Prentice-Hall of India. 2005.

15BBI102 ALLIED BIOCHEMISTRY 0 0 42

Course Outcome

CO-1: To identify the quantitate analysis of sugar monosaccharides – Aldose.

CO-2: Through biochemical techniques the quantitative analysis of saccharides were analyzed.

CO-3: To identify carbohydrates from samples using biochemical procedures.

CO-4: To find the qualitative analysis of polysaccharides.

CO-5: To analyze the aromatic amino acids.

CO-6: To observethe presence of sulphur containing amino acids qualitatively.

CO-7: Togain knowledge on the analyses the basic aminoacids.

CO-8: To estimate the presence of glycine by Sorrenson's Formal Titration.

CO-9: To learn about the estimate and observe the ascorbic acid by 2,3 Dichlorophenol Indophenol.

CO-10: To learn about the estimation of protein by Lowry's method.

1. Qualitative analysis of monosaccharides – Aldose.	**5**
2. Qualitative analysis of monosaccharides – Ketose.	**5**
3. Qualitative analysis of disaccharides.	**5**
4. Qualitative analysis of polysaccharides.	**5**
5. Qualitative analysis of aromatic amino acids.	**5**
6. Qualitative analysis of sulphur containing amino acids.	**5**
7. Qualitative analysis of basic amino acids.	**5**
8. Estimation of glycine by Sorrenson's Formal Titration.	**5**
9. Estimation of ascorbic acid by 2,3 Dichlorophenol Indophenol.	**5**
10. Estimation of glucose by Ortho Toluidine method.	**5**
11. Estimation of protein by Lowry's method.	**5**
12. Separation of amino acids by thin layer chromatography.	**5**

Total: 60 Hours

Text Book:

1. Horton, R, Moran, L, Scrinmgeour, G, Perry, M, Ravon, D "Principles of Biocehmistry", 4th edition, Prentice-Hall of India. 2005.

References:

1. Voet, D., and J.G. Voet. "Biochemistry" 3rd edition. Hoboken, NJ: Wiley. 2004.

15BBI103 MICROBIOLOGY AND IMMUNOLOGY 0 0 42

Course outcome:

CO-1: Able to acquire knowledge relevant to microbial infection caused by microorganism.

CO-2: To develop the basic information towards laboratory and hospital control of microbial infection

CO-3: To determine biological importance of cells that are responsible for immune system

CO-4: To acquire the basic information about the organs of immune system which plays a major role in the producing immune cells.

CO-5: To study the effect of destruction of immune cell by the entry of specific antigen into the human body

CO-6: To acquire the detailed information about the production and working of immunoglobins toward the antigenic response

CO-7: To study the systematic production of B cells and T cells during the immune response.

CO-8: To elaborate in detail about the antigen presenting cell in the human body

CO-9: To gain knowledge on immune system, its function and also the response to the foreign bodies

CO-10: To get a clear knowledge on immunoassays to perform anti-doping concepts to include in scientific experiments regarding human growth hormone

UNIT I MICROBIOLOGY 12

Introduction to Microbiology, History of Microbiology, Morphology of bacteria and Physiology of bacteria , Sterilization and Disinfection, Culture Technique, Culture Media, Culture Methods, Identification of Bactria, Bacterial Taxonomy, Bacterial Genetics. Normal Microbial

Flora of the Human Body, Bacteriology of Water, Milk,& Air, Medical Mycology, Laboratory Control of Antimicrobial Therapy, Hospital Infection.

UNIT II CELL AND ORGANS OF IMMUNE SYSTEM 12

Introduction to cells, types of cells, Single-celled organisms, multicellular organisms, Blood and immune system cells – Erythrocyte (red blood cell), Megakaryocyte (platelet precursor), Monocyte (white blood cell),Connective tissue macrophage (various types),Epidermal Langerhans cell, Osteoclast (in bone),Dendritic cell (in lymphoid tissues),Microglial cell (in central nervous system),Neutrophil granulocyte, Eosinophil granulocyte, Basophil granulocyte, Hybridoma cell, Mast cell, Helper T cell, Suppressor T cell, Cytotoxic T cell, Natural Killer T cell, B cell Natural killer cell, Reticulocyte, Stem cells and committed progenitors for the blood and immune system (various types),organs of the immune system, Primary and secondary Lymphoid organs, Classification of immune system – innate and adaptive immunity.

UNIT III ANTIGENS, ANTIBODIES 12

Antigens, Antibodies and their structure, types of immune responses, anatomy of immune response.structure, function, classification of immunoglobulin- Immunoglobulin G (IgG), Immunoglobulin M(IgM), Immunoglobulin A(IgA), Immunoglobulin E(IgE) and Immunoglobulin D (IgD).genetic control of antibody production, production of monoclonal and polyclonal antibodies.

UNIT IV T-CELL & B- CELL 12

T-Cell – Anatomy, structure & function – Thymus, Development of T- Cell, Antigen Presenting Cells (APC), mechanisms of T cell activation, macrophages, dendritic cells, langerhans cells, mechanism of phagocytosis, B- cells – Anatomy, structure & function - Spleen. Development of B- cell, Functions of B- cell, Activation of B cells, ancestral roots of B cells Origin of the term, B cell-related pathology

UNIT V IMMUNO ASSAY TECHNIQUE 12

Blotting: Southern Blotting- working, Flowchart, Application, Advantage and Disadvantage , Northern Blotting – working, Flowchart, Application, Advantage and Disadvantage, Western Blotting – working, Flowchart, Application, Advantage and Disadvantage,Antigen antibody interaction – Precipitation reactions, Agglutination reactions, Blood typing, A, B, ABO & Rh, principles and applications of ELISA, Radio Immuno Assay (RIA, Immuno-electrophoresis)

Total: 60 Hours

Text Book:

Subhash Chandra Parija. "Textbook of Microbiology and Immunology" Paperback – Elsevier; Second edition 2012. ISBN-13: 978-8131228104

References:

1. Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Roitt "Immunology" W. H. Freeman – Paperblack 5th edition 2002, ISBN-13: 978-0716749479.
2. N Arumugam, Dulsy Fatima. "Immunology & Microbiology". Saras Publication (2013). ISBN-13: 978-9382459057
3. Parija. "Textbook of Microbiology & Immunology" Elsevier India, 2009 . ISBN-8131221636, 9788131221631
4. R. Vasanthakumari. "Textbook of Microbiology" BI Publications Pvt Ltd, 2007. ISBN-9788172252342

15BBI104 INTRODUCTION TO MICROBIALINFORMATICS – PRACTICAL 0 0 42

Course outcome:

CO-1: To identify the bacterial strains present in the bacteria.

CO-2: Through *in silico* subtractive hybridization analysis of multiple bacterial genomes was predicted.

CO-3: To identify the thiopeptide antibiotic gene clusters present in the given DNA sequences.

CO-4: To find out the integrative and conjugative elements present in the microorganism.

CO-5: To analyze the Bacterial Type IV & Type VI secretion system resource through *in silico.*

CO-6: To analyze the Phosphorothioation of the DNA backbone that were available in the cells of bacteria.

CO-7: To analyze the Type 2 toxin-antitoxin loci in micro-organism like Bacteria, Archaea.

CO-8: To find out the essential genes that was responsible for the function of the cells.

CO-9: To recognize the translation starting sites in bacterial genomes through *in silico* analysis

CO-10: Through *in silico* analysis the relocation of the translation start sites of putative CDSs of genomes were predicted.

1. Identification of Bacterial strains – **MobilomeFINDER** **5**
2. *In silico* subtractive hybridization analysis of multiple bacterial genomes using **mGenomeSubtractor** **5**
3. Identification of thiopeptide antibiotic gene clusters in DNA sequences using **ThioFinder**
4. Finding integrative and conjugative elements in Bacteria using **ICEberg** **5**
5. Analysing Bacterial Type IV secretion system resource using **SecReT4** **5**
6. Analysing Bacterial Type VI secretion system resource using **SecReT6** **5**

7. Analysing Type 2 toxin-antitoxin loci in Bacteria and Archaea using **TADB** **5**
8. Analysing Phosphorothioation of the DNA backbone using **dndDB** **5**
9. Finding essential Genes among a wide range of organisms using **DEG** **5**
10. Recognizing translation start sites in bacterial genomes without a prior knowledge of rRNA in the genomes concerned using **GS-Finder** **5**
11. Relocating the translation start sites of putative CDSs of genomes using **Zcurve 1.0** **5**
12. Comparative analysis of the contents and contexts of tRNA sites in closely related bacteria using **tRNAcc** **5**

Total: 60 Hours

Text Book:

Borini, **"**Computing for Comparative Microbial Genomics: Bioinformatics for Microbiologists (Computational Biology)**",** Springer, 2009.

References:

Özlem Taştan, Bishop *Rhodes, "*Bioinformatics and Data Analysis in Microbiology Caister", Academic Press ISBN: 978-1-908230-73-7. 2014

15BBI105 FUNDAMENTALS OF PLANT BIOINFORMATICS 4 0 04

Course Outcome:

CO-1: To acquire sound knowledge on Plant cell architecture.

CO-2: To understand the molecular basis of the cell.

CO-3: To acquire knowledge on earlier and modern view of classification on living organisms, in specific the classification of plant kingdom.

CO-4: To understand the basis of genetics in hereditary, inheritance, therefore to develop genetically engineered crops.

CO-5: To understand the steps involve in the preparation of herbarium and its importance

CO-6: To understand the cache architecture and different cache mapping techniques.

CO-7: To acquire the knowledge on Bioinformatics and the major database available for usage.

CO-8: To understand the usage of Bioinformatics tools.

CO-9: To be well versed with the databases available especially for plants.

CO-10: To acquire knowledge on accessing the informations on hereditary and inheritance.

UNIT I PLANT 12

Plant cell architecture, Cell walls: structure & biosynthesis, Photosynthesis, Respiration, Plant growth regulator: auxins, gibberellins, cytokinins, ethylene abscisic acid, Gene expression and signal transduction. Internal structure of leaves of Dicot and monocot. Economic importance.of plant. Primary structure of stem and root of Dicotyledons and monocotyledons plants

UNIT II PLANT KINGDOM 12

Definition and associated terms of Plant Kingdom. Classification of Plant Kingdom – Cryptogams: Thallophyta - voiroids and viruses, Algae and Fungi, Bryophyta , Pteridophyta . Phanerogams: Gymnosperms, Angiosperms – dicot, monocot. Modern view – The three domains of life, Kingdoms of the Eukaryota, Historical development, Cavalier-Smith's systems – Eight kingdoms, Six kingdoms.

UNIT III PLANT GENETICS 12

Introduction to Plant genetics – Features of plant biology , DNA, Gregor Mendel, Modern ways to genetically modify plants, Genetically engineered crops, Benthan and Hooker's classification of plants – Summary, Families and orders in the Bentham & Hooker system – Dicotyledons, Monocotyledons. Types of classifications – artificial – natural – phylogenetic. Biosystematics – binomial nomenclature – herbarium and its uses, herbarium and computer data.

UNIT IV INTRODUCTION TO BIOINFORMATICS 12

Definition of Bioinformatics, History of Bioinformatics, Introduction to existing Bioinformatics resources on the web – NCBI, EBI, EXPASY, PUBMED, NCBI EMBL, GENBANK, Entrez, Unigene, PDB, Swissprot, and TrEMBL. Derived databases (Prosite, PRODOM, Pfam,

PRINTS), Structural database (PDB). Similarity searching- FASTA and BLAST. Phylogenetic tree- Rooted tree, unrooted tree.

UNIT V BIOINFORMATICS TOOLS FOR PLANTS 12

Bioinformatics Tools for Plant Genomics – PPNEMA, MaizeGDB, CCPMT, Blast2GO, SSR locator Bioinformatic Tools for Inferring Functional Information from Plant Microarray Data – Agbase, Kyoto Encyclopedia of Genes and Genomes (KEGG), Ensembl, Entrez Gene, Plant Associated Microbe Geneontology (PAMGO), Gene Index, ArrayExpress, GEO, Plant Expression Database (PlexDB) PLEXdb (Plant Expression Database), Plant Promoter Database (PlantProm DB), PlantCARE (Plant Cis-Acting Regulatory Elements), PLACE (Plant Cis-Acting Regulatory DNA Elements).

Total: 60 Hours

Text Book:

David Edwards. "Plant Bioinformatics – Methods and Protocols". Springer. 2007 ISBN: 978-1-58829-653-5

References:

1. Gurcharan Singh." Plant Systematics: An Integrated Approach". Science Publishers, 2004 ISBN:9781578083510
2. Susheela M. Das "A Textbook of Plant Taxonomy: Theory & Objectives" Hardcover – Wisdom Press. 2013 ISBN: 978-9381052945

15BBI106 PLANT BIOINFORMATICS TECHNIQUES – PRACTICAL 0 0 42

Course Outcome:

CO-1: To understand the importance and preparation of herbarium, therefore to compile the data shorter and meaningful.

CO-2: To access and store the taxonomy information of a medicinal plant from the databases available.

CO-3: To explore the NCBI database for its various information under different criteria.

CO-4: To understand the retrieval system of Entrez.

CO-5: To acquire knowledge from tremendous literature available in PubMed database and to retrieve the required information from it.

CO-6: To access and query the protein data bases for its sequence and other details

CO-7: To acquire knowledge on the EBI search providing easy and uniform access to the biological data.

CO-8: To understand and explore the sequence retrieval system.

CO-9: To access the data stored from the GenBank databases.

CO-10: To understand the indexing and retrieval system of Entrez.

1. Collecting and Creating Herbarium of 5 different kinds of plants 8
2. Creating computer data for Herbaria. 8
3. Biological Data retrieval system using Entrez for plants. 8
4. Exploring the integrated database system at NCBI server and querying the PUBMED. 8
5. Exploring and querying the SWISSPROT database. 7
6. Exploring the integrated database system at EBI server and searching the EMBL Nucleotide database using the SRS search engine. 7
7. Accessing GenBank databases. 7
8. Using the ENTREZ search engine for plants. 7

Total: 60 Hours

Text Book:

David Edwards. "Plant Bioinformatics – Methods and Protocols". Springer. 2007 ISBN: 978-1-58829-653-5

References:

1. Gurcharan Singh." Plant Systematics: An Integrated Approach". Science Publishers, 2004 ISBN:9781578083510
2. Susheela M. Das "A Textbook of Plant Taxonomy: Theory & Objectives" Hardcover – Wisdom Press. 2013 ISBN: 978-9381052945

15BBI107 **CHEMINFORMATICS** **4 0 04**

Course Outcome:

CO-1: To acquire knowledge on the basic representation and file formats of chemical molecules.

CO-2: To understand the applications of chemical information in various fields.

CO-3: To gain knowledge on different descriptor formats available for the molecules.

CO-4: To understand the important properties of small molecules and its application in the similarity and diversity analysis.

CO-5: To observe the infrastructure of chemical databases, information stored and its types.

CO-6: To be clear with the different search techniques and its importance in acquiring required data.

CO-7: To perceive the molecular relationships based on physical and chemical properties with the biological properties.

CO-8: To obtain knowledge on the molecular properties and to develop tools for predicting the specific properties.

CO-9: To observe the features of pharmacophore and to access the combinatorial libraries for pharmacophore designing.

CO-10: To be clear with identification, accession and application of pharmacophores in drug designing process.

UNIT I INTRODUCTION TO CHEMO INFORMATICS 12

Introduction To Chemo Informatics: Aims, Scope.History, Basics, Role OfChemo Informatics In Pharmaceutical/Chemical Research. Chemical Structure Representation: 1D, 2D And3D Structures. Molecular File Formats (SMILES, WLN, SDF, AndMOL). Applications – Storage and Retrieval, Virtual Libraries, Virtual Screening, Quantitative Structure-Activity Relationship (QSAR)

UNIT II MOLECULAR DESCRIPTORS 12

Introduction, Invariance Properties of Molecular Descriptors, Degeneracy of Molecular Descriptors, Basic Requirements For Optimal Descriptors, Molecular Descriptors (1dimension, 2dimension And 3dimension) And MACCS Keys Topological, Electrotoplogical And Shape Indices. Molecular Similarity andMolecular Diversity Analysis.

UNIT III MOLECULAR DATABASE SCREENING 12

Introduction to Molecular Database Screening, Methods- Ligand-Based, Structure-Based, Computing Infrastructure – Ligand-Based, Structure-Based, Accuracy, Lipinski Rule: Drug/Lead like Molecules.Chemical Structure Representation – Substructure, Conformation. Chemical Structure Based Search Techniques: Exact, Sub-Structure and Similar Structure Searches.

UNIT IV QUANTITATIVE STRUCTURE ACTIVITY RELATIONSHIP 12

Quantitative Structure Activity/Property/Toxicity Relationship Studies.SAR and the SAR paradox, Types- Fragment based (group contribution), 3D-QSAR, Chemical descriptor based,Modeling – Data mining approach, Matched molecular pair analysis, Evaluation of the quality of QSAR models, Application- Chemical, Biological, Applications. Introduction to Molecular Properties, Activities and Toxicities.Training Data, Test Data and External validation Data.

UNIT V PHARMACOPHORE 12

Historical Perspective AndFeaturesDesign &Analysis of Combinatorial Libraries. Molecular Scaffolds, Linkers AndFunctional groups. Reagents and products based combinatorial library generation. Identification of pharmacophore features. Searching databases using pharmocophoresDocking Studies. Pharmacophore Model, Viewpoint of Pharmacophore

Total: 60 Hours

Text Books:

1. Gasteiger Johann, Engel Thomas. Chemoinformatics: A Textbook. Publisher: WileyVCH; 1st edition. 2003. ISBN: 3527306811.

Reference Books:

1. Bunin Barry A. SieselBrian,MoralesGuillermo,Bajorath Jürgen. Chemoinformatics: Theory, Practice, & Products Publisher:New York, Springer. 2006. ISBN: 1402050003.
2. Leach Andrew R., Valerie J. Gillet. An introduction to chemoinformatics. Publisher: Kluwer academic, 2003. ISBN: 1402013477.
3. Gasteiger Johann, Handbook of Chemoinformatics: From Data to Knowledge (4 Volumes), 2003. Publisher: Wiley-VCH. ISBN:3527306803
4. Dr. Thomas Engel.Chemoinformatics – A Textbook Publisher: Kluwer academic , 2005 ISBN 3-527-30681-1.

15BBI108 CHEMINFORMATICS - PRACTICAL 0 0 42

Course Outcome:

CO - 1: To differentiate and understand the features different molecular representation of a molecule.

CO - 2: To be capable in interpreting the chemical molecular structure from different molecular representation.

CO - 3: To observe the different molecular file formats, its variation and application.

CO - 4: To acquire structural knowledge from the given molecular file formats.

CO - 5: To observe the molecular patterns of various molecules.

CO - 6: To workout tools available for describing molecular pattern of a chemical substance.

CO - 7: To acquire knowledge in accessing the database and the screening techniques for a molecule.

CO - 8: To predict the drug-likeness and other properties of a molecule using tools and software.

CO - 9: To observe the molecular descriptors for different molecule representation.

CO -10: To explore molecular descriptors to understand and develop tools in design and discovery of new compounds.

1. Chemical Structure representation for the following categories, **12**
   - 1 Dimension Structures,
   - 2 Dimension Structures
   - 3 Dimension Structures

2. Analysing Molecular file formats for the following, **12**
   - SMILES,
   - WLN
   - SDF
   - MOL

3. Analysing Molecular patterns for the following, **12**
    - SMARTS
    - SMIRKS

4. Analysing Molecular Database Screening for **10**
    - Lipinski Rule: Drug/Lead like molecules

5. Analysing Molecular Descriptors for the following, **14**
    - 1 Dimension Structures,
    - 2 Dimension Structures
    - 3 Dimension Structures

Total: 60 Hours

Text Book:

Gasteiger Johann, Engel Thomas. Chemoinformatics: A Textbook. Publisher: WileyVCH; 1st edition. 2003. ISBN: 3527306811.

References:

1. Bunin Barry A. SieselBrian,MoralesGuillermo,Bajorath Jürgen. Chemoinformatics: Theory, Practice, & Products Publisher:New York, Springer. 2006. ISBN: 1402050003.

2. Leach Andrew R., Valerie J. Gillet. An introduction to chemoinformatics. Publisher: Kluwer academic , 2003. ISBN: 1402013477.

15BBI109 ALLIED MATHEMATICS 4104

Course Outcome

CO-1: To learn the basic needs Trigonometry.

CO-2: To learn the basic ideas of angles along with its expansion.

CO-3: To study the basic rule that are incorporated in the Matrices.

CO-4: To train the students in solving statistical problems

CO-5: To lean the basic concepts in the integration.

CO-6: To train the students in basic calculus using Bernoulli's formula.

CO-7: To train the students in the numerical problems

CO-8: To train the students to solve the problems in Theory of Equations

CO-9: To learn the basic needs for their major concepts in Laplace Transforms

CO-10: To train the students in solve the problem through Laplace Transforms

UNIT I TRIGONOMETRY 12

Introduction – Angles – Expansions of sinnθ cosnθ,tannθ. Expansion of sinθ, cosθ, tanθ, interms of θ- Simple problems.

UNIT II MATRICES 12

Introduction-Basic operations-Symmetric-skew symmetric-Hermitian-Skew Hermitian –Unitary-orthogonal-Inverse of a matrix -Solution of linear system(Cramer's rule)- Finding the Eigen roots and Eigen vectors of a matrix-Cayley Hamilton theorem(without proof).

UNIT III INTEGRAL CALCULUS 12

Integral calculus: Integration – Definite integrals – Bernoulli's formula -Reduction formula for $\int sin^n x dx$,$\int cos^n x dx$,$\int tan^n x dx$, $\int x^n e^{ax} dx$.

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS 12

Ordinary differential equations: First order of higher degree equations – Second order and non-homogenous linear differential equations with constant coefficient – Second order linear differential equations with variable coefficients.

UNIT V LAPLACE TRANSFORM 12

Laplace transform: Definition, Laplace transform of basic trigonometric. Exponential and algebraic functions - Inverse laplace transform- Solving differential equation of second order with constant coefficients using laplace transform.

Total: 75 Hours

Text Books:

1. P. Kandaswamy and K.Thilagavathy, Allied Mathematics paper I, 1st Semester, S.Chand Publishing Pvt. Ltd. 1st Edition 2003.(Unit I, II)
2. P. Kandaswamy and K.Thilagavathy, Allied Mathematics paper II, 2nd Semester, S.Chand Publishing Pvt. Ltd. 1st Edition, 2004.(Unit III,IV,V)

References:

1. P.R. Vittal, Allied Mathematics, Margham Publications, 4th Edition 2009.
2. A. Singaravelu, Allied Mathematics, Meenakshi Agency, 2007.

15BBI110 **MATHEMATICS FOR BIOINFORMATICS** **4004**

Course Outcome:

CO-1: To acquire knowledge on basics of mathematics and to implement it in biological concepts.

CO-2: To be clear in converting the biological data to knowledge and to utilize matrices in analyzing genetic codes.

CO-3: To understand symmetry concepts and apply in analyzing biological sequences and genetics.

CO-4: To acquire knowledge to establish the theoretical concepts in analyzing biological information.

CO-5: To understand the geometric perspective in revealing the regularities in protein construction.

CO-6: To explore the geometrics and to develop in higher-level symmetries in understanding protein structure.

CO-7: To understand the inheritance properties using algebra concepts of mathematics.

CO-8: To develop tools and software to predict the genotype distribution of a particular trait in a population or in number of generations.

CO-9: To understand the basics of denotational mathematics and cognitive informatics.

CO-10: To get clear knowledge on natural intelligence and the brain through theoretical and computational approach.

UNIT I **GENETIC CODE AND MATHEMATICS** **12**

Introduction, Genetic Code and Mathematics, Mathematical Background, Converting Data to Knowledge, The Big Picture: Informatics, Challenges and Perspectives, Genetic Codes and Matrices.

UNIT II MATHEMATICAL SEQUENCES 12

Symmetrical Patterns, Molecular Genetics, and Bioinformatics, Mathematical Sequences, Sequence Alignment, Structures of DNA and Knot Theory – Introduction, Knot Theory Preliminaries, DNA Knots and Links, Challenges and Perspectives.

UNIT III PROTEIN STRUCTURES, GEOMETRY AND TOPOLOGY 12

Protein Structures, Geometry, and Topology: Introduction, Computational Geometry and Topology Preliminaries, Protein Structures and Prediction, Statistical Approach and Discussion, Biological Networks and Graph Theory – Introduction, Graph Theory Preliminaries and Network Topology, Models of Biological Networks.

UNIT IV GENETIC MATRICES 12

Matrix Genetics, Hadamard Matrices, and Algebraic Biology: Introduction, Genetic Matrices and the Degeneracy of the Genetic Code, The Genetic Code and Hadamard Matrices, Genetic Matrices and Matrix Algebras of Hypercomplex Numbers, Some Rules of Evolution of Variants of the Genetic Code, Challenges and Perspectives

UNIT VDENOTATIONAL MATHEMATICS AND COGNITIVE INFORMATICS 12

Bioinformatics, Denotational Mathematics, and Cognitive Informatics: Introduction, Emerging Pattern, Dissipative Structure, and Evolving Cognition, Denotational Mathematics and Cognitive Computing, Challenges and Perspectives.

Total: 60 Hours

Text Book:

Matthew He, Sergey Petoukhov, "Mathematics of Bioinformatics: Theory, Practice, And Applications", Wiley Series of Bioinformatics, 2010.

References:

1) Ahmed , N. , and Rao , K., "*Orthogonal Transforms for Digital Signal Processing"* .New York : Springer – Verlag, 1975.
2) B.S.Vatssa- wishwa Prakashan, "Discrete Maths", A Division of wiley Eastern ltd Chennai -1993.
3) P.R.Vittal, "Mathematical Foundations" – Margham Publication, Chennai, 2012

15BBI111 **VIROLOGY** **4004**

Course Outcome:

CO-1: To understand the basics structures, morphology and taxonomy of virus.

CO-2: To acquire knowledge on bio-safety measures to maintain and handle virus in the laboratorial conditions.

CO-3: To obtain a clear knowledge on basic cellular functions and the cell receptors involve in interactions.

CO-4: To get a clear understanding in the cell organelles and its role in regular cellular functions.

CO-5: To acquire knowledge on viral cell morphogenesis and transport of proteins, replications.

CO-6: To attain clear knowledge on signaling pathways and cytoskeletal interactions as well as the host-parasite relations.

CO-7: To figure out the strategies of replication in both RNA and DNA molecules.

CO-8: To be aware of mechanism involve in host viral infection in order to develop effective antiviral medicines.

CO-9: To perceive knowledge on antiviral and viral vaccines combating viral infections in the host.

CO-10: To implement modern approaches and computational techniques to get rid of viral infections.

UNIT I INTRODUCTION OF VIRUS 15

Introduction of virus, History and principles of virology, virus taxonomy, introduction to replication strategies. Virus structure and morphology, viruses of veterinary importance and plant viruses.Principles of bio-safety, containment facilities, maintenance and handling of laboratory animals and requirements of virological laboratory.

UNIT II CELLULAR RECEPTORS 10

Cellular receptors and virus entry – Definition, structure and methods of discovery of viral receptors (polio, herpes, VSV, HIV). Kinetics of receptor binding. Cellular interactions—clathrin coated pits, lipid rafts, caveolae, endocytosis and virus uncoating mechanisms Nuclear localization signals and nuclear pore transit, virus –cytoskeletal interactions, chaperons.

UNIT III VIRUS MORPHOGENESIS 10

Virus morphogenesis Replication sites and their characterization, IRES, replicones, transport of viral proteins.Mechanism of host cell damage- Host cell 'shut off', apoptosis, necrosis, stress response, alteration of signaling pathways, cellular basis of transformation, types of cenotaphic effects, ultrastructural cytopathology.

UNIT IV VIRUS REPLICATION 15

Virus Replication: RNA viruses: General strategies, replication of plus stranded RNA virus (polio), negative strand. RNA viruses (VSV and influenza). Other RNA viruses. Replication of double stranded RNA virus (rota), ambisense RNA (LCM) and retroviruses (HIV and HTLV). DNA viruses Replication of double stranded DNA viruses (SV40, pox), ssDNA virus (AAV). Miscellaneous(Prion proteins, replication of plant virus (Poty))

UNIT V ANTIVIRALS AND VIRAL VACCINES 10

Antivirals and Viral Vaccines:Viral Vaccines – Conventional vaccines –killed and attenuated, modern vaccines—recombinant proteins, subunits, DNA vaccines, peptides, immunomodulators (cytokines), vaccinedelivery and adjuvants. Antivirals- Interferons, designing and screening for antivirals, mechanisms of action, antivirallibraries, antiretrovirals—mechanism of action and drug resistance.Modern approaches of virus control Anti-sense RNA, siRNA, ribozymes, *in silico* approaches for drug designing.

Total: 60 Hours

Text Books:

P.saravanan, "Virology", Neha Publishers & Distributors, 2009,ISBN13: 9788180940170.

References:

1. Antiviral Agents, Vaccines, and Immunotherapies. Stephen K. Tyring. Latest edition / Pub. Date: October 2004. Publisher: Marcel Dekker.
2. Antiviral Drug Discovery for Emerging Diseases and Bioterrorism Threats. Paul F. Torrence (Editor). Latest edition / Pub. Date: July 2005. Publisher: Wiley, John & Sons, Incorporated
3. Principles of Virology: Molecular Biology, Pathogenesis, and Control of Animal Viruses. S. J. Flint, V. R. Racaniello, L. W. Enquist, V. R. Rancaniello, A. M. Skalka Latest edition / Pub. Date: December 2003 Publisher: American Society Microbiology.
4. DNA Virus Replication. Alan J. Cann. Latest edition / Pub. Date: March 2000. Publisher: Oxford University Press.

15BBI112 **BIOPHYSICAL CHEMISTRY** **4004**

Course Outcome

CO-1: To know the nature of quantum particles and its mechanics.

CO-2: To understand the molecular basics of quantum particles.

CO-3: To acquire knowledge on thermodynamics of particles and the importance of various laws in computing energies.

CO-4: To understand the concepts of energy contributions in biological systems.

CO-5: To understand the theoretical basics of atoms and biological systems.

CO-6: To gain knowledge on various bond interactions and its dynamic behavior in biology.

CO-7: To acquire the knowledge on basics of physical concepts of X-ray and crystallization.

CO- 8: To understand the usage of X-ray crystallography and macromolecular structure.

CO-9: To be well versed with the spectroscopy techniques and its uses.

CO-10: To acquire knowledge on NMR technique and its uses in macromolecular structure.

UNIT I CLASSICAL AND QUANTUM MECHANICS 15

Classical mechanics: History, Description of the theory, Limits of validity. Quantum mechanics-History, Interactions with other scientific theories, Philosophical implications, Applications, Examples.Elementary introduction to Lagrangian and Hamiltonian formulation of mechanics — Planck theory of blackbody radiation – photoelectric effect – Bohr model of the atom – atomic spectra – De Broglie theory of matter waves – Schrodinger wave equation – interpretation of wave function .

UNIT II THERMODYNAMICS 10

Thermodynamics And Energetics**:** Thermodynamics Systems – Laws Of Thermodynamics First Law Of Thermodynamics, SecondLaw Of Thermodynamics, ThirdLaw Of Thermodynamics – Statement And Applications – Concepts Of Entropy And Enthalpy – Chemical Potentials – Free Energy – Gibbs And Helmholtz Free Energy – ATP (Adenosine triphosphate)As Energy Currency In Biological Systems.

UNIT III MOLECULARMECHANICS AND DYNAMICS 15

Molecular Mechanics – Functional form, Areas of application, Environment and 87alvation, Software packages Molecular Dynamics:History, Areas of application and limitations, Basic Principles – Molecular Representations – Force Fields – Atom-Atom Pair Potentials – Bond Length And Bond Angle And Torsion Angle Potential – Van Der Waals And Electrostatic Potential – Hydrogen Bonding Terms.

UNIT IV X-RAY CRYSTALLOGRAPHY 10

X-ray crystallography – History, Contributions to chemistry and material science, Relationship to other scattering techniques, Methods – Procedure, Limitations, Crystallization, Data collection, Data analysis, Diffraction theory, Advantages of a crystal, Elementary description of crystallography- Unit cell – Miller indices – Crystal growth, X-ray diffraction- Refinement and interpretation- Concept of resolution.

UNIT V SPECTROSCOPY TECHNIQUES 10

IR spectroscopy – Theory, Practical IR spectroscopy, Absorption bands, Uses and applications UV-Visible spectroscopy – Principle of ultraviolet-visible absorption, Applications, Beer–Lambert law, Ultraviolet-visible spectrophotometer, Microspectrophotometry, Additional applications Raman spectroscopy – Theoretical basis, History, Raman shift, Applications, Microspectroscopy, Polarized analysis, Variations. NMR(Nuclear magnetic resonance) spectroscopy.History, Basic NMR techniques, Correlation spectroscopy, Biomolecular NMR spectroscopy

Total: 60 Hours

Text Books:

1) VasanthaPattabhi and N.Gautham‘Biophysics’Narosa Publishing Company, New Delhi. (2001)
2) P.Narayanan. ‘Introductory Biophysics’ New Age Publishing Co., Mumbai, India(1999)

References:

1. C.R.Cantor and P.Schimmel‘Biophysical Chemistry, Vol.I, II and III’W.H.Freeman and Company, New York, USA. (1985)
2. D.Freifelder‘Physical Biochemistry’W.H.Freeman and Company, New York, USA. (1982)
3. E.Ackerman, L.B.M.Ellis and L.E.Williams‘Biophysical Science’ Prentice Hall Inc., New Jersey, USA. (1979)
4. F.W.Sears, M.W.Zemansky and H.D.Young. ‘College Physics’ Addison Wesley Publishing Company, Massachusetts, USA (1985).

15BBI113 **CLOUD COMPUTING BASICS** **4002**

Course Outcome

CO-1: To acquire sound knowledge on cloud and its architecture in computing.

CO-2: To understand the business values of cloud computing.

CO-3: To know the concepts of cloud computing applied in various field.

CO-4: To understand the basis of service administration of cloud computing.

CO-5: To know the steps involve in cloud computing technology.

CO-6: To understand the usage of cloud computing in web applications.

CO-7: To acquire the knowledge on cloud computing data management, security and protection.

CO-8: To understand the concepts of data storage in cloud computing.

CO-9: To be well versed with the private cloud computing concepts.

CO-10: To acquire knowledge on accessing the novel hybrid clouds.

UNIT I INTRODUCTION TO CLOUD COMPUTING 12

Introduction to cloud computing: Collaborative to Cloud – A Short History, Functioning of Cloud computing, Cloud Architecture, Cloud Storage and Cloud Services, Industrial Applications, Business Values :– Introduction, Service Modeling, Infrastructure as a Service, Platform as a Service.

UNIT II SERVICE ADMINISTRATION 12

Inside Cloud Computing: Introduction, Sensational Feeling about Organization, Deciding on Strategy, Governance Issues, Monitoring Business Process, IT Cost Management, Cloud Service Administration:- Introduction, Service Level Agreements and Monitoring, Support Services, Resource Management, Service Management.

UNIT III COMPUTING TECHNOLOGY 12

Cloud Computing Technology: Introduction, Clients – Hardware clients, software clients, cloud clients, Security, Network – Basic public internet, The accelerated internet, Site-to-Site VPN, cloud providers, Cloud consumers, Pipe size, Redundancy, Services – Identity, Integration, Mapping, Payments, Search, Accessing the Cloud:- Introduction, Platforms – Web application frame work, web hosting service, propriety methods, Web applications, API in cloud computing, browsers for cloud computing.

UNIT IV DATA MANAGEMENT 12

Cloud Data Management: Data Security, Data Location, Data Control, Securing data for Transport, Scalability and cloud services – Large scale data processing, Databases and data stores and data archival, Storage as a Service, Information Storage in Cloud computing – Storage Providers, Storage Security, Merits and Demerits of Cloud Storage.

UNIT V PRIVATE AND HYBRID CLOUDS 12

Discovery of Private and Hybrid clouds: Need for privacy, comparing public, private and hybrid, Examining the economics of the private cloud, The Up Key Vendors, Cloud Computing Standards – Best Practices and Standards, Practical Issues, Standards Organizations and Groups.

Total: 60 Hours

Text Book:

1. Dr. Kumar Saurabh, “Cloud Computing”, Second Edition, Wiley India Private Limited; 2012

Reference:

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, Tata McGrah Hill, 2014

15BBI114 RECOMBINANT DNA TECHNOLOGY 4002

Course Outcome

CO-1: To learn about the fundamentals and role of biomolecules in Recombinant DNA technology.

CO-2: To gain knowledge about strategies in gene cloning.

CO-3: To understand the basic techniques and applications in Genetic engineering

CO-4: To enrich the quest on applications including cloning vectors and expression vectors.

CO-5: To know about the concepts of cell transformation due to the changes in genetic material, and cell cloning.

CO-6: To bring into the light about the creation of gene libraries.

CO-7: To learn about the beginning of transformation and transfection methods.

CO-8: To bring abundant knowledge in cloning methodologies, sequencing and human genome project.

CO-9: To learn about the advent of Polymerase Chain Reaction and tremendous impact on molecular biology.

CO-10: To understand the Polymerase Chain Reaction based mutagenesis and gene silencing techniques.

UNIT I CLONING AND RDNA TECHNOLOGY 10

Introduction to cloning and rDNA technology, Recombinant DNA, Cloning DNA, Cloning vectors: Plasmids (pUC 18 and Ti plasmids), Bacteriophages, Plasmids, Cosmids , SV40, retrovirus and Artificial Chromosomes (BAC, YAC), Amplification of Recombinant DNA.

UNIT II GENE CLONING 15

Strategies in gene cloning: restriction, ligase, insertion into vector, cloning, transformation into host cell, Enzymology of Recombinant DNA. Screening for recombinant (Insertional inactivation, Colony/in situ hybridization, radioactive antibody test, Xgal, complementation and physical methods).

UNIT III GENOME SEQUENCING 15

Methods of gene transfer and genome sequencing:CaPO4 mediated gene transfer, liposomes, electroporation, electro fusion, micro-injection, particle bombardment. DNA sequencing (Sanger and Coulson method; Maxam and Gilbert method and Automated method) – Chromosomal walking, transposons, construction of genomic and cDNA libraries; molecular markers- RAPD, RFLP.

UNIT IV TRANSGENIC PLANTS 10

Transgenic plants: Definitions, types of Transgenic plants, benefits, public concern and future, high yielding, salt, draught, herbicide, disease resistant. Genetically modified crops, Transgenic animals –for improved livestock production.

UNIT V RDNA IN MEDICINE 10

rDNA in medicine: Recombinant DNA Therapy in Medicine, Vaccines, enzymes, blood factors, interferon, gene therapy, DNA fingerprinting and its applications in forensic sciences, Application of Recombinant Technology – Gene mapping, Diagnosis of Molecular disease, Application in forensic medicine.

Total: 60 Hours

Text Book:

1. Primrose. Principles of genetic manipulation; 6th Edition. Blackwell Science publication BN-10: 0632059540,ISBN-13: 978-0632059546

References:

1. Keya Chaudhuri Recombinant DNA Technology ,Paperback, July 19, 2013 b ISBN-10: 8179933202 ,ISBN-13: 978-8179933206

2. T. A. Brown . A Introduction To Gene Cloning, Chapman and Hall publications, 3rd Edition, 1995. ISBN 978-1-4051-8173-0
3. Sardul Singh Sandhu. Recombinant DNA Technology Hardcover – Import.Oct 2010 ISBN-10: 938057844X,ISBN-13: 978-9380578446
4. Monika Jain. Recombinant DNA Techniques: A Textbook 1st Edition.Paperback.2011 ISBN-13: 978-1842656679,ISBN-10: 1842656678

15BBI115 DATA WAREHOUSING AND DATA MINING 4002

Course Outcome

CO-1: To learn about the components in dataware housing.

CO-2: To gain knowledge in identify the subject area for which a data warehouse is to be built.

CO-3: To enlighten about query tools and Applications.

CO-4: To learn the Dimensional model for data warehouse.

CO-5: To know about introduction and types of data mining.

CO-6: Analyze the market needs by applying suitable OLAP operations.

CO-7: Identify the patterns that can be extracted on application of data mining techniques in various domains.

CO-8: To Understand several different data mining techniques such as market basket analysis, Clustering, classification.

CO-9: To develop an application by using various data mining techniques to identify patterns that evolves in various business domains.

CO-10: To know about clustering and applications and trends in data mining.

UNIT I INTRODUCTION TO DATA WAREHOUSING 12

Data Warehousing:- Data warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

UNIT II BUSINESS ANALYSIS 12

Business Analysis:- Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Online Analytical Processing (OLAP) – Need –Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multi relational OLAP – Categories of Tools – OLAP Tools and the Internet.

UNIT III DATA MINING 12

Data Mining:- Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of patterns – Classification of Data Mining Systems – Data Mining Task Primitives –Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

UNIT IV ASSOCIATION RULE MINING AND CLASSIFICATION 12

Association Rule Mining and Classification:- Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction – Basic Concepts.

UNIT V CLUSTERING AND APPLICATIONS AND TRENDS IN DATA MINING 12

Clustering and Applications and Trends in Data Mining:- Cluster Analysis – Types of Data – Categorization of Major Clustering Methods – K means – Partitioning Methods – Hierarchical Methods – Density-Based Methods – Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data – Constraint – Based Cluster Analysis.

Total: 60 Hours

Text Book:

Alex Berson and Stephen J. Smith,“ Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.

References:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Second Edition, Elsevier, 2007.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction To Data Mining”, Person Education, 2007.
3. G. K. Gupta, “ Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
4. Data Mining Data Warehousing And Olap S K Kataria Paperback 2010.

GENERIC ELECTIVES

15BBI151 INTRODUCTION TO BIOINFORMATICS 2 0 0 2

Course Outcome

CO-1: To acquire the skill of constructing algorithms and there by determining the computational complexity of algorithms by knowing the basic biological information.

CO-2: To provide the necessary biological (Gene and protein) background which are required solve the problem that arise during the designing of algorithm.

CO-3: To map an unknown segment of DNA by breaking it into pieces and then by identifying the locations of the breakpoints in the gene.

CO-4: To follow the problem solving heuristic of making the locally optimal choice at each stages with the hope of finding a global optimum.

CO-5: To solve many different types of complex problem by breaking down into a collection of simpler sub biological problems and by solving each of those biological problems one by one until expected solutions arrived.

CO-6: To analyze the previously solved sub problems and combine their solutions along with the achieved result to give the best solution for the given biological problem.

CO-7: To divide the given problem, at least into 2 sub-problems and the combination of the results arrived by sub problem is much easier than finding the solution of the initial problem directly.

CO-8: To prove an algorithm for the given biological problem is often necessary to replace the original problem with a more complicated problem in order to initialize the recursion.

CO-9: Mathematical approach to solving certain types of biological problem like sequence alignment, gene detection, structure prediction, data-mining literature.

CO-10:The problem is not directly noticeable, but the output of the problem dependent on the result predicted by the probability distribution.

UNIT I INTRODUCTION TO COMPUTERS 6

Basics of computing: Introduction to operating systems – WINDOWS, UNIX, LINUX; Advantages of security installation; Use of internet; Graphics – visualization techniques; softwares and hardwares; Computer networking – LAN, WAN, MODEM, Optical vs electronic networking, firewalls; Ethernet and TCP/IP family of protocols.

UNIT II INTRODUCTION TO BIOLOGICAL DATABASES 6

Introduction To Nucleic Acid Data Banks, Introduction To Protein Sequence Data Banks; Nucleotide Databases, Nucleic Acids Research Database Issue, Access, Species-Specific Databases Protein Databases (Swiss-Prot, Tr-EMBL, PIR_PSD, Expasy); Derived Databases Sequence Submission Methods And Tools (Sequin, Sakura, BankiT); Sequence Retrieval Systems (Entrez& SRS)

UNIT III BIOPOLYMERS 6

Introduction to Biopolymer, Synthetic Polymer, Biopolymers vs synthetic polymers, Conventions and nomenclature, Structural characterization, Biopolymers as materialsInternal and external co-ordinate system; Generation of co-ordinates of biopolymers in Cartesian and cylindrical polar co-ordinate system; Genome Anatomy, Prokaryotic genomes structures, Eukaryotic genomes structures.

UNIT IV SEQUENCE ANALYSIS 6

Introduction to Sequence analysis, History, Sequence Alignment , Profile comparison , Analysis of protein and nucleic acid sequences, multiple alignment programs, Development of programs for analysis of nucleic acid sequences, Pair wise Sequence Alignment – Similarity, Identity and Homology, Global Alignment, Local Alignment, Sequence assembly, Gene prediction, Protein Structure Prediction, Methodology.

UNIT V STRUCTURAL ANALYSIS 6

Structures And Loads- Classification Of Structures & Loads, Analytical Methods- Limitations. Strength Of Materials Methods (Classical Methods), Example – Method Of Joints, Method Of Sections, Elasticity Methods, Methods Using Numerical Approximation, Timeline, Analysis Of Structures And Correctness Of Structures, Submission Of Data To PDB: Atomic Coordinates And Electron Density Maps; Methods For Prediction Of Secondary And Tertiary Structures Of Proteins.

Total : 30 hours

Text Book:

1. Baxevanis A.D., Davison D.B., Page R. D. M. & Petsko G.A. Current Protocols in Bioinformatics. New York, John Wiley & Sons Inc., 2004. ISBN: 0555015254 Syllabus draft: BoS April 26, 2010 Dr. Urmila Kulkarni-Kale 15

References:

1. N. Gautham, "Bioinformatics", Narosa Publishing Company, New Delhi, 2006.
2. Lesk, A.M., "Introduction to Bioinformatics", 1st Edition, Oxford University Press, Oxford, UK, 2002.

15BBI152 CHEMINFORMATICS 2 0 0 2

Course Outcome

CO-1: To acquire knowledge on the basic representation and file formats of chemical molecules.

CO-2: To understand the applications of chemical information in various fields.

CO-3: To gain knowledge on different descriptor formats available for the molecules.

CO-4: To understand the important properties of small molecules and its application in the similarity and diversity analysis.

CO-5: To observe the infrastructure of chemical databases, information stored and its types.

CO-6: To be clear with the different search techniques and its importance in acquiring required data.

CO-7: To perceive the molecular relationships based on physical and chemical properties with the biological properties.

CO-8: To obtain knowledge on the molecular properties and to develop tools for predicting the specific properties.

CO-9: To observe the features of pharmacophore and to access the combinatorial libraries for pharmacophore designing.

CO-10: To be clear with identification, accession and application of pharmacophores in drug designing process.

UNIT I INTRODUCTION TO CHEMINFORMATICS 6

Introduction To Chemo Informatics: Aims, Scope. History, Basics, Role Of Chemo Informatics In Pharmaceutical/Chemical Research. Chemical Structure Representation: 1D, 2D And 3D Structures. Molecular File Formats (SMILES, WLN, SDF, And MOL). Applications – Storage And Retrieval, Virtual Libraries, Virtual Screening, Quantitative Structure-Activity Relationship (QSAR)

UNIT II MOLECULAR DESCRIPTORS 6

Introduction, Invariance Properties Of Molecular Descriptors, Degeneracy Of Molecular Descriptors, Basic Requirements For Optimal Descriptors, Molecular Descriptors (1dimension, 2dimension And 3dimension) And MACCS Keys Topological, Electrotoplogical And Shape Indices. Molecular Similarity and Molecular Diversity Analysis.

UNIT III MOLECULAR DATABASE SCREENING 6

Introduction To Molecular Database Screening, Methods- Ligand-Based, Structure-Based, Computing Infrastructure – Ligand-Based, Structure-Based, Accuracy, Lipinski Rule: Drug/Lead Like Molecules,. Chemical Structure Representation – Substructure, Conformation. Chemical Structure Based Search Techniques: Exact, Sub-Structure and Similar Structure Searches.

UNIT IV QUANTITATIVE STRUCTURE ACTIVITY RELATIONSHIP 6

Quantitative Structure Activity/Property/Toxicity Relationship Studies. SAR and the SAR paradox, Types- Fragment based (group contribution), 3D-QSAR, Chemical descriptor based, Modeling – Data mining approach, Matched molecular pair analysis, Evaluation of the quality of QSAR models, Application- Chemical, Biological, Applications. Introduction to Molecular Properties, Activities and Toxicities. Training Data, Test Data and External validation Data.

UNIT V PHARMACOPHORE 6

Historical Perspective andFeatures Design & Analysis of Combinatorial Libraries. Molecular Scaffolds, Linkers and Functional groups. Reagents and products based combinatorial library generation. Identification of pharmacophore features. Searching databases using pharmocophoresDocking Studies. Pharmacophore Model, Viewpoint of Pharmacophore

Total : 30 hours

Text Book:

Gasteiger Johann, Engel Thomas. Chemoinformatics: A Textbook. Publisher: WileyVCH; 1st edition. 2003. ISBN: 3527306811.

References:

1. Bunin Barry A. Siesel Brian,Morales Guillermo,Bajorath Jürgen. Chemoinformatics: Theory, Practice, & Products Publisher:New York, Springer. 2006. ISBN: 1402050003.
2. Leach Andrew R., Valerie J. Gillet. An introduction to chemoinformatics. Publisher: Kluwer academic, 2003. ISBN: 1402013477.
3. Gasteiger Johann, Handbook of Chemoinformatics: From Data to Knowledge (4 Volumes), 2003. Publisher: Wiley-VCH. ISBN:3527306803

15BBI153 MOLECULAR MODELING AND DRUG DESIGNING 2 0 0 2

Course Outcome

CO-1: To understand the molecular geometry information, basic concepts of a molecule.

CO-2: To explore the molecular geometry information to determine the stability of small molecule interactions with the proteins.

CO-3: To perceive the knowledge on the activities of a molecule inside the biological system through simulation studies.

CO-4: To understand the algorithms used to develop software to predict the molecular activities through computational approach.

CO-5: To get knowledge on pharmacophore, its features, applications and to get access to the sources exist at present

CO-6: To determine a significant pharmacophore model in order to identify the most promising candidates.

CO-7: To understand the algorithms used in the molecular docking concepts and its types.

CO-8: To get an exposure to the existing docking software and to observe the result.

CO-9: To be aware of molecular databases available at present to explore the biological molecules.

CO-10: To understand the basic steps in querying database and to interpret information from the datas available.

UNIT I MOLECULAR GEOMETRY 6

Molecular Geometry – Introduction to Molecular Geometry, Electronic Spatial Extent and Molecular Volume, Electron Affinity and Ionization Potential, Hyperfine Coupling, Dielectric Constant, Force Field Customization., The influence of thermal excitation, Bonding, Isomers, Types of molecular structure(VSEPR table), 3D representations, Molecular geometry determination.

UNIT II MOLECULAR DYNAMICS 6

Molecular Dynamics- Introduction to Molecular Dynamics, History, Areas of application and limitations, Design constraints, Potentials in MD simulations,Examples of applications, Density Functional Theory, Linear Scaling Techniques, Ab initio Methods, Hartree-Fock Approximation, Mùller-Plesset Perturbation Theory, Quantum Monte Carlo Methods, Natural Orbitals and Monte Carlo Simulations.

UNIT III PHARMACOPHORE 6

Pharmacophore – Historical Perspective andFeatures, Viewpoint of Pharmacophore, Functional Groups Considered as Pharmacophores, Molecular Alignments, Handling Flexibility, Alignment Techniques, Scoring and Optimization, Pharmacophores, Model development – Select a training set of ligands, Conformational analysis, Molecular superimposition, Abstraction, Validation. Applications

UNIT IV MOLECULAR DOCKING 6

Molecular Docking – Introduction to molecular docking, Definition of problem, Docking approaches, Mechanics of docking, Applications, Types of docking – Rigid docking, Flexible docking, manual docking, Advantage and disadvantage of Flex-X, Flex-S,List of Protein-Ligand Docking Software AUTODOCK, Arguslab, Hex, PyRx.

UNIT V MOLECULAR AND STRUCTURAL DATABASE 6

Library and Database- Molecular Database – Swiss-model, ModBase , Protein Model Portal and Structural Database - Protein Data Bank, (SCOP) Structural Classification of Proteins, (CATH) Protein Structure Classification, PDBsum, Bioactivity Databases, Gene and Protein Sequence Databases,Cambridge Crystallographic Database, Compound Storage and Management.

Total : 30 Hours

Text Book:

1. Andrew R. Leach. Molecular Modelling: Principles and Applications, second edition. Pearson Education EMA, January 2001 ISBN 0-582-38210-6

References:

1. D. C. Rapaport, The Art of Molecular Dynamics Simulation, 2004, ISBN 0-521-82568-7
2. M. P. Allen, D. J. Tildesley, Computer simulation of liquids, 1989, Oxford University Press, ISBN 0-19-855645-4.
3. R. J. Sadus, Molecular Simulation of Fluids: Theory, Algorithms and Object-Orientation, 2002, ISBN 0-444-51082-6
4. J.M.Haile, Molecular Dynamics Simulation Elementary Methods, John Wiley and Sons, 1997.

15BBI154 STRUCTURAL BIOINFORMATICS 2 0 0 2

Course Outcome

CO-1: To learn about the introduction to bioinformatics, structural bioinformatics, molecular structure and internal energy.

CO-2:To gain knowledge in energy minimization of small molecules.

CO-3:To enlighten about bioinformatics databases applied in protein structure prediction.

CO-4: To learn the protein structural terminology, protein classification and modelling.

CO-5: To know about the protein structures.

CO-6: To enrich the knowledge on Proteomic tools.

CO-7:To learn about the protein stability and fold, protein function prediction methods and approaches to protein structural genomics.

CO-8:To understand protein function predictions- sequence based and network based methods.

CO-9:To learn secondary structure predictions homology modelling, fold recognition and *ab initio* 3D structure predictions.

CO-10: To know about protein sequence and structure analysis tools.

UNIT I ENERGY MINIMIZATION 6

Introduction to bioinformatics-structural bioinformatics-molecular structure and internal energy. Application of molecular graphics. Energy minimization of small molecules: empirical representation of molecular energies. Use of force fields and the molecular mechanics method. Discussion of local and global energy minima.

UNIT II COMPARATIVE FEATURES 6

Protein structure evolution and the SCOP database- CATH domain structure databases-Structural quality assurance – Structure comparison alignment, Protein structure terminology, Protein classification, Comparative protein modeling – Homology modeling and Protein threading.

UNIT III STRUCTURE AND FUNCTIONAL ASSIGNMENT 6

Protein structure: - Primary, Secondary, Tertiary structure and Quaternary structure, Secondary structure assignment-identifying structural domains in proteins-Inferring protein function from structure, Evaluation of automatic structure prediction servers.

UNIT IV DETERMINATION OF FUNCTION 6

Protein stability and folding-SCOP-DALI-assignment of protein structures to genomes-determining gene function through conserved protein structure-prediction of protein function-approaches to protein structural genomics, Protein function prediction:- Homology Based Methods, Sequence motif – based methods, Structure based methods, network based methods,

UNIT V STRUCTURE PREDICTION 6

Structure prediction – secondary structure – homology modeling, fold recognition and *ab initio* 3D structure prediction – structure comparison and alignment, Structural information of protein – ExPasy, protein sequence analysis, De Novo Protein Structure prediction.

Total: 30 Hours

Text Book:

1. Webster David (Editor). Protein Structure Prediction: Methods and Protocols (Methods in Molecular Biology) Volume 143. Publisher: New Jersey Humana Press. 2000. ISBN: 0896036375.

References:

1. Cesareni Giovanni, Gimona Mario, Sudol Marius, Yaffe Michael (Editors). Modular Protein Domains. Publisher: Weinheim Wiley-VCH. 2005. ISBN: 352730813X.
2. Höltje Hans-Dieter, Sippl Wolfgang, Rognan Didier, Folkers Gerd. Molecular Modeling: Basic Principles and Applications. Publisher: New York, Wiley-VCH. 2003. ISBN: 3527305890.

15BBI155 PROGRAMMING IN PERL AND BIOPERL 2 0 0 2

Course Outcome

CO-1: To acquire sound knowledge on basics in perl and more on usage of scalar, arrays and hashes.

CO-2: To understand the concepts of subroutines in perl.

CO-3: To acquire knowledge on file handling and file management in perl.

CO-4: To understand the role of regular expressions concepts in perl and its major role in bioinformatics.

CO-5: To understand the basics of control structures in perl.

CO-6: To understand the importance of perl modules in the advance programming skills.

CO-7: To acquire the knowledge on BioPerl and its modules.

CO-8: To understand the usage of BioPerl in Bioinformatics research.

CO-9: To gain knowledge on common gateway interface (CGI) and methods.

CO-10: To acquire knowledge on CGI connecting HTML and webpages.

UNIT I INTRODUCTION TO PERL 6

Introduction:- Scalar Data- Numbers, Strings, Scalar Variables, Output with print, Getting User Input, The chomp operator, undef Value, defined function, The if and while control structures, **Lists and Arrays:-** Accessing elements of an array, Subroutines.

UNIT II EXPRESSIONS 6

Input and Output:- Input from Standard Input, Input from the diamond operator, Invocation arguments, Output to Standard Output, Filehandles, Opening a Filehandle, Expressions:- Matches with m//, Option Modifiers, Anchors, The Binding operator, =~, Interpolating into Patterns, The match Variables, General Quantifiers.

UNIT III CONTROL STRUCTURES 6

Control Structures:- The unless Control Structure, The until Control Structure, Expression Modifiers, The Naked Block Control Structure, The elsif Clause, Autoincrement and Autodecrement, The for Control Structure, Loop Controls, Logical Operators,

UNIT IV FILES 6

File Tests:- File Test Operators, The stat and lstat functions, The localtime function, Bitwise Operators, Using the Special Underscore Filehandle, Strings and Sorting:- Finding a Substring with index, Manipulating a Substring with substr, Formatting Data with sprint, Advanced Sorting, Perl Modules:- Finding Modules, Installing Modules, Using Simple Modules.

UNIT IV INTRODUCTION TO BIOPERL 6

Bioperl:- Introduction, Installing Bioperl, General Bioperl Classes, Sequences (Bio::Seq Class, Sequence Manipulation), Features and Location Classes (Extracting CDS), Alignments (AlignIO), Analysis (Blast, Genscan). Application of BioPerl Module, uses of BioPerl Module in biological analysis.

Total: 30 Hours

Text Book:

Martin C Brown, "Perl The Complete Reference", Tata McGraw Hill, 2001

References:

1. Erick Storm, "Perl CGI Programming", BPB Publication, 1998.
2. Steven Holzner, "Per: Black Book", Second Edition, Dreamtech Publication, 2007.
3. Ed Peschko & Michele Dewolf, "Perl Developer's Guide", Tata McGraw Hill, 2000.

15BBI156 PYTHON FOR BIOINFORMATICS 2 0 0 2

Course outcome

CO-1: To understand script and the contributions of scripting languages.

CO-2: To understand Python especially toward object-oriented concepts

CO-3: To understanding of the built-in objects of Python,

CO-4: To implement a given biological algorithm as a computer program using Python

CO-5: To adapt and combine standard python algorithms to solve a given biological problem (incudes numerical as well as non-numerical algorithms)

CO-6: To use standard python programming for biological constructs of algorithm using repetition, selection, functions, composition, modules, aggregated data (arrays, lists, etc.)

CO--7: To identify and to repair coding errors in a biological program

CO-8: To understand and use object based software concepts to solve the gene coding problem

CO-9: To use library software for building a graphical user interface, web application, mathematical software

CO-10: To build new Python software tools for life science research.

UNIT I INTRODUCTION TO PYTHON 6

Introduction to Python, History of Python, Python Features, Python Development Tools, Writing Python Program, Values and Variables:- Numeric Values, Variables and Assignment, Identifiers, Control codes within Structure, Controlling the print Function

UNIT II EXPRESSION 6

Expressions and Arithmetic:- Operator Precedence and Associativity, Comments, Errors (Syntax, Run-time errors, Logic Errors), Arithmetic Examples, Conditional Execution:- Simple if Statement, if/else statement, Compound Boolean Expressions, Nested Conditionals, Multi-way Decision Statements, Conditional Expressions.

UNIT III CONDITIONAL EXECUTION 6

Conditional Execution:- What is conditional statement in Python, Simple if Statement, if/else statement, nested if condition, else – if ladder, Compound Boolean Expressions, Nested Conditionals, Multi-way Decision Statements, Conditional Expressions.

UNIT IV ITERATION 6

Iteration:- While Statement, For Statement, Nested Loops, the break statement, the continue statement, Infinite Loops, Computing Square roots, Drawing a Tree, Using Functions – mathematical functions – time Functions, reading the files from existing database using Python.

UNIT V SEQUENCE ANALYSIS THROUGH PYTHON 6

Sequence Alignment:- Alphabets, Matching Sequences – Perfect Matches – Insertions and Deletions – Rearrangements – Global Versus Local Alignments – Sequence Length, Simple Alignment (Direct Alignment), Statistics:- Simple Statistics, Distributions, Normalizations, Multivariate Statistics, Probabilities, Odds.

Total: 30 Hours

Text Book:

1. Jason Kinser, “Python for Bioinformatics”, Jones and Bartlett Publishers, Sudbury, Massachusetts 2009

References:

2. Richard L., Halterman, “Learning to Program with Python”, 2011

3. Kent D. Lee, “Python Programming Fundamentals: Second Edition”, Springer, 2010

4. Cody Jackson, “Learning to Program Using Python”, Second Edition, 2013

5. Mark Lutz, “Learning Python”, Third Edition, O’Reilly, 2007