PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM 638 011

MASTER OF SCIENCE IN COMPUTER SCIENCE

SEMESTER PATTERN

Under Choice Based Credit System

REGULATIONS AND SYLLABUS

FOR AFFILIATED COLLEGES

(Effective from the Academic year 2017-2018 onwards)

PERIYAR UNIVERSITY
PERIYAR PALKALAI NAGAR
SALEM 638 011
Regulations
Effective from the Academic year 2017 - 2018

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)	Marks		
				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 17PCSZ1_	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
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-	4	4	3	25	75	100
Core Course-XIV-17PCS10-	4	4	3	25	75	100
Core Course-XV-17PCS11-	4	4	3	25	75	100
Core Course-XVI-17PCS12 -	4	4	3	25	75	100
Elective Course II 17PCSZ2 _	4	4	3	25	75	100
Core Course-XVII - 17PCSP05 - Lab – V -	2	5	3	40	60	100
Core Course-XVIII - 17PCSP06 - Lab - VI -	2	5	3	40	60	100
Semester-IV						
Elective Course III 17PCSZ3 _	4	5	3	25	75	100
Elective Course IV 17PCSZ4 _	4	5	3	25	75	100
Core Course-XIX-17PCSPR1 Project Work and Viva-Voce	10	-	-	50	150	200
Total Core	70			590	1410	2000
EDC	04			25	75	100
Elective	16			100	300	400
Human Rights	-			-	-	-*
Grand Total	90			715	1785	2500

* Human Rights mark is excluded for aggregation

Electives

Elective Course -I
Course 17PCSZ11 Theory of Automata
Course 17PCSZ12 Compiler Design
Course 17PCSZ13 Embedded Systems
Course 17PCSZ14 E–Technologies

Elective Course -II
Course 17PCSZ21
Course 17PCSZ22
Course 17PCSZ23
Course 17PCSZ24

Elective Course -III
Course 17PCSZ31
Course 17PCSZ32
Course 17PCSZ33
Course 17PCSZ34

Elective Course -IV
Course 17PCSZ41
Course 17PCSZ42
Course 17PCSZ43
Course 17PCSZ44

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

1. Principles of Information Technology
2. Fundamentals of Computers and Communications
3. E-Commerce

CIA – CONTINUOUS INTERNAL ASSESSMENT
EA – EXTERNAL ASSESSMENT

6.   EXAMINATIONS
6.1   THEORY
6.1.1   EVALUATION OF CONTINUOUS INTERNAL ASSESSMENT

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

Total	:	25 Marks

(No passing minimum)

6.1.2 EVALUATION OF EXTERNAL ASSESMENT
QUESTION PAPER PATTERN

Time: 3 Hours   Max. Marks: 75
PART- A: 5x5 = 25 marks
Answer all the questions
One question from each unit (either or type)

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

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

6.2   PRACTICAL / SOFTWARE DEVELOPMENT
6.2.1   EVALUATION OF CONTINUOUS INTERNAL ASSESSMENT

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

Total	:	40 Marks

(No passing minimum)

6.2.2 EVALUATION OF EXTERNAL ASSESSMENT
I) PRACTICAL
QUESTION PAPER PATTERN

Time: 3 Hours   Max. Marks: 60

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

Distribution of Marks

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

II) SOFTWARE DEVELOPMENT

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

Students should write about their software development briefly.
  i.   Aim
 ii.   Features
iii.   Modules
 iv.   Modification

III) PROJECT WORK

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

7. REGULATIONS OF PROJECT WORK
- Students should do their Project work in Company / Institutions during the fourth semester.
- The Candidate should submit the filled in format as given in Annexure-I to the department for approval during the Ist Week of December.
- Periodically the project should be reviewed.
- The Student should submit three copies of their Project 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]
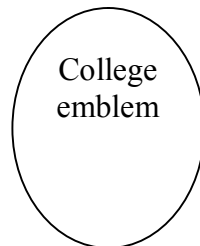
CONTENTS

A. Format of the title page

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

B. Format of the Certificate

Name and Address of the Internal Guide

<div align="right">Place</div>

<div align="right">Date</div>

<div align="center">

CERTIFICATE

</div>

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.

<div align="right">Internal Guide</div>

Head of the Department

Date of Viva-voice:

Internal Examiner   External Examiner

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

Credits: 4

UNIT-I

Introduction: Notion of Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Frame Work – Asymptotic Notations and Basic Efficiency Classes – Mathematical Analysis of Non-recursive Algorithms – Non-recursive Solution to the Matrix Multiplication – Mathematical Analysis of Recursive Algorithms – Recursive Solution to the Tower of Hanoi Puzzle.

UNIT-II

Divide and Conquer: Mergesort – Quicksort – Binary Search – Binary Tree Traversals – Multiplication of Large Integers – Strassen's Matrix Multiplication – Closest Pair and Convex Hull Problems – Greedy Technique: Prim's Algorithm – 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 Algorithm for the All-Pairs Shortest-Paths Problem – Optimal Binary Search Trees – The Knapsack Problem and Memory Functions.

UNIT-IV

Backtracking: N-Queens Problem – Hamiltonian Circuit Problem – Subset Sum Problem – Branch and Bound: Assignment Problem – Knapsack Problem – Traveling Salesman Problem.

UNIT-V

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

TEXT BOOK

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 2008.

REFERENCE BOOKS

1. S.K. Basu, "Design Methods and Analysis of Algorithms", Prentice Hall, 2005.

2. E.Horowitz, S.Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd 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

UNIT-I

Evolution of Computer systems – Parallelism in Uniprocessor 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 – Collision-free scheduling – Instruction Pipeline Design : Instruction Execution Phases – Mechanisms for Instruction Pipelining – Arithmetic Pipeline Design : Computer Arithmetic Principles – Static 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 Synchronization 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 And Parallel Processing," McGraw-Hill, 1985.
2. Kai Hwang, "Advanced Computer Architecture," McGraw-Hill International Editions, 2001.

REFERENCE BOOK:

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

UNIT – I

Multithreading: Java Thread Model-Main Thread-Creating a Thread-Creating MultipleThreads-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 TextField, 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-ImageObserver-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," 7th Edition, TMH,2012
2. Deitel H.M. & Deitel P.J, "Java: How To Program," Prentice-Hall of India, 5th Edition, 2003.

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

REFERENCE BOOKS
1. C.Muthu, "Programming with Java," Vijay Nicole Imprints 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

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, 4th edition, 2008
2. Kenneth C. Louden , "Programming Languages-Principles and Practices," Cengage Learning Publications , 2nd Edition, 2008

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

Core Course-V-17PCS05 - ADVANCED OPERATING SYSTEMS

Credits: 4

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 Deadlocks: 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 – Lamport's logical clocks – Vector clocks — Termination detection. Distributed Mutual exclusion: Preliminaries – Non- Token based and Token Based Algorithms – Comparative Performance analysis. Distributed Deadlock detection: Deadlock handling strategies – Control organization – Centralized and Distributed deadlock detection algorithm.

UNIT – III:

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

UNIT - IV:

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

UNIT – V:

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

TEXT BOOK:
1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced Concepts 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 concepts and Design," PHI, 2003

Core Course-VI - 17PCSP01- Lab – I - ADVANCED JAVA PROGRAMMING LAB

Credits: 2

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

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.

II SEMESTER
Core Course-VIII-17PCS06 - .NET PROGRAMMING

Credits: 4

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 –Variables – Data types – Constants – Arrays – Dynamic arrays – Controlling the flow – if statement – 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 – Introduction to ASP .NET server Programming – Using variables and constants in web forms – Working with web objects to store data – Designing .NET web Applications –Programming 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 – Programming based on events – Database access with ADO .NET

TEXT BOOKS

1. Evangelos Petroutsos, "Mastering Visual Basic .NET," BPB Publications, 2002
2. Barbara Doyle, "Programming in C#," Cengage Learning 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 Ltd., 2007
2. David Chappell, "Understanding .NET," Pearson education, 2002
3. David.S.Platt, "Introducing Microsoft .Net," PHI, 2003.
4. G.Andrw Duthie , "Microsoft ASP .NET Programming with 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," Black Book , Dreamtech Press, 2005.

Core Course-IX - 17PCS07 DISCRETE STRUCTURES

Credits: 4

UNIT-I

Mathematical Logic: Propositions – Connectives – Order of Precedence for Logical Connectives – Conditional and Biconditional Propositions – Tautology and Contradiction – Equivalence of Propositions – Duality Law – Duality Theorem – Algebra of Propositions – Tautological

Implication – Normal Forms – Disjunctive and Conjunctive Normal Forms – Principal Disjunctive and Principal Conjunctive Normal Forms.

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

TEXT BOOK:

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

REFERENCE BOOKS:

1. B.Praba "Discrete Mathematics," Vijay Nicole Imprints Private Ltd., 2010
2. N.Chandrasekaran and M.Umaparvathi, "Discrete mathematics", PHI Learning Private Limited, New Delhi, 2010
3. J.P.Trembley and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science," Tata McGraw Hill, New Delhi, 1997.
4. T. Sengadir, "Discrete Mathematics and Combinatorics", Pearson New Delhi 2009.

Core Course-X-17PCS08- DATA MINING TECHNIQUES

Credits: 4

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 Preprocessing: Data Cleaning – Handling Missing Data – Identifying Misclassification – Graphical Methods for Identifying Outliers – Measures of Center and Spread – Data Transformation – Min-Max Normalization – Z-Score Standardization – Decimal Scaling – Transformations to Achieve Normality – Numerical Methods for Identifying Outliers – Flag Variables – Transforming Categorical Variables into Numerical Variables – Binning Numerical Variables – Reclassifying Categorical Variables – 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 Data Set – The Eigenvalue Criterion – The Proportion of Variance Explained Criterion – The Minimum Communality Criterion – The Scree Plot Criterion – Profiling the Principal Components – Communalities –Validation of the Principal Components – Factor Analysis – Applying Factor Analysis to the Adult Data Set – Factor Rotation – User-Defined Composite.

UNIT III

Classification: Classification Task – k-Nearest Neighbor Algorithm: Distance Function – Combination Function – Simple Unweighted Voting – Weighted Voting – Quantifying Attribute Relevance: Stretching the Axes – Database Considerations – k-Nearest Neighbor Algorithm for Estimation and Prediction – Choosing k – Application of k-Nearest Neighbor Algorithm 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 Clustering Methods – Single-Linkage Clustering – Complete-Linkage Clustering – k-Means Clustering – Example of k-Means Clustering at Work – Behavior of MSB, MSE, and Pseudo-F as the k-Means Algorithm Proceeds – Application of k-Means Clustering Using SAS Enterprise Miner – Using Cluster Membership to Predict Churn – Kohonen Networks**:** Self-Organizing Maps – Kohonen Networks – Example of a Kohonen Network Study – Cluster Validity – Application of Clustering Using Kohonen Networks – Interpreting The Clusters – Cluster Profiles – Measuring Cluster Goodness: Rationale for Measuring Cluster Goodness – The Silhouette Method – Silhouette Example – Silhouette Analysis of the IRIS Data Set – The Pseudo-F Statistic – Example of the Pseudo-F Statistic – Pseudo-F Statistic Applied to the IRIS Data Set – Cluster Validation – Cluster Validation Applied to the Loans Data Set.

UNIT V

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

TEXT BOOK

1. Daniel T. Larose, Chantal D. Larose, "Data mining and Predictive analytics", 2nd Edition, Wiley Publication, 2015.

REFERENCE BOOKS

1. David L. Olson DursunDelen, "Advanced Data Mining Techniques," Springer-Verlag Berlin Heidelberg, 2008

2. Jiwei Han, Michelien Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers an Imprint of Elsevier, 2006.

3. John Wang, "Encyclopedia of Data Warehousing and Mining," Idea Group Publishing, 2005

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

Credits: 2

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 Excel 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

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. Write R script to diagnose any disease using KNN classification.
10. To perform market basket analysis using Apriori algorithm.

Elective Course -I

Course 17PCSZ11 THEORY OF AUTOMATA
Credits: 4

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 Grammars – Derivation trees – Simplification of context free grammar (only construction and no proof of equivalence of grammars) – Chomsky Normal Form – Greibach Normal From.

UNIT III
Pushdown automata: Pushdown Automata – Pushdown Automata and Context Free Languages – Pumping lemma for Context Free Languages.

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 undecidable problems.

UNIT V

The Chomsky hierarchy: Regular Grammar – Unrestricted Grammar – Context sensitive languages – Linear bounded Automata – Relation between 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.

Course 17PCSZ12 COMPILER DESIGN

Credits: 4

UNIT - I

Introduction: Compilers – Analysis of source program – Phases of a compiler – cousins of compiler – Grouping of phases – compiler construction 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 Grammars – Grammars – Context free grammar. **Parsing**: Introduction – Types of parsing – shift-reduce parsing – Operator Precedence Parsing – LR Parsers.

UNIT - III

Intermediate Code Generation: Introduction – Generation of Intermediate Code – Declarations – Assignment statements – Boolean expression – 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 Simple Code generator- DAG Representation of Basic Blocks – Peephole Optimization.

UNIT - IV

Code Optimization: Introduction – Principal Sources of Optimization – Optimization of Basic Blocks – Introduction to Global Data-Flow Analysis.

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, "Compiler Design," Yesdee Pub., 2016
2. Alfred V. Aho, Ravi Sethi, Jeffery D. Ullman, "Complier Principles Techniques and Tools", Pearson Education, 2008.
3. Kenneth C. Louden, "Compiler Construction, Principles and Practice", Thomson Learning Inc, 2007.

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Course 17PCSZ13 EMBEDDED SYSTEMS

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Credits: 4

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UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT – V

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

TEXT BOOK:

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

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.

Course 17PCSZ14 E–TECHNOLOGIES

Credits: 4

UNIT – I

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

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

UNIT – II

E-Business Revenue Models: Introduction-Revenue Models -Creating an effective Web Presence. **Selling to Consumers Online**: Introduction –Web Marketing strategies. **Selling to Businesses Online**:Introduction- Electronic Data Interchange .**Virtual Communities**: From Virtual Communities to Social Networks- Mobile Commerce - Online Auctions. **E- Business**

Law and Taxation: The Legal Environment of E – Commerce-Ethical issues-Taxation and E-commerce.

UNIT – III

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

UNIT - IV

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

UNIT – V

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

TEXT BOOKS:-

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

REFERENCE BOOKS

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

COMPUTER SCIENCE

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

PAPER – I   PRINCIPLES OF INFORMATION TECHNOLOGY

Credits: 4

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

TEXT BOOK

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

   REFERENCE BOOK

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

PAPER - II   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 - Input devices for physically challenged users- Output: What is output – display devices – Flat panel displays – CRT monitors – Printers – Speakers, Headphones and Ear phones – other 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 programs – types of operating systems – stand alone operating systems – network operating systems – embedded operating system – Standalone utility programs. Application Software: Application software – Business software – Graphics and Multimedia Software – Application software for Communication.

Unit-IV

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

Unit-V

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

TEXT BOOK:

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

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

PAPER - III - E-COMMERCE

Credits: 4

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT – V

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

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

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