PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM 638 011

MASTER OF SCIENCE IN COMPUTER SCIENCE

(M.Sc Computer Science)

SEMESTER PATTERN

Under Choice Based Credit System

REGULATIONS AND SYLLABUS

FOR AFFILIATED COLLEGES

(Effective from the Academic year 2017-2018 onwards)

1. OBJECTIVE OF THE COURSE

To Develop the Post Graduate in Computer Science with strong knowledge of theoretical computer science and who can be employed in research and development units of industries and academic institutions.

2. CONDITION FOR ADMISSION

A candidate who has passed in B.Sc Computer Science / B.C.A / B.Sc Computer Technology / B.Sc Information Science / B.Sc Information Technology degree of this University or any of the degree of any other University accepted by the syndicate as equivalent thereto subject to such conditions as may be prescribed therefore shall be permitted to appear and qualify for the M. Sc Computer Science degree examination of this University after a course of study of two academic years.

3. DURATION OF THE COURSE

The programme for the degree of Master of Science in Computer Science shall consist of two Academic years divided into four 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.Sc., (Computer Science) 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)	CIA	EA	Total
Semester-I						
Core Course-I-17PCS01- Design and Analysis of Algorithms	4	4	3	25	75	100
Core Course-II-17PCS02- Advanced Computer Architecture	4	4	3	25	75	100
Core Course-III-17PCS03- Advanced Java Programming	4	4	3	25	75	100
Core Course-IV-17PCS04- Principles of Programming Languages	4	4	3	25	75	100
Core Course-V-17PCS05- Advanced Operating Systems	4	4	3	25	75	100
Core Course-VI - 17PCSP01- Lab – I - Advanced Java Programming Lab	2	5	3	40	60	100
Core Course-VII- 17PCSP02- Lab - II Algorithms Using C++ Lab	2	5	3	40	60	100
Semester-II						
Core Course-VIII-17PCS06- .NET Programming	4	4	3	25	75	100
Core Course-IX - 17PCS07- Discrete Structures	4	4	3	25	75	100
Core Course-X-17PCS08- Data Mining Techniques	4	4	3	25	75	100
Elective Course I - 17PCSE_ _	4	4	3	25	75	100
EDC –I	4	4	3	25	75	100
Core Course-XI-17PCSP03- Lab – III .Net Programming Lab	2	4	3	40	60	100
Core Course-XII-17PCSP04- Lab – IV Data Mining Lab	2	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-III						
Core Course-XIII-17PCS09- Open Source Computing	4	4	3	25	75	100
Core Course-XIV-17PCS10- Network Security and Cryptography	4	4	3	25	75	100
Core Course-XV-17PCS11- Mobile Computing	4	4	3	25	75	100
Core Course-XVI-17PCS12 - Digital Image Processing	4	4	3	25	75	100
Elective Course II - 17PCSE_ _	4	4	3	25	75	100
Core Course-XVII -17PCSP05 - Lab – V - Python Programming Lab	2	5	3	40	60	100
Core Course-XVIII-17PCSP06-Lab - VI - Mobile Application Development Lab	2	5	3	40	60	100
Semester-IV						
Elective Course III - 17PCSE _ _	4	5	3	25	75	100
Elective Course IV - 17PCSE _ _	4	5	3	25	75	100
Core Course-XIX-17PCSPR1 Project Work and Viva-Voce	10	-	-	50	150	200
Total Core EDC Elective Human Rights	70 04 16 -			590 25 100 25*	1410 75 300 75*	2000 100 400 100*
Grand Total	90			715	1785	2500

* Human Rights mark is excluded   for aggregation

Electives
Elective Course -I

Course 17PCSE01 Theory of Automata
Course 17PCSE02 Compiler Design
Course 17PCSE03 Embedded System
Course 17PCSE04 E–Technologies

Elective Course -II

Course 17PCSE05 Soft Computing
Course 17PCSE06 Internet of Things
Course 17PCSE07 Object Oriented Analysis and Design
Course 17PCSE08 Reso urce Management Techniques

Elective Course -III

Course 17PCSE09 Cyber Security
Course 17PCSE10 Cloud Computing
Course 17PCSE11 Big Data Analytics
Course 17PCSE12 Social Computing

Elective Course -IV

Course 17PCSE13 Artificial Intelligence
Course 17PCSE14 Web Technologies
Course 17PCSE15 Software Engineering
Course 17PCSE16 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
6.1THEORY
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 fourth semester.
- The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the First Week of December.
- Periodically the project should be reviewed.
- The Student should submit three copies of their Project work.
- 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 two 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 M.Sc., Computer Science 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.

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]

CONTENTS
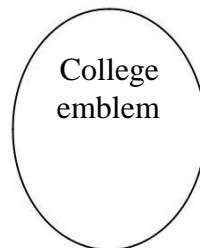
A. Format of the title page

<div align="center">

TITLE OF THE PROJECT WORK

A Project Work submitted in partial fulfillment of

the requirements for the degree of

Master of Science in Computer Science

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

</div>

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 Science in

Computer Sciences 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

Core Course-I-17PCS01 DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 4

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 Analy sis of Algorithm Efficiency – Analysis Frame Work – Asymptotic Notations and Basic Efficie ncy Classes – Mathematical Analysis of Non-recursive Algorithms – Non-recursive Solutio n to the Matrix Multiplication – Mathematical Analysis of Recursive Algorithms – Rec ursive Solution to the Tower of Hanoi Puzzle.

UNIT-II

Divide and Conquer: Merge sort – Quick sort – Binar y Search – Binary Tree Traversals – Multiplication of Large Integers – Strassen's Matri x Multiplication – Closest Pair and Convex Hull Problems – Greedy Technique: Prim's Alg orithm – Kruskal's Algorithm – Dijkstra's Algorithm.

UNIT-III

Dynamic Programming: Computing a Binomial Coefficient – Warshall's and Floyd's Algorithms – Warshall's Algorithm – Floyd's Algorit hm for the All-Pairs Shortest-Paths Problem – Optimal Binary Search Trees – The Knapsac k Problem and Memory Functions.

UNIT-IV

Backtracking: N-Queens Problem – Hamiltonian Circui t Problem – Subset Sum Problem – Branch and Bound: Assignment Problem – Knapsack Pro blem – Travelling Salesman Problem.

UNIT-V

P, NP and NP-Complete Problems – Approximation Algo rithms for NP-Hard Problems – Approximation Algorithms for the Travelling Salesman Problem – Approximation Algorithms for the Knapsack Problem.

TEXT BOOK
1. Anany Levitin, "Introduction to the Design and Anal ysis of Algorithms", Pearson Education, 2008.

REFERENCE BOOKS
1. S.K. Basu, "Design Methods and Analysis of Algorith ms", Prentice Hall, 2005.
2. E.Horowitz, S.Sahni and Sanguthevar Rajasekaran, "F undamentals of Computer Algorithms", 2 nd Edition, Universities Press, 1998.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, "Introduction to Algorithms", Prentice Hall 1990.

Core Course-II-17PCS02 ADVANCED COMPUTER ARCHITECTURE

Credits: 4

Course Objectives:
- To study parallel computer architecture, design and micro-operations
- To understand the interconnection networks and synchronization mechanism

UNIT-I

Evolution of Computer systems – Parallelism in Unip rocessor Systems: Architecture, Mechanisms – Parallel Computer Structures: Pipeline , Array, Multiprocessor.

UNIT - II

Linear Pipeline processors: Asynchronous and Synchronous Models – Non-linear Pipeline Processors: Reservation and Latency Analysis – Coll ision-free scheduling – Instruction Pipeline Design: Instruction Execution Phases – Mechanisms f or Instruction Pipelining – Arithmetic Pipeline Design: Computer Arithmetic Principles – S tatic Arithmetic Pipelines – Multifunctional Arithmetic Pipelines - Superscalar Pipeline Design.

UNIT- III

SIMD Array Processor – SIMD Interconnection Network : Static vs Dynamic Network – Mesh connection Illiac Network- Tube interconnection Network. Associative Array Processing: Associative memory organisation.

UNIT - IV

Multiprocessor System Interconnects : Hierarchical Bus System - Crossbar Switch and Multiport Memory - Multistage and Combining Networks – Cache Coherence and Synchronization Mechanisms: The Cache Coherence Problem – Snoopy Bus Protocols – Directory-Based Protocols – Hardware Synchronizatio n Mechanisms – Message-Passing Mechanisms: Message-Routing Schemes – Deadlock and Virtual Channels – Flow Control Strategies – Multicast Routing Algorithms.

UNIT - V

Multiprocessor Operating Systems - Interprocessor Communication Mechanisms - Multiprocessor Scheduling Strategies.

TEXT BOOKS:

1. Kai Hwang, Faye A.Briggs, "Computer Architecture an d Parallel Processing," McGraw-Hill, 1985.
2. Kai Hwang, "Advanced Computer Architecture," McGraw -Hill International Editions, 2001.

REFERENCE BOOKS:

1. Grama, "An Introduction to Parallel Computing: Design and Analysis of Algorithms," 2nd Edition, Pearson, 2004.
2. Gita Alaghband, Harry Frederick Jordan, "Fundamentals of Parallel Processing," Prentice Hall, 2003.
3. Seyed H Roosta, "Parallel Processing and Parallel Algorithms: Theory and Computation," Springer Science & Business Madia, 1999

Core Course-III-17PCS03 ADVANCED JAVA PROGRAMMING

Credits: 4

Course Objectives:

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

UNIT – I

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 Inet6Address-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 – II

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 – III

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 – IV

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.

UNIT – V

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. Herbert Schildt, "The Complete Reference – JAVA," 7 th Edition, TMH,2012
2. Deitel H.M. & Deitel P.J, "Java: How To Program," P rentice-Hall of India, 5th Edition, 2003.

3. Tom Valesky, "Enterprise JavaBeans – Developing com ponent based Distributed Applications," Pearson 2000.

REFERENCE BOOKS

1. C.Muthu, "Programming with Java," Vijay Nicole Impr ints Private Ltd., 2004
2. Cay.S. Horstmann, Gary Cornel, "Core Java 2 – Vol. II- Advanced Features," Pearson Education, 2004.
3. S.Gokila, "Advanced JAVA Programming," Vijay Nicole Imprints Private Ltd., 2014

Core Course-IV-17PCS04 PRINCIPLES OF PROGRAMMING LANGUAGES
Credits:4

Course Objectives:

- To introduce the programming paradigms and to understand the principles and techniques involved in design and implementation of different programming languages
- To introduce notations to describe syntax and semantics of programming languages

UNIT - I

Language Design Issues: History-Role of Programming languages - environments - Impact of machine Architectures - Language Translation Issues: Programming language Syntax- Stages in Translation - formal Translation models - recursive descent Parsing

UNIT - II

Modeling Language Properties: Formal Properties of Languages- Language Semantics-Elementary data Types: Properties of Types and Object- Scalar Data Types - Composite Data Types

UNIT - III

Encapsulation: Structure data types - Abstract data types - Encapsulation by sub programs
Type Definitions Inheritance: - Polymorphisms

UNIT -IV

Functional Programming: Programs as Functions- Functional Programming in an Imperative Language - LISP - Functional Programming with static typing - delayed evaluation-Mathematical functional programming- recursive functions and lambda calculus - Logic programming : Logic and Logic Programs - Horn Clauses - Prolog - Problems with logic programming

UNIT V

Formal Semantics: Sample small language - operational Semantics - Denotation Semantics - Axiomatic Semantics - Program correctness - Parallel Programming: Parallel Processing and programming languages - threads - Semaphore - monitors-message passing - parallelism Non Imperative Languages

TEXT BOOKS

1. Terrence W Pratt, Marvin V Zelkowitz, "Programming Languages - Design and Implementation," PHI Publications, 4 th edition, 2008
2. Kenneth C. Louden , "Programming Languages-Principl es and Practices," Cengage Learning Publications , 2 nd Edition, 2008

REFERENCE BOOK

1. Daniel P Friedman, Mitchell Wand, Christopher T Haynes, "Essentials of programming languages," 2 nd Edition, PHI Publishers, 2005

Core Course-V-17PCS05 ADVANCED OPERATING SYSTEMS

Credits: 4

Course Objectives:
- To study the concepts of synchronization mechanisms and deadlock models
- To learn the theoretical foundation of clock, mutual exclusion, deadlock detection, resource sharing and concurrency control in distributed environment

UNIT - I

Process Synchronization: Overview: Functions of an OS – Design approaches. Synchronization mechanisms: Concept of a process – concurrent process – Critical section problem – Other synchronization problems. Process D eadlocks: Preliminaries – Models of Deadlocks – Models of resources – A Graph theoretic model of a system state – Systems with only reusable Resources.

UNIT - II

Distributed Operating System: Communication networks – Communication primitives. Theoretical foundations: Inherent limitations – Lam port's logical clocks – Vector clocks — Termination detection. Distributed Mutual exclusion: Preliminaries – Non- Token based and Token Based Algorithms – Comparative Performance an alysis. Distributed Deadlock detection: Deadlock handling strategies – Control o rganization – Centralized and Distributed deadlock detection algorithm.

UNIT – III

Distributed Resource Management: Architecture – Mec hanisms – Design Issues – case studies – Distributed shared memory: Architecture – Algorithms – Memory coherence – Coherence protocols – Design Issues. Distributed sc heduling: Issues – components – Load-distributing algorithms – Performance Comparison.

UNIT - IV

Multiprocessor Operating Systems: Motivations – Bas ic Architectures – Interconnection Networks – Caching – MOS Structures – Design Issues – Threads – Process Synchronization – Processor Scheduling – Memory Management.

UNIT – V

Database Operating Systems: Introduction – Concurre ncy Control: Database Systems – Serializability Theory – Distributed database syste ms – Lock based and Timestamp based algorithm – Concurrency control algorithms.

TEXT BOOK

1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced Co ncepts in Operating Systems: Distributed, Database and Multiprocessor Operating Systems," TMH,2001.

REFERENCE BOOKS

1. Andrew S. Tanenbaum, "Modern Operating System," PHI , 2003.
2. Pradeep K.Sinha, "Distributed Operating System conc epts and Design," PHI, 2003

Core Course-VI-17PCSP01 LAB–I ADVANCED JAVA PROGRAM MING LAB

Credits: 2

Course Objective:

- To implement various Java concepts such as multi threading, exception and event handling etc., and write programs using AWT, Swing, JDBC, Servlets, JSP, and RMI

1. Implementation of Multi threading and Exception handling concepts
2. Write a program to read, write and copy a file using byte streams.
3. Write a program to read, write and copy a file using character streams.
4. Develop a programs using AWT to display the personal detail of an employee.
5. Develop a banking system using Swing.
6. Write a program to handle Mouse and Key events.
7. Implement TCP/IP protocol for message communication.
8. Implement UDP protocol for message communication.
9. Using JDBC develop a student information system.
10. Implement client/server communication using servlets.
11. Develop a web page using JSP.
12. Implementation of RMI.

Core Course-VII-17PCSP02 LAB-II ALGORITHMS USING C++ LAB

Credits: 2

Course Objective:

- To study about various designing paradigms of algorithms for solving real world problems and introduce the methods of designing and analyzing algorithms

1. Apply the Divide and Conquer technique to arrange a set of numbers using Merge Sort method.
2. Perform Strassen's matrix multiplication using Divide and Conquer method.
3. Solve the Knapsack problem using Dynamic Programming.
4. Construct a Minimum Spanning Tree using Greedy method.
5. Perform Warshall's Algorithm using Dynamic Programming.
6. Solve Dijkstra's Algorithm using Greedy Technique.
7. Solve Subset Sum problem using Backtracking
8. Implement the 8-Queens Problem using Backtracking.
9. Implement Knapsack Problem using Backtracking.
10. Find the solution of Traveling Salesperson Problem using Branch and Bound technique.

Core Course-VIII-17PCS06 .NET PROGRAMMING

Credits: 4

Course Objectives:
- To study the concepts of .NET framework
- To learn the programming concepts in visual basic.Net, ASP.Net web services, ADO.Net Data Access, and C#

UNIT – I

Microsoft .NET Framework: The .NET Framework classes –Common Language Runtime – Common Type system and Common Language specification – Visual studio .NET IDE. Visual Basic .NET – Visual Basic .NET IDE –Variable s – Data types – Constants – Arrays – Dynamic arrays – Controlling the flow – if statemen t – select case – Loops.

UNIT – II

Procedures: Modular coding, arguments – Structures- Collections: Advanced array, Array, list and hash table. Lists- sorted list. Creating custom class, adding methods and properties. Building Windows Applications – working with forms.

UNIT – III

Basic windows controls- common dialog controls- Rich text box control- Debugging and Error Handling: types of errors, Exceptions and structured exception handling – Accessing databases – Building Database applications with ADO .Net- ADO .Net objects.

UNIT – IV

ASP .NET – Introducing web developer tools – Introd uction to ASP .NET server Programming – Using variables and constants in web forms – Working with web objects to store data – Designing .NET web Applications –Progr amming with Visual Basic .NET – Advanced web controls – Managing data with ASP .NET

UNIT – V

C# Programming – Evolution of C# and .NET – Why C# - Elements of C# program – Programming Example – Data types and Expressions – Making decisions – Repeating Instructions – Arrays and Collection – Controls – P rogramming based on events – Database access with ADO .NET

TEXT BOOKS
1. Evangelos Petroutsos, "Mastering Visual Basic .NE T," BPB Publications, 2002
2. Barbara Doyle, "Programming in C#," Cengage Learni ng publications, 1st Edition, 2008
3. Kathleen Kalata , "Web Applications using ASP.NET 2.0 ," Cengage Learning publications, 2009.

REFERENCE BOOKS
1. C.Muthu, "VB.NET," Vijay Nicole Imprints Private Lt d., 2007
2. David Chappell, "Understanding .NET," Pearson educ ation, 2002
3. David.S.Platt, "Introducing Microsoft .Net," PHI, 2 003.
4. G.Andrw Duthie , "Microsoft ASP .NET Programming wi th Microsoft Visual C# .NET step by step," PHI, 2003.
5. George Shepherd, "Microsoft ASP .NET 3.5," PHI, New Delhi, 2008.
6. Steven Holzner, "Visual Basic .NET Programming," Bl ack Book, Dreamtech Press, 2005.

Core Course-IX-17PCS07 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 a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
* To be aware of the Combinatorics principles
* To be exposed to concepts and properties of graphs & trees.

UNIT - I

Mathematical Logic: Propositions – Connectives – Or der of Precedence for Logical Connectives – Conditional and Biconditional Proposi tions – Tautology and Contradiction – Equivalence of Propositions – Duality Law – Duality Theorem – Algebra of Propositions – Tautological Implication – Normal Forms – Disjuncti ve 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 o f Proof – Predicate Calculus or Predicate Logic – Quantifiers – Existential Quantifier – Nega tion 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 – Compo sition of Relations – Properties of Relations – Equivalence Classes – Partition of a Se t – Partitioning of a Set Induced by an Equivalence Relation. Functions: Representation of a Function – Types of Functions – Classification of Functions – Composition of Functi ons – Inverse of a Function – Binary and n-ary Operations – Properties of Binary Operations – Some Special Functions – Characteristic Function of a Set – Hashing Function s – Recursive Functions – Composition of Functions of Several Variables – Recursion – Pri mitive Recursive Function – Recursive Relations and Sets – Permutation Function.

UNIT - IV

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

UNIT - V

Graph Theory: Basic Definitions – Degree of a Verte x – Some Special Simple Graphs – Matrix Representation of Graphs – Paths, Cycles and Connectivity – Eulerian and Hamiltonian Graphs – Connectedness in Directed Grap hs – Shortest Path Algorithms – Trees

– Spanning Trees – Minimum Spanning Tree – Rooted a nd Binary Trees – Binary Tree –
Tree Traversal – Expression Trees.

TEXT BOOK

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

REFERENCE BOOKS

1. N.Chandrasekaran and M.Umaparvathi, "Discrete mathe matics", 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, 199 7.
3. T. Sengadir, "Discrete Mathematics and Combinatoric s", Pearson New Delhi 2009.
4. RakeshDube, AdeshPandeyRitu Gupta, "Discrete Struct ures and Automata Theory",
   Narosa publishing House New Delhi 2007.

Core Course-X-17PCS08 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 – The Need for Human Direction of Data Mining –
The Cross-Industry Standard Process for Data Mining – CRISP-DM: The Six Phases –
Fallacies of Data Mining – Tasks – Data Preprocessi ng: Data Cleaning – Handling Missing
Data – Identifying Misclassification – Graphical Me thods for Identifying Outliers – Measures
of Center and Spread – Data Transformation – Min-Ma x 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 –
Removing Variables that are not Useful – Variables   that Should Probably not be Removed –
Removal of Duplicate Records

UNIT - II

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

UNIT - III

Classification: Classification Task – k-Nearest Nei ghbor Algorithm: Distance Function –
Combination Function – Simple Unweighted Voting – W eighted 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 Using IBM/SPSS Modeler – Decision Tree **:** Requirements for Using Decision Trees – Classification and Regression Trees – C4.5 Algorithm – Decision Rules – Comparison of the C5.0 and CART Algorithms Applied to Real Data.

UNIT - IV

Clustering: The Clustering Task – Hierarchical Clus tering Methods – Single-Linkage Clustering – Complete-Linkage Clustering – k-Means Clustering – Example of k-Means Clustering at Work – Behavior of MSB, MSE, and Pseu do-F as the k-Means Algorithm Proceeds – Application of k-Means Clustering Usin g SAS Enterprise Miner – Using Cluster Membership to Predict Churn – Kohonen Networks **:** Self-Organizing Maps – Kohonen Networks – Example of a Kohonen Network Study – Clu ster Validity – Application of Clustering Using Kohonen Networks – Interpreting Th e Clusters – Cluster Profiles – Measuring Cluster Goodness: Rationale for Measuring Cluster Goodness – The Silhouette Method – Silhouette Example – Silhouette Analysis o f the IRIS Data Set – The Pseudo-F Statistic – Example of the Pseudo-F Statistic – Pse udo-F Statistic Applied to the IRIS Data Set – Cluster Validation – Cluster Validation Appli ed to the Loans Data Set.

UNIT - V

Association Rules: Affinity Analysis and Market Basket Analysis – Data Representation for Market Basket Analysis – Support, Confidence, Frequ ent Item sets, and the a Priori Property – Generating Frequent Item sets – Generating Associ ation 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 – Clustering and Principal Components analysis

TEXT BOOK
1. Daniel T. Larose, Chantal D. Larose, "Data mining a nd Predictive analytics", 2 [nd] Edition, Wiley Publication, 2015.

REFERENCE BOOKS
1. David L. Olson DursunDelen, "Advanced Data Mining T echniques," 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 Mi ning," Idea Group Publishing, 2005

Core Course-XI-17PCSP03 LAB–III .NET PROGRAMMING L AB

Credits: 2

Course objectives:
- To design/develop programs with GUI interfaces
- To write programs and develop interface using Visual Basic.Net

1. Create minimum two simple applications using controls. Eg: Calculator, Drawing Pictures using GDI, Animation and Trainer Kit.
2. Write a program to simulate MS – OFFICE word and Ex cel packages with minimum five features.
3. Develop a website using ADO.Net to implement online shopping with registration, login, product page (minimum 3 pages), and contact-us page. While clicking cart icon allow to modify and display final purchase details for check-out.
   Note: create menu for navigation and also maintain session that expires after inactive of 5 min.
4. Develop a website using ADO.Net to implement online Banking with login page, account details, deposit, withdraw, fund transfer and report of transaction with following options – last 10 days, last 1 month, last 6 month, last 1 year.
   Note: create menu for navigation and also maintain session that expires after inactive of 5 min.
5. Develop a web page to insert, update, delete student details using web service for accessing database.
6. Develop Console application.
   - i) Using Structure
   - ii) Using arrays
   - iii) Creating functions and Procedures
   - iv) Create a new class, add methods and properties.

Core Course-XII-17PCSP04 LAB-IV DATA MINING LAB

Credits: 2

Course Objectives:
- To make students able to write programs in R
- To learn the implementation concepts of data mining operations

Develop **R** Script 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 and Multi Linear Regression.
8. To perform K-Means clustering operation and visualize it.
9. To diagnose any disease using KNN classification.
10. To perform market basket analysis using Apriori algorithm.

17PHR01 - HUMAN RIGHTS
(Common Paper for all PG Programmes)   Credits:0

Elective Course -I-17PCSE _ _

Elective Course-I-17PCSE01 THEORY OF AUTOMATA
                                                        Credits: 4

Course Objectives:
- To introduce the concepts of automata theory and make the students to identify different formal language classes and their relationships
- To develop the skill to determine the decidability of computational problems

UNIT - I
Regular sets and finite state automata: Finite State Automata – Deterministic and Non-deterministic models – Languages accepted by Finite State Automata – Regular Expression - Pumping Lemma for regular set.

UNIT - II
Context free languages: Grammar – Context Free Gram mars – Derivation trees –
Simplification of context free grammar (only construction and no proof of equivalence of grammars) – Chomsky Normal Form – Greibach Normal F rom.

UNIT - III
Pushdown automata: Pushdown Automata – Pushdown Aut omata and Context Free Languages – Pumping lemma for Context Free Language s.

UNIT - IV
Turing machines and undecidability: Turing Machine model – Computational languages and functions – Modifications of Turing Machines (only descriptions, no proof for theorems on equivalence of the modifications). – Properties of recursive and recursively enumerable languages – Universal Turing Machines and the undec idable problems.

UNIT - V
The Chomsky hierarchy: Regular Grammar – Unrestrict ed Grammar – Context sensitive languages – Linear bounded Automata – Relation betw een classes of languages.

TEXT BOOK
1. Hopcroft,J.E. and Ullman, J.D. "Introduction to Automata Theory, Languages and Computation," Naraosa Publishing House, 2002.

REFERENCE BOOKS
1. S.P.Eugene Xavier, "Theory of Automata, Formal Languages and Computation," New Age International, 2004.
2. A.M.Natarajan, A.Tamilarasi, P.Balasubramani, "Theory of Computation," New Age International, 2003.

3. E.V.Krishnamurthy, "Introductory Theory of Computer Science," East-West Press Pvt. Ltd, 1983.
4. Bernard M. Moret, "The Theory of Computation," Pearson Education, 1998.

Elective Course-I-17PCSE02 COMPILER DESIGN

Credits: 4

Course Objectives:
- To develop a greater understanding of the issues involved in programming language design and implementation
- To learn basic principles and advanced techniques of compiler design
- To understand the theory and practice of compiler design

UNIT - I
Introduction: Compilers – Analysis of source program – Phases o f a compiler – cousins of compiler – Grouping of phases – compiler constructi on tools. **Lexical analysis**: Introduction – definition of lexical analyzer – Input Buffering – specification of Tokens – Recognition of tokens – Regular expression to NFA – Conversion of NFA to DFA – minimization of DFA – optimization of DFA from Regular Expression.

UNIT - II
Syntax Analysis: Introduction – Role of the Parser – Writing Gramm ars – Grammars – Context free grammar. **Parsing**: Introduction – Types of parsing – shift-reduce pa rsing – Operator Precedence Parsing – LR Parsers.

UNIT - III
Intermediate Code Generation: Introduction – Generation of Intermediate Code – Declarations – Assignment statements – Boolean expr ession – Case statements – Back patching – Procedure calls – Type Conversion. **Code Generation**: Introduction – Issues of the Design of Code Generator – The Target Machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-Use Information – A S imple Code generator- DAG Representation of Basic Blocks – Peephole Optimizat ion.

UNIT - IV
Code Optimization: Introduction – Principal Sources of Optimization – Optimization of Basic Blocks – Introduction to Global Data-Flow Ana lysis.

UNIT - V
Runtime Environments: Introduction – Source language issues – Storage organization – Storage Allocation strategies – Access to Non-local names – Parameter Passing.

TEXT BOOK
1. Dr. R. Venkatesh, Dr. N. Uma Maheswari and Ms. S. Jeyanthi , "Compiler Design", Yes Dee Publishing Ltd., 2015.

REFERENCE BOOKS
1. S.Godfrey Winster, S. Arunadevi, R.Sujatha, "Compil er Design," Yesdee Pub., 2016
2. Alfred V. Aho, Ravi Sethi, Jeffery D. Ullman, "Comp lier Principles Techniques and Tools", Pearson Education, 2008.
3. Kenneth C. Louden, "Compiler Construction, Principl es and Practice", Thomson Learning Inc, 2007.

Elective Course-I-17PCSE03 EMBEDDED SYSTEMS

Credits: 4

Course Objectives

- To Know about Embedded processor Modeling , Bus Communication in processors, Input/output interfacing
- To Know about processor scheduling algorithms , Basics of 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– E mbedded Software in a System – Examples of Embedded Systems.

UNIT - II

Advanced Processor Architecture and Memory Organization: Introduction to advanced Architectures–Processor and Memory organization. De vices 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 Servicin g (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 D ata - 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 Mach ines- 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, Progra mming and Design", Second 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-I-17PCSE04 E–TECHNOLOGIES

Credits: 4

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 – Ad vantages and disadvantages of Electronic Commerce - Economic Forces and Electronic Commerce – Identifying Electronic Commerce Opportunities – International Nature of El ectronic Commerce. **E-Business Technology Basics**: The Internet and the World Wide Web– Packet – Swi tched 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 - Electr onic wallets. **Implementing E- Business Initiatives:** Identifying Benefits and Estimating cost of Electronic Commerce initiatives – Strategies for De veloping E-commerce Web sites - Managing   E-Commerce Implementations.

UNIT - IV

E-Marketing: Traditional Marketing – Identifying Web Presence Go als – The Browsing Behaviour Model – Online Marketing – E-Advertising - Internet Marketing Trends – Target Markets – E-Branding – Marketing Strategies. - E-se curity – **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-Bu siness Strategy and Data Warehousing and Data mining. **Mobile Commerce:** Wireless Applications – Technologies for Mobile Commerce – WAP Programming Model – Wirel ess Technologies – Different Generations in Wireless Communication – Security is sues 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.

Core Course- XIII-17PCS09 OPEN SOURCE COMPUTING

Credits: 4

Course Objective:

- To understand the basic Concepts of Python

UNIT - I

Python: Introduction – Numbers – Strings – Variables – Lists – Tuples – Dictionaries – Sets – Comparison.

UNIT - II

Code Structures: if, elif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.

Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. **Objects and Classes**: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods – Composition

UNIT-III

Data Types: Text Strings – Binary Data. **Storing and Retrieving Data**: File Input/Output – Structured Text Files – Structured Binary Files - Relational Databases – NoSQL Data Stores.

UNIT-IV

Web: Web Clients – Web Servers – Web Services and Automation – **Systems:** Files – Directories – Programs and Processes – Calendars and Clocks

UNIT-V

Concurrency: Queues – Processes – Threads – Green Threads and gevent – twisted – Redis. **Networks:** Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – ZeroMQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and MapReduce – Working in the Clouds.

TEXT BOOK

1. Bill Lubanovic, "Introducing Python", O'Reilly, First Edition-Second Release, 2014.

REFERENCE BOOKS

1. Mark Lutz, "Learning Python", O'Reilly, Fifth Edition, 2013.

David M. Beazley,"Python Essential Reference", Developer's Library, Fourth Edition, 2009.

Core Course-XIV-17PCS10 NETWORK SECURITY AND CRYPTOGRAPHY

Credits: 4

Course Objectives:

- To introduce the classical encryption techniques for information hiding
- To analyze cryptographic techniques, protocols, formats, and standards

UNIT - I

Types of Physical Medium – Topologies – Wireless Ne tworking: Wireless Protocols, Data Link Layer: Layered Data Link Protocols – SLIP and PPP – MAC and ARP, Network Layer: Routing Risks – Addressing – Fragmentation

UNIT - II

Internet Protocol: IP Addressing – ICMP – Security options. Transport Layer: Common Protocols – Transport Layer Functions – Gateways. T CP: Connection Oriented Protocols – TCP Connections – UDP. SSL: SSL Functionality – Cer tificates. SSH : SSH and Security – SSH Protocols. STMP: E-Mail Goals – Common Servers.

UNIT - III

Security: Threat Models – Concepts – Common Mitigat ion Methods. Network Theory: Standards Bodies – Network Stacks – Multiple Stacks – Layers and Protocols – Common Tools. Cryptography: Securing Information – Authent ication and Keys – Cryptography and Randomness - Hashes – Ciphers – Encryption – Stegan ography.

UNIT - IV

Data Encryption Techniques – Data Encryption Standa rds – Symmetric Ciphers. Public Key Cryptosystems – Key Management.

UNIT - V

Authentication – Digital Signatures – E-Mail Securi ty – Web Security – Firewall.

TEXT BOOKS

1. Neal Krawetz, "Introduction Network Security", Indi a Edition, Thomson Delmar Learning,2007.
2. V.K. Pachghare, "Cryptography and Information Secur ity", PHI Learning Private Limited 2009.

REFERENCE BOOKS

1. William Stallings," Cryptography and Network Securi ty", Prentice – Hall of India, 2008.
2. Lincoln D.Stein, "Web Security", Addison Wesley 199 9.
3. Behrouz A. Forouzan, Cryptography and Network Security, Tata McGraw-Hill, 2007.

Core Course-XV-17PCS11 MOBILE COMPUTING

<div align="right">

Credits: 4
</div>

Course Objectives

- To introduce the characteristics, basic concepts and system 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 802.11Standards - 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 R Yavagal, Mobile Computing, Second Edition, Tata McGraw Hill Publishing Company Limited, 2010.

REFERENCE BOOKS

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

Core Course-XVI-17PCS12 DIGITAL IMAGE PROCESSING

<div align="right">Credits: 4</div>

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 – Com ponents 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 Im age 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 – Matchi ng – Mean Shift Segmentation – Active Contour Models- Snakes – Fuzzy Connectivity **Shape Representation and Description:** Region Identification – Contour Based Shape Represe ntation and Description - Chain codes, Simple Geometric Border Representation - Region Based Shape Representation and Description

UNIT - IV

Object recognition: Knowledge Representation – Statistical Pattern Reco gnition – Neural Nets – Fuzzy Systems - Mathematical Morphology – Ba sic Morphological concepts – Binary Dilation and Erosion.

UNIT - V

Image Data Compression: Image Data Properties – Discrete Image Transforms i n 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.

Core Course-XVII - 17PCSP05 LAB–V PYTHON PROGRAMMI NG LAB Credits: 2

Course Objective:
* To understand the concepts and develop the programming skills in Python

Implement the following in Python:
1. Programs using elementary data items, lists, dictionaries and tuples
2. Programs using conditional branches, loops.
3. Programs using functions
4. Programs using exception handling
5. Programs using classes and objects
6. Programs using inheritance
7. Programs using polymorphism
8. Programs to implement file operations.
9. Programs using modules.
10. Programs for creating dynamic and interactive web pages using forms.
11. Program using database connection.
12. Program using web services.

Core Course-XVIII - 17PCSP06 - LAB - VI – MOBILE AP PLICATION DEVELOPMENT LAB

Credits: 2

Course Objective:
* To understand the concepts and develop the programming skills in J2ME

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

Elective Course - II
Elective Course-II-17PCSE05 SOFT COMPUTING

Credits: 4

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 Netw orks – 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 - Mul tiple Adaptive Linear Neurons – Back-Propagation Networks . **Associative Memory Networks:** Introduction – Training Algorithm for Pattern Assoc iation – **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 Relat ions – 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 Computin g & Intelligent System – Theory & Application" - Academic press serving in Engin eering, 1999.

<center>**Elective Course-II-17PCSE06 INTERNET OF**</center>

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

UNIT – I

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

UNIT – II

Internet Principles: Internet Communications overview – IP – TCP – TCP/I P – UDP. IP Addresses: DNS – Static and Dynamic IP Address Assi gnment – 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 St arting 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. OvidiuVermesan and Peter Friess, "Internet of Thing s – From Research and Innovation to Market Deployement" , River Publishers, 2014.
2. Peter Waher, "Learning Internet of Things" ,Packt P ublishing, 2015.
3. Donald Norris, "The Internet of Things: Do-It-Yours elf at Home Projects for Arduino, Raspberry Pi and BeagleBone Black",McGraw Hill, 201 5.

Elective Course-II-17PCSE07 OBJECT ORIENTED ANALYSIS AND DESIGN

Credits: 4

Course Objectives:

- Describe Object Oriented Analysis and Design concepts to solve many real life problems and to develop Software.
- Helps to prepare Object Oriented Analysis and Design documents for a given problem using Unified Modeling Language

UNIT – I

Introduction: Role of Analysis and Design in Software Development – Meaning of Object Orientation - Overview of Various OOAD Methodologies - Goals of UML. **Use case Modeling:** Actors and Use Cases - Use Case Relationships - Writing Use Cases formally - Choosing the System Boundary - Finding Actors - Finding Use Cases - Use of Use Cases for Validation and Verification - Use Case Realization.

UNIT - II

Concept: The Object Model - The Evolution of the Object Model - Foundations of the Object Model - Elements of the Object Model - Applying the Object Model**. Classes and Object:** The Nature of an Object - Relationships among Objects - The Nature of a Class - Relationships among Classes - The Interplay of Classes and Objects - On Building Quality Classes and Objects **Classification:** The importance of proper classification - Identifying classes and objects - Key abstractions and Mechanisms.

UNIT - III

Notations: The Unified Modeling Language - Package Diagrams - Component Diagrams - Deployment Diagrams - Use Case Diagrams - Activity Diagrams.

UNIT – IV

Class Diagrams: Sequence Diagrams - Interaction Overview Diagrams - Composite Structure Diagrams - State Machine Diagrams - Timing Diagrams - Object Diagrams - Communication Diagrams.

UNIT – V

Applications: System Architecture: Satellite-Based Navigation - Control System: Traffic Management - Web Application: Vacation Tracking System - Data Acquisition: Weather Monitoring Station.

TEXT BOOKS
1. Mahesh P. Matha, "Object – Oriented Analysis and D esign Using UML" , PHI Learning Private Limited, New Delhi, 2008.
2. Grady Booch Robert A. Maksimchuk Michael W. Engle Bobbi J. Young, Ph.D. Jim Conallen Kelli A. Houston "Object-Oriented Analysis and Design with Applications" Third Edition, Pearson Education, Inc.,April 2007.

REFERENCE BOOKS
1. Martin Fowler, Kendall Scott, "UML Distilled, A Bri ef Guide to the Standard Object Modeling Languages", Second Edition, Pearson Educat ion., 2000.
2. James Rumbaugh et al, " Object - Oriented Modeling and Design With UML" sec ond Edition, Pearson Education, 2007.

Elective Course-II-17PCSE08 RESOURCE MANAGEMENT TECHNIQUES (Theory and Proof are not expected)

Credits: 4

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: $(M/M/1):(\infty/FIFO)$, $(M/M/1):(N/FIFO)$, $(M/M/C):(\infty/FIFO)$ 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 Sched uling.

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 Introductio n", Seventeenth Edition, Pearson Education, 2002.
2. S.D Sharma, "Operation Research", Kedar Nath and Ra m Nath - Meerut, 2008.

Elective Course-III

Elective Course-III-17PCSE09 CYBER SECURITY

Credits: 4

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 polic y – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technolo gy Operations – Technology Configuration - Strategy Versus Policy – Cyber Secu rity Evolution – Productivity – Internet – E-commerce – Counter Measures - Challenges.

UNIT - II

Cyber Security Objectives and Guidance: Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Framewo rks – E-Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Securit y Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Pro ject – 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 – Interne t Names and Numbers – Copyright and Trademarks – Email and Messaging-Cyber User Issues - Malvertising Impersonation – Appropriate Use – Cybe r 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 and 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 Ne xt Threat to National Security & What to Do About It", Ecco, 2010.
3. Dan Shoemaker, "Cyber security The Essential Body O f Knowledge", Cengage Learning, 2011.

Credits: 4

Course Objective:
- To learn the concepts of cloud computing , cloud services and platforms
- To understand real-world cloud applications

UNIT - I
Introduction to Cloud Computing: Introduction **-** Characteristics of Cloud Computing - Cloud Models – Cloud Service Examples - Cloud Base d Services & Applications - Cloud concepts and Technologies.

UNIT - II
Cloud Services and Platforms: Compute Service - Storage Services - Cloud Database Services - Application Services - Content Delivery Services - Analytics Services - Deployment And Management Service - Identity And Access Management Services - Open Source Private Cloud Software- Apache Hadoop - Hadoop Map Reduce Job Execution – Hadoop Schedulers - Hadoop Cluster Setup.

UNIT - III
Application Design: Cloud Application Design - Reference Architecture for Cloud Application - Cloud Application Design Methodologies - Data Storage Approaches.
Development in Python: Design Approaches – Image Processing App - Documen t Storage App - Map Reduce App - Social Media Analytics App.

UNIT - IV
Python for Cloud: Python for Amazon Web Services – Python for Google Cloud Platform - Python for Windows Azure – Python for Map Reduced – Python Packages of Interest - Python Web Application Frame Work-Django – Designin g a RESTful Web API.

UNIT - V
Big Data Analytics: Clustering Big data - Classification of Big Data - Recommendation systems. **Multimedia Cloud:** Live Video Stream App - Streaming Protocols - Video Transcoding App. **Cloud Security:** CSA Loud Security Architecture - Authentication - Authorization - Identity and Access management - Data Security - Key Management.

TEXT BOOK
1. Arshdeep Bahga, Vijay Madisetti, "Cloud Computing: A Hands – On Approach" Universities press (India) pvt limited 2016.

REFFRENCE BOOKS
1. Michael Miller "Cloud Computing Web based applicati on that change the way you work and collaborate online". Pearson edition, 2008.
2. Kris Jamsa "Cloud Computing Saas , PaaS , IaaS , Vi rtualization , BusinessModels , Security, And more". Jones & Bartlett Student Editi on, 2014.

Elective Course-III-17PCSE11 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 Edi tion, O'reily Media, 2012.

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

Elective Course-III-17PCSE12 SOCIAL COMPUTING

Credits: 4

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, Analyzi ng 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: AnIntroduction," 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-IV-17PCSE13 ARTIFICIAL INTELLIGENCE

Credits: 4

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.

Credits: 4

Course Objectives:

- To transform graduates with potential in computational into experts in information technology that the industry requires from time to time
- To study the basics involved in publishing content on the World Wide Web
- To learn the basic tools and applications used in Web publishing.

UNIT – I

Internet Concept: Fundamental of Web, History of Web, Web development overview, Domain Name System (DNS), DHCP, and SMTP and other servers, Internet service provider (ISP), Concept of IP Address, Internet Protocol, TCP/IP Architecture and protocol (IP), Web Browser and Web Server.

UNIT – II

HTML and DHTML: HTML Tag, Rules of HTML, Text Formatting & Style, List, Adding Graphics to Html Document, Tables and Layout, Linking Documents, Frame, Forms, Project in HTML, Introduction to DHTML, CSS, Class & DIV, External Style Sheet.

UNIT – III

Scripting Languages: Java Script (JS) in Web Page, Advantage of Java Script, and JS object model and hierarchy, Handling event, Operators and syntax of JS, Function, Client side JS Vs Server side JS, JS Security. Introduction to VB Script, Operator & Syntax of VB Script, Dialog Boxes, Control & Loop, Function in VBs.

UNIT – IV

XML: Introduction to XML, XML in Action, Commercial Benefits of XML, Gaining Competitive Advantage with XML, Programming in XML, XML Schema, XSLT, DOM structure model, XML quires and transformation.

UNIT – V

Active Server Page (ASP): Introduction, Internet Information System (IIS), ASPobject, Server object File system Object, session, accessing data base with an ASP page, ODBC – ADO connection object, Common Methods and properties, ADO record set object.

TEXT BOOK

1. N.P.Gopalan, J.Akilandeswari, "Web Technology: A de velopers Perspective", Second Edition, PHI Publications, 2014**.**

REFERENCE BOOKS

1. Thomas A. Powel "HTML The complete Reference",Third Edition,TMH publication, 1999
2. Sean Mc GrathPentice, "XML By Example", Hall Public ation, 1998
3. David Flangan, "JavaScript: The definite Guide", Si xth Edition, O Reilly Publication, 2011
4. Doug Tidwell "Introduction to XML", IDG Publicatio n,2002
5. Christopher J.Goddard, Mark White,"Mastering VB Scr ipt", BPB Publication,2000
6. David Buser, john Kauffman, "Beginning ASP 3.0", Wr oxpress Publications,2000

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 Spe cification – 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 Evolutio n. **Development:** Rapid Software Development – Agile Methods – Extreme Programming – Rapid Application Development – Software Prototyping - Application Framework – App lication System Reuse – Program Evolution Dynamics – Software Maintenance – Evolut ion 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 T esting – 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 Validat ion – 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 Te sting – 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, 201 1.
2. Srinivasan Desikan, Gopalaswamy Ramesh. "Software T esting Principles and Practices", Dorling Kindersley (India) Private Ltd , Pearson edition, 2013.

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

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Elective Course-IV-17PCSE16 WIRELESS APPLICATION PROTOCOLS
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Credits: 4
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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 th e WAP Standard – Network Infrastructure Services Supporting WAP Clients – WA P Architecture Design Principles – Relationship to Other Standards.

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

UNIT - III
Variables – Controls – Miscellaneous Markup – Sendi ng Information – Application Security – Other Data - The Meta Element – Document Type De clarations – Errors and Browser Limitations – Content Generation – WML Version Nego tiation.

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 Guideline s – Design Guidelines for Selected WML Elements.

UNIT - V
Wireless Telephony Applications - Overview of the WTA Architecture – WTA Client Framework – WTA Server & Security – Design Consider ations – Application Creation Toolbox – Future WTA Enhancements. The Mobile Inter net 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 McGra w Hill 2001.

Core Course-XIX-17PCSPR1 PROJECT WORK AND VIVA-VOCE

Credits: 10

The students are expected to do their dissertation 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 inf ormation system – Information Technology in the Modern Organization.

UNIT-II

Computer Hardware – Significance of Hardware – Cent ral 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 – Programm ing languages – Enterprise Software.

UNIT-III

Managing Organizational Data and Information: Basics of Data arrangement and Access – Traditional file environment – modern approach: dat abase 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 Extr anets.

UNIT-IV

Functional, Enterprises, and Interorganizational Systems: Information system to support business functions – transaction processing informa tion systems – accounting and finance system – marketing and sales system – production an d 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 sy stem development –system development outside the IS department – building Internet and I ntranet applications – Implementing: Ethics, Impacts and Security.

TEXT BOOK

1. Turban, Rainer, Potter "Introduction to Information Technology," 2nd edition, Wiley India, 2007

REFERENCE BOOK

1. V. Rajaraman – Introduction to Information Technolo gy, Prentice Hall of India, 2007

EDC-17PCSED2 - FUNDAMENTALS OF COMPUTERS AND COMMUNICATIONS
Credits: 4

UNIT- I

Computer: Introduction – 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 - I nput devices for physically challenged users- Output: What is output – display devices – F lat panel displays – CRT monitors – Printers – Speakers, Headphones and Ear phones – ot her output 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 program s – 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 so ftware for Communication.

Unit-IV

Internet and World Wide Web: Internet – History of the Internet – How the Internet works – WWW – E-commerce – Other Internet Services – Netiqu ette. Communications and Networks: Communications – Uses of Computer Communi cations – Networks – Network communication standards – Communication software – Communication over the telephone network – Communication devices – Home networks – C ommunications 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 C omputers- Today and Tomorrow", 14th Edition, Thomson Course Technology, 2012
3. Alexis Leon, Mathew's Leon, "Fundamentals of Comput er 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 – Des igning Electronic Payment Systems.

UNIT - IV

Electronic Data Interchange – EDI Applications in B usiness – EDI: Legal, Security and Privacy issues EDI and Electronic Commerce – Standa rdization 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 Inte rnet- 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 Cu tting 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.