B.Sc. (Computer Science) Third Year
(With effects from 2013-14)

Fifth Semester:

Paper Code	Subject	Lectures/ Week		Max. Marks (A)	Term Work (B)	Total Marks (A+B)	Exam Duration
		Theory	Practical				
B.Sc.(CS).S5.1	Cyber Security	4		80	20	100	03 Hrs
B.Sc.(CS).S5.2	Cloud Computing	4		80	20	100	03 Hrs
B.Sc.(CS).S5.3	Programming in Java-I	4		80	20	100	03 Hrs
B.Sc.(CS).S5.4	Oracle 10G SQL & PL/SQL	4		80	20	100	03 Hrs
B.Sc.(Cs).S5	Digital Image Processing	4		80	20	100	03 Hrs
B.Sc.(CS).S5.PR1	Programming in Java –I		3	50		50	03 Hrs
B.Sc.(CS).S5.PR2	Oracle 10G SQL & PLSQL		3	50		50	03 Hrs
B.Sc.(CS).S5.PR3	Digital Image Processing		3	50		50	03 Hrs
B.Sc.(CS).S5.PR4	Seminar		3	50		50	03 Hrs
	Total					**700**	
Sixth Semester							
B.Sc.(CS).S6.1	Programming in Java-II	4		80	20	100	03 Hrs
B.Sc.(CS).S6.2	Oracle 10G DBA	4		80	20	100	03 Hrs
B.Sc.(CS).S6.3	Business Applications	4		80	20	100	03 Hrs
B.Sc.(CS).S6.4	Elective: A. Data Mining B. Research Methodology C. Bioinformatics D. Linux Administration	4		80	20	100	03 Hrs
B.Sc.(CS).S6.5	Seminar on Project report	4		80	20	100	03 Hrs
B.Sc.(CS).S6.PR1	Programming in Java-II		3	50		50	03 Hrs
B.Sc.(CS).S6.PR2	Oracle 10G DBA		3	50		50	03 Hrs
B.Sc.(CS).S6.PR3	Business Applications (Industry Visit & Report writing)		3	50		50	03 Hrs
B.Sc.(CS).S6.PR4	Elective: 1. Data Mining 2. Research Methodology 3. Bioinformatics 4. Linux Administration		3	50		50	03 Hrs
	Total					**700**	
	5^{th} and 6^{th} Semester					**1400**	

B.Sc.(CS).S5.1 Cyber Security

1 Object and Scope of the IT Act
1.1 Genesis
1.2 Object
1.3 Scope of the Act

2 Encryption
2.1 Symmetric Cryptography
2.2 Asymmetric Cryptography
2.3 RSA Algorithm
2.4 Public Key Encryption

3 Digital Signature
3.1 Technology behind Digital Signature
3.2 Creating a Digital Signature
3.3 Verifying a Digital Signature
3.4 Digital Signature and PKI
3.5 Digital Signature and the Law

4 Domain Name Disputes and Trademark Law
4.1 Concept of Domain Names
4.2 New Concepts in Trademark Jurisprudence
4.3 Cyber squatting, Reverse Hijacking, Meta tags, Framing, Spamming,
4.4 Jurisdiction in Trademark Dispute

5 Cyber Regulations Appellate Tribunal
5.1 Establishment & Composition Of Appellate Tribunal
5.2 Powers of Adjudicating officer to Award Compensation
5.3 Powers of Adjudicating officer to Impose Penalty

6 The Cyber Crimes
6.1 Tampering with Computer Source Documents
6.2 Hacking with Computer System
6.3 Publishing of Information Which is Obscene in Electronic Form
6.4 Offences : Breach of Confidentiality & Privacy
6.5 Offences : Related to Digital Signature Certificate

References:
1) Cyber Law in India by Farooq Ahmad – Pioneer Books
2) Information Technology Law and Practice by
Vakul Sharma – Universal Law Publishing Co. Pvt. Ltd.
3) The Indian Cyber Law by Suresh T Vishwanathan –
Bharat Law house New Delhi.
4) Hand book of Cyber & E-commerce Laws by P.M. Bakshi & R.K.Suri –
Bharat Law house New Delhi.
5) Guide to Cyber Laws by Rodney D. Ryder –
Wadhwa and Company Nagpur.
6) The Information Technology Act,2000 – Bare Act –
Professional Book Publishers – New Delhi.

B.Sc.(CS).S5.2 Cloud Computing

Chapter 1 Enterprise computing: a retrospective
- 1.1 Introduction
- 1.2 Mainframe architecture
- 1.3 Client-server architecture
- 1.4 3-tier architectures with TP monitors

Chapter 2 The internet as a platform
- 2.1 Internet technology and web-enabled applications
- 2.2 Web application servers
- 2.3 Internet of services

Chapter 3 Software as a service and cloud computing
- 3.1 Emergence of software as a service
- 3.2 Successful SaaS architectures
- 3.3 Dev 2.0 platforms
- 3.4 Cloud computing
- 3.5 Dev 2.0 in the cloud for enterprises

Chapter 4 Cloud computing platforms
- 4.1 Infrastructure as a service: Amazon EC2
- 4.2 Platform as a service: Google App Engine
- 4.3 Microsoft Azure

Chapter 5 Web services, AJAX and mashups
- 5.1 Web services: SOAP and REST
- 5.2 SOAP versus REST
- 5.3 AJAX: asynchronous ‘rich’ interfaces
- 5.4 Mashups: user interface services

Chapter 6 Data in the cloud
- 6.1 Relational databases
- 6.2 Cloud file systems: GFS and HDFS
- 6.3 BigTable, HBase and Dynamo
- 6.4 Cloud data stores: Datastore and SimpleDB

Chapter 7 MapReduce and extensions
- 7.1 Parallel computing
- 7.2 The MapReduce model
- 7.3 Parallel efficiency of MapReduce
- 7.4 Relational operations using MapReduce
- 7.5 Enterprise batch processing using MapReduce

Chapter 8 Dev 2.0 platforms
- 8.1 Salesforce.com’s Force.com platform
- 8.2 TCS InstantApps on Amazon cloud
- 8.3 More Dev 2.0 platforms and related efforts
- 8.4 Advantages, applicability and limits of Dev 2.0

Reference Book: Enterprise Cloud Computing: Technology, Architecture, Application
By Gautam Shroff

B.Sc.(CS).S5.3 Programming in Java –I

1. An Introduction to Java (3)
- A Short History of Java
- Features of Java
- Comparison of Java and C++
- Java Tools And Editors(Appletviewer,Jar,Jdb)
- Java Environment.

2. An Overview of Java (3)
- Types of Comments.
- Built In Data Types.
- Variables and Constants(Final Keyword Related to variables)
- Operators
- Memory Allocation Using new Operator.
- Output using println() method
- Control Statements.
- Arrays, static and dynamic
- Simple Java Program.

3. Objects and Classes (6)
- Defining Your Own Classes and Use of 'this' Keyword.
- Using Predefined Classes
- Object the cosmic class
- Constructor and Overloading Constructors
- Method Parameters
- Static Fields and Methods
- Access Specifiers (public, protected, private, friendly(defualt))
- Creating Accesses and using Packages
- Wrapper Classes
- Garbage Collection(finalize() Method)

4. Inheritance (5)
- Inheritance Basics (extends Keyword) and Types of Inheritance

Superclass, and Subclass and use of Super Keyword
- Method Overriding and Use of final keyword related to method and class
- Use of Abstract class

5. Interfaces and Inner Classes (4)
- Defining and Implementing Interfaces
- Object Cloning
- Inner Classes

6. Exception Handling (5)
- Dealing Errors
- Catching exception and exception handling
- Creating user defined exception.
- Using assertion

7. Strings, Streams and Files. (8)
- String class and StringBuffer Class
- Stream classes

Byte Stream classes

Character Stream Classes
- Using the File class
- Creation of files
- Reading/Writing characters and bytes
- Handling primitive data types
- Random Access files

8. User Interface Components with AWT and Swing (11)
- What AWT ? What is Swing? Difference between AWT and Swing.

- The MVC Architecture and Swing
- Layout Manager and Layouts, The JComponent class
- Components -

Buttons and Labels (JButton, JLabel), Checkboxes and Radio Buttons (JCheckBox and JRadioButton), Lists and Combo Boxes (JList and JCombo) along with the JScrollPane Class, Menus – Jmenu and the JPopupMenu Class, JMenuItem and JCheckBoxMenuItem, Scrollbars and Sliders(JScrollBar and JSlider), Dialogs (Message, confirmation, input (like file selection) and options(like color chooser))

- Event Handling: Event sources, Listeners, Adapters, Anonymous class

9. Applet Programming (3)

- Applet Life Cycle.
- Applet HTML Tags.
- Passing parameters to Applet
- Repaint() and Update() method

Reference Books :

1) Complete reference Java by Herbert Schildt(5th edition)
2) Java 2 programming black books, Steven Horlzner
3) Programming with Java , A primer ,Forth edition , By E. Balagurusamy
4) Java servlet Programming by Jason Hunter, O'Reilly
5) Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press.
6) Core Java Volume-II-Advanced Features, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press.

B.Sc.(CS).S5.4 Oracle 10G SQL & PL/SQL

1. Introduction and Basic Concepts DBMS **5 Hrs.**

1.1 Structure of DBMS
1.2 Advantages & Disadvantages
1.3 Users of DBMS
1.4 Database Models
- Hierarchical Data Model
- Network Data Model
- Relational Data Model
- E R Data Model

2. SQL Statements &Working with tables **8 Hrs.**

2.1 DDL
2.2 DML
- Procedural DML
- Non Procedural DML

2.3 DQL
2.4 DCL
2.5 Transaction Control Commands
2.6 Data types in SQL
2.7 Creating & Managing Tables
2.8 Manipulating Data
2.9 Retrieving data using SELEC T Command
2.10 WHERE Clause
2.11 DISTINCT Clause
2.12 Using Column Aliases
2.13 Working with Views
- Creating View on Tables
- Creating View on Views
- Updating Views
- Altering Views

3. Sorting & grouping Data in SQL **5 Hrs.**

3.1 Using Order By Clause
3.2 Using Group By & Having clause
3.3 Substitution Variables
3.4 Using &, &&
3.5 Using DEFINE
3.6 Using VERIFY

4. SQL Functions **6 Hrs.**

4.1 Single Row Functions
- Character Functions
  - Case Manipulation
  - Character Manipulation
- Number Functions
- Date Functions
- ConversionFunctions
- GeneralFunctions

4.2 Multiple Row Functions

5. Using Operators **6 Hrs.**

5.1 Using Comparison Operators
- BETWEEN
- IN

- LIKE
- IS NULL

5.2 Logical Operators

- AND
- OR
- NOT

6. Joining Tables&Working with Sub queries **6 Hrs.**

6.1 What is Join?
6.2 Natural Join/Inner Join/Equijoin
6.3 Joining With 'USING' Clause
6.4 Joining With 'ON' Clause
6.5 Self Join
6.6 Cross Join/ Cartesian Product
6.7 Outer Join

- Left Outer Join
- Right Outer Join
- Full Outer Join

6.8 What is Sub query?
6.9 Single Row Sub query
6.10 Multiple Row Sub query

7. Security **6 Hrs.**

7.1 Creating User
7.2 Privileges

- System Level Privileges
- Object Level Privileges

7.3 Granting Privileges
7.4 Revoking Privileges
7.5 Roles

- Study of default roles
- Creating roles

7.6 Granting and Revoking roles

8. PL/SQL **7 Hrs.**

8.1 An Introduction to PL/SQL
8.2 PL/SQL Overview
8.3 Declaration section
8.4 Executable Commands section
8.5 Condition logic
8.6 Loops
8.7 Exception Handlings
8.8 Triggers

- Triggers Syntax
- Types of triggers
- Enabling and Disabling Triggers
- Replacing and Dropping Triggers

8.9 Working Cursor

- % TYPE Variable
- % ROWTYPE Variable

Reference Books -

1. Oracle Database 10g SQL (Osborne ORACLE Press Series)by Jason price, McGrawHill, 0-07-222981-0.
2. Oracle Database 10g PL/SQL Programming by Scott Urman , Ron HARDMAN, MichaleMc Laughlin, Oracle Press, TMH, ISBN-0-07-059779-0.
3. Oracle Database 10g The Complete Reference By Kevin Loney, Bob Bryla Oracle Press (TATA McGraw Hill Edition) ISBN-13:978-0-07-059425-8, ISBN-10: 0-07-059425-2

B.Sc.(CS).S5.5 Digital Image Processing

1. Digital Image Processing Systems:

1.1 Elements of Digital Image Processing System
1.2 Elements of Visual Perception
1.3 Brightness, Adaptation and Discrimination
1.4 Color Representation
1.5 Statistical Background

2. **Introduction to Digital Image Representation**
   2.1 Digital Image Representation
   2.2 Read & Displaying, Writing Images
   2.3 Data Classes & Image types
   2.4 Converting between Data Classes and Image types
   2.5 Introduction to M Function Programming
3. **Intensity transformation & Spatial filtering**
   3.1 Background
   3.2 Intensity Transformation function
   3.3 Histogram processing & Function plotting
   3.4 Spatial filtering
4. **Frequency Domain Processing**
   4.1 2D –discrete Fourier transform
   4.2 Filtering in frequency domain
   4.3 Obtaining Frequency Domain Filters from spatial filters
5. **Image Restoration**
   5.1 A Model of the Image Degradation /Restoration Process
   5.2 Noise Models
   5.3 Geometric Transformation and Image Registration
6. **Introduction to MATLAB**
   6.1 Advantages and Disadvantages of MATLAB
   6.2 MATLAB Environment
   6.3 Using MATLAB Scratch Pad
   6.4 Variables and Arrays
   6.5 Multidimensional Arrays
   6.6 Scalar and Array Operations

References:

1. R.C. Gonsales R. E. Woods, *Digital Image Processing*, Second Edition, Pearson Education
2. Anil K. Jain, *Fundamentals of Image Processing*, PHI
3. R.C. Gonsales R. E. Woods, *Digital Image Processing using MATLAB*, Second Edition, Pearson Education

4.MATLAB for Engineers (IE) By Stephen J Chapman (Thomson)

Practical List

15 Programs from the Above syllabus

B.Sc.(CS).S6.1 Programming in Java –II

1. Graphics Programming Using Swing (4)
- Working with 2D Basic Shapes
- Using Color
- Using Font
- Displaying Images

2. Multithreading (6)
- What are threads
- Running and starting thread
- Running multiple threads
- The Runnable interface
- Thread priorities
- Synchronization and interthread communication

3. Database Programming (10)
- The design of jdbc, jdbc configuration
- Types of drivers
- Executing sql statements, query execution
- Scrollable and updatable result sets, rowset
- Metadata, transactions

4. Collections (6)
- Collections, Introduction to the Collection framework (Interfaces, Implementation and algorithms), Interfaces, collection classes : Set, List, Queue and Map
- Set : HashSet, TreeSet, and LinkedHashSet
- Interfaces such as Lists, Set, Vectors, LinkedList, Comparator, Iterator, hash tables.

5. Servlet (10)
- Introduction to Servlet(HTTP Servlet)
- Life Cycle of servlet
- Handing get and post request(HTTP)
- Data handling using servlet
- Creating and cookies
- Session tracking using HTTP servlet

6. JSP (5)
- Getting Familiar with JSP Server
- First JSP
- Adding Dynamic contents via expressions
- Scriptlets, Mixing Scriptlets and HTML
- Directives, Declaration, Tags and Session

7. Networking (5)
- The java.net package
- Connection oriented transmission – Stream Socket Class
- Creating a Socket to a remote host on a port (creating TCP client and server)
- Simple Socket Program Example.

8. JavaBeans Components (2)
- Why beans?
- The bean-writing process
- Using beans to build an application

Reference Books :

1) Complete reference Java by Herbert Schildt(5th edition)
2) Java 2 programming black books, Steven Horlzner
3) Programming with Java , A primer ,Forth edition , By E. Balagurusamy
4) Java servlet Programming by Jason Hunter, O'Reilly
5) Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell,
Prentice Hall, Sun Microsystems Press.

6) Core Java Volume-II-Advanced Features, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press.

B.Sc.(CS).S6.2 Oracle 10G DBA

1. Basic of the DBA — 7 Hrs.

1.1 Installing ORACLE 10g
1.2 Functions of DBA
1.3 Oracle Instance
1.4 Starting & Stopping Instance
1.5 Memory Architectures
- Oracle 9i Memory Structure
- Oracle 10g Memory Structure

1.6 Physical Database structure
- Control Files
- Data files
- On line Redo log Files
- Archive Files
- Trace & Alert log files
- Parameter file & SPFILE
- Password File

1.7 Database Creation using DBCA
1.8 Manual Database Creation

2. Tablespaces, Datafiles, and Control Files — 7 Hrs.

2.1 Introduction to Tablespaces, Datafiles, and Control Files
2.2 Overview of Tablespaces
- SYSTEM Tablespace
- SYSAUX Tablespace
- Bigfile Tablespaces
- Undo Tablespaces
- Default Temporary Tablespace
- Using Multiple Tablespaces
- Managing Space in Tablespaces
- Online and Offline Tablespaces
- Read-Only Tablespaces

2.3 Working with tablespaces
- Creating Tablespaces
- Altering Tablspaces
- Modifying Tablespaces

2.4 Types of tablespaces
- Dictionary Managed
- Locally Managed Tablespaces
- Oracle Managed Files

2.5 Overview of Control Files
- Control File contents
- Multiplexed Control Files

3. Physical Database Layouts & Storage Management

3.1 Traditional Disk space Storage
- Resizing Tablespaces & datafiles
- Moving Datfiles
- Moving Online Redo log files
- Moving Control files

3.2 Automatic Storage Management
- ASM Architecture

- Creating ASM Instance
- ASM Instance Components
- ASM Dynamic Performance View

4 . Managing Transactions with Undo Tablespaces **6Hrs.**

4.1 Transaction Basics

4.2 Undo Basics

- Rollback
- Read Consistency
- Database recovery
- Flashback Operations

4.3 Managing Undo tablespaces

- Creating Undo Tablespaces
- Undo tablespace Dynamic Performance View
- Undo tablespace Initialization Parameters
- Multiple Undo Tablespaces

5 Backup & Recovery Options

5.1 Capabilities

5.2 Logical Backups

- The Data Pump Export/ImportProcess

5.3 Physical Backups

- Offline Backup
- Online Backup

5.4 Using Data Pump Export & Import

- Creating a Directory
- Data Pump Export Options
- Starting Data Pump Export Job

5.5 Using Flash Recovery Area

- What is Flash Recovery Area
- Sizing the Flash Recovery Area
- Creating a Flash Recovery Area
- Default File Location & the Flash Recovery Area
- Managing Flash Recovery Area

5.6 Using Incremental Backups

- Recovering with Incrementally Updated Backups
- Fast Incremental Backup

6 Database Tuning

6.1 Tuning Application Design

- Effective Table Design
- Distribution of CPU Requirements
- Effective Application Design

6.2 Tuning SQL

- Impact of Order of Load Rates
- Additional Indexing Options
- Generating Explain Plans

6.3 Tuning Memory Usage

- Specifying the size of the SGA
- Using cost based Optimizer

6.4 Tuning Data Access

- Locally Managed Tablespaces
- Indentifying chained Rows
- Increasing the Oracle Block Size

6.5 Tuning Data Manipulation
- Bulk Inserts
- Bulk Data Moves
- Bulk Deletes

7 Database Security & Auditing

7.1 Non Database Security

7.2 Database Authentication Methods
- Database Authentication
- Database Administrator Authentication
- Operating System Authentication
- User accounts

7.3 Database Authorization Methods
- Profile Management
- System Privileges
- Object Privileges
- Creating , Assigning & Maintaining Roles

7.4 Auditing
- Auditing Locations
- Statement Auditing
- Schema Object Auditing
- Fine Grained Auditing
- Auditing Related Data Dictionary Views

References Books

1. Oracle Database 10g DBA Handbook By Kevin Loney, Bob Bryla Oracle Press (TATA McGraw Hill Edition) ISBN-13:978-0-07-060113-0, ISBN-10:0-07-060113-5
2. . OCP Oracle Database 10g - New Features for Administrators Exam Guide Sam R. Alapati (MCGRAW-HILL Publications)
3. Oracle Database 10g The Complete Reference By Kevin Loney, Bob Bryla Oracle Press (TATA McGraw Hill Edition) ISBN-13:978-0-07-059425-8, ISBN-10: 0-07-059425-2

B.Sc.(CS).S6.3 Business Applications

1. Sales and Distribution Management System [8]
1.1 Sales Budgeting-Market Segments/Customer/Product
1.2 Customer Enquiry and Preparation of Quotation.
1.3 Customer Order Processing
1.4 Pending Customer Orders
1.5 Sales Analysis
1.6 Case Study on Sales Analysis with specific reference to Shopping Mall / Sales Organization
2. Human Resource Management System [10]
2.1 Employee Database and Knowledge Management System
2.2 Recruitment – Technique
2.3 Employee Appraisal – Performance Efficiency
2.4 Employee Training
2.5 Leave Accounting and Payroll
2.6 Case Study on Human Resource Management
3. Manufacturing / Production Planning Control System [10]
3.1 Capacity Requirements Planning for Equipment, MRP-I
3.2 Manpower and Time, Material Resource Planning, MRP-II
3.3 Production Planning – Work Order Management- EOQ
3.4 Material Procurement –Indenting, Purchasing, Vendor Analysis, BOM, Supplier Bill Passing and Receipt of Material
3.5 Case Study on Manufacturing/ Production Planning and Control
4. Banking [8]
4.1 Saving Bank Account Processing – Opening, Cancellation, Transfer, Transaction (Deposit, Withdrawal), Cheque Book issue process of Saving A/c's
4.2 ATM Application
4.3 E-Banking
4.4 Biometric Devices and its scope in Applications
4.5 Case Study on Banking
5. Advanced Business System [12]
5.1 Enterprises Resource Planning-Evaluation, Scope, Package ERP Solution Vs Custom Development Features of ERP, Different Modules of ERP, Selection of ERP Software
5.2 Supply Chain Management (SCM)
5.3 Customer Relationship Management (CRM): CRM covers Marketing, Sales and Service functions of a Company, CRM Process, Customer Acquisition / Development, Retention, Call Centre / Knowledge Centre, KPO's, BPO's
5.4 International Business Management-Basic Concept, Market Potential opportunities, Competitive Advantage
5.5 TQM – Total Quality Management, Six Sigma

References:
1. Mayer Production and Operation Management
2. K. Aswathapa Human Resource and Personal Management
3. M. M Shaikh Enterprise Resource Planning and Business Process
4. Dr. Milind Oka Business Applications

B.Sc.(CS).S6.4.A Data Mining (Elective)

1	**Introduction** 1.1 Basic Data Mining task 1.2 Data Mining Vs Knowledge discovery in databases 1.3 Data mining metrics 1.4 Social Implication of Data Mining	**07**
2	**Related Concepts** 2.1 Database/OLTP systems 2.2 Information Retrieval 2.3 Decision Support Systems 2.4 Dimensional Modeling 2.5 OLAP 2.6 Web Search Engines	**08**
3	**Data Mining Techniques** 3.1 Introduction 3.2 Statistical perspective on Data Mining 3.3 Decision Tree 3.4 Neural networks	**08**
4	**Classification** 4.1 Introduction 4.2 Statistical based algorithms 4.3 Distance based algorithms 4.4 Decision tree based algorithms 4.5 Neural network based algorithm	**08**
5	**Clustering** 5.1 Introduction 5.2 Hierarchical algorithms 5.3 Partitional algorithms 5.4 Clustering large databases	**08**
6	**Association Rules** 6.1 Introduction 6.2 Basic algorithms 6.3 Parallel and distributed algorithms	**06**

Reference Books

1. **Data Mining – Introductory and Advanced Topics by Margaret H. Dunham & S. Shridhar**
2. **Data Warehousing Fundamentals by Paulraj Ponniah**

B.Sc.(CS).S6.4.B Research Methodology (Elective)

1. **The Purpose and Products of Research**
   - Reasons for doing research
   - Possible products – the outcomes of research
   - Finding and choosing research topics
   - Evaluating the purpose and products of research
2. **Overview of the Research Process**
   - Model of the research process
   - Alternative models of the research process
   - Evaluating the research process
3. **Internet Research**
   - Background to the Internet and World Wide Web
   - Internet research topics
   - The Internet and a literature review
   - The Internet and research strategies and methods
   - Internet research, the law and ethics
4. **Reviewing the Literature**
   - Purpose of a literature review
   - Literature resources
   - The Internet and literature reviews
   - Conducting a literature review
   - Evaluating literature reviews
5. **Surveys**
   - Defining surveys
   - Planning and designing surveys
   - Grounded theory and surveys
   - The Internet and surveys
   - Examples of surveys in IS and computing research
   - Evaluating survey-based research
6. **Experiments**
   - Defining experiments
   - Planning and conducting experiments
   - The Internet and experiments
   - Examples of experiments in IS and computing research
   - Evaluating experiment-based research
7. **Case Studies**
   - Defining case studies
   - Planning and conducting case studies
   - The Internet and case studies
   - Examples of case studies in IS and computing research
   - Evaluating case study-based research

Reference Books

1. Researching Information Systems and Computing by Briony J Oastes
   Sage Publication India Pvt. Ltd.
2. Your Research Project, A step by step Guide for the first time researcher by NicholosWalliman
   Vistaar Publication

Research Methods by William M K Trochim

B.Sc.(CS).S6.4.C Bioinformatics (Elective)

1. Bioinformatics: An Introduction **05 hrs.**

- 1.1 Introduction
- 1.2 Historical Overview & Definition
- 1.3 Applications
- 1.4 Major Databases

2. Information Search & Data Retrieval **05 hrs.**

- 2.1 Introduction
- 2.2 Tools for Web Search
- 2.3 Data retrieval tools
- 2.4 Data mining of Biological Databases

3. Genome Analysis & Gene Mapping **08 hrs.**

- 3.1 Introduction
- 3.2 Genome Analysis
- 3.3 Genome Mapping
- 3.4 The Sequence Assembly Problem
- 3.5 Physical Maps
- 3.6 Applications of Genetic Maps
- 3.7 The Human Genome Project

4. Alignments of Pairs of sequences **07 hrs.**

- 4.1 Introduction
- 4.2 Biological Motivations of Alignment Problems
- 4.3 Methods of sequence Alignments
- 4.4 Using Scoring Matrices

5. Tools for Similarity Search & Sequence Alignment **07 hrs.**

- 5.1 Introduction
- 5.2 Working with FASTA
- 5.3 Working with Blast
- 5.4 FASTA & BALSTA Algorithms Comparison

6. Introduction to Drug Discovery **08 hrs.**

- 6.1 Introduction
- 6.2 Areas Influencing Drug Discovery
- 6.3 Phamacogenetics & Pharmacogenomics Applications
- 6.4 Important parameters in Drug Discovery

Reference Books:-

Bioinformatics Methods & Applications S.C. Rastogi
An Introduction to Bioinformatics V. Kothekar & T. Nandi

B.Sc. (CS).S6.4.D Linux Administration

1 Introduction to RED Hat Linux **05Hrs**

1.5 Advantages of Linux
1.6 Other Linux distributions
1.7 Red Hat Linux Installation
1.8 Concept of Linux loader
1.9 Hardware Requirements

2 Working with Linux **07Hrs**

2.7 Linux file system
2.8 Shells, Text editors
2.9 Changing User Information
2.10 File Permissions
2.11 Virtual Consoles

3 The X Window System **05Hrs**

3.1 Basic X window system
3.2 Configuring X window systems
3.3 Starting X
3.4 Selecting & using X window

4 Managing Services **05Hrs**

4.6 Linux Boot Process
4.7 System services and run levels
4.8 Controlling services at boot with administrative tools
4.9 Starting and stopping services manually

5 Managing Software & System Resources **08 Hrs**

5.5 Using RPM for software management
5.6 Using RPM on the command line
5.7 Extracting a single file from & RPM file
5.8 Graphical Package Management
5.9 System monitoring tools

6 Printing with Linux **08 Hrs**

6.1 Configuring & managing print services
6.2 Local printer installation
6.3 Network printer installation
6.4 Linux printing commands
6.5 Using the Common UNIX Printing System (CUPS)
6.6 Console print control

Reference Books

1] Red Hat Linux Unleashed by Bill Ball, David Pitts
2] Fedora Unleashed by Bill Ball

Practical List

1] Introduction to RED HAT Linux
2] RED HAT Linux installation
3] Simple Linux Commands
alias, at, atrm, banner, batch, cat, cd, chmod, chown, chroot, cp, cpio, dc, dd, dir, du,

find, finger, grep, unzip, gunzip, halt, hostname, ifconfig, kill, ln, locate, look,
man, mcopy, mdel, mdir, mlabel, more, mv, netstat, passwd, ping, ps, pwd, rm, rmdir, route, shutdown, sort, su, tar, tree, unzip, vi, vdir, who, whoami, wc, zip,

4] Communication Commands

Write, wall, talk, mesg, motds

5] Administration Commands

adduser,cpio,fdformat,halt,hostname,ifconfig,login,logout,lpc,lpd,lprm,mount,mv,ppasswd, ping, quota, route, unmount

6] Network Installation

DHCP configuration

Network file system

DNS Concept

Samba Installation

7] Shell scripting

8] Any ten shell programs