**BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI – 620 024.**
**Master of Computer Application Course Structure under CBCS**
**(For the candidates admitted from the academic year 2016-2017 onwards)**

| Semester | Course | Course Title | Ins. Hrs / Week | Credit | Exam Hrs | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Int. | Extn. | |
| I | Core Course – I (CC) | Programming in C++ | 5 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – II (CC) | Operating Systems | 5 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – III (CC) | Computer Organization & Architecture | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – IV (CC) | Data Structures and Algorithms | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – V (CC) | OOAD & UML | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – VI (CC) | C++ Programming Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Core Course – VII (CC) | Shell Programming Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | | **Total** | **30** | **24** | **-** | **-** | **-** | **700** |
| II | Core Course – VIII (CC) | Programming in Java | 5 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – IX (CC) | Database Systems | 5 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – X (CC) | Software Engineering | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XI (CC) | Computer Graphics | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XII (CC) | Java Programming Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Core Course – XIII (CC) | Database Systems Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Elective – I(EC) | | 4 | 4 | 3 | 25 | 75 | 100 |
| | | **Total** | **30** | **24** | **-** | **-** | **-** | **700** |
| III | Core Course –XIV(CC) | Distributed Technologies | 5 | 4 | 3 | 25 | 75 | 100 |
| | Core Course –XV(CC) | Accounting and Financial Management | 5 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XVI(CC) | Discrete Mathematics | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XVII(CC) | Enterprise Resource Planning | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XVIII(CC) | Distributed Technologies Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Core Course –XIX(CC) | Accounting and Financial Management Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Elective Course II(EC) | | 4 | 4 | 3 | 25 | 75 | 100 |
| | Professional Skills – I Practical / Hands-on | | - | 2 | | 100 | N/A | 100 |
| | | **Total** | **30** | **26** | **-** | **-** | **-** | **800** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| IV | Core Course – XX(CC) | Web Technologies. | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XXI(CC) | Data Mining & Warehousing | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XXII(CC) | Organizational Dynamics | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XXIII(CC) | Probability & Statistics | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XXIV(CC) | Web Technologies Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Core Course – XXV(CC) | Data Mining Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Elective Course III (EC) | | 4 | 4 | 3 | 25 | 75 | 100 |
| | Managerial Skills | Managerial Skills | 2 | 2 | 3 | 25 | 75 | 100 |
| | | **Total** | **30** | **26** | **-** | **-** | **-** | **800** |
| V | Core Course – XXVI(CC) | Computer Networks | 5 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XXVII(CC) | Smart Devices Programming | 5 | 4 | 3 | 25 | 75 | 100 |
| | Core Course –XXVIII(CC) | Optimization Techniques | 4 | 4 | 3 | 25 | 75 | 100 |
| | Core Course – XXIX(CC) | Smart Devices Programming Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Core Course – XXX(CC) | Open Source Lab | 4 | 2 | 3 | 40 | 60 | 100 |
| | Elective IV (EC) | | 4 | 4 | 3 | 25 | 75 | 100 |
| | Elective V (EC) | | 4 | 4 | 3 | 25 | 75 | 100 |
| | | **Total** | **30** | **24** | **-** | **-** | **-** | **700** |
| VI | Major Project | Dissertation=100 Marks<br>[2 reviews –20+20=40 marks<br>Report Valuation = 40 marks]<br>Viva = 20 Marks | - | 16 | - | - | - | 100 |
| **Total** | | | **-** | **16** | **-** | **-** | **-** | **100** |
| **Grand Total** | | | **150** | **140** | **-** | **-** | **-** | **3800** |

**List of Elective Courses (For 2016 – 2017) :**

| **Elective I** | | **Elective II** | |
|---|---|---|---|
| 1 | e-Commerce | 1 | Artificial Intelligence |
| 2 | Software Project Management | 2 | Computer Simulation and Modelling |
| 3 | Pervasive Computing | 3 | Mobile Communication |
| **Elective III** | | **Elective IV** | |
| 1 | Parallel Processing | 1 | Big Data Analytics |
| 2 | Cloud Computing | 2 | Network Security |
| 3 | Soft Computing | 3 | Digital Image Processing |
| **Elective V** | | | |
| 1 | Compiler Design | | |
| 2 | Human Computer Interaction | | |
| 3 | Medical Informatics | | |

**Recommended Credits Distribution:** (Total should not be less than 140 Credits)

| Course Type | Course | Credits | Total Credits |
|---|---|---|---|
| Core (Theory) | 20 | 4 | 80 |
| Core (Practical) | 10 | 2 | 20 |
| Core (Major Project ) | 1 | 16 | 16 |
| Elective | 5 | 4 | 20 |
| Professional Skill | 1 | 2 | 2 |
| Skill Development | 1 | 2 | 2 |
| **Total** | **38** | | **140** |

The Internal and External Marks to be awarded for any **Practical Course** is **40 & 60** respectively and for **Theory course**, it is **25 & 75** respectively for MCA, M.Sc (CS), M.Sc (IT) & PGDCA.
Professional Skill Course:

This course is intended to make the students to learn Hardware Assembly, Trouble Shooting a Computer System and Peripherals, configuration Management, System Maintenance, Installation of Software Tools & Packages, Network Fundamentals, System Administration, etc.,

- No Theory Examination will be conducted.
- Students must learn the required things by themselves.
- The College may arrange for a workshop or invite Experts from the Industry to demonstrate the essential methods, tools and techniques to the students.
- An internal assessment of the knowledge acquired by the students should be evaluated at the End of the Semester and marks (Max: 100) awarded to each student to be communicated to the University.

Note:

| | | | | |
|---|---|---|---|---|
| 1. Theory | Internal | 25 marks | External | 75 marks |
| 2. Practical | ” | 40 marks | ” | 60 marks |

3. Separate passing minimum is prescribed for Internal and External

a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
c) The passing minimum not less than 50% in the aggregate.

*****

## CORE COURSEI

## PROGRAMMING IN C++

**Objective :**

To impart Object Oriented Programming skills using C++

**Unit I**

What is Object Oriented Programming? – C++ Console I/O- C++ comments- Classes: Some difference between C and C++ - Introducing Function Overloading - Constructor and Destructor Functions- Constructors take parameters- Introducing Inheritance – Object Pointers – In line Functions – Automatic in lining.

**Unit II**

Assigning Objects – Passing Object to Functions – Returning Object from Functions- An Introduction to friend functions- Arrays of objects – Using Pointers to Objects – Using new & delete – More about new & delete – references – Passing references to objects - Returning references- Independent References and restrictions.

**Unit III**

Overloading Constructor Functions- Creating and Using a Copy constructor- Using default arguments- Overloading and ambiguity – Finding the address of an overload function- the basics of operator overloading- overloading binary operators-overloading the relational and logical operators- overloading a Unary operator – using friend operator functions- a closer at the assignment operator- overloading the subscript() operator.

**Unit IV**

Base class access control –using protected members- Constructors, destructors and inheritance - multiple inheritance- virtual bas classes- Some C++ I/O basics- formatted I/O using width(), precision () and fill() – using I/O manipulators- Creating your own inserters- creating extractors.

**Unit V**

Creating your own manipulators- File I/O basics- unformatted, binary I/O- more unformatted I/O functions- random access- checking the I/O status- customized I/O and files- Pointers and derived classes- Introduction to virtual functions- more about virtual functions- applying polymorphism- Exception handling.

**Text Book(s)**

Herbert Schildt, “Teach Yourself C++”, III edition, Tata McGraw Hill 5th Reprint 2000.

**Reference(s)**

1. Bjarne Stroustrup, The C++ Programming Language, Addison wesley,2013
2. E. Balagurusamy “Object Oriented Programming with C++ “, TMH New Delhi,2013
2. Robert Lafore, “Object Oriented Programming in Turbo C++”, Galgotia 2001

*****

## CORE COURSE II

## OPERATING SYSTEMS

**Objective :**

To present fundamental aspects of various managements in an operating

**Unit I**

Operating Systems Objectives and functions – Operating System and User /Computer Interface, Operating System as a Resource Manager: Evaluation of Operating Systems – Serial Processing, Sample Batch Systems, Time Sharing Systems.

**Unit II**

Process Description, Process Control – Processes and Threads. Concurrency – Principles of Concurrency, Mutual Exclusion – Software support, Dekker's Algorithm – Mutual Exclusion – Hardware support, Mutual Messages – Deadlock – Deadlock prevention, Deadlock Detection, Deadlock Avoidance – An Integrated deadlock Strategy.

**Unit III**

Memory Management – Memory Management Requirements – Fixed Partitioning, Placement Algorithm, Relocation in a Paging System – Sample Segmentation. Virtual Memory – Paging – Address Translation in a Paging System. Segmentation – Organization, Address Translation in a Segmentation System – Combined Paging and Segmentation – Virtual Memory – Operating System Software – Fetch Policy, Placement Policy and replacement Policy, Page buffering resident set Management.

**Unit IV**

Scheduling – Types of Scheduling, scheduling Algorithms, scheduling criteria, FIFO, Round Robin, Shortest Process next, Shortest Remaining Time, Highest response ratio and Feedback scheduling Performance comparison – Fair – Share Scheduling. I/O Management and disk scheduling – Organization of the I/O function – the Evaluation of the I/O function, Logical structure of the I/O function, I/O Buffering, Disk Cache.

**Unit V**

File Management – Files, File Management Systems, File System Architecture, Functions of File Management File Directories – File Sharing – Secondary Storage Management – File allocation.

**Text Books**


1. William Stallings, "Operating Systems", Second edition, Maxwell McMillan, International Editions, 1997.
2. Charles Crowley, "Operating Systems-A Design Oriented Approach", IRWIN Publications Chicago, 1997.


**References**


1. Ann McIver McHoes and Ida M. Flynn, Understanding Operating Systems, Sixth Edition, Course Technology, Cengage Learningm2011
2. Ann McHoes, Ida M. Flynn**,Understanding Operating Systems, Seventh Edition,** Cengage Learning, 2013.
3. Deital H.M. "An Introduction to Operating Systems", Addison Wesley Publishing
4. Silberchatz A., Peterson J.L., Galvan P. "Operating System Concepts", Third Edition, Addison Wesley Publishing Co., 1992.

## CORE COURSE III

## COMPUTER ORGANIZATION AND ARCHITECTURE

**Objective:**

To understand the principles of digital computer logic circuits and their design. To understand the working of a central processing unit architecture of a computer

**Unit I**

Number Systems – Decimal, Binary, Octal and Hexadecimal Systems – Conversion from one system to another – Binary Addition, Subtraction, Multiplication and Division – Binary Codes– 8421, 2421, Excess-3, Gray, BCD – Alphanumeric Codes – Error Detection Codes.

**Unit II**

Basic Logic Gates – Universal Logic – Boolean Laws and Theorems – Boolean Expressions – Sum of Products – Product of Sums – Simplification of Boolean Expressions –Karnaugh Map Method (up to 4 Variables) – Implementation of Boolean Expressions using GateNetworks.

**Unit III**

Combinational Circuits – Multiplexers – Demultiplexers – Decoders – Encoders – Arithmetic Building Blocks – Half and Full Adders – Half and Full Subtractors – Parallel adder –2's Complement Adder – Subtractor – BCD Adder.

**Unit IV**

Sequential Circuits – Flip Flops – RS, Clocked RS, D, JK, T and Master-Slave Flip Flops –Shift Register – Counters – Asynchronous, MOD-n and Synchronous Counters – BCD Counter –Ring Counter.

**Unit V**

Central Processing Unit: General Register Organization – Stack Organization – Instruction Formats – Addressing Modes – Data Transfer and Manipulation – Program Control – Reduced Instruction Set Computer – CISC characteristics – RISC Characteristics.

**Text Books:**

1. Donald P. Leach, Albert Paul Malvino and GoutamSaha, *Digital Principles and Applications*, TataMcGraw Hill, Sixth Edition, Third Reprint, 2007.
   Unit:I : Chapter-5 Section (5.1-5.8)
   Unit:II : Chapter-2 Section (2.1-2.2), Chapter-3 Section (3.1, 3.2, 3.5, 3.7)
   Unit: III: Chapter-4 Section (4.1-4.3, 4.6), Chapter-6 Section (6.7, 6.8)
2. Thomas C. Bartee, *Digital Computer Fundamentals*, Tata McGraw-Hill, Sixth Edition, Twenty FifthReprint, 2006.
   Unit:III : Chapter-5 Section (5.1, 5.3, 5.10, 5.11)
   Unit:IV : Chapter-4 Section (4.1-4.9)
3. Morris Mano M, *Computer System Architecture*, Prentice Hall of India, Third Edition,2008.
   Unit: I: Chapter-3 Section (3.5-3.6)
   Unit: V: Chapter-8 Section (8.2-8.8)

**Books for Reference:**

1. Morris Mano. M, *Digital Logic and Computer Design*, Prentice Hall of India, 2008.
2. Linda Null, Julia Lobur, The Essentials of Computer Organization and Architecture, Fourth Edition2014

*****

## CORE COURSE IV

## DATA STRUCTURES AND ALGORITHMS

**Objective:**

To give a detailed knowledge on Data structures and to give an exposure in the development of algorithms related to data structures.

**Unit I**

Introduction to data structures, Records, Arrays, Stacks, Queues, Recursion, Linked list, Binary tree and traversing.

**Unit II**

Sorting and Searching Techniques: Introduction, Internal and External Sorting, Insertion, Selection, Merging, Radix, Quick sort, Heap sort and Bubble sort. Searching: Introduction, Sequential search, Binary search, Binary Tree search.

**Unit III**

Graphs and Their applications: Introduction, Graph Theory, Terminology, Representation of graphs, Tree & Binary tree, operations on graphs, shortest path Algorithms, Topological sorting.

**Unit IV**

Algorithms, Development of Algorithms, basic concepts, Structured Program Concepts, Top down development of algorithms, Principle of analyzing Algorithms, Algorithms design methods, Sub goals, Hill climbing.

**Unit V**

Algorithms Design Techniques: Divide and Conquer algorithms, Dynamic Programming, Greedy algorithms, Backtracking and Branch & bound.

**Text Books**

1. Seymour Lipschitz "Data Structures, Tata McGraw-Hill
2. Ellis Horowitz & S. Sahni, Fundamentals of Data Structures, Galgotia Pub.

**References**


1. An Introduction to Data Structures and Algorithms, James A Store, Springer Science, 2012.
2. Data Structures and Algorithms made easy, Narasimha Karumanchi, CreateSpace Independent Publishing Platform, 2011.
3. Data Structures Using C - Langsam, Augenstien, Tenenbaum, PHI
4. Data structures and Algorithms, V.Aho, Hopcropft, Ullman , LPE
5. Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniem- TMH

## CORE COURSE V

## OOAD & UML

**Objective:**

To give a detailed knowledge on Structured approach to system construction, Various object oriented methodologies, Object oriented analysis, Object oriented design and UML examples

**Unit I**

Structured approach to system construction : SSADM/SADT - An overview of object oriented systems development & Life cycle

**Unit II**

Various object oriented methodologies – Introduction to UML

**Unit III**

Object oriented analysis – Use cases- Object classification, relationships, attributes, methods

**Unit IV**

Object oriented design – Design axioms – Designing classes – Layering the software design :- data access layer, User interface layer, Control/business logic layer

**Unit V**

UML - Examples on :Behavioral models – Structural models – Architectural models from real world problems.

**TEXT BOOK:**


1. **D Jeya Mala, S Geetha,**Object Oriented Analysis and Design using UML, Mc Graw Hill Edition, 2013
2. **Bahrami Ali**, Object oriented systems development, Irwin McGrawHill, 2005 (First 4 units covered here).
3.. **Booch Grady, Rumbaugh James, Jacobson Ivar**, The Unified modeling language – User Guide, Pearson education, 2006 (ISBN 81-7758-372-7) (Unit: -5 covered here).


*****

## CORE COURSE VI

### C++ Programming Lab
### (Applied to Data Structures and Algorithms)

**Objective :**

To get hands on experience in developing Programs using C++ for Data Structures applications.

1. Implement Array Merging, sorting of array elements [Integer elements & character Elements]
2. Implement sorting of array of English words (in Dictionary order)
3. Implement Stack Data Structures and Operations on it (push, pop)
4. Implement Singly linked list Data structure and operations on it (insert, delete, print, navigate, search)
5. Implement sorting operation on a singly linked list data structure
6. Implement doubly linked list data structure and operations on it (insert, delete, print, navigate, search)
7. Implement Sorting operation on a doubly linked Data Structure
8. Implement Queue Data Structure and operations on it
9. Implement table Data structure and operations on it (insert, delete, print, navigate, search)
10. Implement binary tree data structure and operations on it (node insertion, deletion)
11. Implement pre-order, in-order, post-order traversal of binary tree and print node contents

*****

## CORE COURSE VII

## SHELL PROGRAMMING LAB

**Objective:**

To get hands on experience in developing shell Programs.

**Write Shell Programs to**

1. Find whether number given is even or odd
2. Reverse the digits of the integer
2. Search for a given number from the list of numbers provided using binary search method
3. Concatenate two strings and find the length of the resultant string
4. Find the position of substring in given string
5. Find the gcd for the 2 given numbers
6. Check whether a given string is palindrome or not.
7. Count number of words, characters, white spaces and special symbols in a given text
8. Sum of all the digits in a given 5 digit number
9. Average of numbers given at command line
10. Accept a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
11. Delete all lines containing a specified word in one or more files supplied as arguments to it.
12. Display a list of all files in the current directory to which the user has read, write and execute permissions.
13. Receive any number of file names as its arguments, checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
14. Receive any number of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.

*****

## CORE COURSE VIII
## PROGRAMMING IN JAVA

**Objective :**

To Impart sound knowledge in Object Oriented Programming skills in JAVA

**UNIT I**

An overview of Java – Java Buzzwords- Data Types, Variables and Arrays - Operators – Control Statements- Introducing Classes: Class Fundamentals – Declaring Objects – IntroducingMethods – Constructors – The this keyword – Garbage Collection – Overloading Methods – Callby value, Call by reference – Recursion– Understanding static – final – Nested and Innerclasses.

**UNIT II**

Inheritance: Inheritance Basics – Using super – Method overriding –Dynamic Method Dispatch- Using Abstract Classes - Final with Inheritance- Object class. Packages and Interfaces:Declaring Packages – #Access Protection# – Importing Packages – Defining, Implementing, Applying Interfaces - Exception Handling: Exception Types – try, catch – throw – throws – finally –multiple catch and nested try statements- Creating User-defined Exception classes.

**UNIT III**

Multithreaded Programming: The Java Thread Model – Creating a Thread –Creating Multiple Threads-Thread Priorities- Synchronization – #Inter-thread communication. String Handling# –The Collection Interfaces and Collection Classes: List,Set,Map,Enumeration and Iterator interfaces-ArrayList, LinkedList, Vector, Stack,Properties,HashTable, StringTokenizer, and Date classes.

**UNIT IV**

Files and IO Streams: File – The Byte Streams: InputStream, Output Stream, FileInputStream,FileOutputStream, PipedInputStream and PrintStream – The Character Streams:Reader, Writer. FileReader and FileWriter – Serialization. Networking- Networking classes andinterfaces: InetAddress class -TCP/IP Client and Server sockets–Datagrams – URL and URLConnection classes.

**UNIT V**

Introduction to Applet class- Applet Architecture- The HTML APPLET tag – Passing parameters to Applets – Event handling: The Delegation Event Model, Event Classes, Event Listener Interfaces - Working with Graphics, Color and Font classes - Understanding Layout managers- Swing Component classes: JApplet, JFrame and JDialog - Text Fields, Buttons, Combo boxes, List ,Tabbled and Scroll Panes.Understanding Layout managers.

**Text Book:**

1. Herbert Schildt, *The Complete Reference Java 2*, Fifth Edition, TMH Education Pvt. Ltd.,2009.
   UNIT I : Chapter 1 to 7
   UNIT II : Chapter 8 to 10
   UNIT III : Chapter 11,13, and 15, 16
   UNIT IV : Chapter 17 and 18
   UNIT V : Chapter 19 to 22, and 26

**Books for Reference:**

1. Herbert Schildt with Joe O' Neil, *Java – Programmer's Reference*, TMH, 2000.

*****

## CORE COURSE IX

## DATABASE SYSTEMS

**Objective:**

To impart knowledge about relational database and distributed database.

**Unit I**

Introduction – purpose of database systems – Data Abstraction – Data models – Instances and schemes – Data independence – DDL – DML – Database users – ER model – Entity sets – Keys – ER diagram – relational model – Structure – Relations Algebra – Relational Calculus – Views.

**Unit II**

SQL – QBE – QUEL – Basic structure – various Operations – Relational database design problems in the relational data base design – Normalisation – normalization using functional, Multi value and join dependencies**.**

**Unit III**

File and system structure – overall system structure – file Organization – data dictionary – Indexing and hashing – basic concept B and B+ tree indices – Static and Dynamic hash functions.

**Unit IV**

Recovery and atomicity – failures classification and types – Transaction model and Log based recovery, schedules – serial and non-serial types – Serialization of schedules and views – testing for seriability – lock based protocols – time based protocols – validation techniques – multiple Granularity – multiversion schemes – insert and delete Operations.

**Unit V**

Distributed data bases – structure of distributed databases – Trade offs in Distributing the database – Transparency and autonomy – distributed query processing – recovery in distributed systems – commit protocols – security and integrity violations – authorization and views – security specification – encryption – Statistical databases.

**Text Book(s):**

Henry F.Korth, and Abraham Silberschatz,,Sudarshan "Database system Concepts", McGraw Hill, 4th Edition, 2002

**References:**


1. Hector Garcia Molina, Jeffrey D Ullman, JenniferWisdom,Database Systems: The Complete Book., Pearson Education 2013.
2. Pipin C. Desai, "An Introduction to data base systems", Galgotia Publications Private Limited, 1991.
3. C.J. Date, "An Introduction to Database Systems", 3rd Edition, Addison Wesley 1983.


*****

## CORE COURSE X

## SOFTWARE ENGINEERING

**Objective:**

To provide knowledge of the various phases of software engineering process.

### Unit 1 SOFTWARE PROCESS

Introduction –S/W Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) – system engineering – computer based system – verification – validation – life cycle process – development process –system engineering hierarchy.

### Unit 2 SOFTWARE REQUIREMENTS

Functional and non-functional – user – system –requirement engineering process – feasibility studies – requirements – elicitation – validation and management – software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping –S/W document. Analysis and modeling – data, functional and behavioral models – structured analysis and data dictionary.

### Unit 3 DESIGN CONCEPTS AND PRINCIPLES

Design process and concepts – modular design – design heuristic – design model and document. Architectural design – software architecture – data design – architectural design – transform and transaction mapping – user interface design – user interface design principles. Real time systems – Real time software design – system design – real time executives – data acquisition system – monitoring and control system. SCM – Need for SCM–Version control – Introduction to SCM process – Software configuration items.

### Unit 4 TESTING

Taxonomy of software testing – levels – test activities – types of s/w test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms – regression testing – testing in the large. S/W testing strategies – strategic approach and issues – unit testing – integration testing – validation testing – system testing and debugging.

### Unit 5 SOFTWARE PROJECT MANAGEMENT

Measures and measurements – S/W complexity and science measure – size measure – data and logic structure measure – information flow measure. Software cost estimation – function point models – COCOMO model- Delphi method.- Defining a Task Network – Scheduling – Earned Value Analysis – Error Tracking – Software changes – program evolution dynamics – software maintenance – Architectural evolution. Taxonomy of CASE tools.

**Text Books:**


1. "Software engineering- A practitioner's Approach", Roger S. Pressman, McGraw-Hill International Edition, 5th edition, 2001.
2. "Software engineering", Ian Sommerville, Pearson education Asia, 6th edition, 2000.
3. "Software Engineering Concepts ", Richard E. Fairley, McGraw-Hill edition, 2002.


**Reference Books:**


1. "Software Engineering –,Jibithesh Mishra, Ashok Mohanty Pearson Education,2011


*****

## CORE COURSE XI

## COMPUTER GRAPHICS

**Objective:**

To present concepts on basic graphical techniques, raster graphics, two dimensional and three dimensional graphics.

**Unit I**

A survey of computer graphics – Overview of Graphic systems- output primitive (Mathematical functions for creating graphic output) – setting attribute of Output primitives

**Unit II**

Two dimensional geometric transformations – Two dimensional viewing

**Unit III**

Graphic structures – Hierarchical modeling – Graphical user interfaces and interactive input methods

**Unit IV**

3D Concepts – 3D- object Representation – 3D Geometric and Modeling Transformations.

**Unit V**

Visible surface detection methods – Illumination models – Computer Animation

**TEXT BOOK:**

1. **Hearn Donald, Baker Paulin M.,** Computer graphics – C version**,** Second edition, Pearson education, 2006. (ISBN 81-7758-765-X)

**REFERENCE BOOK:**

1.Rajiv Chopra, Computer Graphics: A Practical Approach, Concepts, Principles, Case Studies, S Chand 2011.
2. **Newman William M., &Sproull Robert F**., Principles of interactive computer graphics, Second edition, Tata –McGraw Hill, 1 (ISBN 0-07-463293-0)
3. Fundamentals of Computer Graphics, Peter Shirley, Michael Ashikhmin, Steve Marschner, 2009

*****

## CORE COURSE XII

## JAVA PROGRAMMING LAB

**Objective :**To get hands on experience in developing Programs using Java applications.

1. Assume that a bank maintains 2 kinds of account for its customers' one called savings account and the other current account' The savings account provides compound interest and withdraw facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account falls below this level a service charge is imposed. Create a class Account that stores customers name' account number and type of account. From this derive the classescurr-acct and sav-acct to make them more specific to their requirements. Introduce the necessary methods in order to achieve the following tasks:

   a. Accept deposit form a customer and update the balance.
   b. Display any deposit interest
   c. Compute and deposit interest.
   d. Permit withdrawal and update the balance.
   e. Check for the minimum balance' impose penalty' if necessary and update the balance.

2. Use constructors and methods to initialize the class members.
   Write a program that accepts a shopping list of five items from the command line and stores them in a vector and accomplish the following:

   a. To delete an item in the list.
   b. To add an item at a specified location in the list.
   c. To add an item at the end of the list.
   d. To print the contents of the vector.

3. Implementation of the concept of multiple inheritance using interfaces and design a package to contain the class students and another package to contain the interfaces sports.

4. Develop a simple real-life application program to illustrate the use of multithreads.

5. Create a try block that is likely to generate three types of exception and then incorporate necessary catch blocks to catch and handle them appropriately.

6. Write a Java applet' which will create the layout below:
   FORMAT
   Enter your Name:
   Enter your Age:
   Select City: *Delhi *Madras
   Select SIW: *Oracle *Visual Basic *Java
   OK CANCEL
   Handle the following simple validations.
   The name entered should be less than 25 characters wide.
   Age entered should be done as the user exits the fields as well as when OK button is pressed. Hint use the Boolean action (Event evt' object arg).

7. Write an Applet which will play two sound notes in a sequence continuously use the play ( ) methods available in the applet class and the methods in the Audio clip interface.

*****

## CORE COURSE XIII

## DATABASE SYSTEMS LAB

**Objective:** To get hands on experience in developing queries and designing forms using RDBMS software.

1.SQL – Data Definition Language
Table Creation with Constraints
Table Alteration (Add Column, Modify size and data type, Drop Column)
Drop Table

2. SQL – Data Manipulation Language
Data Insertion
Data Updation
Data Deletion
Ordering Tuples
Tuple Variable
Pattern Matching
Build-in Function
Set Operations
Join Operations
Nested Subqueries
Views

3. PL/SQL Procedure
3.1 Reverse the string.
3.2 Delete any record and count it.
3.3 Student Mark Sheet Preparation
3.4 Pay Roll preparation.
3.5 Excess record stored in separate files.
3.5 Split a table in to two tables.
3.6 Joining two tables in to one table.
3.7 Find factorial number using recursive function.
3.8 Find Fibonacci series using recursive function.

4. SQL Forms
Student Mark System
Pay Roll Preparation
Income Tax Calculation
Train Reservation System

*****

## ELECTIVE COURSE I:1

## e-Commerce

**Objective:**

To acquire the knowledge in Electronic Commerce, Electronic Payment systems, Security systems , Online Advertising and Marketing.

**Unit I**

Electronic Commerce Framework – Electronic Commerce and Media Convergence – The Anatomy of E-Commerce Applications – Electronic Commerce Consumer Applications – Electronic Commerce Organization Applications. The Network Infrastructure for Electronic Commerce: Components of the High way – Network Access Equipment – Global information Distribution Networks.

**Unit II**

The Internet as a Network Infrastructure: The Internet Terminology – NSFNET Architecture and components – National Research and Education Network – Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization :Telco/Cable/On-Line Companies - National Independent ISPs – Regional Level ISPs – Local –level ISPs – Internet Connectivity options.

**Unit III**

Electronic Commerce and the World Wide Web: Architectural Framework for ElectronicCommerce – World Wide Web as the Architecture – Technology behind the Web – Security and the Web, Consumer-Oriented Electronic Commerce: Consumer-Oriented Applications – mercantile process model – mercantile models from the consumers perspective.

**Unit IV**

Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems – Credit Card – Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems. Inter Organizational Commerce and EDI: Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues.

**Unit V**

Advertising and the Marketing on the Internet: The New Age of Information Search and Retrieval – Electronic Commerce Catalogs – Information filtering – Consumer – Data Interface – Emerging Tools. On Demand Education and Digital Copyrights: Computer-based Education and Training – Technological Components of Education on demand. Software Agents: Characteristics and Properties of Agents – The Technology behind Software Agents – Applets, Browsers and Software Agents.

**Book for Study:**

"Frontiers of Electronic Commerce", Ravikalakota& Andrew Whinston, Adison Wesley, 2000.

**Book for Reference:**

1. E-Commerce: An Introduction, Manzoor, Lambert Publications, 2010
2. "Electronic Commerce", Pete Loshin& Paul A.Murphy, Second edition, Jaico Publishing House, 2000.

*****

## ELECTIVE COURSE I:2

## SOFTWARE PROJECT MANAGEMENT

**Objective:**

To impart knowledge related to the various concepts, methods of Software Project Management using management process framework, management disciplines, and risk management techniques.

**Unit I Basics of Software Project Management:**

Introduction to Software-Introduction to Software Project Management

**Unit II Software Project Initiation:**

Software Project Evaluation- Contract Mangaement-Requirements Management

**Unit III Software Project Planning:**

Software Estimation Tools - Techniques and Models- Software Project Management Plan - Schedule Management-Cost Management

**Unit IV Software Project Execution, Monitoring and Control:**

Risk Management - Quality Management- Software Project Reviews

**Unit V Project Closure and Manintenance:**

Software Project Closure-Software Maintenance, Support and Implementation

**Text Book:**

1. "Software Project Management" - Subramanian Chandramouli, SaikatDutt - Pearson India Education Services Pvt. Ltd, 2015.
2. "Software Project Management" - Bob Hughes & Mike Cotterell – FourthEdition - 2008 - ISBN: 978 - 0 - 07 - 061985-2

*****

## ELECTIVE COURSE I:3

## PERVASIVE COMPUTING

**Objective :**

To understand about pervasive computing through pervasive devices and PDA.

**Unit I**

Pervasive Computing: Past, Present and Future - Pervasive Computing Market – m-Business – Application examples: Retail, Airline check-in and booking – Health care – Car information system – E-mail access via WAP and voice.

**Unit II**

Device Technology: Hardware – Human Machine Interfaces – Biometrics – Operating Systems – Java for Pervasive devices.

**Unit III**

Device Connectivity: Protocols – Security – Device Management - Web Application Concepts: WWW architecture – Protocols – Transcoding - Client Authentication via Internet.

**Unit IV**

WAP and Beyond: Components of the WAP architecture – WAP infrastructure – WAP security issues – WML – WAP push – Products – i-Mode - Voice Technology: Basics of Speech recognition- Voice Standards – Speech applications – Speech and Pervasive Computing.

**Unit V**

PDA: Device Categories – PDA operation Systems – Device Characteristics – Software Components - Standards – Mobile Applications - PDA Browsers - Pervasive Web Application architecture: Background – Development of Pervasive Computing web applications - Pervasive application architecture.

**Text Book:**

Pervasive Computing, Technology and Architecture of Mobile Internet Applications, JochenBurkhardt, Horst Henn, Stefan Hepper, Thomas Schaech & Klaus Rindtorff, Pearson Education, 2006.

**Reference Book**

1. Pervasive Computing and Networking,Mohammad S. Obaidat, Mieso Denko, Isaac Woungang, Wiley 2011.
2. Fundamentals of Mobile and Pervasive Computing, Frank Adelstein, Sandeep KS Gupta, Golden Richard III, Loren Schwiebert, McGraw Hill edition, 2006.

*****

## CORE COURSE XIV

## DISTRIBUTED TECHNOLOGIES

**Objectives**

To know the architectures of Distributed systems, to understand andcompare the technologies associated with J2EE and DOTNET.

**Unit I**

Client server architecture: 2-tier model - 3-tier model - n-tier model - J2EEarchitecture - DOTNET architecture - MVC architecture.

**Unit II**

Presentation services: Servlet - JSP - Javamail - Interaction services: RMI -CORBA - XML.

**Unit III**

Component model: EJB : Session Beans: Stateless and Stateful - Entity Beans- CMP and BMP - Message Driven Beans.

**Unit IV**

ASP.NET : Introduction - architecture - ASP.NET Runtime - ASP.NET Parser--Assembly - Page class. Web Server Controls - HTML Controls –AdRotatorand Calendar controls - Validation Controls - Security Management.

**Unit V**

ADO.NET: System.Data, SqlClient and Xml namespaces - Provider objectsand Consumer objects - Disconnected data access - GridView&FormView.

**Books for Study**

**Unit I,II**

1. Justin Couch, Daniel H.Steinberg, “J2EE Bible”, Wiley India(P) Ltd, NewDelhi, 2002.

**Unit III**

2. Paul Tremblett, “Instant Enterprise Java y - Beans”, Tata McGraw HillPublishing company, New Delhi, 2001.

**Unit IV,V**

3. Platt S David, “Introducing Micorsoft .Net”, Prentice Hall of India, NewDelhi, 2003.

**Books for Reference**

1. Stephanie Bodoff, Dale Green, Eric Jendrock, “The J2EE tutorial”,Addison-Wesley, 2002.
2. Hitesh Seth, “Microsoft .NET: kick start”, Sams Publishing, 2004.

*****

## CORE COURSE XV

## ACCOUNTING AND FINANCIAL MANAGEMENT

**Objective :**

To present the whole range of book keeping & accountancy and to give comprehensive coverage to management accounts.

**Unit I**

Accounting Principles and Concepts – Double entry book keeping- Income and expenditure- Accounting record and system- assets and liabilities- Depreciation, Depletion and Amortization - Accounting for depreciation.

**Unit II**

Journal – Ledger- Trial Balance- Trading, Manufacturing and profit and Loss account – Balance sheet.

**Unit III**

Analysis and interpretation of financial statements with ratios

**Unit IV**

Cost Accounting- Methods and Techniques of Cost Accounting- classifications of cost - Material Cost- Labour Cost – Overhead- fixed and variable cost- Cost-volume – profit analysis - marginal costing and decision making.

**Unit V**

Budgeting and budgetary control – types of budgets- Preparation of various functional budgets- Preparations of cash budgets- flexible budgets- Advantages of Budgeting and Budgetary control.

**Text Book(s):**

1. T.S. Grewal, “Double Entry Book Keeping”, All India Sultan Chand (Recent Edition)
2. S.N. Maheswari “Principles of Management Accounting “, Sultan Chand, New Delhi (Recent Edition)
3. Shukla, Grewal& Gupta, “Advanced Accounts “Sultan Chand Publications

**Reference(s):**

1. S.K. Gupta & R.K. Sharma- Practical Problems in Management Accounting (Recent edition)
2. Khan and Jain “Financial Management” Tata McGraw Hill (Recent Edition)

*****

## CORE COURSE XVI

## DISCRETE MATHEMATICS

**Objective:**

To impart knowledge on Sets, Relations & Functions, Mathematical logic, Groups & Subgroups, Lattices & Boolean Algebra and Combinatorics& Recurrence Relations

**Unit I**

Sets, Relations & Functions: Property of binary relations, equivalence, compatibility, partial ordering relations, Hasse diagram, functions, inverse functions, compositions of functions, recursive functions.

**Unit II**

Mathematical logic: Logic operators, Truth tables, Theory of inference and deduction, mathematical calculus, predicate calculus, predicates and qualifiers.

**Unit III**

Groups & Subgroups: Group axioms, permutation groups, subgroups, cosets, normal subgroups, semi groups, free semi-groups, monoids, sequential machines, error correcting codes, modular arithmetic grammars.

**Unit IV**

Lattices & Boolean Algebra: Axiomatic definition of Boolean algebra as algebra as algebraic structures with two operations , basic results truth values and truth tables, the algebra of propositional functions, Boolean algebra of truth tables.

**Unit V**

Combinatorics& Recurrence Relations: Disjunctive and sequential counting, combinations and permutations, enumeration without repetition, recurrence relation, Fibonacci relation, solving recurrence relation by substitution, solving non- recurrence relation by conversion to linear recurrence relation.

**Text Book(s)**

1. Trembly. J.P &Manohar. P., "Discrete Mathematical Structures with Applications to Computer Science" McGraw Hill.
2. Kolman, Busy & Ross "Discrete Mathematical Structures", PHI
3. K.D Joshi, "Foundations of Discrete Mathematics", Wiley Eastern Limited.

**References**

1. Seymour Lipschutz& March Lipson Tata McGraw Hill.
2. C.L. Liu " Elements of screte mathematics " Tata McGraw Hill.

*****

## CORE COURSE VII

## ENTERPRISE RESOURCE PLANNING

**Objective:**

In this course students shall learn various components of an application software that help computerize functioning of an enterprise such as sales, materials, production, financial , customer relationship AND supply chain modules.

**Unit I**

A Foundation for Understanding Enterprise Resource Planning systems – Re-engineering and Enterprise Resource Planning Systems – Planning ,Design ,and Implementation of Enterprise Resource Planning Systems – ERP Systems: Sales and Marketing – ERP Systems: Accounting and finance ERP Systems :Production and Materials Management ERP Systems: Human Resources

**Unit II**

Managing an ERP Project – Supply chain Management and the marketplace – Rules of the game – Winning as a team.

**Unit III Solutions**

Supply chains as Systems - Modeling the Supply Chain – Supply Chain Software - **Operations** – Meeting Demand – Maintaining Supply – Measuring Performance

**Unit IV Planning**

Forecasting Demand – Scheduling Supply – Improving performance – Mastering Demand – Designing the Chain – Maximizing Performance

**Unit V**

Essentials of Customer relationship management – Designing CRM application – Various modules of CRM application - Advantages of CRM

**TEXT BOOK:**

1. **Sumner Mary**, Enterprise Resource Planning, First edition, Pearson education, 2006 (ISBN 81-317-0240-5) (**Unit 1**: Chapters 1 to 7; **Unit 2:** Chapters 8, 9 (continued on text book number TWO)
2. **Taylor David A**., Supply Chains (A managers guide), Pearson education, 2004 (ISBN 81-297-0334-3) (**Unit 2:** Chapters 1, 2, 3; **Unit 3:** Chapters 4, 5, 6, 7, 8, 9; **Unit 4:** Chapters 10, 11, 12, 13)
3. **Tiwana**, Essential guide to knowledge management : The e-business and CRM applications, Pearson education (ISBN 81-780-8326-4) **(Unit 5)**

**REFERENCE BOOK:**


1. Leon, ENTERPRISE RESOURCE PLANNING, Tata Mc Graw Hill, 2013
2. **ALTEKAR Rahul V**., Enterprise wide resource planning (Theory and practice), Prentice Hall of India, 2005 (ISBN 81-203-2633-4)
3. **GargVinod K &Venkitakrishnan N.K**, Enterprise resource planning, Second edition, Prentice Hall of India, 2006 (ISBN 81-203-2254-1).
4. **Handfield R. B & Nichols. Ernest L**., Introduction to supply chain management, Prentice Hall of India, 2006 (ISBN 81-203-2753-5)


*****

## CORE COURSE XVIII

## DISTRIBUTED TECHNOLOGIES LAB

**Objective:** To get hands on experience in developing applications for distributed environment.

1. RMI - Invocation of server side methods.
2. Servlets - Returning Information received from the client.
3. Servlets and JDBC - Constructing a response by accessing a database.
4. JSP - use of scriptlet.
5. JSP - use of java beans.
6. EJB - Session Bean.
7. EJB - Entity Bean.
8. ASP.NET - Server & Client side controls.
9. ASP.NET and ADO.NET - use of disconnected data object.
10. ASP.NET: Databind Controls.
11. DOM usage on the server side.
12. AJAX: Dynamic client - server interaction example.

*****

## CORE COURSE XIX

## ACCOUNTING AND FINANCIAL MANAGEMENT LAB

**Objective:** To get hands on experience in developing accounting and financial management applications using accounting software.

1. Creation of company, Groups – Single & Multiple
2. Posting of Journal to ledger – Single & Multiple.
3. Preparation of Accounting vouchers.
4. Preparation of Trail balance.
5. Financial Statement: Trading account, profit and loss account and Balance sheet.
6. Preparation of Bank Reconciliation Statement
7. Preparation of Inventory: Stock Item, Stock Group, Stock category,
8. Preparation of VAT (Value Added Tax)
9. Inventory Voucher.
10. Preparation of TDS (Tax Deducted at Source) & Service Tax.

*****

## ELECTIVE COURSE II:1

## ARTIFICIAL INTELLIGENCE

**Objective :**

To provide the knowledge of problem solving using AI techniques, knowledge representations, expert system development process and tools.

**Unit I**

What is Artificial Intelligence? The AI Problems – The Underlying Assumptions – What is an AI Techniques? Problems: Problems spaces and search – Defining the Problems as a State Space Search – Production Systems – Problem Characteristics – Production System Characteristics – Issues in the Design of Search Programmes.

**Unit II**

Generate – and-Test – Hill Climbing – Best-First Search – Problem Reduction – Constraint Satisfaction – Means – Ends – Analysis-Knowledge Representation issues: Representation and Mappings – Approaches to Knowledge Representation – Issues in Knowledge Representation – The Frame Problem

**Unit III**

Using predicate logic – Representing Simple facts in Logic – Representing Instance and Is a relationships – Computable functions and Predicates – Resolutions – Natural Deductions – Representing Knowledge Using Rules: Procedural versus Declarative Knowledge – Forward versus Backward Reasoning – Matching – Control Knowledge

**Unit IV**

Symbolic Reasoning under uncertainty – Introduction to Non Monotonic Reasoning – Logics for Non Monotonic Reasoning – Implementation issues – Augmenting a Problem solver – Implementation :Deapth – First Search – Implementation : Breadth – First Search – Statistical reasoning – Bayesian Networks – Fuzzy Logic- Learning: What is learning? – Rote Learning – Learning by taking advice – Learning in Problem Solving

**Unit V**

Connectionist Models – Introduction – Hopfield Networks – Learning in Neural Networks – Applications of Neural Networks – Expert Systems – Representing and Using Domain Knowledge – Expert System Shells – Explanation – Knowledge acquisition

**Text Book**

Artificial Intelligence, Elaine Rich, Kevin Knight, 2/e, TataMcGraw Hill Publishing Ltd., - New Delhi, 1991
Chapters: 1.1 – 1.3, 2.3, 4.5, 6.7, 8.3 – 8.5, 17.1 – 17.4, 18.1 – 18.3 & 20

**Reference Books**


1. Artificial Intelligence, A Modern Approach, Stuart J. Russell and Peter Norvig, Prentice, 2010.
2. Introduction to Artificial Intelligence and Expert Systems, Dan W.Patterson, PrenticeHall of India, New Delhi, 1992
3. Introduction to Expert Systems, 3/e, Peter Jackson, Pearson Education, Reprint 2003
4. Artificial Intelligence, A New Synthesis, Nils J. Nilsson Harcourt Asia Pvt. Ltd., 1998


*****

## ELECTIVE COURSE II:2

## COMPUTER SIMULATION AND MODELING

**Objective :**

To impart knowledge in real time modeling process and the simulation of any system using the real time mode.

**Unit I**

Introduction to Simulation: When Simulation is the Appropriate Tool- When Simulation is not Appropriate- Advantages and Disadvantages of Simulation- Areas of Application- Systems and System Environment- Components of a System- Discrete and Continuous Systems- Model of aSystem- Types of Models- Discrete-Event System Simulation –Steps in a simulation study.Simulation Examples: Simulation of Queuing Systems, Simulation of Inventory Systems.

**Unit II**

Simulation Software: History of Simulation Software- Selection of Simulation Software- Simulation in JAVA, Simulation in GPSS, Simulation in SSF- Simulation software – Experimentation and Statistical and analysis tools .

**Unit III**

Statistical Models in Simulation: Review of Terminology and Concepts- Useful Statistical Models- Discrete Distributions- Continuous Distributions- Poisson process. Queuing models- Characteristics of queuing systems.

**Unit IV**

Random-Number Generation: Properties of Random Numbers-Generation of Pseudo-Random Numbers-Techniques for Generating Random Numbers-Linear congruential Method- Random number streams -Tests for random numbers-Frequency tests - Test for Autocorrelation.Random-Variate Generation: Inverse Transform Technique-Exponential Distribution-Uniform Distribution- Weibull Distribution.

**Unit V**

Input Modeling: Data Collection - Identifying the Distribution with Data- parameter estimation- goodness of fit tests. Verification and Validation of Simulation Models: Model Building, Verification, and Validation-Verification of Simulation Models-Calibration and Validation of Models.

**Text Book:**

1. Jerry Banks, John S. Carson, II Barry L. Nelson., *Discrete-Event System Simulation*, FourthEdition, PHI Edition, 2009.
   Unit:I :Chapter 1 Sections (1.1-1.11), Chapter 2 Sections (2.1, 2.2)
   Unit:II :Chapter 4 Sections (4.1, 4.2, 4.4-4.7)
   Unit:III :Chapter 5 Sections (5.1-5.5), Chapter 6 Sections (6.1)
   Unit:IV :Chapter 7 Sections (7.1, 7.2, 7.3.1, 7.3.3, 7.4), Chapter 8 Sections (8.1.1-8.1.3)
   Unit:V :Chapter 9 Sections (9.1-9.4), Chapter 10 Sections (10.1-10.3)

**Book for Reference:**

E.Winsberg, Science in the age of computer simulation, Chicago: University Press, 2010.

*****

## ELECTIVE COURSE II:3

## MOBILE COMMUNICATION

**Objective : To understand the concepts of Mobile and wireless devices, Mobile IP and WAP.**

**Unit I**

Introduction: Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing – Wireless Transmission – Multiplexing – Spread Spectrum and cellular systems – Medium Access Control – Comparisons

**Unit II**

Medium Access Control: TDMA,CDMATelecommunications System: Telecommunication System – GSM – Architecture– Protocols – Hand over and Security–Satellite System

**Unit III**

Wireless LAN : IEEE S02.11– Bluetooth – MAC Layer – Security-and Link Management.

**Unit IV**

Mobile IP: Goals – Packet Delivery – Strategies – Registration – Tunneling andReverse Tunneling – Adhoc Networks – Routing Strategies

**Unit V**

WIRELESS APPLICATION PROTOCOL: Wireless Application Protocol (WAP) – Architecture – XML – WML Script – Applications

**Text Book(s)**

1. Jochen Schiller, Mobile Communication, Pearson Education, Delhi, 2008.
2. Sandeep Singhal, et al.The Wireless Application Protocol: Writing Applications for theMobile Internet

**Reference:**

Rich Ling, Jonathan Donner, Mobile Communication, Wiley Publications,2013.

*****

**CORE COURSE XX**

**WEB TECHNOLOGIES**

**Objective:**

**Unit I WEB PROGRAMMING**

PHP introduction : variables – operators – control structures – Advanced concepts in PHP : Cookies – sessions – server variables

**Unit II**

PHP Files :accessing files – reading – writing - MySQL database: insert – update – delete – join – group by – aggregate functions – formats – case studies .

**Unit III WEB SERVICES:**

Introduction – What are web services? SOAP WSDL UDDI-Why Web Services are important ? – The evolution of web applications Not just another distributed computing platform – Web services and enterprises. XML: XML Fundamentals XML: The Lingua Franca of web services - XML Documents XML namespaces Explicit and Default namespaces, Inheriting namespaces, And not inheriting namespaces, Attributes and namespaces –XML Schema XML schema and namespaces, A first schema, Implementing XML schema types, The any Element, Inheritance, Substitution groups, Global and local type declarations, Managing Schemas, Schemas and instance documents, XML schema best practices- Processing XML SAX: Simple API for XML, DOM: Document object Model, XSLT, XPATH

**Unit IV**

SOAP and WSDL5 The SOAP Model- SOAP- SOAP Messages SOAP Envelope, SOAP Header, SOAP Body, SOAP Faults- SOAP encoding – SOAP RPC- Usingalternative SOAP Encodings, Document, RPC, Literal, Encoded SOAP RPC andSOAP Document-Literal, SOAP web services and the REST Architecture-Looking back to SOAP 1.1 Syntactic differences between SOAP 1.2 and SOAP1.1- Changes to SOAP-RPC- SOAP Encoding- WSDL structure, The stock quoteWSDL interface, definitions, The type element, bindings, services, managingWSDL descriptions, Extending WSDL – Using SOAP and WSDL

**Unit V**

UDDI: UDDI at a glance- The UDDI Business registry- UDDI under the covers – Accessing UDDI- How UDDI is playing out Conversations Overview – Web Services – Web services Conversation Language – WSCL Interface components – The Bar scenario conversations – Relationship between WSCL and WSDL Workflow Business Process Management – Workflow and Workflow management systems – Business process execution language for web services

**Text Book(s)**


1. K. Meena , R. Sivakumar , A.B. KarthickAnandBabu "Web programming using PHP and MySQL" - Himalaya Publishing House – 2011. (**for Unit 1 and Unit 2)**
2. SandeepChatterjee, James Webber, "Developing Enterprise Web Services - An Architect's Guide" - Pearson Education– Second Indian Reprint 2005. (**for Unit 3, Unit 4 and Unit 5)**


*****

## CORE COURSE XXI

## DATA MINING AND WAREHOUSING

**Objective:**

In this course students shall learn the mathematical & algorithmic details of various data association techniques to discover patterns in underlying data (namely mining data).He also learn how to consolidate huge volume of data in one place efficiently.

**Unit I**

Introduction to data mining – Association Rule Mining.

**Unit II**

Classification – Cluster analysis.

**Unit III**

Web Data Mining – Search engines.

**Unit IV**

Data warehousing – Algorithms & operations to create data warehouse – Designing data warehouse- Applications of data warehouse.

**Unit V**

Online analytical processing – Information Privacy.

**TEXT BOOK:**

1. **G.K. Gupta,** Introduction to Data mining with case studies ,Prentice Hall India, 2006 (ISBN 81-203-3053-6) **[Unit-1 : (**Chapters 1,2); **Unit-2** : (Chapters 3,4); **Unit-3 (**Chapters 5,6); **Unit-4 (**Chapters 7), **Unit-5 (**Chapters 8,9)**].**

**REFERENCE BOOK:**


**1.S. K. Mourya, Shalu Gupta**, data Mining and Data Warehousing, Alpha Science International Limited, 2013

2**. K.P.Soman&ShyamDiwakar and V. Ajay,** Insight to Data Mining Theory and Practice, Prentice Hall of India, 2006. (ISBN -81-203- 2897-3)

3. **Jiawei Han and MichelineKamber**, Data Mining Concepts and Techniques, Elsevier, Second Edition, 2007 (ISBN: 81-312-0535-5)


*****

## CORE COURSE XXII

## ORGANIZATIONAL DYNAMICS

**Objective:**

To impart knowledge about fundamentals of organization behavior, Motivation, Individualand Interpersonal Behavior, Change, Stress and Counseling

**Unit I**

Fundamentals of Organization Behavior: – Understanding Organization Behavior – Fundamental Concepts – Contingency Approach – Limitation of Organization Behavior – AnOrganization Behavior System – Model of Organization Behavior. Managing Communications:communications Fundamentals – #Upward and Downward Communication# – Other Form ofCommunication – Informal Communication

**Unit II**

Social Systems and Organizational Culture: Understanding a Social System – Social Culture – Role – Status – Organizational Culture – Motivation: Model – Motivational Drives –Human Needs – Behavior Modification – #Goal Setting. Appraising: Organizational Behavior andperformance Appraisal# – Economic Incentive Systems

**Unit III**

Leadership – The Nature of Leadership – Behavior Approaches to Leadership Style – Contingency approaches to Leadership Style – Individual and Interpersonal Behavior: Nature ofEmployee Attitudes – Effects of Employee Attitudes – Studying Job Satisfaction. InterpersonalBehavior: Conflict in Organizations – #Power and Politics#.

**Unit IV**

Organizations and Individuals: Rights to Privacy – Discipline – QWL –Individual Responsibilities. Informal and Formal Groups: Group Dynamics –Nature of Informal Group –Formal Group. Team and Team Building: Organizational Context for Teams – Teamwork – TeamBuilding

**Unit V**

Change and its Effects: Change at Work- Resistance to Change – Implementing Change
Successfully – Understanding Organization Development. Stress and counseling: Employee Stress– #Employee Counseling – Type of counseling#.

**Text Book:**

1. John W Newstrom, “Organizational Behavior: Human Behavior at Work”, 12th Edition,Tata McGraw Hill Education Private Limited, 2007.

**Books for Reference:**

1. Organizational Behavior, 12th Edition, Tata McGraw Hill Education Private Limited, 2011.
2. Stephen P. Robbins, *Organizational Behavior*, 13th Edition, PHI Pvt. Ltd, New Delhi, 2010.

******

## CORE COURSES XXIII

## PROBABILITY AND STATISTICS

**Objective**

**Unit I**

Probability: Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Baye's theorem of probability and Geometric probability. Random variables and their properties, Discrete Random variable, Continuous Random variable, Probability Distribution joint probability distributions their properties, Transformation variables, Mathematical expectations, probability generating functions

**Unit II**

Probability Distributions / Discrete distributions: Binomial, Poisson Negative binominal distributions and their properties. (Definition, mean, variance, moment generating function, Additive properties, fitting of the distribution.)
Continuous distributions: Uniform, Normal, exponential distributions and their properties. Curve fitting using Principle of Least Squares.

**Unit III**

Multivariate Analysis: Correlation, correlation coefficient, Rank correlation, Regression Analysis, Multiple Regression, Attributes, coefficient of Association, X2 – test for goodness of fit, test for independence.

**Unit IV**

Sample, populations, statistic, parameter, Sampling distribution, standard error, unbiasedness, efficiency, Maximum likelihood estimator, notion & interval estimation. Testing of Hypothesis: Formulation of Null hypothesis, critical region, level of significance, power of the test.

**Unit V**

Queuing theory: Queue description, characteristics of a queuing model, study state solutions of M/M/1: ∝ Model, M/M/1 ; N Model.

**Text book:**

1. T.Veerarajan, "Probability, Statistics and Random Processes", Tata McGraw Hill

**Reference Book:**

1. **Yuri Suhov, Mark Kelber,** Probability and Statistics by Example, Cambridge University Press,2014.
2. **Kishor S. Trivedi**, "Probability & Statistics with Reliability, Queuing and Computer Applications", Prentice Hall of India, 1999

*****

## CORE COURSE XXIV

## WEB TECHNOLOGIES LAB

**Objective :** To get hands on experience in developing web based applications.

1. Create a simple Web Service that converts the temperature from Farenheit toCelsius and vice versa.

2. Use the above Web Service on a web page and execute to fetch the results

3. Create a Web Services provider and make it available on the Internet or intranet.

4. Create a web based Consumer of an existing web service.

5. Create a Windows application based consumer of an existing web service.

6. Write an application that simulates sending a SOAP message as a request and receiving another as a response.

7. Develop a Web Service that provides images as responses.

8. Develop a web service that access table contents of a database.

9. Develop a console based Web Service Client.

10. Develop a Web intranet/internet based Web Service Client.

*****

## CORE COURSE XXV

## DATA MINING LAB

**Objective :**

To get hands on experience in developing applications using data mining tool.

| **Practical** | **Practical List** |
|---|---|
| Exercise 1 | Preprocessing<br>a. Datatype Conversion<br>b. Data Transformation |
| Exercise 2 | Filters- **Practical**<br>a. Replace Missing Values<br>b.Add Expression |
| Exercise 3 | Feature Selection<br>Select Attributes- **Practical**<br>a. Filter<br>b. Wrapper<br>c. Dimensionality Reduction |
| Exercise 4 | Supervised Technique<br>Classifier - Function - **Practical**<br>a. Multilayer Perceptron Tree - **Practical**J48 |
| Exercise 5 | Classifier- Bayes –**Practical**<br>a.Naive Bayes Rule- **Practical**<br>b.ZeroR |
| Exercise 6 | Unsupervised Techniques<br>Clustering- Theory<br>Partitioned – Algorithm – Practical<br>Hierarchical Algorithm – Practical<br>Semi Supervised Algorithm – Practical |
| Exercise 7 | Association Rule Mining<br>A-Priori –Algorithm –Practical<br>Predictive A-Priori –Practical |
| Exercise 8 | Experimenter<br>Dataset – Test – Practical<br>Algorithm based –Test –Practical |
| Exercise 9 | Knowledge Flow<br>Feature Selection – Practical<br>Clustering –Practical |
| Exercise 10 | Knowledge Flow<br>Classification – Practical |

## ELECTIVE COURSE III:1

## PARALLEL PROCESSING

**Objective:**

To study the Parallel computer Architecture, theories of parallel computing, interconnection networks and applications of cost effective computer systems.

**Unit I**

Parallel computer models: the state of computing – Multiprocessors and multicomputers – Multivector and SIMD computers.

**Unit II**

Program and Network properties: Conditions of parallelism – Program partitioning and scheduling – program flow mechanisms – system interconnect architectures.

**Unit III**

Processors and memory hierarchy : Advanced processor Technology – Superscalar and vector processors – Linear Pipeline Processors – Nonlinear Pipeline Processors.

**Unit IV**

Multiprocessors and Multicomputers: Multiprocessor System Interconnects-Message-Passing Mechanisms – SIMD Computer Organization. The Connection Machine CM5 – Fine – Grain Multicomputers.

**Unit V**

Software for Parallel Programming : Parallel Programming Models – Parallel Languages and Compilers – Dependence Analysis of Data Arrays.

**Books for reference:**

1. Introduction To Parallel Processing, By M. Sasikumar, Dinesh Shikhare, Ravi P.Prakash, Eastern Economy Edition, 2014
2.Computer Architecture and Parallel Processing, Kai Hwang and Baye
3. Parallel Computing, Theory and Practice, Michel J.Quinn, McGraw-Hill International Edn., Singapore 1994

*****

## ELECTIVE COURSE III:2

## CLOUD COMPUTING

**Objective:**

To impart knowledge on Introduction to Cloud Computing, The Evolution of SaaS, The Anatomy of Cloud Infrastructure, Workflow Management Systems and Clouds.

**Unit I**

Introduction to Cloud Computing: Roots of Cloud Computing - Layers and Types of Cloud - Features of a cloud-Infrastructure Management-Infrastructure as a Service Providers-Platform as a Service Providers-Challenges and Risks. Broad Approaches to Migrating into the Cloud - Seven Step Model of Migration into a Cloud. .

**Unit II**

The Evolution of SaaS-The Challenges of SaaS Paradigm- Approaching the SaaS Integration Enigma- New Integration Scenarios- The Integration Methodologies- SaaS Integration Products, Platforms and Services-B2Bi Services -. Background of Enterprise cloud computing paradigm- Issues for Enterprise Applications on the Cloud- Transition Challenges- Enterprise Cloud Technology and Market Evolution - Business drivers toward a marketplace for Enterprise cloud computing- The Cloud Supply Chain. .

**Unit III**

The Anatomy of Cloud Infrastructure- Distributed Management of Virtual Infrastructures- Scheduling Techniques for Advance Reservation of Capacity- RVWS Design - Cluster as a Service: The Logical Design - Cloud Storage : from LANs TO WANs- Technologies for Data Security in Cloud Computing . .

**Unit IV**

Workflow Management Systems and Clouds - Architecture of Workflow Management Systems - Utilizing Clouds for Workflow Execution- A Classification of Scientific Applications and Services in the Cloud- SAGA based Scientific Applications that Utilize Clouds. MapReduce Programming Model- Major MapReduce Implementations for the Cloud- MapReduce Impacts and Research Directions. A Model for Federated Cloud Computing - Traditional Approaches to SLO Management- Types of SLA -Life Cycle of SLA - SLA Management in Cloud- Automated Policy based Management. **.**

**Unit V**

Grid and Cloud- HPC in the Cloud: Performance related Issues -Data Security in the Cloud- The Current State of Data Security in the Cloud- Homo Sapiens and Digital Information- Risk- Identity- The Cloud, Digital Identity and Data Security - Content Level Security :Pros and Cons- Legal Issues in Cloud Computing - Data Privacy and Security Issues- Cloud Contracting models- Case Studies : Aneka and CometCloud. **.**

**Text Book(s):**

1. Cloud Computing - Principles and Paradigms, by RajkumarBuyya, James Broberg, and AndrzejGoscinski. 2011 .

**REFERENCES:**

1. Cloud Application Architectures,GeorgeReese,ISBN: 184047142,Shroff/O'Reilly,2009.

*****

**ELECTIVE COURSE III:3**

**SOFT COMPUTING**

**Objective:**

To impart knowledge in Fuzzy Set Theory, Optimization, Neural Networks, Neuro Fuzzy Modelingand Application Of Computational Intelligence.

**Unit I FUZZY SET THEORY**

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set – Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

**Unit II OPTIMIZATION :**

Derivative based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative Free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

**Unit III NEURAL NETWORKS:**

Supervised Learning Neural Networks – Perceptrons – AdalineBackpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

**Unit IV NEURO FUZZY MODELING:**

Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

**Unit V APPLICATION OF COMPUTATIONAL INTELLIGENCE:**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

**TEXT BOOK**

1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro Fuzzy and Soft Computing", PHI, Pearson Education, 2004.

**REFERENCE BOOK**

1. By L. Fortuna, G.. Rizzotto, M. Lavorgna, G. Nunnari, M.G. Xibilia, Riccardo Caponetto, Soft Computing: New Trends and Applications, Springer 2012
2. Timothy J. Ross, "Fuzzy Logic with Engineering Application, "McGraw Hill, 1977.
3. Davis E. Goldberg, "Genetic Algorithms Search, Optimization and Machine Learning", Addision Wesley, 1989.
4. S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003. Emereo Pty Limited, July 2008..

*****

## MANAGERIAL SKILLS

**Learning Objective**

The learning objective of this course is to enable the students to learn the art of getting things done in the modern business world by learning topics like lateral thinking, decision making, balancing work and life, corporate social responsibility, and work ethics.

### UNIT I THINKING STRATEGIES

Strategic thinking – meaning – questions- things included in Strategic thinking – Process consideration in Strategic thinking – Strategic thinking competencies – importance of Strategic thinking – characteristics of Strategic Thinkers – Points to be kept in mind in Strategic thinking.

Lateral Thinking – meaning – why Lateral Thinking – when to use Lateral Thinking – Benefits of Lateral Thinking – Techniques used in Lateral Thinking – Who needs Lateral Thinking – How to use Lateral Thinking? – Conventional Vs Lateral Leaders – Questions asked by Lateral Leaders – becoming a Lateral leader

### UNIT II INTERPERSONAL STRATEGIES

Conflict Resolution – meaning – points to be understood before studying conflict resolution – sources of conflict – common reactions to conflict – role of perception in conflict – steps for Conflict Resolution – Conflict handling matrix – Functional and Dysfunctional outcome of conflict.

Negotiation skills – process – styles – outcome – principles involved – negotiation model – being a negotiator – qualities of a negotiator.

### UNIT III IMPLEMENTATION STRATEGIES

Facing changes – meaning – characteristics –why changes –pace of changes – impact of resistance –Reasons for resistance – types of people in facing changes – introducing change. Facing challenges – meaning – importance – path to facing challenges – benefits of facing challenges.

### UNIT IV ACTION BASED STRATEGIES

Risk taking - meaning – factors determining Risk Taking – Risk management – users of Risk Management – Steps in Risk Management.

Effective decision making – meaning – approaches – methods – steps – Decision making at the work place.

## UNIT V BEHAVIOURAL STRATEGIES

Motivation and Staying motivated – meaning – finding reason for being motivated – staying motivated at work place – staying motivated in negative work environment – staying motivated during crisis.

Balancing work and life – meaning – work satisfaction – gender differences – responsibility of the employers and employees – ways of balancing work and life – handling professional and personal demands – organizing your desk.

## TEXT BOOK:

Alex K. (2012) Soft Skills – Know Yourself & Know the World, S.Chand & Company LTD, Ram Nagar, New Delhi- 110 055. Mobile No :94425 14814 (Dr. K. Alex)

## REFERENCE BOOKS:


1. Meena.K and V.Ayothi (2013) A Book on Development of Soft Skills (Soft Skills : A Road Map to Success), P.R. Publishers & Distributors, No, B-20 & 21, V.M.M. Complex, Chatiram Bus Stand, Tiruchirappalli- 620 002.(Phone :0431-2702824: Mobile : 94433 70597, 98430 74472)
2. Emotional Quotient – Daniel Goleman
3. Power of the Plus factor – Norman Vincent Peale.
4. The Seven Habits of Highly Effective people – Stephen covey.


*****

## CORE COURSE XXVI

## COMPUTER NETWORKS

**Objective:**

To provide an overall knowledge in computer communication networks concepts and itsimplementation details in the Internet

**Unit I**

Introduction – Uses of Computer Networks – Network Hardware: LAN-MAN-WAN – Networks Software: Protocol Hierarchies – Reference models: OSI - TCP/IP.The Physical Layer: Guided Transmission Media - The Public Switched Telephone Network:Structure of the Telephone System – Switching

**Unit II**

The Data Link Layer: Design Issues –Error Detection and Correction – Elementary DataLink Protocol – Sliding Window Protocol – HDLC.The Medium Access Control Sub Layer: Multiple Access Protocol: CSMA Protocol – CollisionFree Protocol – Data Link Layer Switching: Repeaters, Hub, Bridges, Switches, Router, andGateways - Bluetooth.

**Unit III**

The Network Layer: Design Issues – Routing Algorithms: Optimality Principle – Shortestpath – Distance Vector – Link State – Hierarchal – Broadcasting –Congestion Controlalgorithm s– The network layer in internet: IP protocol – IP address.

**Unit IV**

The Transport Layer: The Transport Service: Service provided to the Upper Layer – Transport Service Primitives – Berkeley Sockets - Elements of Transport Protocols – The InternetTransport Protocol: UDP: Introduction – TCP: Service Model – TCP Segment Header.The Application Layer: DNS – E-Mail: Architecture and Services – Message Formats.

**Unit V**

Network Security: Cryptography: introduction – Substitution and Transposition Cipher –Symmetric-key Algorithm: DES – Public-key Algorithms: RSA – Digital Signature: Symmetricand Public key Signature – Communication Security: Firewalls – VPN. Authentication Protocol:Authentication based on shared key – Diffie-Hellman key Exchange.

**Text Book:**

1. Andrew S. Tanenbaum, *Computer Networks***,** PHI, Fourth Edition, 2003.
   **Unit: I**: Chapter 1 (1.1, 1.2(1.2.1 to 1.2.3), 1.3(1.3.1), 1.4(1.4.1, 1.4.2)Chapter 2 (2.2, 2.5(2.5.1, 2.5.5)
   **Unit: II**: Chapter 3(3.1, 3.2, 3.3, 3.4, 3.6.1), Chapter 4(4.2.2, 4.2.3, 4.6, 4.7.5)
   **Unit: III**: Chapter 5 (5.1, 5.2(5.2.1, 5.2.2, 5.2.4, 5.2.5, 5.2.6, 5.2.7), 5.3, 5.6(5.6.1, 5.6.2)
   **Unit: IV**: Chapter 6 (6.1(6.1.1 to 6.1.3), 6.2, 6.4.1, 6.4.2, 6.5.2, 6.5.4.Chapter 7 (7.1, 7.2.1, 7.2.3)
   **Unit: V**: Chapter 8 (8.1.1, 8.1.2, 8.1.3, 8.2.1, 8.3.1, 8.4.1, 8.4.2, 8.6.2, 8.6.3, 8.7.1, 8.7.2)

**Books for Reference:**


1. William Stallings, *Data and Computer Communication*, PHI, Eighth Edition, 2009
2. Behrouz A. Forouzan, *Data Communications and Networking*, Third Edition, TataMcGraw Hill, 2003.

## CORE COURSE XXVII

## SMART DEVICES PROGRAMMING

**Objective:**

To provide concepts to enable the students for creating applications for smart devices using Android

**Unit I**

Introduction to Android: History of Android – Versions of Android – Android Architecture – App Architecture – Components – Intents – Mainfest – App Package - Activities - Services –Broadcast Receivers – Content Providers – Installing the Android SDK – Installing an Android Platform – Creating an Android Virtual Device – Starting the AVD – Introducing UC – Creating UC – Installing and Running UC – Preparing UC for Publishing – Migrating to Eclipse –Developing UC with Eclipse.

**Unit II**

User Interface: Customizing the Window – Creating and Displaying Views – MonitoringClick Actions – Resolution Independent Assets – Locking Activity Orientation –DynamicOrientation Locking – Manually Handling Rotation - Creating Pop-up Menu Actions –Customizing Options Menu – Customizing Back Button – #Emulating the Home Button –Monitoring TextView Changes – Scrolling TextView Ticker – Animating a View – Creating –Drawables as Backgrounds – Creating Custom State Drawables – Applying – Masks to Image –Creating Dialogs that Persist – Implementing Situation – Specific Layouts – Customizing Keyboard Actions – Dismissing Soft Keyboard – Customizing AdapterView Empty View –Customizing ListView Rows – Making ListView Section Headers – Creating Compound Controls.

**Unit III**

Interacting with Device Hardware and Media – Interacting Device Location – MappingLocations – Annotating Maps – Capturing Images and Videos – Making a Custom Camera Overlay – Recording Audio – Adding Speech Recognition – Playing Back Audio/Video – Creating a Tit Monitor – Monitoring Compass Orientation.

**Unit IV**

Persisting Data : Marking a Preference Screen – Persisting Simple Data – Reading andWriting Files – Using Files as Resources - Managing a Database – Querying a Database –Backing Up Data – Sharing your Database – Sharing your other Data.

**Unit V**

Interacting with the Systems: Notifying from the Background – Creating Timed andPeriodic Tasks – Scheduling a Periodic Task – Creating Sticky Operations – Running Persistent Background Operations – Launching Other Applications – Launching System Application – other Applications – Interacting with Contacts – Picking Device Media – Saving to the MediaStore Working with Libraries : Creating Java Library JARs – Using Java Library JARs – Creating Android Library Projects - Using Android Library Projects – Charting – Practical Push Messaging.

**Text Book:**

1. Dave Smith and Jeff Friesen, “Android Recipes: A Problem – Solution Approach”, RakmoPress Pvt., Ltd, New Delhi, 2011.
**Web Reference:**http://developer.android.com/Android Developer’s Guides

*****

## CORE COURSE XXVIII

## OPTIMIZATION TECHNIQUES

**Objective:**

To understand the basic concepts of operations research and to impart the knowledge on various operations research techniques and their applications.

**Unit I**

Linear Programming : Introduction – History of OR – Meaning of OR – Principles of Modeling – Linear equation – Gaussian Elimination – Formulation of LP models – Graphical Solution – Algebraic Solutions – Simplex Method – Feasibility – Optimality – Artificial Variables – M – Technique – Duality – Dual simplex Algorithm – Transportation Problem – Assignment Problem – Least Time Transportation Problems.

**Unit II**

Queuing Models : Introduction – Deterministic Model – Queue Parameters – M/M/I Queue – Limited queue Capacity – Multiple Servers – Finite Sources – Waiting Times – Queue discipline – Non – Markovian Queues – Probabilistic models.

**Unit III**

Inventory Models: Determine Models – EOQ – Finite and Infinite Delivery Rates without Back- Ordering – Finite and Infinite delivery rates with Backordering – Quantity Discounts – EOQ with constraints – Probabilistic model – Single Period Model – Reorder Point Model – Variable Lead Times

**Unit IV**

PERT / CPM: Arrow (Network) Diagram Representation – Time estimates – Critical Path – Floats – Construction of Time chart and Resource Leveling – Probability and Cost Consideration in Project Scheduling – Project Control.

**Unit V**

Replacement Theory : Introduction – Various replacement situations – Replacement Policy – Variables Maintenance costs and fixed money value – Variable Maintenance Costs and Variable Money Value – Individual Replacement Policy – Group Replacement Policy – Reliability.

**Text Book:**

KantiSwarup P.K. Gupta and Man Mohan, “Operation Research”, Sultan & Chand Publishers New Delhi, 1992.

**Reference Book:**


2. By Jagdish S. Rustag, Optimization Techniques in Statistics, Academic Press, 2014
2. Hamdy A Taha, Operations Research – An Introduction Macmillan Publishing Company, 1982.
3. Don.T. Philps, A.Ravindran, James. J. Solberg, “Operations Research – Principles and Practice John Wiley & Sons, 1976.


*****

## CORE COURSE XXIX

## SMART DEVICES PROGRAMMING LAB

**Objective :**

To get hands on experience in developing applications for smart devices.

**XML**

1. XML document creation
2. Style sheets: CSS
3. Style sheets: XSL
4. XSL templates
5. Validation using DTD
6. SAX and DOM

**Android**

1. Different Layout design including nested layout for a single biodata.
2. Arithmetic Operation for two numbers
3. Business Calculator
4. Animation: Bouncing of a ball
5. Intent
6. Database SQLite: Student Biodata
7. Fragments - Tablet Programming
8. Media Player

*****

## CORE COURSE XXX

## OPEN SOURCE LAB

**Objective : To** get hands on experience in developing Programs using LAMP.

1. Write a server side PHP program that displays marks, total, grade of a student in tabular format by accepting user inputs for name, number and marks from a HTML form.

2. Write a PHP program that adds products that are selected from a web page to a shopping cart.

3. Write a PHP program to access the data stored in a mysql table.

4. Write a PHP program interface to create a database and to insert a table into it.
   i)Write a PHP program using classes to create a table.
   ii) Write a PHP program to upload a file to the server.

5. Write a PHP program to create a directory, and to read contents from the directory.

6. Write a shell program to find the details of an user session.

7. Write a shell program to change the extension of a given file.

8. Create a mysql table and execute queries to read, add, remove and modify a recordfrom that table.

*****

## ELECTIVE COURSE III:1

## PARALLEL PROCESSING

**Objective:**

To study the Parallel computer Architecture, theories of parallel computing, interconnection networks and applications of cost effective computer systems.

**Unit I**

Parallel computer models: the state of computing – Multiprocessors and multicomputers – Multivector and SIMD computers.

**Unit II**

Program and Network properties: Conditions of parallelism – Program partitioning and scheduling – program flow mechanisms – system interconnect architectures.

**Unit III**

Processors and memory hierarchy : Advanced processor Technology – Superscalar and vector processors – Linear Pipeline Processors – Nonlinear Pipeline Processors.

**Unit IV**

Multiprocessors and Multicomputers: Multiprocessor System Interconnects-Message-Passing Mechanisms – SIMD Computer Organization. The Connection Machine CM5 – Fine – Grain Multicomputers.

**Unit V**

Software for Parallel Programming : Parallel Programming Models – Parallel Languages and Compilers – Dependence Analysis of Data Arrays.

**Books for reference:**


1. Introduction To Parallel Processing, By M. Sasikumar, Dinesh Shikhare, Ravi P.Prakash, Eastern Economy Edition, 2014
2. Computer Architecture and Parallel Processing, Kai Hwang and Baye
3. Parallel Computing, Theory and Practice, Michel J.Quinn, McGraw-Hill International Edn., Singapore 1994


*****

## ELECTIVE COURSE III:2

## CLOUD COMPUTING

**Objective:**

To impart knowledge on Introduction to Cloud Computing, The Evolution of SaaS, The Anatomy of Cloud Infrastructure, Workflow Management Systems and Clouds.

**Unit I**

Introduction to Cloud Computing: Roots of Cloud Computing - Layers and Types of Cloud - Features of a cloud-Infrastructure Management-Infrastructure as a Service Providers-Platform as a Service Providers-Challenges and Risks. Broad Approaches to Migrating into the Cloud - Seven Step Model of Migration into a Cloud. .

**Unit II**

The Evolution of SaaS-The Challenges of SaaS Paradigm- Approaching the SaaS Integration Enigma- New Integration Scenarios- The Integration Methodologies- SaaS Integration Products, Platforms and Services-B2Bi Services -. Background of Enterprise cloud computing paradigm- Issues for Enterprise Applications on the Cloud- Transition Challenges- Enterprise Cloud Technology and Market Evolution - Business drivers toward a marketplace for Enterprise cloud computing- The Cloud Supply Chain. .

**Unit III**

The Anatomy of Cloud Infrastructure- Distributed Management of Virtual Infrastructures- Scheduling Techniques for Advance Reservation of Capacity- RVWS Design - Cluster as a Service: The Logical Design - Cloud Storage : from LANs TO WANs- Technologies for Data Security in Cloud Computing . .

**Unit IV**

Workflow Management Systems and Clouds - Architecture of Workflow Management Systems - Utilizing Clouds for Workflow Execution- A Classification of Scientific Applications and Services in the Cloud- SAGA based Scientific Applications that Utilize Clouds. MapReduce Programming Model- Major MapReduce Implementations for the Cloud- MapReduce Impacts and Research Directions. A Model for Federated Cloud Computing - Traditional Approaches to SLO Management- Types of SLA -Life Cycle of SLA - SLA Management in Cloud- Automated Policy based Management. **.**

**Unit V**

Grid and Cloud- HPC in the Cloud: Performance related Issues -Data Security in the Cloud- The Current State of Data Security in the Cloud- Homo Sapiens and Digital Information- Risk- Identity- The Cloud, Digital Identity and Data Security - Content Level Security :Pros and Cons- Legal Issues in Cloud Computing - Data Privacy and Security Issues- Cloud Contracting models- Case Studies : Aneka and CometCloud. **.**

**Text Book(s):**

1. Cloud Computing - Principles and Paradigms, by RajkumarBuyya, James Broberg, and AndrzejGoscinski. 2011.

**REFERENCES:**

1. Cloud Application Architectures,GeorgeReese,ISBN: 184047142,Shroff/O'Reilly,2009.

*****

**ELECTIVE COURSE III:3**

**SOFT COMPUTING**

**Objective:**

To impart knowledge in Fuzzy Set Theory, Optimization, Neural Networks, Neuro Fuzzy Modelingand Application Of Computational Intelligence.

**Unit I FUZZY SET THEORY**

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set – Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

**Unit II OPTIMIZATION**

Derivative based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative Free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

**Unit III NEURAL NETWORKS:**

Supervised Learning Neural Networks – Perceptrons – AdalineBackpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

**Unit IV NEURO FUZZY MODELING**

Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

**Unit V APPLICATION OF COMPUTATIONAL INTELLIGENCE:**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

**TEXT BOOK**

1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro Fuzzy and Soft Computing", PHI, Pearson Education, 2004.

**REFERENCE BOOK**

1. By L. Fortuna, G. Rizzotto, M. Lavorgna, G. Nunnari, M.G. Xibilia, Riccardo Caponetto, Soft Computing: New Trends and Applications, Springer 2012
2. Timothy J. Ross, "Fuzzy Logic with Engineering Application, "McGraw Hill, 1977.
3. Davis E. Goldberg, "Genetic Algorithms Search, Optimization and Machine Learning", Addision Wesley, 1989.
4. S. Rajasekaran and G.A.V. Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003. Emereo Pty Limited, July 2008..

*******

## ELECTIVE COURSE IV:1

## BIG DATA ANALYTICS

**Objective:**

To impart knowledge in Fundamentals, Big Data Analytics, Operationalizing Big Data, Big Data Warehouses and Map Reduce Fundamentals

**Unit I**

Fundamentals of Big Data : The Evolution of Data Management – Understanding the waves of Managing Data – Defining Big Data – Building a Successful Big Data Management Architecture – Examining Big Data Types : Defining Structured Data – Defining Unstructured Data – Looking at Real Time and Non Real Time Requirements - Digging into Big Data Technology Components : Exploring the Big Data Stack – Redundant Physical Infrastructure – Security Infrastructure – Operational Databases – organizing data Services and Tools – Analytical Data Warehouses – Big Data Analytics – Big Data Applications.

**Unit II**

Defining Big Data Analytics : Using Big Data to get Results – Modifying Business Intelligence Products to Handle Big Data – Studying Big Data Analytics Examples – Big Data Analytics Solutions – Understanding Text Analytics and Big Data : Exploring Unstructured Data – Analysis and Extraction Techniques – Putting Results Together with Structured Data – Putting Big Data to use – Text Analytics Tools for Big Data – Customized Approaches for Analysis of Big Data : Building New Models and Approaches to Support Big Data - Understanding Different Approaches to Big Data Analysis - Characteristics of a Big Data Analysis Framework.

**Unit III**

Operationalizing Big Data : Making Big Data a Part of Your Operational Process - Integrating Big Data - Incorporating big data into the diagnosis of diseases - Understanding Big Data Workflows - Workload in context to the business problem - Ensuring the Validity, Veracity, and Volatility of Big Data - Security and Governance for Big Data Environments : Security in Context with Big Data - Understanding Data Protection Options - The Data Governance Challenge - Putting the Right Organizational Structure in Place - Developing a Well-Governed and Secure Big Data Environment.

**Unit IV**

Appliances and Big Data Warehouses : Integrating Big Data with the Traditional Data Warehouse - Big Data Analysis and the Data Warehouse - Changing the Role of the Data Warehouse - Changing Deployment Models in the Big Data Era - Examining the Future of Data Warehouses - Examining the Cloud and Big Data : Defining the Cloud in the Context of Big Data - Understanding Cloud Deployment and Delivery Models - The Cloud as an Imperative for Big Data - Making Use of the Cloud for Big Data - Providers in the Big Data Cloud Market.

**Unit V**

MapReduce Fundamentals : Tracing the Origins of MapReduce - Understanding the map Function - Adding the reduce Function - Putting map and reduce Together - Optimizing MapReduce Tasks - Exploring the World of Hadoop : Explaining Hadoop - Understanding the Hadoop Distributed File System - HadoopMapReduce - The Hadoop Foundation and Ecosystem - Building a Big Data Foundation with the Hadoop Ecosystem - Managing Resources and Applications with Hadoop YARN - Storing Big Data with HBase - Mining Big Data with Hive - Interacting with the Hadoop Ecosystem.

**Text Book**

"Big Data" by Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, Wiley Publications, 2014.

**Reference Book**

"Big Data Imperatives : Enterprise Big Data Warehouse, BI Implementations and Analytics" by SoumendraMohanty, MadhuJagadeesh and HarshaSrivatsa, Apress Media, Springer Science + Business Media New York, 2013

*****

## ELECTIVE COURSE IV:2

## NETWORK SECURITY

**Objective:**

To impart knowledge related to the various concepts, methods of Network Security using cryptography basics, program security, database security, and security in networks.

**Unit I**

Overview-Symmetric Ciphers: Classical Encryption Techniques

**Unit II**

Symmetric Ciphers: Block ciphers and the Data Encryption Standards Public-key Encryption and Hash Functions: Public-Key Cryptography and RSA

**Unit III**

Network Security Practices: Authentication applications-Electronic Mail Security

**Unit IV**

Network Security Practices: IP Security-Web Security

**Unit V**

System Security: Intruders-Malicious Software-Firewalls

**Text Book**

1. William Stallings, Cryptography and Network Security-Principles and Practices, Prentice-Hall, Third edition, 2003 **ISBN:** 8178089025

**References**

1. By Joseph Migga Kizza, Guide to Computer Network Security, Springer 2015.
2. Johannes A. Buchaman, Introduction to cryptography, Springer-Verlag 2000.
3. AtulKahate, Cryptography and Network Security, Tata McGraw Hill. 2007

*****

**ELECTIVE COURSE IV:3**

**DIGITAL IMAGE PROCESSING**

**Objective:**

To study the various concepts, methods and algorithms of digital image processing with image transformation, image enhancement, image restoration, image compression techniques.

**Unit I CONTINUOUS AND DISCRETE IMAGES AND SYSTEMS :**

Light, Luminance,Brightness and Contrast, Eye, The Monochrome Vision Model, ImageProcessing Problems and Applications, Vision Camera, Digital ProcessingSystem, 2-D Sampling Theory, Aliasing, Image Quantization, Lloyd MaxQuantizer, Dither, Color Images, Linear Systems And Shift Invariance, FourierTransform, ZTransform, Matrix Theory Results, Block Matrices and KroneckerProducts.

**Unit II IMAGE TRANSFORMS :**

2-D orthogonal and Unitary transforms, 1-D and 2-DDFT, Cosine, Sine, Walsh, Hadamard, Haar, Slant, Karhunen-loeve, Singularvalue Decomposition transforms.

**Unit III IMAGE ENHANCEMENT :**

Point operations - contrast stretching, clipping andthresholding density slicing, Histogram equalization, modification andspecification, spatial operations - spatial averaging, low pass, high pass, bandpass filtering, direction smoothing, medium filtering, generalized cepstrum andhomomorphic filtering, edge enhancement using 2-D IIR and FIR filters, colorimage enhancement.

**Unit IV IMAGE RESTORATION :**

Image observation models, sources of degradation,inverse and Wiener filtering, geometric mean filter, non linear filters, smoothingsplines and interpolation, constrained least squares restoration.

**Unit V IMAGE DATA COMPRESSION AND IMAGE RECONSTRUCTION FROM PROJECTIONS:**

Image data rates, pixel coding, predictive techniques transformcoding and vector DPCM, Block truncation coding, wavelet transform coding ofimages, color image coding. Random transform, back projection operator,inverse random transform, back projection algorithm, fan beam and algebraicrestoration techniques.

**Book for study :**

1. Bernd Jähne, Digital Image Processing, Springer, 2013
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, PHI, 1995.
3. Sid Ahmed M.A., “Image Processing”, McGraw Hill Inc, 1995.
4. Gonzalaz R. and Wintz P., “Digital Image Processing”, Addison Wesley, 2nd Ed, 1987.

## ELECTIVE COURSE V:1

## COMPILER DESIGN

**Objective:**

To understand the various phases of a compiler and to develop skills in designing acompiler.

**Unit I Introduction**

Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens

**Unit II Basic Data Structures**

Role of the parser, Writing Grammars – Context – Free Grammars – Top Down parsing – Recursive Descent parsing – Predictive parsing – bottom –up parsing – shift Reduce Parsing – Operator Precedent Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser

**Unit III Advanced Data Structures**

Intermediate Languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – procedure calls

**Unit IV Sorting & Searching Techniques**

Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole optimizaion

**Unit V Files**

Introduction – Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing

**Text Book(s)**

1. Alfred Aho, Ravi Sethi, Jeffy D. Ullman, “Compilers – Principles, Techniques and Tools”, Pearson Education Asia, 2003

**References**

1. Torben Ægidius Mogensen, ntroduction to Compiler Design, Springer, 2011.
2. HenkAlblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001
3.. Kenneth C. Louden, «Compiler Construction : Principles and Practices», Thompson Learning, 2003

*****

## ELECTIVE COURSE V:2

## HUMAN COMPUTER INTERACTION

**Objective:**

To impart knowledge related to the various concepts, methods of Human Computer Interaction techniques with design basics, design rules and evaluation techniques

**Unit I The Interaction :**

Introduction – Models of interaction – Frameworks and HCI Ergonomics – Interaction styles – Elements of the WIMP interface – Interactivity – The context of the interactions.

**Paradigms :** Introduction – Paradigms for interaction.

**Unit II Interaction, Design basics :**

Introduction – What is design? – User focus – Scenarios – Navigation design – Screen design and layout – Interaction and prototyping.

**HCL in the software process :** Introduction – The software lifecycle – Usability engineering – interactive design and prototyping – Design rationate.

**Unit III Design rules :**

Introduction – Principles to support usability – Standards – Guidelines – Golden rules and heuristics – HCI patterns.

**Implementation Support :** Introduction – Elements of windowing systems – Programming the application Using toolkits – User interface management systems.

**Unit IV Evaluation techniques :**

What is evaluation – Goals of evaluation – Evaluation through expert analysis – Evaluation through user participation – Choosing an evaluation method.

**Universal Design :** Introduction – Universal design principles – Multi-modal interaction – Designing for diversity – summary. Introduction – Requirements of user support – Approaches to user support Adaptive help systems – Designing user support systems.

**Unit V User support :**

Introduction Requirements of user support – Approaches to; user support – Adaptive help systems designing designing user support systems.

**Text Book**

1. Human - Computer Interaction, Third Edition, “Alan Dix, Janet Finlay, Gregory D. Abowd and Russell Beale”, Pearson Education, 2004.

**Reference Book**

1. Human – Computer Interaction in the New Millennium, “John C. Carroll”, Pearson Education” 2002.
2. Handbook of Human-Computer Interaction, M.G. Helander, Elsevier, 2014.

*****

## ELECTIVE COURSE V:3

## MEDICAL INFORMATICS

**Objective:** To understand the various aspects of medical informatics.

**UNIT I Healthcare Data, Information And Knowledge:**

Definitions And Concepts, Converting Data To Information To Knowledg,Clinical Data Warehouses, (Cdws). **Healthcare Data Analytics:** Terminology Of Analytics, Challenges To Data Analytics, Research And Application Of Analytics, Role Of Informaticians In Analytics.**Electronic Health Records:**Need For Electronic Health Records, Institute Of Medicine's Vision For Ehrs,Electronic Health Record Key Components, Computerized Physician Order Entry (Cpoe), Clinical Decision Support Systems (Cdss),Electronic Prescribing, Practice Management Integration,Electronic Health Record Adoption, Electronic Health Record And Meaningful Use Challenges,

**Unit II Health Information Exchange:**

History Of The Nationwide Health Information Network,Hitech Act Impact, Health Health Information Exchange Concerns, Health Information Organization Resources.**Data Standards and Medical Coding:**Content Standards, Terminology Standards, Transport Standards, Medical Coding And Reimbursement.**Architectures of Information Systems:**The Internet And World Wide Web, Web Servicesnetworks

**Unit III Health Information Privacy And Security:**

Hipaa Review, Basic Security Principles, Hipaa, Meaningful Use, And The Hitech Act Authentication And Identity Management, Data Security In The Cloud And Client/Server Solutions ,Standards, Compliance And Law, Security Breaches And Attacks, Medical Privacy And Security Stories In The News.**Health Informatics Ethics:**The Road From Nuremberg, Informatics Ethics,International Considerations: Ethics, Laws And Culture, Codes Of Individual Countries, Pertinent Ethical Principles, Difficulties Applying Medical Ethics In The Digital World, Transferring Ethical Responsibility, Electronic Communication With Patents And Caregivers, Practical Steps, Health Informatics Ethics And Medical Students.**Consumer Health Informatics:**The Origins Of Consumer Health Informatics, Classification Of Health Informatics Applications, Health Education & Information Applications, Home Telemedicine Devices, Patient Web Portals, Personal Health Records (Phrs), Electronic Patient To Physician Communication, Social Media,

**Unit IV Mobile Technology:**

History Of Mobile Technology Mobile Health (Mhealth), Mobile Technology And Patients,Mobile Technology And Clinicians, Mobile Technology To Track Health

Habits Mobile Telemedicine, Mobile Technology Resources, Mobile Technology Challenges, Future Trends.**Online Medical Resources:**Sponsored Medical Web Sites , Sponsored And Non-Sponsored Resources, Government Medical Web Sites, Free Medical Web Sites, Free Patient Education Sites, Subscription (Fee-Based) Resources, Evidence Based Subscription Products **Quality Improvement Strategies:** Quality Improvement Strategies, Quality Improvement Projects, Quality Improvement Dashboards, Recommended Reading, Quality Improvement Concerns And Limitations **Patient Safety And Health Information Technology:**Patient Safety Reports, Organizations And Programs Supporting Patient Safety, Health Information Technology And Patient Safety, Technologies With Potential To Decrease Medication Errors

**Unit V Telemedicine:**

Teleconsultations, Telemonitoring, Telemedicine Initiatives, International Telemedicine, Barriers To Telemedicine, Telemedicine Organizations And Resources.**Medical Imaging Informatics:**Typical Pacs Workflow, Web Based Image Distribution, Pacs And Mobile Technology, Pacs For A Hospital Desktop Computer, Pacs Advantages And Disadvantages,**Bioinformatics:**Introduction, Genomic Primer, Importance Of Bioinformatics, Bioinformatics Projects And Centers, Personal Genomics, Genomic Information Integrated With Ehrs.

**Text Book:**

HEALTH INFORMATICS, Practical Guide for Healthcare and Information Technology Professionals, Robert E Hoyt, Ann Yoshihashi. Informatics Education, Sixth Edition.

*****