PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM 638 011

MASTER OF COMPUTER APPLICATIONS (M.C.A)

SEMESTER PATTERN

Under Choice Based Credit System

REGULATIONS AND SYLLABUS

FOR AFFILIATED COLLEGES

(Effective from the Academic year 2017-2018 onwards)

PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM 638 011
Regulations
(FOR AFFILIATED COLLEGES)
Effective from the academic year 2017 - 2018

1. OBJECTIVE OF THE PROGRAMME

Enable the students to pursue lifelong multidisciplinary learning, function effectively on teams to accomplish a common goal and become innovative through technical advancement.

To meet dynamic global needs, the syllabus is focused on technical concepts, to enrich the knowledge of students.

2. CONDITION FOR ADMISSION

Candidates who have passed in any one of the following or equivalent are eligible to apply:

i) Bachelor's degree (under 10+2+3/4) in any subject with Mathematics at +2 level.

ii) Bachelor's degree (under 10+2+3/4 or 10+3 year Diploma + 3 year later entry BE) in any subject with Mathematics / Business Mathematics / Statistics as one of the subjects.

3. DURATION OF THE PROGRAMME

The duration of the degree of Master of Computer Applications shall consist of three Academic years divided into six semesters.

4. EXAMINATIONS

The examination shall be of three hours duration for each course at the end of each semester. The candidate failing in any subject(s) will be permitted to appear in the subsequent examination.

The practical / project should be an individual work. The University examination for practical / project work will be conducted by the internal and external examiners jointly at the end of each semester.

5. STRUCTURE OF M.C.A PROGRAMME UNDER CBCS PATTERN FOR AFFILIATED COLLEGES (FROM 2017 AND THEREAFTER)

Curriculum and Scheme of Examinations

Courses	Number of Credits	Hours Per Week	Exam Duration (hrs)	Marks		
				CIA	EA	Total
Semester-I						
Core Course-I-17PCA01- Computer System Architecture	4	4	3	25	75	100
Core Course-II-17PCA02- Data Structures	4	4	3	25	75	100
Core Course-III-17PCA03- Programming in C	4	4	3	25	75	100
Core Course-IV-17PCA04- Structured System Analysis and Design	4	4	3	25	75	100
Core Course-V-17PCA05- Web Technologies	4	4	3	25	75	100
Core Course-VI - 17PCAP01- Lab – I - C Programming Lab	2	5	3	40	60	100
Core Course-VII- 17PCAP02- Lab - II Web Designing Lab	2	5	3	40	60	100
Semester-II						
Core Course-VIII-17PCA06- Object Oriented Programming with C++	4	4	3	25	75	100
Core Course-IX - 17PCA07- Unified Modeling Language	4	4	3	25	75	100
Core Course-X-17PCA08- Database Management Systems	4	4	3	25	75	100
Core Course-XI-17PCA09- Data Communications and Networking	4	4	3	25	75	100
Core Course-XII-17PCA10- Managerial Accounting	4	4	3	25	75	100
Core Course-XIII-17PCAP03- Lab – III C++ Programming Lab	2	4	3	40	60	100
Core Course-XIV-17PCAP04- Lab – IV RDBMS Lab	2	4	3	40	60	100
Core Course-XV-17PCAP05- Lab – V Financial Computing Lab	1	2	3	40	60	100

Courses	Number of Credits	Hours Per Week	Exam Duration (hrs)	Marks		
				CIA	EA	Total
Semester-III						
Core Course-XVI-17PCA11 Java Programming	4	4	3	25	75	100
Core Course-XVII-17PCA12 Visual Programming	4	4	3	25	75	100
Core Course-XVIII-17PCA13 Discrete Structures	4	4	3	25	75	100
Core Course-XXII-17PCA14 Operating Systems	4	4	3	25	75	100
Elective Course-I-17PCAE_ _	4	4	3	25	75	100
Core Course-XIX-17PCAP06 Lab-VI Java Programming Lab	2	4	3	40	60	100
Core Course-XX–17PCAP07 - Lab-VII Visual Programming Lab	2	4	3	40	60	100
Core Course-XXI–17PCAP08 - Lab-VIII Python Programming Lab	1	2	3	40	60	100
Semester-IV						
Core Course-XXIII-17PCA15 Software Engineering	4	4	3	25	75	100
Core Course-XXIV-17PCA16 Mobile Computing	4	4	3	25	75	100
Core Course-XXV-17PCA17 Data Mining Techniques	4	4	3	25	75	100
EDC-I	4	4	3	25	75	100
Elective Course-II- 17PCAE_ _	4	4	3	25	75	100
Core Course-XXVI-17PCAP09 Lab-IX – Mobile Application Development Lab	2	4	3	40	60	100
Core Course-XXVII – 17PCAP10 Lab-X Data Mining Lab	3	4	3	40	60	100
17PHR01 - Human Rights	-	2	3	25*	75*	100*

Courses	Number of Credits	Hours Per Week	Exam Duration (hrs)	Marks		
				CIA	EA	Total
Semester-V						
Core Course-XXVIII-17PCA18 Big Data Analytics	4	4	3	25	75	100
Core Course-XXIX-17PCA19 .Net Programming	4	4	3	25	75	100
Core Course-XXX-17PCA20 Open Source Technologies	4	4	3	25	75	100
Elective Course-III- 17PCAE_ _	4	4	3	25	75	100
Elective Course-IV- 17PCAE_ _	4	4	3	25	75	100
Core Course-XXXI-17PCAP11-Lab - XI Big Data Analytics Lab	2	3	3	40	60	100
Core Course-XXXII-17PCAP12-Lab - XII .Net Lab	2	3	3	40	60	100
Core Course-XXXIII-17PCAP13-Lab-XIII Software Development Lab	2	4	3	40	60	100
Semester-VI						
Core Course-XXXIV-17PCAPR1 Project Work and Viva-Voce	15	-	-	50	150	200
Total Core	120			1070	2430	3500
EDC	04			25	75	100
Elective	16			100	300	400
Human Rights	-			25*	75*	100*
Grand Total	140			1195	2805	4000

*** Human Rights mark is excluded for aggregation**

Elective Course -I

Course 17PCAE01 Computer Graphics
Course 17PCAE02 E-Technologies
Course 17PCAE03 Theory of Computation
Course 17PCAE04 Design and Analysis of Algorithms

Elective Course -II

Course 17PCAE05 Artificial Intelligence
Course 17PCAE06 Soft Computing
Course 17PCAE07 Machine Learning
Course 17PCAE08 Resource Management Techniques

Elective Course -III

Course 17PCAE09 Image Processing
Course 17PCAE10 Embedded Systems
Course 17PCAE11 Social Computing
Course 17PCAE12 Enterprise Resource Planning

Elective Course -IV

Course 17PCAE13 Grid Computing
Course 17PCAE14 Internet of Things
Course 17PCAE15 Cyber security
Course 17PCAE16 Wireless Application Protocols

EDC-EXTRA DISCIPLINARY COURSE
Students are expected to opt EDC (Non major elective) offered by other departments.

1. 17PCSED1 Principles of Information Technology
2. 17PCSED2 Fundamentals of Computers and Communications
3. 17PCSED3 E-Commerce

CIA – CONTINUOUS INTERNAL ASSESSMENT
EA – EXTERNAL ASSESSMENT

6. EXAMINATIONS
6.1 THEORY
6.1.1 EVALUATION OF CONTINUOUS INTERNAL ASSESSMENT

Test	:	10 Marks
Seminar	:	05 Marks
Assignment	:	05 Marks
Attendance	:	05 Marks

Total	:	25 Marks

(No passing minimum)

6.1.2 EVALUATION OF EXTERNAL ASSESMENT
QUESTION PAPER PATTERN

Time: 3 Hours Max. Marks: 75

PART- A: 5x5 = 25 marks
Answer all the questions
One question from each unit (either or type)

PART- B: 5x10 = 50 marks
Answer all the questions
One question from each unit (either or type)

The Passing minimum shall be 50% out of 75 marks (38 marks)

6.2 PRACTICAL / SOFTWARE DEVELOPMENT
6.2.1 EVALUATION OF CONTINUOUS INTERNAL ASSESSMENT

Test 1	:	15 Marks
Test 2	:	15 Marks
Record	:	10 Marks

Total	:	40 Marks

(No passing minimum)

6.2.2 EVALUATION OF EXTERNAL ASSESSMENT

I) PRACTICAL

QUESTION PAPER PATTERN

Time: 3 Hours Max. Marks: 60

There will be two questions with or without subsections to be asked for the practical examination. Every question should be chosen from the question bank prepared by the examiner(s). Every sixth student should get a new question i.e. each question may be used for at most five students.

Distribution of Marks

Each question	: 30 Marks
Problem Understanding	: 05 Marks
Program writing	: 10 Marks
Debugging	: 10 Marks
For Correct Results	: 05 Marks

II) SOFTWARE DEVELOPMENT

Viva-voce (jointly)	: 30 Marks
Modification	: 30 Marks

Students should write about their software development briefly.

i. Aim
ii. Features
iii. Modules
iv. Modification

III) PROJECT WORK

Continuous Internal Assessment	: 50 Marks
Evaluation (External)	: 50 Marks
Viva-voce (jointly)	: 100 Marks

7. REGULATIONS OF PROJECT WORK

- Students should do their Project work in Company / Institutions during the sixth semester.
- The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the Ist Week of December.
- Periodically the project should be reviewed.
- The Student should submit three copies of their Project Report.
- A Sample format is enclosed in Annexure-II.
- Format of the Title page and Certificate are enclosed in Annexure III.
- The students may use power point presentation during their viva voce examination.

8. PASSING MINIMUM

The candidate shall be declared to have passed in the Theory / Practical / Project Work examination, if the candidate secures not less than 50% marks in EA and also in Total of the prescribed marks. However submission of a record notebook is a must.

9. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who obtain 75% and above in the aggregate shall be deemed to have passed the examination in **First Class with Distinction** provided they pass all the examinations prescribed for the programme at the first appearance. Candidates, other than the above, who secure not less than 60% of the aggregate marks in the whole examinations shall be declared to have passed the examination in **First Class**. The remaining successful candidates shall be declared to have passed in **Second Class**.

Candidates who pass all the examinations prescribed for the programme in first instance and within a period of three academic years from the year of admission are only eligible for **University Ranking.**

10. MAXIMUM DURATION FOR THE COMPLETION OF THE PROGRAMME

The maximum duration to complete the programme shall be three academic years after normal completion of the programme.

11. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2017-18, that is, for students who are admitted to the first year of the programme during the academic year 2017-18 and thereafter.

12. TRANSITORY PROVISION

Candidates who were admitted to the MCA programme of study before 2017-2018 shall be permitted to appear for the examinations under those regulations for a period of three years after completion of the programme. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

ANNEXURE - I

PERIYAR UNIVERSITY

Name of the College :
Programme :
Name of the Student :
Register Number :
Title of the Project Work :
Address of Organization / Institution :

Name of the External Guide :
Designation :

Place :
Date : Signature of External Guide
(with seal)

Name of the Internal Guide :
Qualification :
Teaching Experience :

Place :
Date : Signature of Internal Guide

Principal

[Approved or not Approved]
[University Use]

ANNEXURE II

CONTENTS

Chapter Page No

ANNEXURE III

A. Format of the title page

TITLE OF THE PROJECT WORK

A Project Work submitted in partial fulfillment of
the requirements for the degree of
Master of Computer Applications
to the
Periyar University, Salem - 11

By

NAME OF THE STUDENT

REG. NO.

College emblem

COLLEGE NAME
(AFFILIATED TO PERIYAR UNIVERSITY)
PLACE with Pin Code

MONTH – YEAR

B. Format of the Certificate

Name and Address of the Internal Guide

Place

Date

CERTIFICATE

This is to certify that the Project Work entitled ……..... .....…… submitted in partial fulfillment of the requirements of the degree of Master of Computer Applications to the Periyar University, Salem is a record of bonafide work carried out by .....…… Reg. No. ..... under my supervision and guidance.

Internal Guide

Head of the Department

Date of Viva-voice:

Internal Examiner

External Examiner

SEMESTER I

Core Course-I-17PCA01 COMPUTER SYSTEM ARCHITECTURE

Credits:4

Course Objectives:

- To understand the design concepts of sequential circuits such as Flip Flops, Registers, and Counters
- To learn the concepts of Micro programmed controls, computer arithmetic and microprocessor architectures

UNIT – I

Digital logic circuit: Logic gates - Boolean algebra - Maps simplification – Combinational Circuits – Flip Flops – Sequential Circuits. **Digital Components:** Integrated Circuits – Decoders – Multiplexers - Registers - Shift Registers – Binary Counters – Memory unit.

UNIT - II

Data representation: Data types –Complements -Other binary codes – Error detection code. **Register Transfer and Micro Operation:** Register Transfer – Bus and Memory transfer – Arithmetic Micro Operations – Logic Micro Operations – Shift Micro Operations – Arithmetic logic shift unit.

UNIT – III

Micro programmed Control: Control Memory – Address Sequencing. **CPU:** General Register Organization – Stack Organization – Instruction Format – Addressing Modes – Data transfer and Manipulation – Program Control – Reduced Instruction Set Computer.

UNIT - IV

Memory Organization: Memory Hierarchy – Associative memory – Cache memory – Virtual memory. **Computer Arithmetic:** Introduction – Addition and Subtraction – Multiplication Algorithms – Division Algorithms – Floating-point Arithmetic Operations – Decimal Arithmetic Unit – Decimal Arithmetic Operations.

UNIT – V

The Processor 8086 Architecture, Pin Diagram and Timing Diagram: Register Organization of 8086 – Architecture – Signal Descriptions of 8086. **Recent Advances and Microprocessor Architecture:** Features of Pentium – System Architecture – Enhanced instruction set of Pentium – Intel MMX Architecture – MMX Instruction Set.

TEXT BOOKS:

1. Morris Mano, “Computer System Architecture,” Third Edition, PHI,1995.
2. K.M.Bhurchandi, A.K.Ray, “Advanced Microprocessor and Peripherals,” Third Edition, TMH, 2012

REFERENCE BOOKS:

1. A.P.Malvino, D.P.Leach, “Digital Principles and Applications,” TMH, Edn.1991.
2. J.P.Hayes, “Computer Organization and Architecture,” TMH, 2nd Edition, 1988.
3. William Stallings, “Computer Organization & Architecture – Designing for Performance”, Pearson Education, 6th Edition, 1997.
4. Mathur Sunil, “Micro processor 8086: Architecture, Programming and Interfacing,” PHI learning Pvt. Ltd.
5. Walter A.Tribel, “The 80386, 80486 and Pentium Microprocessor: Hardware, Software and Interfacing”, Simon & Schuster Trade, 1997.

Core Course-II-17PCA02 DATA STRUCTURES

Credits: 4

Course Objectives:

- To familiarize the students with different data structures and their implementations
- To understand the basic concepts of different searching and sorting techniques.

UNIT - I

Introduction to Data Structures: Need for Data structures - Definitions – Algorithm Analysis: Problem Solving – Modular Design - Implementation of Algorithms – Testing – Verification – Algorithm Analysis – Time Complexity Classes – Asymptotic Analysis. **Arrays**: Range of an Array – One-Dimensional Array – Two-Dimensional Array – Multidimensional Arrays – Special Types of Matrices – Strings.

UNIT - II

Linked Lists: Memory Allocation – Benefits - Limitations – Types – Basic Operations in Linked List – Singly Linked Lists – Circular Linked Lists – Doubly Linked Lists – Circular **Doubly Linked List**: Initialization of a Circular DLL – Header – Allocate a Node – Deallocation of a Node from the List – Initialization of a List – Insert a Node at the Head of a List – Insert a Value After a Given Key – Deletion of a Value from a List – Print the Values of a List – Multiply Linked Lists. **Stacks**: ADT Stack – Implementation of Stack – Linked List Implementation of Stack – **Applications of Stack**: Well Formedness of Parenthesis – Syntax Checking Using Stacks – Infix, Prefix and Postfix Forms of Expressions – Conversion of Infix Expression to Postfix Form – Steps in Conversion of Infix Expression to Postfix Notation – Evaluation of Postfix Expressions – Algorithm to Evaluate Postfix Expression – Evaluation of Recursive Functions.

UNIT - III

Queues: Implementation of Queues – Basic Operations on Array-Based Implementation of Queues - Basic Operations on Linked List-Based Implementation of Queues – **Queue Operations Using Stacks**: Enqueue Operation – Dequeue Operation – Priority Queue – Circular Queues. **Trees**: Binary Trees – **Types of Binary Trees**: Strictly Binary Tree – Complete Binary Tree – Skew Trees – **Number of Nodes in Binary Trees** : Strictly Binary Tree – Complete Binary Tree – Binary Trees – Operations on Binary Trees – Inorder Traversal – Preorder Traversal – Postorder Traversal – Breadth First Traversal – **Representation of Binary Trees**: Linear Representation – Linked Representation – Node Representation of Binary Trees – Applications of Binary Trees – Huffman Coding – Decoding – Heap – Properties of Heap – Operations of a Heap – Deletion – Expression Trees – Evaluating an Expression Tree – Representation of General Trees Using Binary Trees.

UNIT - IV

Balanced Search Trees: AVL Trees : Height of AVL Trees – Operations in AVL Trees – Single Right Rotation(SRR) – Single Left Rotation(SLR) – Double Left Right Rotation(DLR) - Double Right Left Rotation –Deletion of Node**. B-Trees**: Operations on B-Tree – B+ Tree. **Hashing**: Hash Functions – Collision Resolution Techniques – Hashing.

UNIT - V

Sorting and Searching: Sorting – **Classification of Sorting Algorithms**: Classification Based on Structure of Algorithm – Computational Complexity – Stability of Sorting –

Memory Usage – Selection of Sorting Method – Selection Sort – Binary Tree Sort – Heap Sort – Shell Sort – Merge Sort – Radix Sort – Bucket Sort – Searching – Binary Search – Searching Using BST – **Graphs**: Representation of Graphs – Adjacency Matrix – Adjacency Lists – Operations on Graphs – Insertion – Deletion – Traversal – Breadth First Search(BFS) – BFS Tree – Depth First Search(DFS) – DFS(G) – DFS_VERTEX(U) – Shortest Path Algorithm - Shortest Path in an Unweighted Graph - Shortest Path in an Weighted Graph – Dijkstra's Algorithm.

TEXT BOOK:

1. A.Chitra, P.T.Rajan, "Data Structures," Vijay Nicole Imprints Private Limited, 2nd Edition,2016

REFERENCE BOOKS:

1. Reema Thareja, "Data Structures using C," Oxford Univ. Press, 2011.
2. D.Samantha, "Classic Data Structures", Prentice-Hall of India Pvt. Limited, 2009.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, 2nd Edition, Reprint 2002.
4. John Paul Tremplay and Paul G.Sorenson, "An Introduction to Data Structures with Applications" ,TMH, 1995.
5. Horowitz.E., Sahni and Anderson Freed, "Fundamentals of Data Structures in C," Universities Press, 2nd Edition, 2008.

Core Course-III-17PCA03 PROGRAMMING IN C

Credits: 4

Course Objectives:

- To learn the basic concepts of programming languages
- Be able to solve the problems using C

UNIT – I

Introduction to programming and algorithm: Programs and programming – Programming Languages – Compiler, Interpreter, Loader and Linker – Program Execution- Classifications of Programming Languages- Algorithms. **Basics of C**: Introduction – Standardization of C Language- Developing Programs in C – A Simple C Program – Parts of C Program – Structure of a C program- Concept of a Variable – Data types in C – Program Statement – Declaration – Storage of data in memory – Token – Operators and Expressions.

UNIT – II

Input and Output: Introduction – Basic Screen and Keyboard I/O in C – Non formatted Input and Output – Formatted Input and Output functions. **Control Statements**: Introduction – Specifying test condition for selection and Iteration – Writing test expression – Condition execution and Selection – Iteration and Repetitive execution – Which loop should be used – Goto statement – Special Control Statements – Nested Loops.

UNIT – III

Arrays and Strings: Introduction – One Dimensional array – **Strings**: One dimensional Character Array – Multidimensional arrays – **Arrays of Strings**: Two dimensional Character Array**. Functions**: Introduction – Concept of Function – Using Functions – Call by value

mechanism – Working with functions – passing Arrays to Functions – Scope and Extent – Storage Classes.

UNIT - IV

Pointer in C: Introduction – Understanding Memory Address – Address Operator(&) – Pointer – Void Pointer – Null Pointer – Use of Pointers – Arrays and Pointers – Pointers and Strings – Pointer Arithmetic – Pointers to Pointers – Array of Pointers – Pointers to an Array – Two dimensional arrays and Pointers – Three dimensional arrays – Pointers to Functions – Dynamic Memory Allocation.

UNIT – V

User-Defined Data types and variables: Introduction – Structure – Union. Files in C: Introduction – Using Files in C – Working with text files –Working with binary files – Direct file Input and Output – Files of records – Random Access to files of records. **Advanced C**: Introduction – Bitwise Operators – Command Line Arguments – C Preprocessor.

TEXT BOOK

1. Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, Oxford University Press, New Delhi, 2013.

REFERENCE BOOKS

1. M.T.Somashekara, "Programming in C," PHI, 2009
2. Kernighan.B.W and Ritehie.D.M, "The C Programming Language", 2nd Edition, PHI, 2015.
3. Herbert Schildt, "C: The Complete Reference," 4th Edition, TMH Edition, 2000.
4. Gottfried.B.S, "Programming with C," 2nd Edition, TMH Pub. Co. Ltd., New Delhi 2012.
5. Kanetkar Y., "Let us C," BPB Pub., New Delhi, 2010.

Core Course-IV-17PCA04 STRUCTURED SYSTEM ANALYSIS AND DESIGN

Credits:4

Course Objectives:

- To understand the methodologies for the analysis, design, and development of an information system
- To learn the basic concepts of software quality assurance, testing and CASE tools

UNIT – I

Basic System concepts: System Concepts and Theory – System Development Life Cycle – System Development Process Models – System Analysis and System Analyst. **Information Systems:** Management Information System Concepts.

UNIT – II

Information Systems Planning: Project Initiation – Feasibility Study. **Information System Analysis**: System Analysis and Design Methods – Information Gathering Techniques – Information System Modeling.

UNIT – III

Detailed Information Systems Design: Logical and Physical Design Concepts – Output Design – Input Design – File Organization and Database Design – Modular and Structured Design.

UNIT – IV

Software Quality Assurance and Testing: Quality Assurance Procedure, Testing Strategies and Validations. **System Implementation and Operations**: System Implementation – System Security and Audit – System Operation and Maintenance.

UNIT - V

Advanced Topics: Object Oriented Analysis and Design – UML Basics – CASE tools – Major Business Functions.

TEXT BOOK

1. ISRD Group, "Structured System Analysis and Design", TMH Publishing Company Ltd., New Delhi, 2007.

REFERENCE BOOKS

1. Preeti Gupta, "Structured System Analysis and Design", Firewall Media, 2005
2. J.B. Dixit and Raj Kumar, "Structured System Analysis and Design", Laxmi Publications, 2007.

Core Course-V-17PCA05 WEB TECHNOLOGIES

Credits:4

Course Objectives:

- To understand, analyze and apply the role languages like HTML, CSS and protocols in the workings of web and web applications
- To learn the theoretical concept about E-Commerce

UNIT - I

Introduction to the Web: Understanding the Internet and WWW – History – Protocols Governing the Web – Creating Websites for Individuals and the Corporate World - Web Applications – Writing Web Projects – Identification of Objects – Target Users – Web Team – Planning and Process Development – Web Architecture – Major Issues in Web Solution Development – Web Servers – Web Browsers - Internet Standards – TCP/IP Protocols Suite IP Addresses – MIME - Cyber laws. **Hyper Text Transfer Protocol**: Introduction – Web Servers and Clients – Resources – URL and its Anatomy – Message Format – Testing HTTP using Telnet – Persistent and Non-Persistent Connections – Web Caching – Proxy.

UNIT - II

Hyper Text Markup Language: Introduction – Elements, Attributes and Tags – Basic Tags – Table – Cell Spacing and Cell Padding – Nested Tables – Forms – Form Elements – Frames – Images – Meta Tag – Planning of Web Page – Model and Structure for a Web Site – Designing Web Pages – Multimedia Content Frames.

UNIT - III

Cascading Style Sheet: Introduction – Advantages – Adding CSS – Browser Compatibility – CSS and Page Layout – **Selectors**: Grouping – Type Selectors – Universal Selectors – Descendant Selectors – Child Selectors – Pseudo Classes and Elements – Pseudo Elements – Attribute Selectors – Class Selectors – ID Selectors.

UNIT - IV

E-Commerce: Introduction: Basic elements – Electronic commerce vs traditional commerce – Electronic commerce framework – Various stakeholders in electronic commerce

– Basic infrastructure – Players – Advantages and disadvantages – SWOT analysis. Electronic commerce software – **Security threats to electronic commerce**: Internet security issues – Intellectual property threats.

UNIT - V

Payment systems for E-Commerce – Inter organizational commerce and EDI – **Consumer Oriented Electronic commerce**: Consumer Oriented Applications – Website usability. **Internet business strategies**: M-Commerce – Virtual communities. **Software agents**: History of software agents – Characteristics and properties of software agents.

TEXT BOOKS

1. Uttam K. Roy, "Web Technologies," Oxford University Press, 2010.
2. Jibitesh Mishra, "E-Commerce", Trinity press, 2017.

REFERENCE BOOKS

1. Faithe Wempen, "HTML and XHTML Step by Step", Prentice- Hall of India Private Limited, 2006.
2. David R. Brooks, "An Introduction to HTML and JavaScript for Scientists and Engineers," New Age International (P) Ltd, 2010.
3. Jon Duckett, "Beginning HTML, XHTML, CSS, and JavaScript," Wiley Pub. Inc. , 2010.
4. Dr.K.Abirami Devi, Dr.M.Alagammai, "E-Commerce", Margham Publications, 2008.
5. Elias M. Awad, "Electronic Commerce," PHI, 2008.

Core course-VI-17PCAP01 Lab – I C PROGRAMMING LAB

Credits:2

Course Objectives:

- To implement various operations on arrays and string, sorting and searching
- To know about the concepts of functions, stack, queue and linked list

Implement the following:

1. Perform various Operations on Single Dimensional Arrays. (SUM, AVERAGE etc.,)
2. Perform various Operations on Matrices. (ADDITION, SUBTRACTION & MULTIPLICATION etc.,)
3. Perform String Operations using String Library Functions.
4. Calculate Binomial coefficient using functions
5. Generate Fibonacci series using recursive functions
6. Create students database using Array of structures
7. Sorting a set of numbers using
    a. Bubble sort
    b. Merge sort
8. Perform addition of Sparse Matrices using arrays.
9. Evaluate the expression using Stack
10. Perform breadth-first search of a graph using Queue
11. Perform polynomial addition and multiplication using Linked lists
12. Implement Doubly Linked Lists to search and print the position of the number using
    a. Linear search technique
    b. Binary search technique

Core Course-VII-17PCAP02 Lab - II WEB DESIGNING LAB

Credits: 2

Course Objective:

- Gain confidence to create static website on real world problems

Develop any five static web pages for the following, similar to the existing websites.

1. Education Institutions website
2. E-Banking website
3. Online shopping website
4. Match Making website
5. Travel & Tourism services website
6. Employment, Placement and Job market website
7. Electronic trading website
8. Healthcare website
9. Public service website

SEMESTER-II

Core Course-VIII-17PCA06 OBJECT ORIENTED PROGRAMMING WITH C++

Credits:4

Course Objectives:

- To understand the object oriented programming features such as objects, overloading, inheritance, Polymorphism etc.
- Be able to write object oriented programs using C++

UNIT - I

Introduction to C++: Key Concepts of OOP – Advantages – Object Oriented Languages – **Input and Output in C++:** Streams in C++ – Pre-Defined Streams –Unformatted Console I/O Operations – Formatted Console I/O Operations – C++ Declarations – **Control Structures**: Decision Making Statements – If…Else – Jump – GOTO – Break – Continue – Switch Case Statements – Loops in C++ – For – While – Do…While Loops – Functions in C++ - In Line Functions – Function Overloading.

UNIT - II

Class and Objects: Declaring Objects – Defining Member Functions – Static Member Variables and Functions – Array of Objects – Friend Functions – Overloading Member Functions – Bit Fields and Class. **Constructor and Destructors:** Characteristics – Calling Constructor and Destructors – Constructor and Destructor with Static Member.

UNIT - III

Operator Overloading: Overloading Unary - Binary Operators – Overloading Friend Functions – Type Conversion – **Inheritance:** Types of Inheritance – Single - Multilevel - Multiple - Hierarchical - Hybrid and Multi Path Inheritance – Virtual Base Classes – Abstract Classes.

UNIT - IV

Pointers: Declaration – Pointer to Class - Object – THIS Pointer – Pointer to Derived Classes and Base Classes – **Arrays:** Characteristics – Arrays of Classes – Memory Models – New and Delete Operators – Dynamic Objects – Binding - Polymorphisms and Virtual Functions.

UNIT - V

Files: File Stream Classes – File Modes – Sequential Read/ Write Operations – Binary and ASCII Files – Random Access Operation – Command Line Arguments – **Exception Handling:** Principles of Exception Handling – The Keywords try, throw and catch – Exception Handling Mechanism-Multiple Catch Statements-Catching Multiple Exceptions – Rethrowing Exception – **Strings:** Declaring and Initializing String Objects – String Attributes – Miscellaneous Functions.

TEXT BOOK

1. Ashok N Kamthane, "Object Oriented Programming with ANSI and Turbo C++," Pearson Education, 2006.

REFERENCE BOOKS

1. Balagurusamy E, "Object Oriented Programming With C++," TMH, 1998.
2. John R Hubbard, "Programming With C++," Schaum's outline series, TMH, 2nd edition 2000

Core Course-IX - 17PCA07 UNIFIED MODELING LANGUAGE

Credits: 4

Course Objectives:

- To learn the basic concepts about structural and behavioral modeling
- To understand and analyze the requirements graphically during enterprise analysis phase of the project

UNIT - I

Getting Started: Why We Model, Introducing the UML, Hello World.

UNIT - II

Basic Structural Modeling: Classes, Relationships, Common Mechanisms.

UNIT - III

Basic Structural Modeling: Diagrams, Class Diagrams.

UNIT - IV

Basic Behavioral Modeling: Interactions, Use Cases, Use Case Diagrams.

UNIT - V

Basic Behavioral Modeling: Interaction Diagrams, Activity Diagrams.

TEXT BOOK

1. Grady Booch, James Rumbaugh and Ivar Jacobson, "The Unified Modeling Language User Guide," Pearson Edition, 1999.

REFERENCE BOOKS

1. James Rumbaugh, Ivar Jacobson, and Grady Booch, "The unified modeling language reference Manual," 2nd edition, Addison-Wesley, 2005.
2. Bruce Powel Douglass, "Real Time UML: Advances in the UML for Real-Time systems," 3rd edition, Pearson, 2004.

Core Course-X-17PCA08 DATABASE MANAGEMENT SYSTEMS

Credits: 4

Course Objectives:

- To understand the architecture and functioning of relational, distributed and object oriented databases
- To learn the use of structural query language and its syntax, transactions and techniques for query optimization

UNIT – I

File Systems and Databases: Introducing the Database – The Historical Roots of the Database: Files and File Systems – A File System Critique – Database Systems – Database Models – **Wrap-Up**: The Evolution of Data Models. **The Relational Database Model**: A Logical view of data – Keys – Integrity Rules Revisited – Relational Database Operators – The Data Dictionary and the System Catalog – Relationships Within the Relational Database – Data Redundancy Revisited.

UNIT – II

Entity Relationship (E-R) Modeling: Basic Modeling Concepts – **Data Models**: Degrees of data Abstraction – The Entity Relationship (E-R) Model – Normalization of Database Tables: Database Tables and Normalization – Higher-Level Normal Forms – Denormalization.

UNIT – III

Relational Databases: Structured Query Language – Other Relational Languages - **Transaction Management and Concurrency Control**: What is a Transaction – Concurrency Control – Concurrency Control with Locking Methods – Concurrency Control with Time Stamping Methods – Concurrency Control with Optimistic Methods – Database Recovery Management. **Distributed Database Management Systems**: The Evolution of Distributed Database Management Systems – Distributed Processing and Distributed Databases – Functions of Distributed Database Management System- DDBMS Components – Levels of Data and Process Distribution – Distributed Database Transparency Features – Distribution Transparency – Transaction Transparency – Performance Transparency and Query Optimization – Distributed Database Design – Data Fragmentation – Data Replication – Data Allocation – Client/Server vs. DDBMS – C.J. Date's Twelve Commandments for Distributed Databases.

UNIT – IV

Query Processing: Overview – Measures of Query Cost – Selection Operation – Sorting – Join Operation – Other Operations – Evaluation of Expressions. **Query Optimization**: Overview – Estimating Statistics of Expression Results – Transformation of Relational Expressions – Choice of Evaluation Plans – Materialized Views. **Distributed Databases**: Homogeneous and Heterogeneous Databases – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency control in Distributed Databases – Availability – Distributed Query Processing – Heterogeneous Distributed Databases – Directory Systems.

UNIT – V

Object Oriented Databases: Object-Oriented Concepts - Characteristics of an Object-Oriented Data Model – **OODM and Previous Data Models**: Similarities and Differences – Object-Oriented Database Management Systems – How Object Orientation Affects Database Design – **OODBMS**: Advantages and Disadvantages – OO Concepts in Relational Model – The Next Generation of Database Management Systems. Advanced Data Types and New Applications: Motivation – Time in Databases – Spatial and Geographic data – Multimedia Databases – Mobility and Personal Databases.

TEXT BOOKS

1. Peter Rob Carlos Coronel, "Database Systems – Design, Implementation and Management", Thomson Course Technology, 5th Edition, 2002.
2. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, "Database System Concepts", McGraw-Hill, 4th Edition, 2002.

REFERENCE BOOKS

1. Alexis Leon, Mathews Leon, "Essentials of Database Managements Systems", Vijay Nicole imprints Pvt Ltd, 2006.

2. C.J.Date, “An Introduction to Database Systems”, 7th Edition, Pearson.
3. Raghu Ramakrishnan and Johannes Gehrke, “Database Management System”, McGraw Hill, 2000.
4. Gerald V.Post, “Database Management Systems – Designing & Building Business Applications”, McGraw Hill, 2000.

Core Course-XI-17PCA09 DATA COMMUNICATIONS AND NETWORKING

Credits:4

Course Objectives:

- To understand the concepts of computer networking and provide the knowledge of different protocols at different layers
- To develop the skill for transferring the data between the computers over the network

UNIT - I

Introduction: Data communications – components, Data Representation, Data Flow; Networks – Network criteria, Physical Structures, Network types - Local area network, Wide area network, switching, The Internet. **Network Models**: Protocol Layering- **TCP/IP Protocol Suite**: Layered architecture, Layers in the TCP/IP protocol suite, Description of Each layer, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing. **OSI model**: OSI versus TCP/IP, Lack of OSI model’s success.

UNIT - II

Data and Signals: Analog and Digital – data, signals, periodic and nonperiodic; Digital signals; Transmission Impairments – Attenuation, Distortion, Noise; Data rate limits – Nyquist Bit Rate, Shannon Capacity; Performance; **Digital Transmission**: Digital-to-Digital conversion - Line coding, Line coding schemes; **Analog-to-Digital conversion**: PCM.

UNIT - III

Error detection and correction: Introduction, Block coding, Cyclic codes – CRC, Polynomials; Checksum; **Data link control**: Data Link Control Services: Framing, Flow & error control, Connectionless and Connection Oriented; **Data link layer Protocols**: Simple Protocol, Stop-and-wait protocol; **Media Access Control**: Random Access, Controlled Access and Channelization.

UNIT - IV

Network Layer: Network Layer Services: Packetizing, Routing and Forwarding; Packet Switching; Network Layer Performance; **IPV4 Addresses**: Address Space, Classful Addressing, Classless Addressing; **Forwarding of IP packets**: Forwarding Based on Destination Address, Forwarding Based on Label; **Network Layer Protocols**: Internet Protocol.

UNIT - V

Transport Layer: Introduction: Transport-Layer Services, Connectionless and Connection-Oriented Protocols; Transport layer Protocols: Simple Protocol, Stop-and-wait Protocol, Go-Back-N protocol(GBN), Selective-Repeat Protocol. **Bidirectional Protocol**: Piggybacking; **Application Layer:** Introduction: Providing Services, Application- Layer Paradigms; **Client-Server Programming**: Application Programming Interface, Using

Services of the Transport Layer, Iterative Communication using UDP, Iterative Communication using TCP, Concurrent Communication

TEXT BOOK

1. Behrouz A. Forouzan, "Data Communications and Networking," 5th Edition, Tata McGraw-Hill, 2014.

REFERENCE BOOKS

1. Bhushan Trivedi, "Data Communication and Networks," Oxford Higher Education, 2014.
2. Andrew Tanenbaum, "Computer Networks," 5th edition, Pearson New International Edition, 2013.
3. James F.Kurose, Keith W.Ross, "Computer Networking – A top down Approach," 6th Edition, 2013.

Core Course-XII-17PCA10 MANAGERIAL ACCOUNTING

Credit: 4

Course Objectives:

- To understand the difference between financial and management accounting
- To be able to prepare and analyze the fund and cash flow statements
- To learn the concepts of budgets and be able to prepare Production, Sales, Cash and Flexible Budgets

UNIT – I

Financial Accounting: Definition – Objectives - Branches of Accounting - Accounting Concepts and Conventions - Groups Interested in Accounting Information - Accounting Rules – Journal - Ledger - Trial Balance – Preparation of Final Accounts / Financial Statements.

UNIT -II

Management Accounting: Definition – Objectives – Distinction between Financial Accounting and Management Accounting. **Analysis and Interpretation of Financial Statements-I :** Tools used - Comparative Statement - Common Size Statement and Trend Percentage. **Ratio Analysis**: Meaning - Advantages and Limitations - Computation of various Ratios – Solvency – Profitability - Activity and Capital Structure Ratios**.**

UNIT - III

Analysis and Interpretation of Financial Statements-II: Fund Flow Analysis: Concept of Funds - Fund Flow Statement - Uses and Limitation - Preparation of Fund Flow Statement. **Cash Flow Analysis:** Computation of Cash from operation and Preparation of Cash Flow Statement.

UNIT - IV

Budgeting and Budgetary Control: Meaning – Advantages and limitations - Classification of Budgets - Preparation of Production, Sales, Cash and Flexible Budgets**. Capital Budget**: Meaning and Importance - Methods of Ranking Investment Proposals - Pay-Back, Average Rate of Return and Discounted Cash Flow Methods.

UNIT - V

Marginal Costing: Meaning - Advantages and Uses - Cost Volume - Profit Analysis – Measurement of Break-even Point - Decisions Involving Alternative Choices.

TEXT BOOKS

1. Shukla M.C. & Grewal T.S., "Advanced Accounts," S.Chand 1991
2. Dr.S.N.Maheswari, "Principles of Management Accounting," Sultan Chand & sons, 2005.

REFERENCE BOOKS

1. S.P.Jain, K.L.Narang, "Advanced Accountancy – Part-I," Kalyani Publishers,1991.
2. Gupta R.L, Radhasamy M., "Advanced Accounts" (Vol.II), S.Chand, 1991.
3. R.K.Sharma, Shasi K.Gupta, "Management Accounting – Principles and Practices," Kalyani publishers, 1992.
4. Man mohan, S.N.Goyal, "Principles of Management Accounting," Agra, Sahithya Bhawan, 1987.
5. Hingorani N.L., Ramanathan A.R., "Management Accounting," S. Chand, 2nd Edition, 1982.

Core Course-XIII-17PCAP03- LAB – III C++ PROGRAMMING LAB

Credits:2

Course Objectives:

- To familiarize the students with object oriented language environment
- To implement various concepts related to C++

Implement the following in C++

1. Program using Classes & Objects.
2. Program using Function Overloading
3. Program using Friend function
4. Program using Operator overloading functions
5. Program using String Manipulation functions
6. Program using Inheritance
7. Program using Pointers
8. Program using Virtual Function
9. Program using Templates
10. Program to perform Insertion - Deletion and Updation using files.
11. Program which takes a file as argument and copies in to another file with line numbers using Command Line Arguments.

Core Course-XIV-17PCAP04 LAB – IV RDBMS LAB

Credits: 2

Course Objectives:

- Understand, analyze and apply SQL statements to perform different operations on database
- Learn to write a PL/SQL block to access the database and exceptional handling

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of a database and perform the operations Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationships between the databases.
6. Write a PL/SQL block for a database and retrieve records from the database using cursor.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
9. Creation of Procedures for a database and perform some operations.
10. Creation of database and perform the following operations :
    a. Insert a record to a database using triggers
    b. Group the records from a database using functions.

Core Course-XV-17PCAP05 Lab - V - FINANCIAL COMPUTING LAB

Credit: 1

Course Objectives:

- To be able to implement the concept of ledger, stock groups and vouchers
- To make the students to prepare balance sheet and profit and loss account

1. Create a Single Ledger using display and alter commends
2. Create a Multiple Ledger using display and alter commends
3. Create Single group using display and alter commends
4. Create a multiple groups using display and alter commends
5. Create a voucher types like contra, credit & debit notes, purchase, sales, receipt and delivery notes.
6. Create a single stock group.
7. Create a multiple stock groups
8. Create balance sheet for various items
9. Create profit and loss account for various aspects
10. Prepare various types of vouchers like accounting, inventory, and import transaction

SEMESTER-III

Core Course-XVI-17PCA11 JAVA PROGRAMMING

Credits:4

Course Objectives:

- Provides a platform for learning Java language, packing the programs into modules and network programs
- Helps to develop some web based applications

UNIT – I

Introduction to Java: Object oriented programming - Java features - Java environment- Data types, variables and arrays. Operators- Expressions - Control Statements: Branching statements - Iteration statements - Jump statements - Classes and object: Class- Objects - Methods - Constructors - this keyword - finalize () method - Overloading methods - Returning objects - Static - Final - Nested inner classes- Command line arguments - Inheritance. **Packages and Interfaces:** Packages - Access protection - Importing packages - Interfaces Exception handling: Fundamentals - Exception types - Try and catch - Multiple catch -Nested try - throw - throws - finally - Built in exception.

UNIT – II

Multithreading: Java Thread Model - Main Thread - Creating a Thread - Creating Multiple Threads - Using isAlive() and join() – Synchronization - Interthread Communication - Suspending, Resuming and Stopping Threads - Using Multithreading. **I/O Exploring java.io:** Java I/O classes and interfaces – File-Closeable and Flushable Interfaces - The stream classes - Byte Streams - Character Streams - Console Class - Using Stream I/O - Serialization. **Networking:** Basics - Networking classes and interface - Inet Address - Inet4 Address and Inet6 Address - TCP/IP Client Socket – URL - URL connection - http URL Connection - URI class – Cookies - TCP/IP server socket - Datagrams. **Event Handling**: Event Handling mechanisms - Delegation Event model - Event classes - Source of Events - Event Listener Interfaces - Using delegation Event model - Adapter classes - Inner classes.

UNIT – III

AWT: AWT classes - Window Fundamentals - Working with frame windows - Creating a frame window in an applet - Creating a windowed program - Displaying information within a window - Working with Graphics, color and font - Managing text output using font metrics. **AWT Controls**: Control Fundamentals, Labels, Using Buttons, Checkboxes, Choice Control, List, Scroll Bars and Text Field. **AWT Layouts and Menus**: Understanding Layout Managers - Menu Bars and Menus - Dialog Boxes - File Dialog - Handling Events.

UNIT – IV

Images, Animation and Audio: File Format - Image fundamentals – Image Observer - Double Buffering - Media Tracker - Image Producer, Consumer and Filter - Cell Animation. **Swing**: Features of Swing - MVC Connection - Components and containers - Swing packages - Event handling - Creating a swing - Exploring swing. **JDBC**: Introduction - Relational Databases – SQL - Manipulating Database with JDBC.

UNIT – V

Java Servlets: Life Cycle - Simple Servlet - Servlet API - javax.servlet package - javax.servlet.http Package - Handling HTTP requests and responses - cookies - session tracking. **Java Server Pages**: Overview - Implicit Objects - Scripting - Standard actions -

Directives. **Remote Method Invocation** - Client/Server Application using RMI. **EJB:** EJB Architecture – overview-Building and Deploying EJB - Roles in EJB - Design and Implementation. **EJB Session Bean**: Constraints - Life Cycle - Stateful Session Bean - Stateless Session Bean. **EJB Entity Bean**: Bean managed versus Container managed persistence - Life Cycle - Deployment.

TEXT BOOKS

1. E. Balagurusamy, "Programming with Java", Forth Edition, Tata McGraw Hill Pub. Ltd., New Delhi, 2009
2. Herbert Schildt, "The Complete Reference - JAVA 2 ", Fourth Edition, 2001

REFERENCE BOOKS

1. Muthu, "Programming with Java", Vijay Nicole Imprints Private Ltd., 2004
2. Deitel H.M. &Deital P.J, "Java How To Program", Fifth Edition, Prentice-Hall of India, 2003.
3. Cay.S. Horstmann, Gary Cornel, "Core Java 2 - Vol. II- Advanced Features", Pearson Education, 2004.
4. Tom Valesky, "Enterprise JavaBeans – Developing component based Distributed Applications", Pearson, 2000.

Core Course-XVII-17PCA12 VISUAL PROGRAMMING

Credits: 4

Course Objectives:

- Understand the concepts of visual programming tool sets
- Create Data centric applications by connecting to the databases

UNIT – I

Visual Basic: Getting Started: Need of Windows and Visual Basic – Setting up Visual Basic – Starting Visual Basic – Working with Visual Basic - Customizing a Form and Writing Simple Programs - **First Steps in Building the User Interface:** The Toolbox – Creating Controls – The Name Property – Properties of Command Buttons – Simple Event Procedures for Command Buttons – Access Keys – Text Boxes – Labels – Navigating Between Controls – Message Boxes – The Grid - Finishing the Interface - The Toolbox Revisited.

UNIT – II

First Steps in Programming: Statements in Visual Basic - Variables - Setting Properties with Code - Data Types - Working with Variables - More on Strings - More on numbers - Constants - Input Boxes. Displaying Information - Controlling Program Flow.

UNIT – III

Built-In Functions: String Functions -Length, Mid, Left, Right, InStr, StrComp - The Rnd Function - Numeric Functions - Date and Time Functions. Functions and Procedures - **Organizing Information via Code:** Lists: One Dimensional Arrays - Arrays with More Than One Dimension - Using Lists and Arrays with Functions and Procedures - The New Array-Based String Handling Functions – The With Statement - Enums. **Organizing Information via Controls:** Control Arrays - Working with a Control Array - Adding and Removing Controls in a Control Array - List and Combo Boxes - The Flex Grid Control.

UNIT – IV

Finishing the Interface: Common Dialog Boxes - The Microsoft Windows Common Controls 6.0 - Menus - MDI Forms. **Basic File Handling**: File Commands - Sequential Files. **File System controls and File System Objects**: File System Controls. **A Survey of Database Development Using Visual Basic**: Using Data Control - An Introduction to Programming with Database Objects - Other Useful Methods and Events for the Data Control. **Building ActiveX Controls**: First Steps - Testing the Control - Polishing the Presentation of Your Control - Adding the Functionality.

UNIT – V

Visual C++: Building Basic Application – Understanding Visual C++ Resources – Building a Database Application Using ODBC.

TEXT BOOKS

1. Gary Cornell, "Visual Basic 6 from the ground up," TMH, 2005.
2. John Paul Mueller, "Visual C++ 6 from the Ground Up," TMH, 2nd Edition,1999.

REFERENCE BOOKS

1. Steven Holzner, "Visual Basic 6 Programming Black Book," Dreamtech Press, 2000.
2. Diane Zak, "Visual Basic 2008," Cengage Learning, India Edition, 2008.
3. Noel Jerke, "Visual Basic 6: The Complete Reference," McGraw-Hill, 1999.
4. Steven Holzner, "Visual C++ 6," BPB publications, 2002.
5. Yashavant P.Kanetkar, "Visual C++ Programming," BPB Publications, 2002
6. James Allert, "Visual C++ Programming," Cengage Learning, India edition, 2009.

Core Course-XVIII-17PCA13 DISCRETE STRUCTURES

Credits: 4

Course Objectives

- To extend student's Logical and Mathematical maturity and ability to deal with abstraction
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems
- To have knowledge of the concepts which needed to test the logic of a program
- To be aware of set theory, functions, combinatorics and graph theory

UNIT – I

Mathematical Logic: Propositions – Connectives – Order of Precedence for Logical Connectives – Conditional and Biconditional Propositions – Tautology and Contradiction – Equivalence of Propositions – Duality Law – Duality Theorem – Algebra of Propositions – Tautological Implication – Normal Forms – Disjunctive and Conjunctive Normal Forms – Principal Disjunctive and Principal Conjunctive Normal Forms.

UNIT – II

Theory of Inference – Truth Table Technique – Rules of Inference – Form of Argument – Rule CP – Inconsistent Premises – Indirect Method of Proof – Predicate Calculus or Predicate Logic – Quantifiers – Existential Quantifier – Negation of a Quantified Expression – Nested Quantifiers – Free and Bound Variables – Inference Theory of Predicate Calculus.

UNIT – III

Set theory: Basic Concepts and Notations – Ordered Pairs and Cartesian Product – Set Operations – Relations – Types of Relations – Composition of Relations – Properties of

Relations – Equivalence Classes – Partition of a Set – Partitioning of a Set Induced by an Equivalence Relation. **Functions**: Representation of a Function – Types of Functions – Classification of Functions – Composition of Functions – Inverse of a Function – Binary and n-ary Operations – Properties of Binary Operations – Some Special Functions – Characteristic Function of a Set – Hashing Functions – Recursive Functions – Composition of Functions of Several Variables – Recursion – Primitive Recursive Function – Recursive Relations and Sets – Permutation Function.

UNIT – IV

Combinatorics: Permutations and Combinations – Pascal's Identity – Vandermonde's Identity – Permutations with Repetition – Circular Permutation – Pigeonhole Principle – Generalisation of the Pigeonhole Principle – Principle of Inclusion - Exclusion – Mathematical Induction – Recurrence Relations – Particular Solutions – Solution of Recurrence Relations by using Generating Functions.

UNIT – V

Graph Theory: Basic Definitions – Degree of a Vertex – Some Special Simple Graphs – Matrix Representation of Graphs – Paths, Cycles and Connectivity – Eulerian and Hamiltonian Graphs – Connectedness in Directed Graphs – Shortest Path Algorithms – Trees – Spanning Trees – Minimum Spanning Tree – Rooted and Binary Trees – Binary Tree – Tree Traversal – Expression Trees.

TEXT BOOK

1. T.Veerarajan, "Discrete Mathematics with Graph Theory and Combinatorics", McGraw Hill Education (India), 2007.

REFERENCE BOOKS

1. N.Chandrasekaran and M.Umaparvathi, "Discrete mathematics", PHI Learning Private Limited, New Delhi, 2010.
2. J.P.Trembley and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, New Delhi, 1997.
3. T. Sengadir, "Discrete Mathematics and Combinatorics", Pearson New Delhi 2009.
4. RakeshDube, Adesh Pandey, Ritu Gupta, "Discrete Structures and Automata Theory", Narosa publishing House New Delhi 2007.

Core Course-XXII-17PCA14 OPERATING SYSTEMS

Credits:4

Course Objectives:

- To be aware of the principles of Operating Systems, Processes and their Communication.
- To understand the various Operating System components.
- To know about file management and the distributed file system concepts

UNIT – I

Introduction: Types of operating systems - **operating system structures**: Operating Systems Services - System calls – Types of system calls - System programs – **Processes**: Process concept - Process Scheduling - Operations on processes - Interprocess Communication - **CPU Scheduling**: Scheduling criteria - Scheduling algorithms - Multiple-Processor Scheduling – Real-time Scheduling.

UNIT – II

Process Management: Process Synchronization: Critical Section problem – Semaphores - Classical problems of synchronization - Monitors – **Deadlocks**: Characterization - Deadlock Handling - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Deadlock Recovery.

UNIT – III

Memory Management: Main Memory: Swapping - Contiguous Memory allocation – Segmentation – Paging - **Virtual Memory**: Demand paging - Page Replacement - Allocation of frames –Thrashing.

UNIT – IV

Storage Management: Disk Structure - Disk Scheduling - **File-Systems Interface**: File concepts - Access Methods - Directory Structure - **File-System Implementation**: File-Systems Structure - Directory Implementation - Allocation Methods - Free-Space management – **I/O Systems**: I/O Hardware – I/O interface – Streams.

UNIT – V

Case Studies: **Linux System**: Design Principles – Kernel Modules – Process Management-File Systems - **Windows 7**: Design Principles – System Components – File System – Networking – Programmer interface.

TEXT BOOK

1. Abraham Silberschatz Peter B Galvin, G.Gagne, "Operating Systems Concepts", Nineth Edition, Addision Wesley Publishing Co., 2012.

REFERENCE BOOKS

1. Andrew S.Tanenbaum, "Modern operating Systems", Third Edition, PHI, 2008.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
3. H M Deital, P J Deital and D R Choffnes, "Operating Systems", Third Edition, Pearson Education, 2011.

Core Course-XIX-17PCAP06 LAB-VI JAVA PROGRAMMING LAB

Credits:2

Course Objectives:

- To make students to implement object oriented concepts in JAVA
- To understand the implementation of AWT, Swing, Servlets and RMI

List of programs:

1. Write a Program to implement class and objects.
2. Write a program to implement method overloading.
3. Write a program to implement method overriding.
4. Design a package to prepare a pay slip using multiple inheritance.
5. Implementation of Multi threading and Exception handling concepts
6. Implementation of I/O Streams
7. Write a programs using AWT, Swing and Event handling
8. Implement message communication using Network Programming.
9. Write a program using JDBC.
10. Implementation of Servlets / JSP

Core Course-XX–17PCAP07 - LAB-VII VISUAL PROGRAMMING LAB

Credits:2

Course Objective:

- To build software development skills using visual programming for real world applications

Visual Basic

1. Develop a Visual Basic Application
   i. To Create a Login Form
   ii. To check whether the given Number is Strong Number or Prime Number or Palindrome or Perfect Number
2. Develop a Visual Basic Application using String and Number Functions (Use Built-in Functions and User Defined Functions).
3. Develop a Visual Basic Application to read the details of the candidate and display the selected items in a Message Box using the following conditions.
   i. Read the Name, Father Name, Address, Qualification and respective Percentage and Experience if any.
   ii. Candidate may choose any two OS types (MAX)
   iii. Candidate may choose any three databases (MAX)
   iv. Candidate may choose any five programming languages (MAX)
4. Develop a Visual Basic Application using Functions and Procedures.
   i. To find Factorial of the given number.
   ii. To generate Fibonacci Series up to n terms
5. Develop a Visual Basic Application to implement Calculator using Control Array.
6. Develop a Visual Basic Application to perform Multiplication Table using Flex grid Control.
7. Develop a Visual Basic Application Using MDI Form and Common Dialog Boxes.
8. Develop a Visual basic application to make the following database operations by
   i. Using DAO Control
      - Search an employee on the basis of employee number.
      - Navigate and display the records on MOVE FIRST, MOVE NEXT, MOVE LAST and MOVE PREVIOUS.
   ii. Using Code.
      - Insert new Employee into the database.
      - Delete an existing employee from the database.
      - Update the employee information on the basis of employee number.
      - Search an employee details on the basis of department number.

Visual C++

1. Develop a Visual C++ Application Using SDI.
2. Develop a Visual C++ Application Using Dialog Based Application.
3. Develop a Visual C++ Database Application for Students Mark Calculation.

Core Course-XXI–17PCAP08 - LAB-VIII PYTHON PROGRAMMING LAB

Credits:1

Course Objective:

- To understand the concepts of Python
- To develop the programming skills in Python

Implement the following in Python:

1. Programs using elementary data items, lists, dictionaries and tuples.
2. Programs using if, elif, else, while and for loop.
3. Programs using while.
4. Programs using for loop.
5. Programs using functions
6. Programs using exception handling
7. Programs using command line arguments and import statements
8. Programs using classes and objects
9. Programs using modules.
10. Programs for creating dynamic and interactive web pages using forms.

Elective Course-I-17PCAE_ _

Credits: 4

Elective Course-I-17PCAE01 COMPUTER GRAPHICS

Course Objectives:

- To provide comprehensive introduction about computer graphics system, design algorithms and two dimensional transformations.
- To make the students familiar with techniques of clipping, three dimensional graphics and three dimensional transformations.
- The computer graphics course prepares students for activities involving in design, development and testing of modeling, rendering, shading and animation.

UNIT – I

Introduction – Graphics Applications – **Graphics Systems:** Video display devices – Raster Scan Systems – Random Scan Systems – Input Devices – Hard Copy devices – **Output Primitives:** Points and Lines – Line Drawing Algorithms – Circle Generating Algorithm – Ellipse Generating Algorithms – Filled Area Primitives.

UNIT – II

Attributes of Output Primitives: Line attributes – Curve attributes – Color and Gray Scale levels – Area-Fill attributes – Character Attributes – Antialiasing. **Two Dimensional Geometric Transformation:** Basic Transformation – Matrix Representation – Composite Transformation – Other Transformation.

UNIT – III

Two Dimensional Viewing: The viewing pipeline – Viewing Co-ordinate Reference Frame – Window to Viewport Co–ordinate Transformation – Two-Dimensional Viewing Function – Clipping Operations – Point Clipping – Line Clipping – Polygon Clipping – Curve Clipping – Text Clipping – Exterior Clipping. **Three Dimensional Concepts:** Three Dimensional Display Methods – Three Dimensional Graphics Packages. **Three Dimensional Geometric**

and Modeling Transformation: Translation – Rotation – Scaling – Other Transformation – Composite Transformation. Three Dimensional Viewing: Viewing Pipeline – Viewing Co-ordinates – Projections – Clipping.

UNIT – IV

Graphical User Interfaces and Interactive Input Methods: The user dialogue – Input of Graphical data – Input function – Interactive Picture Construction techniques. **Illumination models and Surface-Rendering Methods:** Light Sources – Basic Illumination models – Displaying light intensities – Halftone Patterns and Dithering techniques – Polygon rendering method.

UNIT – V

Visible-Surface Detection Methods: Classification of Visible-Surface Detection Methods – Back-Face Detection – Depth-Buffer Method – A-Buffer Method – Scan-Line Method – Depth-Sorting Method – BSP-Tree Method – Area-Subdivision Method – Octree Methods – Ray-Casting Method. **Color Models and Color Applications:** Properties of Light – Standard Properties and the Chromaticity Diagram – Intuitive Color Concepts – RGB, YIQ, CMY, HSV Color Models - Conversion between HSV and RGB Models **Computer Animation:** Design of Animation Sequences – Raster Animations – Key-Frame Systems – Motion Specifications

TEXT BOOK

1. Donald Hearn and M. Pauline Baker, "Computer Graphics", Second Edition, Prentice-Hall of India Private Limited, 1994.

REFERENCE BOOKS

1. John F.Hughes, Andries Van Dam, Morgan McGuire, David F. Sklar, James D.Foley, Steven K.Feiner, Kurt Akeley, "Computer Graphics Principles and Practice," Third Edition, Addison-Wesley, 2014.
2. William M. Newman and Robert F. Sproull, "Principles of Interactive Computer Graphics", Second Edition, Tata McGraw – Hill Edition, 1979.
3. Steven Harrington, "Computer Graphics A Programming Approach", Second Edition, McGraw – Hill International Edition, 1987.

Elective Course-I-17PCAE02 E-TECHNOLOGIES

Course Objectives:

- Provides a better understanding of the orientation in the current development of the modern network technologies which are used in E-business
- Provides an idea about B2B, E-Payment and M-Commerce

UNIT – I

The second wave of Global E-Business: Introduction - Electronic Commerce– Business Models, Revenue Models, and Business Processes – Advantages and disadvantages of Electronic Commerce - Economic Forces and Electronic Commerce – Identifying Electronic Commerce Opportunities – International Nature of Electronic Commerce. **E-Business Technology Basics**: The Internet and the World Wide Web– Packet – Switched Networks – Internet Protocols – Markup Languages and the Web – Intranets and Extranets – Internet Connection Options - Internet2 and The Semantic Web.

Web server and E-Mail Technologies: Introduction – web server basics-software for web servers - web site utility programs - web server hardware.

UNIT – II

E-Business Revenue Models: Introduction - Revenue Models - Creating an effective Web Presence. **Selling to Consumers Online**: Introduction – Web Marketing strategies. **Selling to Businesses Online**: Introduction - Electronic Data Interchange. **Virtual Communities**: From Virtual Communities to Social Networks - Mobile Commerce - Online Auctions. **E-Business Law and Taxation**: The Legal Environment of E-Commerce - Ethical issues - Taxation and E-commerce.

UNIT – III

Web Hosting and E-Business Software: Basic Functions – Advanced Functions – E-commerce Software for Small and Midsize companies, Mid size to Large Businesses, Large Businesses. **Online Security**: Online Security Issues overview - security for client and server computers. **Online payment systems**: Basics - Payment Cards – Electronic cash - Electronic wallets. **Implementing E-Business Initiatives:** Identifying Benefits and Estimating cost of Electronic Commerce initiatives – Strategies for Developing E-commerce Web sites - Managing E-Commerce Implementations.

UNIT - IV

E-Marketing: Traditional Marketing – Identifying Web Presence Goals – The Browsing Behaviour Model – Online Marketing – E-Advertising - Internet Marketing Trends – Target Markets – E-Branding – Marketing Strategies - E-security – **E-Payment Systems:** E-Customer Relationship Management: E Supply Chain Management.

UNIT – V

E-Strategy: Information and Strategy – The Virtual Value Chain – Seven Dimensions of E-Commerce Strategy – Value Chain and E-Strategy – Planning the E-Commerce Project – E-Commerce Strategy and Knowledge Management – E-Business Strategy and Data Warehousing and Data mining. **Mobile Commerce:** Wireless Applications – Technologies for Mobile Commerce – WAP Programming Model – Wireless Technologies – Different Generations in Wireless Communication – Security issues Pertaining to Cellular Technology – M-Commerce in India. **Customer Effective Web Design:** Legal and Ethical Issues.

TEXT BOOKS

1. Gary P. Schneider, "E-Commerce Strategy, Technology and Implementation," Cengage Learning INDIA Private Limited,. Reprint 2008
2. T. Joseph, "E-Commerce an Indian Perspective," 3rd Edition Prentice Hall of India,

REFERENCE BOOKS

1. Mike Papazologn, "E-Business, Organizational and Technical Foundations," Wiley India Pvt Ltd, 2008
2. Elias M. Awad, "Electronic Commerce," Prentice-Hall of India, 2008
3. Kenneth C.Laudon, Carlo Guercio Traver, " E- Commerce-business, Technology, Society," Pearson Education 2009..

Elective Course-I-17PCAE03 THEORY OF COMPUTATION

Course Objectives:

- Understand various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine
- Be aware of Decidability and Un-decidability of various problems

UNIT – I

Finite State Automata: Introduction - Finite State Machine – Deterministic Finite Automata – Transition System – Nondeterministic Finite Automata – Difference between DFA and NFA – Equivalence of DFA and NFA - Finite Automata with Epsilon moves - Two-way Finite Automata - Finite Automata with Outputs.

UNIT – II

Grammar and Chomsky Classification: Introduction - Grammar – Chomsky Classification – Languages and their Relation. **Regular Languages and Expressions:** Introduction - Regular Languages – Regular Expressions – Finite Automata and Regular Expressions – Pumping Lemma – Regular Sets and Regular Grammar - Equivalence of Two Finite Automata.

UNIT – III

Context-Free Languages: Introduction - Context-Free Grammar – Context-free languages – Simplification of Context-free grammars. **Pushdown Automata**: Introduction - Pushdown Automata - Working Principle of Pushdown Automata – Auxiliary Pushdown Automata - Two-stack Pushdown Automata.

UNIT – IV

Turing Machine: Introduction - Turing Machine Model – Turing Machine – Representation of Turing Machine –Acceptance of Language by Turing Machine - Design of Turing Machines - Two-stack Pushdown Automata and Turing Machine - Variations of Turing Machine - Universal Turing Machine - Halting problem og Turing Machine - Linear-bounded Automata - Post Machine.

UNIT – V

Computability and Undecidability: Introduction - Unsolvable Problems – Computability - Mapping Reducibility - Decidability of Logical Theories - Turing Reducibility. **NP-Completeness:** Introduction - Measuring Complexity - The Class P – The Class NP - NP-Complete Problems..

TEXT BOOK

1. D.P.Acharjya, “Theory of Computation”, MJP Publishers, 2010.

REFERENCE BOOKS

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, “Introduction to Automata Theory, Languages and Computations”, Third Edition, Pearson Education, 2007.
2. H.R. Lewis and C.H. Papadimitriou, “Elements of the theory of Computation”, Second Edition, Pearson Education, 2003.
3. Thomas A. Sudkamp, “An Introduction to the Theory of Computer Science, Languages and Machines”, Third Edition, Pearson Education, 2007.

Elective Course-I-17PCAE04 DESIGN AND ANALYSIS OF ALGORITHMS

Course Objectives:

- Apply the algorithms and design techniques to solve problems
- Analyze the complexities of various problems in different domains.

UNIT – I

Introduction – Notion of Algorithm - Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm efficiency – analysis frame work – Asymptotic Notations and Basic Efficiency Classes - Mathematical analysis of non-recursive Algorithms – Non-recursive solution to the Matrix Multiplication - Mathematical analysis of recursive algorithms – Recursive solution to the Tower of Hanoi Puzzle.

UNIT – II

Divide and conquer Technique – Multiplication of large integers – Strassen's matrix multiplication – Closest pair and Convex Hull Problems - Greedy method – Prim's algorithm – Kruskal's algorithm – Dijkstra's algorithm.

UNIT – III

Dynamic Programming - Computing a binomial coefficient – Warshall's and Floyd' Algorithm – Application of Warshall's Algorithm to the digraph – Flyd's Algorithm for the all pairs shortest paths Problem - The Knapsack problem and Memory function.

UNIT – IV

Backtracking – N-Queens problem – Hamiltonian circuit problem – Subset sum problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem.

UNIT – V

P, NP and NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem – Knapsack problem.

TEXT BOOK

1. Anany Levitin "Introduction to the Design and Analysis of Algorithms" Pearson Education 2009.

REFERENCE BOOKS

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, "Introduction to algorithms", Prentice Hall 1990.
2. S.K. Basu, "Design methods and Analysis of Algorithms", Prentice Hall, 2005.

SEMESTER-IV

Core Course-XXIII-17PCA15 SOFTWARE ENGINEERING

Credits:4

Course Objectives:

- A broad perspective on widely used techniques for developing large scale systems.
- The area of Software Testing has acquired wider horizon and significance.
- Easier to grasp and gives students a clear understanding to overall SE process.

UNIT – I

Overview: Introduction - Emergent System Properties - Systems Engineering - Legacy Systems - A Simple Safety Critical System - System Dependability – Availability And Reliability **–** Safety **–** Security - Software Process Model - Process Iteration- Process Activities - Project Planning – Project Scheduling – Risk Management **.**

UNIT – II

Requirements: Functional and Non Functional Requirements – User Requirements - System Requirements - Interface Specification - The Software Requirement document -Feasibility Studies **–** Requirement elicitation and Analysis - Requirements Validation - Context Model - Behavioral Models - Data Models - Object Models - Structured Methods – Risk-Driven Specification - Safety Specification – Security Specification – Formal Specification in the Software Process.

UNIT – III

Design: Architectural Design Decisions– System Organization–Modular Decomposition Style – Control Styles – System Design – Real Time Operating System – Design Issues - UI Design Process – User Analysis – Interface Evolution. **Development:** Rapid Software Development – Agile Methods – Extreme Programming –Rapid Application Development – Software Prototyping - Application Framework – Application System Reuse – Program Evolution Dynamics – Software Maintenance – Evolution Process**.**

UNIT – IV

White Box Testing: Introduction **–** Static Testing – Structural Testing – Challenges in White Box Testing . **Black Box Testing:** Introduction – Need of Black Box Testing – Perform Black Box Testing. **Integration Testing:** Integration Types of Testing – Integration Testing as a Phase of Testing – Scenario Testing .**System and Acceptance Testing:** Functional Versus Non-Functional Testing – Functional System Testing – Non–Functional Testing .**Performance Testing:** Factors Governing Performance Testing – Methodology For Performance Testing. **Regression Testing:** Introduction – Types of Regression Testing – Perform Regression Testing.

UNIT – V

Internationalization Testing: Primer on Internationalization - Test Phase for Internationalization – Internationalization Validation – Fake Language Testing – Language Testing – Localization Testing. **Specialized and Organizational Testing:** Primer on Object-Oriented Software – Difference in OO Testing. **Usability and Accessibility Testing:** usability Testing – Quality Factors of Usability Testing – Accessibility Testing – Tools for Usability Testing. **Organization Structures for Testing Terms:** Structure in Single –

Product Companies - Structure for Multi-Product Companies – Testing Service Organizations.

TEXT BOOKS

1. Ian Sommerville, "Software Engineering", Eighth Edition, Pearson, 2011.
2. Srinivasan Desikan, Gopalaswamy Ramesh. "Software Testing Principles and Practices" , Dorling Kindersley (India) Private Ltd , Pearson edition, 2013.

REFERENCE BOOKS

1. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, "Fundamentals of Software Engineering", Second Edition, Pearson edition, PHI Learning Private Ltd., 2003.
2. Roger S Pressman, "Software Engineering", Sixth Edition, Tata McGraw-Hill Edition, 2010.

Core Course-XXIV-17PCA16 MOBILE COMPUTING

Credits:4

Course Objectives:

- To introduce the characteristics, basic concepts and systems issues in mobile computing
- To study the various concepts like GSM, CDMA, and 3G of Mobile Communications
- To illustrate architecture and protocols in mobile computing

UNIT – I

Mobile Computing - Dialog Control - Networks - Middleware and Gateways - Application and Services - Developing Mobile Computing Applications - Standards - Standard Bodies - Players in Wireless Space. Mobile Computing Architecture: Architecture for Mobile Computing -Three Tier Architecture - Design Considerations for Mobile Computing.

UNIT – II

Mobile Computing Through Telephony: Evolution of Telephony - Multiple Access Procedure - Mobile Computing Through Telephone - Voice XML - TAPI - Emerging Technologies: Bluetooth - RFID - Mobile IP - IPV6.

UNIT – III

GSM: Global System for Mobile Communications - GSM Architecture - GSM Entities - Call Routing in GSM - GSM Address and Identifiers - Network Aspects in GSM. SMS: Mobile Computing Over SMS - SMS - Value Added Services through SMS.

UNIT – IV

GPRS: GPRS and Packet Data Network - GPRS Network Architecture - Data Services in GPRS - Billing and Charging in GPRS. WAP: Evolution of Wireless Data and WAP - GPRS Applications.

UNIT – V

CDMA and 3G: Introduction - Architecture CDMA versus GSM - IEEE 802.11 Standards - Wireless Data. Wireless LAN: Introduction - Wireless Advantages - Wireless LAN Architecture - Types of Wireless LAN - Mobility in Wireless LAN - Wireless LAN Security. Next Generation Networks – OFDM – MPLS - Wireless asynchronous transfer Mode - Multimedia Broadcast Services.

TEXT BOOK

1. Asoke K Talukder, Roopa RYavagal, "Mobile Computing," Second Edition, Tata McGraw Hill Publishing Company Limited, 2010.

REFERENCE BOOKS

1. Jochen Schiller, "Mobile Communications," Second Edition, Pearson Education, 2011
2. William C.Y. Lee, "Mobile Cellular Telecommunications," Second Edition, McGraw Hill, *1995*.

Core Course-XXV-17PCA17 DATA MINING TECHNIQUES

Credits:4

Course Objectives:

- To understand the fundamental processes, concepts and techniques of data mining
- Investigate different applications, algorithms and trends of data mining

UNIT – I

Introduction to Data Mining: Data miners - Human Direction of Data Mining – The Cross-Industry Standard Process for Data Mining: CRISP-DM - CRISP-DM: The Six Phases - Fallacies of Data Mining. **Data Preprocessing:** Data Cleaning - Handling Missing Data – Identifying Misclassification – Graphical Methods for Identifying Outliers - Measures of Center and Spread - Data Transformation - Min–Max Normalization – Z-Score Standardization – Decimal Scaling – Transformations to Achieve Normality – Numerical Methods for Identifying Outliers – Flag Variables – Transforming Categorical Variables into Numerical Variables – Binning Numerical Variables – Reclassifying Categorical Variables – Adding an Index Field – Removing Variables – Variables that Should Probably not be Removed- Removal of Duplicate Records.

UNIT – II

Dimension–Reduction Methods: Dimension-Reduction in Data Mining – Principal Components Analysis – PCA to the Houses Data Set – The Eigenvalue Criterion – The Proportion of Variance Explained Criterion – The Minimum Communality Criterion – The Scree Plot Criterion – Profiling the Principal Components – Communalities – Minimum Communality Criterion – Validation of the Principal Components – Factor Analysis – Factor Analysis to the Adult Data Set – Factor Rotation – User-Defined Composite.

UNIT – III

K-Nearest Neighbor Algorithm: Classification Task – k-Nearest Neighbor Algorithm – Distance Function – Combination Function – Simple Unweighted Voting – Weighted Voting – Quantifying Attribute Relevance – Stretching the Axes – Database Considerations – k-Nearest Neighbor Algorithm for Estimation and Prediction – Choosing k – Application of k-Nearest Neighbor Algorithm. **Decision Tree:** Requirements – Classification and Regression Trees – C4.5 Algorithm – Decision Rules – Comparison of the C5.0 and CART Algorithms.

UNIT – IV

Clustering: The Clustering Task – Hierarchical Clustering Methods – Single-Linkage Clustering – Complete-Linkage Clustering – k-Means Clustering – Example of k-Means Clustering at Work – Behavior of MSB, MSE, and Pseudo-F as the k-Means Algorithm Proceeds – Application of k-Means Clustering Using SAS Enterprise Miner – Using Cluster Membership to Predict Churn. **Measuring Cluster Goodness:** Rationale for Measuring

Cluster Goodness – The Silhouette Method - Silhouette Example - Silhouette Analysis of the IRIS Data Set – The Pseudo-F Statistic – Example of the Pseudo-F Statistic – Pseudo-F Statistic Applied to the IRIS Data Set - Cluster Validation – Cluster Validation Applied to the Loans Data Set.

UNIT-V

Association Rules: Affinity Analysis and Market Basket Analysis – Data Representation for Market Basket Analysis – Support, Confidence, Frequent Itemsets, and the a Priori Property – Generating Frequent Itemsets – Generating Association Rules – Extension from Flag Data to General Categorical Data – Information. **Theoretic Approach**: Generalized Rule Induction Method - J-Measure - Association Rules are Easy to do Badly - Local Patterns Versus Global Models. **Case Study**: Business understanding, Data Preparation and EDA

TEXT BOOK

1. Daniel T. Larose , Chantal D. Larose, "Data mining and Predictive analytics," Second Ed., Wiley Publication, 2015.

REFERENCE BOOKS

1. David L. Olson Dursun Delen, "Advanced Data Mining Techniques," Springer-Verlag Berlin Heidelberg, 2008
2. Jiwei Han, Michelien Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann Publishers an Imprint of Elsevier, 2006.
3. John Wang, "Encyclopedia of Data warehousing and Mining," Idea Group Publishing, 2005.

Core Course-XXVI-17PCAP09 LAB-IX – MOBILE APPLICATION DEVELOPMENT LAB

Credits:2

Course Objectives:

- To make the students to aware about WML and J2ME
- To understand the functioning of GSM, Mobile phone and GlomoSim simulators

List of Programs:

1. Study of WML and J2ME simulators
2. Design of simple Calculator having +, -, * and / using WML/J2ME
3. Design of Calendar for any given month and year using WML/J2ME
4. Design a Timer to System Time using WML/J2ME
5. Design of simple game using WML/J2ME
6. Animate an image using WML/J2ME
7. Design a personal phone book containing the name, phone no., address, e-mail, etc

.8. Simulation of Authentication and encryption technique used in GSM

9. Browsing the Internet using Mobile phone simulator
10. Study of GlomoSim Simulator

SOFTWARE REQUIREMENTS FOR J2ME PROGRAM

- Nebeans7.0 ml Windows
- Java setup 6.0
- Jdk 6- nb7.0

Core Course-XXVII – 17PCAP10 LAB-X DATA MINING LAB

Credits:3

Course Objectives:

- To make students able to write program in R
- To learn the implementation concepts of data mining operations

Develop R Program for the following:

1. To get the input from user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND).
2. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames.
3. To get the input matrix from user and perform Matrix addition, subtraction, multiplication, inverse transpose and division operations using vector concept.
4. To perform statistical operations (Mean, Median, Mode and Standard deviation).
5. To perform data pre-processing operations:
   i) Handling Missing data ii) Min-Max normalization
6. To perform dimensionality reduction operation using PCA.
7. To perform Simple Linear Regression.
8. To perform K-Means clustering operation and visualize it.
9. Write R script to diagnose any disease using KNN classification and plot the results.
10. To perform market basket analysis using Apriori algorithm.

17PHR01 - HUMAN RIGHTS

(Common Paper for all PG Programmes) **Credits:0**

Elective Course-II-17PCAE_ _

Credits:4

Elective Course-II-17PCAE05 ARTIFICIAL INTELLIGENCE

Course Objectives:

- To understand about the basic theory of problem solving paradigms and search strategies in artificial intelligence
- To make the students familiar with knowledge representation, planning, learning, natural language processing and robotics

UNIT – I

Introduction - Intelligent Agents- Problem Solving - by Searching - Informed Search Strategies-Optimization Problems - Adversarial Search

UNIT – II

Knowledge and Reasoning - Logical Agents - First-Order Logic - Inference in First-Order Logic - Knowledge Representation

UNIT – III

Planning – Planning and Acting in the Real World - Uncertain knowledge and reasoning - Uncertainty - Probabilistic Reasoning - Probabilistic Reasoning Over Time - Making Simple Decisions - Making Complex Decisions

UNIT – IV

Learning - Learning from Examples - Knowledge in Learning - Statistical Learning Methods - Reinforcement Learning

UNIT – V

Communicating, Perceiving, and Acting - Natural Language Processing – Communication-Perception – Robotics.

TEXT BOOK

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach," Third Edition, Prentice Hall of India, New Delhi, 2010.

REFERENCE BOOKS

1. Elaine Rich, Kevin Knight, B. Nair, "Artificial Intelligence," Third Edition, Tata McGraw-Hill, New Delhi, 2017.
2. Eugene Charniak, Drew McDermott, "Introduction to Artificial Intelligence," Pearson, 2002.
3. Mick Benson, "Artificial Intelligence: Concepts and Applications," Willford Pr, 2018.

Elective Course-II-17PCAE06 SOFT COMPUTING

Course Objectives:

- To understand the basic Concept of neural network, various models of Neural networks and supervised and unsupervised learning techniques
- To get familiar with the basis of Fuzzy logic , fuzzy relations, fuzzy inference system and defuzzification techniques

UNIT – I

Introduction: Neural Networks – Application scope of Neural Networks – Fuzzy Logic. **Artificial Neural Networks:** Fundamental Concept – Evaluation Neural Networks – **Basic Models of Artificial Neural Networks:** Learning - Terminologies of ANNs - McCulloch-Pitts Neuron - Linear Separability - Hebb Network.

UNIT – II

Supervised Learning Network: Perceptron Networks – Adaptive Linear Neuron - Multiple Adaptive Linear Neurons – Back-Propagation Networks. **Associative Memory Networks:** Introduction – Training Algorithm for Pattern Association – **Hopfield Networks:** Discrete Hopfield Networks.

UNIT – III

Unsupervised Learning Network: Introduction – Maxnet – Maxican Hat Net – Hamming Network - Kohonen Self-Organizing Feature Maps - Learning Vector Quantization-Adaptive Resonance theory Network.

UNIT – IV

Fuzzy logic: Introduction – Classical Sets – Fuzzy Sets. **Fuzzy Relations:** Cardinality of Fuzzy Relation – Operations and properties of Fuzzy Relations – Fuzzy Composition – Noninteractive fuzzy sets. **Membership Functions:** Introduction – Features of Membership functions – Fuzzification.

UNIT – V

Defuzzification: Introduction – Lambda cut for Fuzzy Sets and Relations – Defuzzification Methods. **Fuzzy Arithmetic and Fuzzy Measures:** Introduction – Fuzzy Arithmetic – Fuzzy Measures.

TEXT BOOK

1. Dr. S. N. Sivanandam and Dr. S. N. Deepa, **"Principles of Soft Computing",** Wiley, Second Edition, 2007.

REFERENCE BOOKS

1. Bart Kosko, "A dynamical system approach to Machine Intelligence, PHI,1992.
2. George J.Klirl Bo Yuen, "Fuzzy sets and Fuzzy Logic Theory and Application", PHI, 1995.
3. Naresh H.sinha, Madan M. Gupta, " Soft Computing & Intelligent System – Theory & Application" - Academic press serving in Engineering, 1999.

Elective Course-II-17PCAE07 MACHINE LEARNING

Course Objectives:

- To learn the basic concepts, techniques and applications of machine learning
- To understand the range of machine learning algorithms along with their strength and weakness

UNIT – I

Introduction: Machine Learning – Examples of Machine Learning Applications. **Supervised Learning:** Learning a Class from Examples – Vapnik-Chervonenkis (VC) Dimension – Probably Approximately Correct (PAC) Learning – Noise – Learning Multiple Classes – Regression – Model Selection and Generalization – Dimensions of a Supervised Machine Learning Algorithm. **Bayesian Decision Theory:** Introduction – Classification – Losses and Risks – Discriminant Functions – Association Rules.

UNIT – II

Parametric Methods: Maximum Likelihood Estimation – Evaluating an Estimator: Bias and Variance – The Bayes' Estimator – Parametric Classification – Regression – Tuning Model Complexity: Bias/Variance Dilemma – Model Selection Procedures. **Nonparametric Methods:** Nonparametric Density Estimation – Generalization to Multivariate Data – Nonparametric Classification – Condensed Nearest Neighbor – Distance-Based Classification – Outlier Detection – Nonparametric Regression: Smoothing Models

UNIT – III

Linear Discrimination – Generalizing the Linear Model – Geometry of the Linear Discriminant – Pairwise Separation – Gradient Descent – Logistic Discrimination – Discrimination by Regression – Learning to Rank. **Multilayer Perceptrons:** The Perceptron – Training a Perceptron – Learning Boolean Functions – Multilayer Perceptrons – MLP as a Universal Approximator – Backpropagation Algorithm

UNIT – IV

Combining Multiple Learners: Generating Diverse Learners – Model Combination Schemes – Voting – Bagging – Boosting – Stacked Generalization – Fine-Tuning an Ensemble – Cascading **Reinforcement Learning**: Elements of Reinforcement Learning – Model-Based Learning – Temporal Difference Learning – Generalization – Partially Observable States

UNIT – V

Design and Analysis of Machine Learning Experiments: Factors, Response, and Strategy of Experimentation – Response Surface Design – Randomization, Replication, and Blocking – Guidelines for Machine Learning Experiments – Cross-Validation and Resampling

Methods – Measuring Classifier Performance – Interval Estimation – Hypothesis Testing – Assessing a Classification Algorithm's Performance – Comparing Two Classification Algorithms – Comparing Multiple Algorithms: Analysis of Variance – Comparison over Multiple Datasets

TEXT BOOK

1. Ethem Alpaydın, "Introduction to Machine Learning" Third Edition, MIT, 2014.

REFERENCE BOOKS

1. Bertt Lantz, "Machine Learning with R," Packt Publishing, 2013
2. Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals," Wiley Publication, 2015.

Elective Course-II-17PCAE08 RESOURCE MANAGEMENT TECHNIQUES
(Theory and Proof are not expected)

Course Objectives:

- To understand the concept of optimization
- To develop mathematical model of real life cases
- To study and implement Optimization algorithms

UNIT – I

Linear Programming Problem (LPP): Formulations and graphical solution of (2 variables) canonical and standard terms of linear programming problem. Algebraic Solution: Simplex algorithm, Simplex methods – solving problems with slack variable.

UNIT – II

Transportation Model: North West corner Method, Least cost method, and Vogel's approximation method to find initial basic feasible solution and Modi method to find optimal solution. **Assignment Model**: Hungarian assignment model – Travelling sales man problem.

UNIT – III

Queueing Models: (M/M/1):(∞/FIFO), (M/M/1):(N/FIFO), (M/M/C):(∞/FIFO) and (M/M/1):(N/FIFO) (Problem and Solution only)

UNIT – IV

Replacement Problem: Replacement policy for equipment that deteriorate gradually, Replacement of item that fail suddenly-Individual and group replacement, Problems in mortality and staffing.

UNIT – V

Project Scheduling: PERT/CPM Networks – Fulkerson's Rule – Measure Of Activity – PERT Computation – CPM Computation – Resource Scheduling.

TEXT BOOK

1. Kanthi Swarup, P.K.Gupta and Man Mohan, "Operations Research" , Fourteenth Edition, Sultan Chand and Sons New Delhi, 2008.

REFERENCE BOOKS

1. Hamdy. A. Taha, "Operations Research an Introduction" Seventeenth Edition, Pearson Education, 2002.
2. S.D Sharma, "Operation Research", Kedar Nath and Ram Nath - Meerut , 2008.

SEMESTER-V

Core Course-XXVIII-17PCA18 BIG DATA ANALYTICS

Credits:4

Course Objectives:

- To study the Big Data Platform, DFS Concepts, Interfacing with DFS, and programming framework for writing applications
- To understand the concept of document-oriented database management systems

UNIT - I

Digital data: Types of Digital Data - Classification of Digital Data - **Big Data**: Characteristics of Data - Evolution of Big Data - Definition of Big Data - Challenges with Big Data - Volume, Velocity, Variety - Other Characteristics of Data - Need for Big Data - Information Consumer or Information Producer - Traditional Business Intelligence (BI) versus Big Data - A Typical Data Warehouse Environment - A Typical Hadoop Environment - Coexistence of Big Data and Data Warehouse - Changing in the Realms of Big Data. **Big Data Analytics** : Big Data Analytics - Sudden Hype Around Big Data Analytics - Classification of Analytics - Greatest Challenges that Prevent Businesses from Capitalizing on Big Data - Top Challenges Facing Big Data - Importance of Big Data Analytics - Technologies to Meet the Challenges Posed by Big Data - Data Science - Data Scientist - Terminologies Used in Big Data Environments - Basically Available Soft State Eventual Consistency (BASE) - Few Top Analytics Tools. **The Big Data Technology Landscape** : NoSQL (Not Only SQL) - Hadoop.

UNIT - II

Hadoop: Introducing Hadoop - Need for Hadoop - RDBMS versus Hadoop - Distributed Computing Challenges - History of Hadoop - Hadoop Overview - Use Case of Hadoop - Hadoop Distributors - HDFS (Hadoop Distributed File System) - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator) - Interacting with Hadoop Ecosystem. **Hadoop I/O**: Data Integrity - Data Integrity in HDFS - LocalFileSystem - ChecksumFileSystem. Compression - Codecs - Compression and Input Splits - Using Compression in MapReduce. Serialization - The Writable Interface - Writable Classes - Implementing a Custom Writable - Serialization Frameworks - Avro. File-Based Data Structures - SequenceFile - MapFile.

UNIT - III

MapReduce: Anatomy of a MapReduce Job Run - Classic MapReduce (MapReduce 1) - YARN (MapReduce 2). **Failures**: Failures in Classic MapReduce - Failures in YARN. Job Scheduling - The Fair Scheduler - The Capacity Scheduler. Shuffle and Sort - The Map Side - The Reduce Side - Configuration Tuning. Task Execution - The Task Execution Environment - Speculative Execution - Output Committers - Task JVM Reuse - Skipping Bad Records**.** **Map Reduce Programming**: Introduction - Mapper - Reducer - Combiner - Partitioner - Searching - Sorting - Compression.

UNIT - IV

MongoDB: MongoDB - Need for MongoDB - Terms Used in RDBMS and MongoDB - Data Types in MongoDB - MongoDB Query Language. **Cassandra**: Apache Cassandra - An Introduction - Features of Cassandra - CQL Data Types - CQLSH - Keyspaces - CRUD (Create, Read, Update and Delete) Operations - Collections - Using a Counter - Time to Live

(TTL) - Alter Commands - Import and Export - Querying System Tables - Practice Examples.

UNIT - V

Hive: Introduction - Hive Architecture - Hive Data Types - Hive File Format - Hive Query Language (HQL) - RCFile Implementation - SerDe - User-Defined Function (UDF). **Pig:** Introduction - The Anatomy of Pig - Pig on Hadoop - Pig Philosophy - Use Case for Pig: ETL Processing - Pig Latin Overview - Data Types in Pig - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions (UDF) - Parameter Substitution - Diagnostic Operator - Word Count Example using Pig - Uses of Pig - Pig at Yahoo! - Pig versus Hive. **JasperReport using JasperSoft**: Introduction to Jasper Reports - Connecting to MongoDB NoSQL Database - Connecting to Cassandra NoSQL Database.

TEXT BOOKS

1. Seema Acharya, Subhasini Chellappan, "Big Data and Analytics" Wiley 2015.
2. Tom White " Hadoop: The Definitive Guide" Third Edition, O'reily Media, 2012.

REFERENCES

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press, 2013
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
4. Pete Warden, "Big Data Glossary", O'Reily, 2011.

Core Course-XXIX-17PCA19 .NET PROGRAMMING

Credits:4

Course Objectives:

- To study the concepts of .NET framework
- To learn the programming concepts in Visual Basic.Net, ASP.Net and C#

UNIT- I

Essential Visual Basic.Net: The .NET Framework and the Common Language Runtime. Operators, Conditionals and Loops: Constants – Enumerations – Variables - DataTypes - Converting Data types - Arrays and Dynamic Arrays - Operators – Decision Making statements - Select case - Switch and choose statement – Looping Statements. Procedures, Scope and Exception Handling.

UNIT – II

Object Oriented Programming: Classes and Objects – Fields – properties – methods – Abstraction – Encapsulation – Inheritance – Polymorphism - Overloading – Overriding – shadowing – Constructors and Destructors – Structures and Modules - **Shared**: data members – methods – properties - events – class libraries – Namespaces - Inheritance – Polymorphism - Interfaces.

UNIT - III

C#: Evolution of C# - Types of application developed with c# - data types and Expressions - Methods and behaviors – creating classes – making decisions – repeating instructions - Arrays – Introduction to windows programming – **Working with data bases**: Database Access – ADO .net – Data Source Configuration Tools.

UNIT – IV

ASP.net: Introduction to ASP.net – Building an ASP.net website – Working with ASP.net server controls - Programming ASP.net web pages – Navigation.

UNIT – V

User controls – Validating User input – Introducing Databases – Displaying and updating Data.

TEXT BOOKS

1. Steven Holzner, "Visual Basic.NET Programming," Black Book, First edition, Dreamtech Press, 2005
2. Barbara Doyle, "C# Programming - From problem Analysis to Program Design," Fourth edition, Cengage Learning publications, 2014.
3. Imar Spaanjaars, "Beginning ASP.NET 4 in C# and VB," Wiley India Edition, 2010.

REFERENCE BOOKS

1. Evangelos Petroutsos, "Mastering Visual Basic .NET", BPB Publications, 2001.
2. Kathleen Kalata, "Introduction to ASP .net," Third edition, Thomson Course Technology, 2007.
3. Herbert Schildt, C# The Complete Reference, McGraw Hill, 2008.
4. Balagurusamy, "Programming in C# A primer," Third edition, Tata McGraw Hill, 2010
5. Kogent Learning Solutions Inc., ".NET 3.5 Programming covering .NET Framework VB 2008, C# 2008 and ASP.NET 3.5", Black Book, DreamTech Press, 2010.

Core Course-XXX-17PCA20 OPEN SOURCE TECHNOLOGIES

Credits:4

Course Objectives:

- To learn the concepts of dynamic web content and implementation of web development server
- To understand the basics of syntax, arrays, functions and objects in PHP programming language
- To know the structure of MySQL database and access using PHP

UNIT-I

Introduction to Dynamic Web Content: HTTP and HTML: Berners-Lee's Basics - The Request/Response Procedure - The Benefits of PHP, MySQL, JavaScript, CSS, and HTML5 - Using PHP - Using MySQL - Using JavaScript - Using CSS - And Then There's HTML5 - The Apache Web Server - About Open Source. **Setting Up a Development Server:** WAMP, MAMP, or LAMP - Installing XAMPP on Windows - Testing the Installation - Installing XAMPP on Mac OS X - Accessing the Document Root - Installing a - LAMP on Linux - Working Remotely - Logging In - Using FTP - Using a Program Editor - Using an IDE

UNIT-II

Introduction to PHP: - Incorporating PHP Within HTML - The Structure of PHP - Using Comments -Basic Syntax - Variables – Operators - Variable Assignment - Multiple-Line Commands -Variable Typing - Constants - Predefined Constants - The Difference Between the echo and print Commands - Functions - Variable Scope. **Expressions and Control Flow in PHP**: Expressions - Operators – Conditionals – Looping - Implicit and Explicit Casting - PHP Dynamic Linking - Dynamic Linking in Action.

UNIT-III

PHP Functions and Objects: PHP Functions - Including and Requiring Files - PHP Version Compatibility - PHP Objects. **PHP Arrays:** Basic Access - The foreach...as Loop - Multidimensional Arrays - Using Array Functions.

UNIT-IV

Practical PHP: Using printf - Date and Time Functions - File Handling - System Calls - XHTML - HTML5 **Introduction to MySQL**: MySQL Basics - Summary of Database Terms - Accessing MySQL via the Command Line – Indexes - MySQL Functions - Accessing MySQL via phpMyAdmin.

UNIT-V

Accessing MySQL Using PHP: Querying a MySQL Database with PHP - Example - Practical MySQL - Preventing Hacking Attempts - Using mysqli procedurally **Form Handling:** Building Forms - Retrieving Submitted Data. **Cookies, Sessions, and Authentication**: Cookies in PHP - HTTP Authentication - Sessions.

TEXT BOOK

1. Robin Nixon, "Learning PHP, MySQL & JavaScript With jQuery, CSS & HTML5", Forth edition, Published by O'Reilly Media, December 2014.

REFERENCE BOOKS

1. Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, "Beginning PHP5, Apache, and MySQL Web Development", Published by Wiley Publishing, Inc., 2005.
2. Tim Converse and Joyce Park with Clark Morgan, "PHP5 and MySQL Bible", Published by Wiley Publishing, Inc., 2004.

Core Course-XXXI-17PCAP11-LAB-XI BIG DATA ANALYTICS LAB

Credits:2

Course Objectives:

- To make the students to write programs using Mapreduce, MangoDB, Cassandra, Hive and Pig

1. Study on files manipulation and directories handling in HDFS
2. Write a Mapreduce program using single reduce function for finding Maximum and Minimum Number.
3. Write a Mapreduce program using multiple reduce function for Word Count in an given Text Document
4. Write a Mapreduce program using multiple reduce function for Matrix Multiplication
5. Consider a table Student(StudID, StudName, Grade, DOB, Hobbies, Address). Using MongoDB , perform all possible Methods, Array, Aggregate function, MapReduce Function, Indexing and Import and Export.
6. Perform all possible Operations, Methods, and Functions using Cassandra.
7. Perform all possible Operations, Methods, and Functions using Hive.
8. Perform all possible Relational Operators, Eval Functions, Complex Data types, User Defined Functions, Advanced Relational Operations using Pig.
9. Perform Word Count using Pig.
10. Prepare JasperReport for Student Information.

Core Course-XXXII-17PCAP12-LAB-XII .NET LAB

Credits:2

Course objective:

- To gain the ability to implement programs in VB.NET, C#.NET and ASP. NET

Write programs to implement the following:

VB. NET

1. Create a simple console application.
    a. Reverse the given number, sum of digits of a given number, solving quadratic equation
    b. Use branching and looping statement - Eg. series generation, pattern generation
2. Arrays and procedures (Eg. sorting, finding maximum and minimum, matrix manipulation, binomial coefficient and function overloading)
3. Using classes and objects.
    a. Create a new class library and add methods and properties. Create a windows application using these classes.
    b. Create a new class library and add methods and properties. Create a console application using these classes - students mark list processing.
4. Create a windows application to validate the marks.
5. Create a database application to read, update and delete records in a database.

C#. NET

1. Create a console application to perform
    a. Armstrong number b. Generate a Fibonacci series
    c. Pattern generation d. Searching
2. Create a windows based application to implement a simple calculator.
3. Inheritance
4. Create a database application to maintain faculty information.

ASP. NET

Create Web application using

a. Web controls (eg. Loan calculator, currency convertor)
b. AdRotator control.
c. Calendar control (Displaying vacation messages in a calendar, Finding difference between two calendar dates etc.)
d. Validation control (registration form)
e. Displaying records from a database based on the query in the textbox.(Eg. Displaying the balance based on account number, Displaying products based on the product category)

Examples for Pattern:

N=4	N= 4	N =4	N=4 hello
1	4	1	h
12	43	1 2 1	e l l
123	432	1 2 3 2 1	o h e l l
1234	4321	1 2 3 4 3 2 1	o h e l l o h

Core Course-XXXIII-17PCAP13-LAB-XIII SOFTWARE DEVELOPMENT LAB

Credits:2

Course Objectives:

- To plan, analyze, design and implement a software project done within a stipulated period of time.

The students are expected to submit a software development report by collecting information within the College/Departments or nearby organizations to design an application software or system software or entertainment software. The project report may contain the following:

1. Introduction
2. Data Collection / system study
3. System development
4. Implementation
   - Source code
   - Sample Input
   - Sample Output
5. Conclusion

Elective Course-III-17PCAE_ _

Credits:4

Elective Course-III-17PCAE09 IMAGE PROCESSING

Course Objectives:

- To develop a theoretical foundation for fundamental concepts of digital image processing
- To understand the mathematical background for image representation, pre-processing, segmentation, object recognition and image compression

UNIT - I

Introduction: Digital Image Processing – Fields that Use Digital Image Processing – Fundamental Steps in Digital Image Processing – Components of an Image processing System – **Digital Image Fundamentals:** Elements of Visual Perception – Light and Electro Magnetic Spectrum – Image sensing and Acquisition – Image Sampling and Quantization – Some Basic Relationships between Pixels.

UNIT - II

The Image and Mathematical Background: Overview – Linear Integral Transforms. **Data Structures for Image Analysis:** Level of Image Data Representation – Traditional Image Data Structures – Hierarchical Data structures. **Image Pre-processing**: Pixel Brightness Transformations - Geometric transformations – **Local pre-processing**: Image smoothing, Edge Detectors – Image Restoration.

UNIT - III

Segmentation : Thresholding – Edge Based Segmentation : Edge Image Thresholding, Border tracing - Region Based Segmentation – Matching – Mean Shift Segmentation – Active Contour Models- Snakes – Fuzzy Connectivity **Shape Representation and Description:** Region Identification – Contour Based Shape Representation and Description-Chain codes, Simple Geometric Border Representation - Region Based Shape Representation and Description

UNIT - IV

Object recognition: Knowledge Representation – Statistical Pattern Recognition – Neural Nets – Fuzzy Systems- Mathematical Morphology – Basic Morphological concepts – Binary Dilation and Erosion.

UNIT - V

Image Data Compression: Image Data Properties – Discrete Image Transforms in Image Data Compression – Predictive Compression Methods – Vector Quantization – Hierarchal and Progressive Compression Methods – Comparison of Compression Methods – Coding – JPEG Image Compression.

TEXT BOOKS

1. Rafael C. Gonzalez, Richard E.Woods, "Digital Image Processing," Prentice Hall, Third Edition, 2008.
2. Sonka, Hlavac, Boyle, "Digital Image Processing and Computer Vision," Cengage Learning, 2009

REFERENCE BOOKS

1. Anil.K.Jain, "Fundamentals of Digital Image Processing," Prentice-Hall, 1989.
2. Chanda and Majumdar, "Digital Image Processing and Analysis," Second Edition, Prentice Hall, 2011.

Elective Course-III-17PCAE10 EMBEDDED SYSTEMS

Course Objectives:

- To understand about Embedded processor Modeling , Bus Communication in processors, Input/output interfacing
- To know about processor scheduling algorithms, and Real time operating system

UNIT - I

Introduction to Embedded System: Embedded Systems – Processor Embedded into a System – Embedded Hardware Units and devices in a system – Embedded Software in a System – Examples of Embedded Systems.

UNIT - II

Advanced Processor Architecture and Memory Organization: Introduction to advanced Architectures – Processor and Memory organization. Devices and Communication Buses for Device Networks: I/O Types and Examples – Timer and Counting Devices – Serial bus Communication and Parallel bus Communication protocols. **Device Drivers and Interrupts Service Mechanism:** ISR concept – Interrupt Servicing (Handling) Mechanism – Context and the periods for context switching, Interrupt Latency and Deadline- Direct Memory Access –Device driver programming.

UNIT - III

Programming Concepts and Embedded Programming in C and C++ and Java: Software Programming in Assembly Language (ALP) and in High Level Language 'C' – Embedded Programming in C++ - Embedded Programming in Java – Inter-Process Communication and Synchronization of Processes, **Threads and Tasks**: Multiple Processes in an Application - Multiple Threads in an Application– Tasks- Shared Data - Inter Process Communication.

UNIT - IV

Real Time Operating Systems: Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls- - RTOS Task Scheduling Models, Interrupt Latency and Response Time of the Tasks as Performance Metrics - OS Security Issues-**RTOS Programming I**: Basic functions and types of RTOS . **RTOS Programming II**: Linux 2.6.x and RTLinux.

UNIT - V

Design Examples and Case study: Case Study of an Embedded System for a Smart Card. **Embedded Software Development Process and Tools**: Introduction to Embedded Software Development Process and Tools – Host and Target Machines - Linking and Locating Software - Getting Embedded Software into the Target System - Issues in Hardware - Software Design and Co-design.

TEXT BOOK

1. Raj Kamal, "Embedded Systems – Architecture, Programming and Design", 2nd Edition, Tata McGraw-Hill, , 2008

REFERENCE BOOKS

1. David E. Simson, "An Embedded Software Primer," Addisons-Wesley, 2001.
2. Steve Heath, Embedded Systems Design, Elsevier, 2003.
3. Frank Vahid and Tony Givargis, "Embedded System Design," John Wiley And Sons, Inc, 2002.

Elective Course-III-17PCAE11 SOCIAL COMPUTING

Course Objectives:

- Understand the important features of social computing
- Learn to analyze the data left behind in social media

UNIT - I

Mining Twitter: twitter in all the rage – Exploring Twitter's API, Analyzing the 140 characters. **Mining Facebook**: Exploring Facebook's social Graph API – Analyzing social graph connections. **Mining Google+:** Exploring the Google+ API. **Mining web pages**: Scraping, Parsing and crawling the Web.

UNIT - II

Analyzing the social web: Nodes, Edges and Network Measures, Basics of network structure, Representing networks, Basic Network structures and properties– Network Structure and Measures, Describing nodes and edges, Describing networks. Entity Resolution and Link Prediction.

UNIT - III

Community Maintained Resources, Supporting technologies for community maintained resources, User motivations-Location based social interaction , location technology, mobile location sharing- Social Information Sharing and social filtering, Automated recommender system – Social Media in the public sector, Analyzing public sector social media.

UNIT - IV

Random walks in social networks and their applications a survey: Random walks on Graphs : Background – **Related work**: Algorithms , Applications , Evaluation and datasets. **A survey of link prediction in social networks**: Feature based link prediction, Bayesian probabilistic models. **Privacy in social networks**: Privacy breaches in social networks.

UNIT - V

Visualizing social networks: A Taxonomy of visualizations – The convergence of Visualization, Interaction and Analytics. Data mining in social media – Text mining in social networks – Integrating sensors and social networks – Multimedia information networks.

TEXT BOOKS

1. Matthew A. Russell, "Mining the Social Web: Data Mining Facebook, Twitter, Linkedin, Google+, Github, and More," 2nd Edition, O'Reilly Media, 2013.
2. Jennifer Golbeck, "Analyzing the social web," Morgan Kaufmann, 2013.
3. Charu Aggarwal (ed.), "Social Network Data Analytics," Springer, 2011.

REFERENCE BOOKS

1. Tina Yesayan, "Social Networking: A Guide to Strengthening Civil Society Through Social Media(SMGuide4CSO)," U S Agency for International Development, 2014.
2. Subhasish Dasgupta, "Social Computing: Concepts, Methodologies, Tools, and Applications," Information Science Reference, Hershey, New York, 2010.
3. Todd Kelsey, "Social Networking Spaces: From Facebook to Twitter and Everything in Between," Apress the experts voice, 2010.
4. Parongama Sen, Bikas K. Chakrabarti, "Sociophysics: An Introduction, "Oxford University press, 2014.
5. Liu, Huan, Salerno, John, Young, Michael J. (Eds.), "Social Computing, Behavioral Modeling, and Prediction," Springer, 2008.
6. Davina Rungen, "Web 2.0 and Social Computing," Lambert Academic Publishing, 2011.

Elective Course-III-17PCAE12 ENTERPRISE RESOURCE PLANNING

Course Objectives:

- To learn the fundamental concepts of ERP systems, architecture and their services
- To develop the skill for planning, implementation and managing ERP projects

UNIT - I

Introduction: Definition – Functional modules – Evolution of ERP systems – Characteristics – Process Integration – Benefits of ERP application – Technology in ERP systems – Implementation costs – Implementation challenges – Facts about Implementations – ERP Implementation in India – **ERP Market and Vendors**: ERP Market – Vendors – Service oriented on Architecture – ERP Package feature – ERP Packages.

UNIT - II

Extended ERP Services: Definition – SCM and ERP – ERP and BI – ERP and E-Commerce – Business Process – **Re-engineering and ERP**: Definition of ERP – Enterprise Redesign Principles - BPR Vs Total Quality – BPR and change management – Implementation approaches – Implementation methodology – Role of IT in BPR – BPR and ERP systems – BPR Success / Failure factors – BPR Implementation cases.

UNIT - III

Planning for ERP: Planning for Implementation – Organizational Requirements –Economic and strategic justification – Analyzing Project scope and Broad implementation approach – Determining resources – Top management commitment – Realizing the commitment – Matching with right ERP systems – Creating a budget – Selecting the right ERP package –

Organization preparation – **Implementation of ERP**: Design – Approaches –Lifecycle – Examples.

UNIT - IV

Managing ERP Projects: Risk/Failure factors – Examples of ERP failure – Implementation risks – Management and Complexity of ERP Projects – Training users –Evaluating ERP projects. **Going Live and Post implementation**: Preparing to GO Live – Strategies for migration to new ERP systems – GO Live performance surprises – Managing after GO Live – Maintenance of ERP systems.

UNIT - V

Expanding ERP boundaries: Service oriented architecture – Enterprise Application Integration – Application service provider model. **Case studies**: Manufacturing Industries – Service Industries – Governmental Organizations

TEXT BOOK

1. Ashim Raj Singla, "Enterprise Resource Planning", Cengage Learning India Pvt Ltd, New Delhi 2008.

REFERENCE BOOK

1. Leon Alexis, "Enterprise Resource Planning", Tata McGraw Hill, New Delhi, 1999.

Elective Course-IV-17PCAE_ _

Credits:4

Elective Course-IV-17PCAE13 GRID COMPUTING

Course Objectives:

- To understand how grid computing helps in solving large scale scientific problems.
- To learn program concepts of grid and cloud.
- Understand the security issues in grid and cloud environment.

UNIT - I

Introduction to Grid Computing: Grid Computing Concept, History of Distributed Computing Computational Grid Applications, Grid Computing Infrastructure Development, Grid Computing Software Interface. **Job Submission:** Introduction, Globus Job Submission. Transferring Files

UNIT - II

Schedulers: Scheduler Features, Scheduler Examples, Grid Computing Meta-Schedule Distributed Resource Management Application (DRMAA).

UNIT - III

Security Concepts: Introduction, Symmetric Key Cryptography, Asymmetric Key Cryptography (Public Key Cryptography), Public Key Infrastructure. Systems/Protocols Using Security Mechanisms **Grid Security:** Introduction, Grid Security Infrastructure (GSI). Delegation, Higher Level Authorization Tools.

UNIT - IV

System Infrastructure I: Web Services: Service-Oriented Architecture, Web Services and Service Implementation. **System Infrastructure II:** Grid Computing Services: Grid Computing and Standardization Bodies Interacting Grid Computing Components, Open Grid

Services Architecture (OGSA), WSRF, User-Friendly Interfaces: Introduction Grid Computing Workflow Editors, Grid Portals

UNIT - V

User-Friendly Interfaces: Introduction-Grid Computing Workflow Editors-Grid Portals **Grid-Enabling Applications:** Introduction, Parameter Sweep, Using an Existing Program on Multiple Grid Computers, Writing an Application Specifically for a Grid, Using Multiple Grid Computers to Solve a Single Problem.

TEXT BOOK

1. Barry Wilkinson, "Grid Computing Techniques and Applications", CRC Press, 2010

REFERENCE BOOKS

1. Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
2. Frederic Magoules, Jie Pan, Kiat-An Tan, Abhinit Kumar, "Introduction to Grid Computing", CRC Press, 2009.

Elective Course-IV-17PCAE14 INTERNET OF THINGS

Course Objectives:

- To understand the technology behind Internet of Things
- To get familiar with the design principles of connected devices
- To know about various business models and ethics in Internet of Things

UNIT – I

The Internet of Things: An Overview –The Internet of Things – The Technology of the Internet of Things - Enhanced objects. **Design Principles for Connected Devices**: Calm and Ambient Technology – metaphor – Privacy – Web thinking for connected Devices.

UNIT – II

Internet Principles: Internet Communications overview – IP – TCP – TCP/IP – UDP. IP Addresses: DNS – Static and Dynamic IP Address Assignment – MAC Addresses – TCP and UDP Ports – Application Layer Protocols. **Prototyping:** Sketching – Familiarity – Prototypes and Production – Open Source versus Closed Source.

UNIT – III

Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. **Prototyping the Physical Design:** Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.

UNIT – IV

Prototyping Online Components: API - Writing a New API - Real-Time Reactions - Other Protocols. **Techniques for Writing Embedded Code:** Memory Management - Performance and Battery Life – Libraries - Debugging.

UNIT – V

Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. **Moving to Manufacture:** Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. **Ethics:** Privacy – Control – Environment – Solutions.

TEXT BOOK

1. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014.

REFERENCE BOOKS

1. Ovidiu Vermesan and Peter Friess, “Internet of Things – From Research and Innovation to Market Deployment” , River Publishers, 2014.
2. Peter Waher, “Learning Internet of Things”, Packt Publishing, 2015.
3. Donald Norris, “The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black”,McGraw Hill, 2015.

Elective Course-IV-17PCAE15 CYBER SECURITY

Course Objectives:

- To Learn the Basics of Cyber Security.
- To Know the Security Policies and cyber management issues.

UNIT - I

Introduction: Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration - Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E-commerce – Counter Measures - Challenges.

UNIT - II

Cyber Security Objectives and Guidance: Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E-Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project – Cyber Security Management– Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.

UNIT - III

Cyber Security Policy Catalog: Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging - Cyber User Issues-Malvertising - Impersonation – Appropriate Use – Cyber Crime – Geolocation – Privacy-Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare.

UNIT - IV

Cyber Management Issues: Fiduciary Responsibility – Risk Management – Professional Certification – Supply Chain – Security Principles – Research and Development – Cyber Infrastructure Issue – Banking and finance – Health care – Industrial Control systems.

UNIT - V

Case Study: A Government’s Approach to Cyber Security Policy.

TEXT BOOK

1. Jennifer L, Bayuk J, Heale P, Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss “Cyber Security Policy Guidebook”, John Wiley & Sons, 2012.

REFERENCE BOOKS

1. Rick Howard, “Cyber Security Essentials”, Auerbach Publications, 2011.

2. Richard A, Clarke, Robert Knake, “Cyber war: The Next Threat to National Security & What to Do About It”, Ecco, 2010.
3. Dan Shoemaker, “Cyber security The Essential Body Of Knowledge”, First Edition, Cengage Learning, 2011.

Elective Course-IV-17PCAE16 WIRELESS APPLICATION PROTOCOLS

Course Objectives:

- To learn the Mobile Concepts
- To know the Wireless Markup Language and its Applications

UNIT - I

The Rise of Mobile Data - Market Convergence Enabling Convergence – Key Services for the Mobile Internet - Overview of the Wireless Application Protocol - The Origins of WAP – Overview of the WAP Architecture – Components of the WAP Standard – Network Infrastructure Services Supporting WAP Clients – WAP Architecture Design Principles – Relationship to Other Standards.

UNIT - II

The Wireless Markup Language - Overview – The WML Document Model – WML Authoring – URLs Identify Content – Markup Basics – WML – Basics – Basic Content – Events, Tasks and Bindings.

UNIT - III

Variables – Controls – Miscellaneous Markup – Sending Information – Application Security – Other Data - The Meta Element – Document Type Declarations – Errors and Browser Limitations – Content Generation – WML Version Negotiation.

UNIT - IV

User Interface Design - Making Wireless Applications - Easy to Use - Web Site Design - Computer Terminals Vs Mobile Terminals – Designing a Usable WAP Site – Structured Usability Methods – User Interface Design Guidelines – Design Guidelines for Selected WML Elements.

UNIT - V

Wireless Telephony Applications - Overview of the WTA Architecture – WTA Client Framework – WTA Server & Security – Design Considerations – Application Creation Toolbox – Future WTA Enhancements. The Mobile Internet Future: Better Content, Easier Access – Beyond Browsing – Beyond Cellular – Mobile Data Unleashed.

TEXT BOOK

1. Sandeep Singhal, Thomas Bridgman, Lalitha Suryanarayana, Daniel Mauney, Jari Alvinen, David Bevis, Jim Chan, Stefan Hild, “The Wireless Application Protocol”, Pearson Education,2007.

REFERENCE BOOKS

1. Sandeep Singal et al. “WAP writing applications for Mobile Internet”, Pearson Education 2001.
2. Data Bubrook, “WAP: A beginner’s guide”, Tata McGraw Hill 2001.

SEMESTER-VI

Core Course-XXXIV-17PCAPR1 PROJECT WORK AND VIVA-VOCE

Credits:15

The students are expected to do their dissertation for one full semester by attaching themselves with a well reputed organization/research institution and should submit the filled in format as given in Annexure-I to the department for approval of their Guide during the First Week of December. Periodically the project should be reviewed. The three copies of the project report should be submitted as per the format provided in Annexure II. Format of the Title page and Certificate are enclosed in Annexure III

EXTRA DISCIPLINARY PAPERS
COMPUTER SCIENCE

List of **Extra Disciplinary Courses** (Non-Major Electives) offered by the Department of Computer Science/Applications for other PG programmes

EDC-17PCSED1 - PRINCIPLES OF INFORMATION TECHNOLOGY

Credits: 4

UNIT - I

Business Environment: Business and Information technology – business in the information age – about information technology – what is an information system – Information Technology in the Modern Organization.

UNIT - II

Computer Hardware – Significance of Hardware – Central Processing Unit – Computer Memory – Computer Hierarchy – Input Technologies – Output Technologies – Strategic Hardware issues. Computer Software: Software History and Significance – System Software – Application Software – Software issues – Programming languages – Enterprise Software.

UNIT - III

Managing Organizational Data and Information: Basics of Data arrangement and Access – Traditional file environment – modern approach: database management systems – logical data models – data warehouses – Telecommunications and Networks: The telecommunication system – Networks – Telecommunications applications – Internet- Evolution of the Internet – Operation of the Internet – WWW- Intranets and Extranets.

UNIT-IV

Functional, Enterprises, and Interorganizational Systems: Information system to support business functions – transaction processing information systems – accounting and finance system – marketing and sales system – production and operations management system – Integrated information system and enterprises resource planning – interorganizational / Global information system. - Electronic Commerce

UNIT-V

Information Systems Development: Information system planning – Traditional systems development life cycle – alternative methods for system development –system development outside the IS department – building Internet and Intranet applications – Implementing: Ethics, Impacts and Security.

TEXT BOOK

1. Turban, Rainer, Potter "Introduction to Information Technology," Second edition, Wiley India, 2007.

REFERENCE BOOK

1. V. Rajaraman, “Introduction to Information Technology,” Prentice Hall of India, 2007

EDC-17PCSED2 - FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS

Credits: 4

UNIT - I

Introduction: What is computer – Components of Computers – Advantages and Disadvantages of using computers – Computer Software – Categories of Computers - Elements of an information Systems. The Components of the Systems Unit: Processor – Data representation – Memory – Expansion Slot and Adapter Cards – Ports and Connectors - Buses – Bays – Power Supply – Mobile Computers and Devices.

UNIT – II

Input and Output Device: What is input - what are input devices – keyboard –pointing device – mouse – other pointing devices – controllers for gaming and media players – Voice input – Input for PDAs, Smart phones and Tablet Pcs- Digital Cameras – Video input – Scanners and Reading devices Terminals – Biometric input - Input devices for physically challenged users- Output: What is output – display devices – Flat panel displays – CRT monitors – Printers – Speakers, Headphones and Ear phones – other out put devices – output device for physically challenged users – Storage devices.

UNIT-III

Operating Systems and Utility Programs: System software – Operating system – Operating system functions – operating system utility programs – types of operating systems – stand alone operating systems – network operating systems – embedded operating system – Standalone utility programs. Application Software: Application software – Business software – Graphics and Multimedia Software – Application software for Communication.

Unit-IV

Internet and World Wide Web: Internet – History of the Internet – How the Internet works – WWW – E-commerce – Other Internet Services – Netiquette. Communications and Networks: Communications – Uses of Computer Communications – Networks – Network communication standards – Communication software – Communication over the telephone network – Communication devices – Home networks – Communications Channel – Physical transmission media and Wireless transmission media.

Unit-V

Database Management: Databases, Data and Information, The Hierarchy of data – Maintaining data – File processing versus databases – database management systems – relational, object oriented and multidimensional databases – web databases – database administration. Computer Security : Computer security risks – Internet and network attacks – Unauthorized access and use.

TEXT BOOK

1. Gary B. Shelly, Thomas j. Cashman, Misty E.Vermaat, "Introduction to Computers," Cengage Learning, 2008

REFERENCE BOOKS

1. Reema Thareja, “Fundamentals of Computers,” Oxford Univ. Press, 2015
2. Deborah Morley, Charles S. Parker, “Understanding Computers- Today and Tomorrow”, 14th Edition, Thomson Course Technology, 2012
3. Alexis Leon, Mathew’s Leon, “Fundamentals of Computer Science and Communication Engineering”, Vikas Publishing House, New Delhi, 1998.

EDC-17PCSED3 - E-COMMERCE

Credits: 4

UNIT - I

Electronic Commerce- Electronic Commerce Framework-The Anatomy of Electronic Commerce Applications- Electronic Commerce Consumer Applications- Electronic Commerce Organization Applications- Components of I-Way – Network Access Equipment.

UNIT - II

Architecture Framework for Electronic Commerce- World Wide Web as the Architecture – Consumer Oriented Applications – Mercantile Process Models – Mercantile Models from the Consumer's Perspective and Merchant's Perspective.

UNIT - III

Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems – Smart Card and Credit Card Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems.

UNIT - IV

Electronic Data Interchange – EDI Applications in Business – EDI: Legal, Security and Privacy issues EDI and Electronic Commerce – Standardization and EDI – EDI Software Implementation.

UNIT – V

Internet and World Wide Web: origin of the Internet – New uses for the Internet – Commerical use of the Internet – Growth of the Internet- Advertising on the Internet.

TEXT BOOKS:

1. Kalakota and Whinston, "Frontiers of Electronic Commerce," Pearson Education, 2004.
2. Gray P. Scheider, "Fourth Annual Edition Electronic Commerce," Thomson Course Technology, 2003.

REFERENCE BOOKS:

1. Kamalesh K. Baja, Debjani Nag, "E-Commerce – The Cutting Edge of Businesss," TMH Publications, 2005.
2. Agarwala, K.N, Deeksha Agarwala, "Business on the Net: What's and How's of E-Commerce;" Macmillan, New Delhi.
3. Parag Diwan, Sunil Sharma, "Electronic Commerce: A Manager's Guide to E-Business," Excel books, 2005.