Table - 5 : Common Course Structure for PG Degree Programme in Science - M.Sc. (Computer Science)

(with effect from the academic year 2017-2018 onwards)

Sem. (1)	Sub. No. (2)	Subject Status (3)	Subject Title (4)	Contact Hrs./ Week (5)	Credits (6)
I	1	Core - 1	Design and Analysis of Algorithms	5	4
	2	Core - 2	Advanced Java Programming	5	4
	3	Core - 3	Mathematical Foundation for Computer Science	4	4
	4	Core - 4	Object Oriented Systems Development	4	4
	5	Core - 5	Distributed Computing	4	4
	6	Core - 6 Practical - 1	Algorithm Lab Using C++	4	2
	7	Core - 7 Practical - 2	Advanced Java Lab	4	2
			Subtotal	30	24
II	8	Core - 8	Web Application Development	5	4
	9	Core - 9	Open Source Technology	5	4
	10	Core - 10	Advanced Data Base Management System	4	4
	11	Core - 11	Security in Computing	4	4
	12	Elective - 1	Data Mining, Multimedia Systems, Cloud Computing	4	3
	13	Core - 12 Practical - 3	Web Application Lab	4	2
	14	Core - 13 Practical - 4	Open Source Lab	4	2
			Subtotal	30	23

Sem. (1)	Sub. No. (2)	Subject Status (3)	Subject Title (4)	Contact Hrs./ Week (5)	Credits (6)
III	15	Core - 14	Digital Image Processing	4	4
	16	Core - 15	Soft Computing	4	4
	17	Core - 16	Software Testing	4	4
	18	Core - 17	Advanced Computer Networks	4	4
	19	Core - 18	Research Methodology	4	4
	20	Elective - 2	Principles of Compiler Design, Big Data Analytics, Mobile Computing	4	3
	21	Core - 19 Practical - 5	Image Processing Using MATLAB	4	2
	22	Core - 20	Mini Project	2+2*	2
			Subtotal	30	27
IV	23	Core - 21	Major Project	30+2*	16
			Subtotal	30	16
			Total	120	90

* Extra hours for Project

For the Project, flexible credits are b/w 5 - 8 & Hours per week are b/w 10 - 16.

Total number of credits ≥ 90 : 90

Total number of Core Courses   : 21 (14 T + 5 P + 2 Prj.)

Total number of Elective Courses : 2

    Total hours   : 120

I SEMESTER

Core – 1
DESIGN AND ANALYSIS OF ALGORITHMS

Unit - I

Introduction : Algorithm-Specification-Performance Analysis. Elementary Data Structure : Stacks And Queues- Trees-Dictionaries-Priority Queues.

Unit - II

Divide And Conquer : General Method-Binary Search- Finding the Maximum And Minimum-Quicksort-Strassen's Matrix Multiplication.

Unit - III

The Greedy Method : General Method-Knapsack Problem-Job Sequencing with Deadlines-Minimum Cost Spanning Tree-Single Source Shortest Path.
Dynamic Programming : General Method-Multistage Graph-All Pairs Shortest Path-Binary Search Tree-0/1 Knapsack Travelling Salesperson Problem.

Unit - IV

Basic Traversal And Search Techniques : Techniques for Binary Trees-Graphs-Connected Components and Spanning Trees-Biconnected Components.
Backtracking : General Method-8-Queen. Graph Coloring : Hamiltonian Cycle.

Unit - V

Branch and Bound : Method-0/1 Knapsack Problem.
NP-Hard And NP-Complete Problem-Basic Concepts-Cook's Theorem- Clique Decision Problem-Job Shop Scheduling.

Text Book

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition,Universities Press(India) Private Ltd., 2008

Reference Books

1. Aho, Hoporoft and Ullman, "The Design and Analysis of Computer Algorithm", Pearson Education, Delhi, 2001.
2. Basu S.K., "Design Methods and Analysis of Algorithms", PHI, 2006.
3. M.A.Weiss, "Data Structures and algorithm Analysis in C++", Pearson Education, Asia, 2013.

Core – 2
ADVANCED JAVA PROGRAMMING

Unit - I

Classes and Objects : Introduction-General form-Object creation-Constructor-Finalize()-Static member-Inner and Anonymous Inner classes; Inheritance and Polymorphism:-Introduction-Inheriting the variables in a class-Inheriting the methods in a class-Inheritance and Constructors-Abstract classes-Final classes-Interfaces and package-Exception Handling.

Unit - II

J2EE Multi-Tier Architecture : Distributive system-The Tier-J2EE Multi Tier Architecture-client-Tier Implementation-web tier Implementation-Enterprise Java Bean tier implementation-Enterprise information system tier implementation; J2EE Best practices:-Enterprise Application strategy-The Enterprise Application-Client Session management-Web Tier and Java Server Pages-Enterprise JavaBean Tier.

Unit - III

JDBC Objects : The concept of JDBC-JDBC drivers-JDBC packages-A brief overview of the JDBC process-database connection-Associating JDBC/ODBC bridge with the database statement objects-Result set-Transaction processing-Metadata; JDBC and Embedded SQL:-Tables-Indexing-Inserting into tables- Selecting data from tables-Joining tables-Calculating data-Grouping and ordering data-subqueries.

Unit - IV

Java Servlets : Java Servlets and Common Gateway Interface Programming-A Simple java Servlet-Anatomy of Java Servlet-Reading Data from a Client-Reading Http Request Headers-Sending Data to Client and Writing the Http Response Headers- Working with Cookies-Tracking Sessions; Java Server Pages:-JSP-JSP Tags Tomcat-Request String-User Sessions Cookies-Session objects.

Unit - V

Enterprise Java Bean:-Enterprise Java Beans-Deployment Descriptors-Session Java Bean-Entity Java Bean- Message Driven Bean-The JAR File; Java Interface Definition Language and CORBA:-The Concept of object RequestBrokerage- Java IDL and CORBA- The IDL Interface-The Client Side the Server Side-Running the Code.

Text Book

1. C.Muthu,"Programming with Java",SecondEdition,VNI, 2008.
2. Jim Keogh,"TheComplete Reference J2EE",TMH, 2004 (Reprint)

References

1. Herbert Schildt, "The Complete Reference Java", Seventh Edition, TMH, 2007.
2. Joseph O'Neil, "JavaBeans Programming", TMH, 1998.

Core -3
MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

Unit - I

Mathematical Logic: Introduction-Statements and Notation-Connectives-Normal Forms-The Theory of Inference for the Statement calculus-The Predicate Calculus-Inference theory of the Predicate Calculus

Unit - II

Set Theory: Introduction- Basic concepts of Set theory-Relations-Functions.

Unit - III

Matrices: Rank of Matrix, Solving System of Equations, Eigen values and Eigen Vectors-Inverse of matrix- Cayley Hamilton Theorem.

Unit - IV

Graph Theory: Introduction-Graphs-Application of Graphs-Finite and Infinite Graphs-Incidence and Degree-Isolated Vertex, Pendant Vertex and Null Graph

Paths and Circuits: Isomorphism- Subgraphs - Walks, Paths and Circuits-Connected and Disconnected graphs-Components-Euler Graphs-Operation on Graphs-Hamiltonian paths and circuits-Travelling Salesman Problem

Unit - V

Trees and Fundamental Circuits: Properties of Trees-Pendant vertices in trees-Distance and centers in a Tree-Rooted and Binary Tree-Spanning Tree-Fundamental circuits—Spanning Tree in the Weighted Graph.

Matrix Representation of Graphs: Incidence Matrix-Submatrices-Circuit Matrix-Path matrix-Adjacency Matrix

References

1. J.P. Trembley and R.Manokar, "Discrete Mathematical Structures with Applications to Computer Science",Tata McGraw Hill Publications, 2009.

2. Narasingh Deo, "Graph Theory With Applications To Engineering And Computer Science", Prentice-Hall of India Private Limited, 2007.

3. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Tata McGraw Hill, 4th edition, 2002.

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Core – 4

OBJECT ORIENTED SYSTEMS DEVELOPMENT

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Unit - I

Overview of Object Oriented Systems Development : Introduction – Two orthogonal views-Development methodology- Object orientation.

Object basics: Introduction-Object Oriented Philosophy- Object – Attributes – Object respond to messages – Encapsulation – Inheritance – Polymorphism – Object relationship and associations. OOSD life cycle : Introduction – Software development process – OOSD Use case Driven Approach – Reusability.

Unit - II

Object Oriented Methodology – Rumbaugh etal's methodology- Booch methodology – Jacobson methodology – Pattern. Unified Modeling Language - Introduction – static dynamic model – UML diagrams – UML class diagrams – Use case- UML dynamic modeling – packages and model organization.

Unit - III

Object Oriented Analysis : Introduction – Business Object Analysis, Use case driven object oriented analysis – Effective documentation. Classification : Introduction – Classification theory – Naming classes. Identifying object relationships, attributes, methods : Association – Super sub class relationship – Aggregation.

Unit - IV

OOD process and design axioms : Introduction – OOD process- Design axioms – Corollaries – Design pattern. Designing classes : Introduction – Designing classes process – Class visibility – Refining attributes – Designing methods and protocols – Packages and managing classes. Access layer: Introduction - Object Store and persistence – DBMS – Logical and physical Database Management System – Distributed Databases and Client Server Computing – Next generation of client Server Computing – Multidata base System – Design Access layer classes

Unit - V

Software Quality Assurance : Introduction – Quality Assurance Tests – Object Orientation on Testing – Testing strategies – Test Cases- Test Plan.

System Usability and Measuring User satisfaction : Introduction – Usability Testing.

Text Book

1. Ali Bahrami, "Object Oriented Systems Development using UML", Tata McGraw-Hill Education Private Limited, 2008

References

1. Brahma Dathan, Sarnath Ramnath, "Object Oriented Analysis, Design and Implementation", Universities Press, 2010.

2. Mahesh P.Matha, "Object-Oriented Analysis and Design Using UML", PHI Learning Private Limited, 2012.

Core - 5
DISTRIBUTED COMPUTING

Unit - I

Fundamentals: What is Distributed Operating System – Evolution of Distributed Computing System – Distributed Computing System Models – Why are Distributed Computing Systems gaining popularity – What is a Distributed Computing System – Issues in Designing Distributed Computing System – Introduction to Distributed Computing Environment.
Introduction to Computer Networks – Network types – LAN –WAN – Communication protocols – Internetworking – ATM Technology

Unit - II

Message Passing: Introduction Desirable features – Issues in PC Message Passing – Synchronization – Buffering – Multidatagram Messages – Encoding and Decoding – Process Addressing – Failure Handling – Group Communication

Unit - III

Remote Procedure Calls : RPC models – Transparency of RPC–Stub generation–RPC messages–Marshaling arguments and results–Exception Handling–Light weight RPC; Distributed Shared Memory: Introduction – General Architecture of DSM system – Design and Implementation Issues of DSM – Granularity – Structure of Shared Memory – Consistency Models – Replacement Strategy – Thrashing.

Unit - IV

Synchronization: Introduction – Clock Synchronization – Event Ordering – Mutual Exclusion – Deadlock – Election Algorithm–Process Management: Introduction-Process Migration–Threads.

Unit - V

Distributed File System: Introduction – Desirable features – File Models – File Accessing Models – File Sharing Semantics – File Caching Schemes – File Replication – Fault Tolerance – Atomic Transactions – Design Principles.

Text Book

1. Pradeep K Sinha, "Distributed Operating Systems – Concepts and Design", PHI, 2003

References

1.Andrew S Tanenbaum , "Distributed Operating Systems", First Edition, PHI.2002
2. Abraham Silberchalz Peter B. Galvin, G.Gagne, "Operating Systems Concepts", Seventh edition, Addision Wesley Publishing Co., 2010.
3.Pabitra Pal Choudhury, "Operating Systems : Principles and Design", PHI, 2009.

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Core – 6
ALGORITHM LAB USING C++

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Programs should include but not limited to:
1. Write a program that implements Stack
2. Write a program to implement Queue
3. Write a program that implements Priority Queue
4. Write a program that implements Binary Search
5. Write a program that implements Quick Sort
6. Write a program that implements Strassen's matrix multiplication
7. Write a program that implements Prim's Algorithm
8. Write a program that implements Kruskal's Algorithm
9. Write a program that implements All pair shortest path problem
10. Write a program that implements N-Queen Problem
11. Write a program that implements BFS
12. Write a program that implements DFS
13. Write a program that implements Travelling Salesperson Problem
14. Write a program that implements knapsack using greedy

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Core – 7
ADVANCED JAVA LAB

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Programs should include but not limited to:
1. Write a java code to demonstrate class with constructors
2. Write a java code to demonstrate Inheritance
3. Write a java code to demonstrate Interface
4. Write a java code to demonstrate packages
5. Write a java code to demonstrate Custom Exception
6. Write a java code to create a connection to access database from hard disk using domain server name and display a message SUCCESSFULLY CONNECTED, if the connection is created.
7. Write a java code to fetch the table information using JDBC.
8. Write a java code to update a particular record using JDBC.
9. Create a servlet and display a message using hyperlink .
10. Write a servlet code to change the Explorer background color
11. Write a HTML code to capture the user Input name and E-mail ID and display the information in the next form using JSP
12. Write a simple JSP code to create a form and validate a password
13. Write a java servlet to get information in the first form and display in second form

Core – 8
WEB APPLICATION DEVELOPMENT

Unit - I

ASP.NET Introduction :.NET Programming Framework, , The Common language runtime and .NET Class Library, Features of ASP.NET and Visual studio .NET.

.NET language : Data types - declaring variables - Scope and accessibility - Variable Operators & Operations - Type conversions - Object based manipulations - Conditional and Loop structures - Functions and subroutines.

Types, Objects and Namespaces : Class – object - constructor - Value types and Reference types. Advanced class programming : Inheritance – polymorphism – Interfaces - Exception handling - Multithreading. Understanding namespaces.

Unit - II

ASP.NET Applications – File types, Simple Application from start to finish. Code behind compilation - Global .asax application files, ASP.Net configuration.

Web Form fundamentals : Simple page applet- server controls - Deeper look in HTML controls - page classes

Web control classes : Auto postback and web control event- Generating Automatic greeting card.

Unit - III

Validation and Rich Controls : Calendar and Ad Rotator control - Validation Controls – Simple validation example – Regular expression concepts- Customer form validation.

State management : view state - custom cookies - Session state - Session state configuration - Application state.

Unit - IV

ASP.NET Intrinsic Objects **:** HTTP Request Object, HTTP Response Object, HTTP ServerUtility Object, ObjectContext Object

Data Access with ADO.NET **:** Overview of ADO.NET Objects - Characteristics of ADO.NET - ADO.NET object model.

ADO.NET data access : SQL basics – select, update, insert, delete statements. Accessing data - Creating a connection – Defining select statement - Using command with data reader - Updating data. Accessing disconnected data.

Unit - V

Comparing the template control : The Data list - The Data grid - The Repeater - Selecting Items - Editing Items - Paging with Data Grid - Sorting with Data grid.

Web Server and IIS manager, Web services Architecture : The Open Standards Plumbing - WSDL- SOAP- UDDI. Communicating with web service.

Text Book

1 Mathew Mac Donald, ''ASP.NET Complete Reference'', TMH 2005.

References

1. Crouch Matt J, "ASP.NET and VB.NET Web Programming", Addison Wesley 2002.
2. J.Liberty, D.Hurwitz, "Programming ASP.NET", Third Edition, O'REILLY, 2006.

Core – 9
OPEN SOURCE TECHNOLOGY

Unit - I

Getting started – Introduction to UNIX, Linux GNU – Programming Linux.

Shell Programming – Basics – Pipes and Redirection – The Shell as a Programming Language – Shell syntax.

Working with files – Linux File Structure –Low level File Access – The Standard I/O Library.

Unit - II

Working with files – Formatted Input and Output – File and Directory Maintenance – Scanning Directories – Errors.

The Linux Environment – Program Arguments – Environment Variables – Time and Date – Temporary Files – User Information – Host Information.

Terminals- Reading from and writing to the terminal.

Unit - III

Why PHP & MySQL – What is PHP? – What is MySQL?

Server-side Web Scripting – Static HTML – Client-side Technologies – Server-Side Scripting

Syntax and Variables – Comments – Variables – Simple types – outputs.

Control and Functions – Boolean expressions – Branching – Looping – Terminating execution – Using functions – Defining your own function – Functions and variable scope.

Unit - IV

Passing information between Pages – GET Arguments – POST Arguments – Formatting Form Variables – PHP super global arrays.

String – Strings in PHP – String Functions.

Arrays and Array Functions – Creating Arrays – Retrieving Values – Multidimensional Arrays – Deleting from Arrays

Numbers – Numerical Types – Mathematical Operators – Simple Mathematical Functions.

Unit - V

PHP/MySQL Functions – Connecting to MySQL – Making MySQL Queries – Fetching Data Sets – Multiple Connections – Error Checking – Creating MySQL Databases with PHP – MySQL Functions.

Displaying Queries in Tables - HTML Tables and Database Tables – Creating the Sample Tables.
Building Forms from Queries – HTML Forms - Basic Form Submission to a Database – Self Submission – Editing Data with an HTML Form.

Textbooks
1) Neil Matthew and Richard Stones "Beginning Linux Programming", 4/e; New Delhi: Wiley-India, 2009.
2) Tim Converse and Joyce Park with Clark Morgon, "PHP 5 and MySQL Bible"; New Delhi: Wiley-India, 2008.

References
1. M.N.Rao, "Fundamentals of Open Source Software", PHI, 2015.
2. Kailash Vadera and Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications, First Edition 2009.
3. Narain Gehani, "The Database Application Book Using the MYSQL Database System", University Press, 2012.

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Core – 10
ADVANCED DATA BASE MANAGEMENT SYSTEM

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Unit - I
Introduction to Relational Model : Structure of Relational Databases- Database Schema – Keys – Schema Diagrams – Relational Query Language – Relational Operations.
Formal Relational Query Languages : The Relational Algebra – The Tuple relational Calculus – The Domain Relational Calculus.

Unit - II
Database Design and the E-R Model : Overview – The Entity-Relationship model – Constraints – Removing Redundant Attributes in Entity Sets – Entity Relationship Diagrams- Reduction to relational schemas – Entity Relationship Design Issues – Extended E-R Features.
Relational Database Design : Features of good relational Design – Atomic Domains and First Normal Forms – Decomposition Using Functional Dependencies.

Unit - III
Indexing and Hashing : Basic Concepts – Ordered Indices – B^+ Tree Index Files – B^+ Tree Extensions – Multiple Key Access – Static Hashing – Dynamic Hashing – Comparison of Ordered Indexing and Hashing – Bitmap Indices .

Transactions : Transaction Concept – A simple Transaction model – Storage Structure – Transaction Atomicity and Durability – Transaction Isolation – Serializability.

Unit - IV

Concurrency Control : Lock based Protocols – Deadlock Handling – Multiple Granularity – Timestamp Based Protocols – Validation Based Protocols – Multiversion Schemes – Snapshot Isolation – Insert Operations, Delete Operations and Predicate Reads.
Recovery Systems : Failure Classification – Storage – Recovery and Atomicity – Recovery Algorithm – Buffer Management.

Unit - V

Database System Architecture : Centralized and Client Server Architectures – Server System Architectures – Parallel Systems – Distributed Systems.
Parallel Databases : Introduction – I/O parallelism – Interquery parallelism – Intraquery parallelism – Intraoperation parallelism – Interoperation parallelism – Query Optimization.
Distributed Databases : Homogeneous and Heterogeneous Databases – Distributed Data Storage – Distributed Transactions.

Textbook

1. Abraham Silberschatz, Henry F. Korth and S.Sudarshan, "Database System Concepts", Sixth Edition, McGrawHill International Edition, 2011.

References

1. Ramez Elmashree, Shamkant B.Navathe, "Fundamentals of Database Systems", Pearson Education, 2011.
2. C.J.Date, "Introduction to Database Systems", 8th Edition, Pearson Education, 2003.
3. Rajesh Narang, "Database Management Systems", 2nd Edition, PHI, 2012.

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Core – 11
SECURITY IN COMPUTING

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Unit – I

Cryptography : Terminology and Background – Substitution ciphers - The Caesar cipher, The Vernam cipher, Book cipher; Transposition ciphers.
DES – AES - Public key encryption - RSA encryption - Possible attacks on RSA-Uses of Encryption

Unit – II

Program Security : Secure programs – Fixing faults, Unexpected behavior, Types of flaws; Nonmalicious Program errors

Virus and other malicious code – Kinds of malicious code, How Viruses attach, Document viruses, How viruses gain control, Homes for viruses, Virus Signatures, The source of Viruses, Prevention of Virus Infection.

Targeted malicious code – Trojans, Trapdoors, Salami Attack.

Unit – III

Security in Databases : Security Requirements - Integrity of the database, Element Integrity, Audibility, Access control, User authentication, Availability, SQL injection; Reliability and Integrity – Protection features from the operating system, Two-phase update, Redundancy/Internal consistency, Recovery, Concurrency/Consistency, Monitors; Sensitive data - Access decisions, Types of disclosures, Security versus Precision; Inference – Direct Attack , Indirect Attack; Multilevel databases – Granularity , Security Issues.

Unit – IV

Security in Networks : Threats in Networks – What makes a network vulnerable? Categories of attack, Who attacks Networks?

Network Security Controls – Security Threat analysis, Effect of security in architecture of network, Encryption, Content integrity, Strong authentication, Access controls, Wireless security, Alarms and alerts, Honeypots, Traffic flow security.

Firewalls – Design of firewalls, Types of Firewalls, Personal Firewalls, Comparison of Firewall Types.

Unit – V

Legal and Ethical Issues in Computer Security : Protecting Programs and data – Information and the law - Redress for software failures – Selling correct software, Reporting software flaws.

Computer Crime : Why a separate category for computer crime is needed, Why computer crime is hard to define, Why computer crime is hard to prosecute, Indian Cyber law offences, Cyber Pornography, Accessing Protected System, Tampering with Computer Source code.

Ethical Issues in Computer Security : Differences between the Law and the Ethics, Studying Ethics, Ethical Reasoning.

Text Book

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007.

References

1. Michael Whitman, Herbert J. Mattord, "Management of Information Security", Third Edition, Course Technology, 2010.

2. William Stallings, "Cryptography and Network Security:Principles and Practices", Fifth Edition. PHI, 2010.

3. V.K.Pachghare, "Cryptography and Information Security", PHI, 2013.

Elective - I
1. DATA MINING

Unit - I

Introduction : Basic Data Mining Tasks - Data Mining Versus Knowledge Discovery in Databases - Data Mining Issues - Data Mining Metrics - Social Implication of Data Mining - Data Mining from a Database Perspective

Data Mining Techniques : A Statistical Perspective on Data Mining - Similarity Measures - Decision Trees - Neural Networks - Genetic Algorithms

Unit - II

Classification : Introduction – Statistical - Based Algorithms - Distance-Based Algorithms - Decision Tree-Based Algorithms - Neural Network - Based Algorithms - Rule-Based Algorithms - Combining Techniques.

Unit - III

Clustering : Introduction - Similarity and Distance Measures - Outliers - Hierarchical Algorithms - Partitional Algorithms - Clustering Large Databases - Clustering with Categorical Attributes.

Unit - IV

Association Rules : Introduction - Large Itemsets - Basic Algorithms - Parallel and Distributed Algorithms - Comparing Approaches - Incremental rules - Advanced Association Rule Techniques - Measuring the Quality of Rules

Unit - V

Web Mining : Introduction - Web content Mining - Web Structure Mining - Web Usage Mining. Spatial Mining : Introduction - Spatial Data Overview - Spatial Data Mining Primitives -Generalization and Specialization - Spatial rules - Spatial Classification Algorithms - Spatial Clustering Algorithms

Text Book

1.Marget H.Dunham, "Data Mining Introductory and Advanced Concepts",Pearson Education 2003.

References

1. G.K.Gupta, "Introduction to Data Mining with Case Studies", 3rd Edition, PHI,2015.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2007.
3. Jiawei Han and Micheline Kambar, "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

2. MULTIMEDIA SYSTEMS

Unit - I

Uses of Multimedia Information : Defining the scope of multimedia, Hypertext and Collaborative research, Multimedia and personalized computing, Multimedia on the map, Emerging applications, The challenges.

The convergence of computers, Communications, and entertainment products: The technology trends, Multimedia appliances, Hybrid Devices, Designers perspective, industry perspective of the future, Key challenges ahead, Technical, regulatory, Social.

Architectures and issues for Distributed Multimedia systems: Distributed Multimedia systems, Synchronization, and QOS Architecture, The role of Standards, A frame work for Multimedia systems

Unit - II

Digital Audio Representation and processing : Uses of Audio in Computer Applications, Psychoacoustics, Digital representation of sound, transmission of digital sound, Digital Audio signal processing, Digital music making, Speech recognition and generation, digital audio and the computers.

Video Technology : Raster Scanning Principles, Sensors for TV Cameras, Colour Fundamentals, Colour Video,Video performance Measurements, Analog video Artifacts, video equipments, Worldwide television standards.

Digital Video and Image Compression : Video compression techniques, standardization of Algorithm, The JPEG Image Compression Standard, ITU-T Recommendations, The EPEG Motion Video Compression Standard, DVI Technology

Unit - III

Operating System Support for Continuous Media Applications : Limitation of Work station Operating system, New OS support, Experiments Using Real Time Mach.

Middleware System Services Architecture : Goals of Multimedia System services, Multimedia system services Architecture, Media stream protocol.

Multimedia Devices, Presentation Services, and the User Interface : Client control of continuous multimedia, Device control, Temporal coordination and composition, toolkits, hyper applications.

Multimedia File systems and Information Models : The case for multimedia information systems, The file system support for continuous Media, Data models for multimedia and Hypermedia information, Content- based Retrieval of Unstructured Data.

Multimedia presentation and Authoring : Design paradigms and User interface, barriers to wide spread use, research trends.

Unit - IV

Multimedia Services over the Public Networks: Requirements, Architecture, and protocols, Net work services, applications.

Multimedia Interchange : Quick time Movie File Format, QMFI, MHEG (Multimedia and Hypermedia Information Encoding Expert Group), Format Function and representation, Track model and Object model, Real Time Interchange.

Multimedia conferencing : Teleconferencing Systems, Requirements of Multimedia Communications, Shared Application Architecture and embedded Distributed objects, Multimedia Conferencing Architecture.

Unit - V

High Definition Television and desktop computing : Video versus Computing-Viewing Conditions-Quality-HDTV,ATV,EDTV,IDTV-HDTV Standards – Standardization Issues HDTV standards.

Knowledge based Multimedia systems - Anatomy of an Intelligent Multimedia system

Text Book

John F.Koegel Buford, "Multimedia Systems", Pearson Education, 2012

References

1.Tay Vaughan, "Multimedia – Making it work", Fifth Edition, TMH 2003

2.Ralf Steinmetz and Klara Nahrstedt, "Multimedia:Computing , Communication and Application", Pearson Education, 2009

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Elective - I

3. CLOUD COMPUTING

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Unit – I

Cloud computing – An Overview : Introduction – History of cloud computing – Characteristics of cloud – Cloud computing model – Advantages and disadvantages of cloud computing – Security, Privacy and trust – Virtualization – Next generation of cloud computing.

Cloud computing Architecture : Introduction - Cloud Architecture – Cloud computing models – Deployment models – Identity as a service.

Unit – II

Virtualization in Cloud : Virtualization – Implementation of Virtualization - Virtualization support at the OS level – Advantages of Virtualization – Application Virtualization - Virtualization implementation techniques – Hardware virtualization – Types of Virtualization – Logical cloud computing model – Virtualization for Data-centre.

Security Issues and challenges in Cloud computing : Introduction - Security challenges in Cloud computing – Information Security in Cloud computing – Security, Privacy and Trust.

Security Management : Introduction – Security in reference architecture – Security Issues in cloud computing – Classification of security issues – Types of attackers – Security risk in

cloud computing – Security Threats against cloud computing – Emerging trends in security and privacy.

Unit - III

Virtualization System specific Attacks : Attacks in cloud computing environment – Attacks in Hypervisor – Security challenges – Desktop virtualization Security – Planning and deployment for secure virtualization.

Web Services : Amazon web services – Microsoft Azure – Google App Engine

Unit – IV

Service Oriented Architecture : SOA components – Design principles of SOA – SOA requirements – Benefits of SOA – Significance of SOA in cloud computing – Enterprise Service Bus – Web Services – Recurring Architectural Capabilities.

Migrating Applications to the Cloud computing : Motivations for migration – Issues in migrating the applications to the cloud – Types of migration – Planning for migrating the application to the cloud – Migration Roadmap. Cloud Computing Applications : Business applications – Finance and banking applications – Cloud computing in education.

Unit – V

Standards in Cloud Computing : Standardization activities – Challenges – Fields of standardization - Standardization organizations in Cloud Computing. Mobile Cloud Computing : Needs of mobile Cloud Computing – Mobile Cloud Computing Architecture – Technologies for MCC – MCC Applications – Challenges in building applications – Platforms.

Microservices : Need of microservices – Microservice architecture – Benefits of Microservices – Drawbacks of microservices – Communication mechanisms – Decentralized data management - Essential ckeck - lists for migration from monolithic to microservices.

Text book

1. V.K.Pachghare, "Cloud Computing", PHI, 2016.

References

1. Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009

2.Anthony T.Velte,Toby J.Velte,Pobert Elsenpeter,"Cloud Computing",TMH,2010

3. Kumar Saurbh , "Cloud Computing – Insights into New-Era Infrastructure", Wiley India, 2011.

4. John W.Rittinghouse and James F. Ransome, "Cloud Computing : Implementation, Management and Security", CRC press, 2010.

Core – 12
WEB APPLICATION LAB

Programs should include but not limited to:

1. Change the background color using RGB()
2. Implement Currency Converter
3. Demonstrate Event Tracker
4. Write a program using file uploading control
5. Write a program to create a registration page using validation controls
6. Write a program using Session State and Application State variables
7. Write a program to demonstrate the use of Session.TimeOut
8. Write a program using QueryString.
9 Write a program to create Cookies
10. Write a program using DataGrid and DataList controls
11. Write a program to search and store student data in MSAccess
12. Write a program to save customer information and generate electricity bill using MS Access

Core – 13
OPEN SOURCE LAB

Programs should include but not limited to:

1. Create a Relational Database in MySQL , insert values and execute queries using basic and advanced select commands.
2. Perform join operation on relational tables
3. Create Queries using aggregate functions
4. Create views of the database
5. Implement a PHP program to display a Welcome page based on client browser.
6. Implement a PHP program to process HTML forms.
7. Implement a PHP program to demonstrate Object Oriented Programming in PHP
8. Implement a PHP program to demonstrate database handing.
9. Write a PHP program to create a directory, and to read contents from the directory.
10. Execute the Linux commands:
    a) ls, cat, chmod, find, sort, bc, cal, wc
    b) pipe and filter
11. Write a C program to generate Fibonacci series and execute in Linux OS
12. Write a shell program to check whether the given number is Armstrong or not.
13. Write a shell program to generate pay slip of an employee.

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
PG - COURSES – AFFILIATED COLLEGES
Course Structure for M.Sc Computer Science
(Choice Based Credit System)
(with effect from the academic year 2017- 2018 onwards)

Sem. (1)	Sub. No. (2)	Subject Status (3)	Subject Title (4)	Contact Hrs./ Week (5)	Credits (6)
III	15	Core - 14	**Digital Image Processing**	4	4
	16	Core - 15	**Soft Computing**	4	4
	17	Core - 16	**Software Testing**	4	4
	18	Core - 17	**Research Methodology**	4	4
	19	Elective - 2	**Principles of Compiler Design, Big Data Analytics, Mobile Computing**	4	3
	20	Core - 18 Practical - 5	**Image Processing Using MATLAB**	4	2
	21	Core - 19	**Mini Project**	6+6*	6
			Subtotal	30	27
IV	22	**Core - 20**	**Major Project**	30+2*	16
			Subtotal	30	16
			Total	120	90

<div align="center">**DIGITAL IMAGE PROCESSING**</div>

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OBJECTIVES
- To understand the broad base of theoretical concepts of image
- To implement the concepts with the state of art of image processing using MATLAB

UNIT - I MATLAB & IMAGE PROCESSING FUNDAMENTALS

Introduction : Fundamentals - The MATLAB Desktop - Using Mat lab Editor /Debugger- getting help-saving and Retrieving work session data - Digital Image Representation - Image I/O and Display – Classes and Image Types - M-Function Programming. Intensity Transformation and Spatial Filtering : Background - Intensity transformation - histogram Processing and function Plotting - Spatial filtering - Image processing toolbox standard spatial filters.   **(12L)**

UNIT - II FILTERING TECHNIQUES

Filtering in Frequency Domain : The 2-D Discrete Fourier transform - Computing and Visualizing the 2-D DFT in MATLAB – Filtering in the Frequency domain - Obtaining frequency domain filters from spatial filters - High pass (sharpening) frequency domain filters. Image Restoration and Reconstruction : A model of the image degradation / restoration process - Noise models - Restoration in the presence of Noise only – Periodic Noise reduction using Frequency Domain Filtering – Modeling the Degradation Function - Direct Inverse Filtering - Wiener filtering.   **(14L)**

UNIT - III COLOR IMAGE PROCESSUNG

Color Image Processing : Colour image representation in MATLAB - converting to other color spaces - The basics of color image processing - Color transformation - Spatial Filtering of colour images.Working directly in a RGB vector space Wavelets : Background - The fast wavelet transform -Working with wavelet decomposition structures - The inverse wavelet transform- Wavelets in image processing.   **(10L)**

UNIT - IV IMAGE COMPRESSION & MORPHOLOGY

Image Compression : Background - Coding Redundancy - Spatial Redundancy - Irrelevant information- JPEG Compression. Morphological image Processor : Preliminaries - Dialation and Erosion - Combining Dialation and erosion - Labelling connected components – Morphological reconstruction - Gray scale morphology.   **(12L)**

UNIT - V SEGMENTATION, REPRESENTATION AND DESCRIPTION

Image Segmentation : Image segmentation - Point, line and edge detection - Line detection using the Hough transform – Thresholding – Region - Based segmentation using the Watershed transform. Representation and Description : Background – Representation - Boundary Descriptors. **(12L)**

(TOTAL : 60L)

OUTCOMES

- Able to understand basic concepts of image processing
- Knows how to use built-in image processing functions in MATLAB
- Able to implement various operations on images

REFERENCES

1. Rafael C.Gonzalez, Richard E.Woods and Steven L.Eddins , "Image Processing Using MATLAB" ,Second edition, Tata McGraw Hill Education Private Limited, 2011.
2.Anil.K.Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 1989.
3.Chanda & Majumdar, Digital Image Processing and Analysis, Prentice Hall ,3rd Edition
4.S.Sridhar, Digital Image Processing,Oxford University Press 2011

SOFT COMPUTING

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OBJECTIVES

- To explore the benefits computing methodologies like neural netwoks, fuzzy logic and genetic algorithms.
- To enable the students to develop hybrid systems for the industrial problems.

UNIT - I NEURAL NETWORKS FUNDAMENTALS

Artificial Neural Network : Basic Concepts of Neural networks - Evolution of Neural networks - Basic Models of Artificial neural network - Terminologies of ANN- McCulloch - Pitts Neuron - Linear separability - Hebb Network - Applications of Neural networks.
Supervised learning Network : Introduction – Perceptron Networks – Adaptive Linear Neuron – Multiple Adaptive Linear Neurons – Back propagation Network.   **(11L)**

UNIT – II CATEGORIES OF NEURAL NETWORKS

Associative Memory Networks : Introduction – Training algorithms for pattern association – Auto associative Memory Network – Bidirectional Associative Memory – Hopfield Networks.
Unsupervised Learning networks: Introduction – Fixed Weight Competitive Nets - Kohonen Self-Organizing Maps – Learning Vector Quantization – Adaptive Resonance Theory Network.   **(13L)**

UNIT – III   BASIC CONCEPTS OF FUZZY SET

Introduction to Classical Sets and Fuzzy Sets : Introduction - Classical sets - Fuzzy Sets. Classical Relation and Fuzzy Relations :- Introduction - Cartesian product of a relation - Classical Relation - Fuzzy Relations. Membership Functions : Introduction - Features of Membership Functions – Fuzzification - Methods of Membership Value Assignments. Defuzzification : Introduction - Lambda-Cuts for Fuzzy Sets - Lambda-Cuts for Fuzzy Relations - Defuzzification Methods.   **(11L)**

UNIT - IV   FUZZY ARITHMETIC AND DECISION MAKING

Fuzzy Arithmetic and Fuzzy Measures : Introduction - Fuzzy Arithmetic - Extension principles – Fuzzy measures. Fuzzy Rule Base and Approximate Reasoning : Introduction- Truth values and Tables in fuzzy logic - Fuzzy properties - Formation of rules- Decomposition of rules - Aggregation of Fuzzy rules - Fuzzy reasoning - Fuzzy Inference Systems. Fuzzy Decision Making : Individual Decision Making - Multiperson Decision Making - Multiobjective Decision Making - Multiattribute Decision Making. Fuzzy Logic

Control Systems : Introduction - Control System Design - Architecture and Operation of FLC System. **(13L)**

UNIT - V GENETIC ALGORITHMS

Genetic Algorithms : Introduction - Basic Operators and Terminologies in GAs - Traditional Algorithm vs. Genetic Algorithm - Simple GA - General Genetic algorithm - The Schema Theorem - Classification of Genetic Algorithm - Applications of Genetic Algorithm.

Applications of Soft Computing : Introduction - A Fusion approach of Multispectral Images with SAR Image for Flood area Analysis - Optimization of TSP using Genetic Algorithm Approach. **(12L)**

(TOTAL : 60L)

OUTCOMES

- Implement machine learning through neural networks
- Able to write genetic algorithms to solve optimization problem
- Understand fuzzy concepts and develop a fuzzy expert system to derive decisions

REFERENCES

1. S.N Sivanandam and S.N Deepa, "Principles of Soft Computing", Wiley –India, 2007.

2. S.Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2004.

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

4. S.N.Sivanandam, S.N.Deepa, "Introduction to Genetic Algorithms", Springer, 2007.

5. Timothy J.Ross, "Fuzzy Logic with Engineering Application", McGraw Hill, 2000.

6. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 2003.

SOFTWARE TESTING

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OBJECTIVES

- To enable a clear understanding about software tester
- To apply software testing knowledge and engineering concepts to detect errors in the software
- To practice software oriented testing projects
- To prepare software testing techniques and tools for industry standards.

UNIT – I SOFTWARE QUALITY ASSURANCE

Introduction to Software Quality Engineering : What is software quality – Benefits of software quality – Software development life cycle model – Types of defects – Definitions used in software quality engineering - Software Quality Assurance and Quality Control - Software Configuration Management (SCM).

Software Quality Assurance : Benefits of SQA – Role of SQA – SQA people – SQA plan – What is process – Process frame works.

Reviews, Inspections and walkthroughs : Management and Technical reviews - Inspections and walkthroughs – Inspection forms and check lists – Rate of Inspection – Inspection metrics- Estimating total number of defects in the software. **(12L)**

UNIT – II TESTING TECHNIQUES

Introduction to Testing : Guiding Principles of testing – Composition of testing team – Essential skills of a tester – Types of Testing – Evaluating the quality of test cases – Techniques for reducing number of test cases – Requirements for effective testing – Test Oracle – Economics of Software testing – Handling defects – Risk in software testing – Requirements traceability matrix.

White box (Structural) Testing : Introduction to control flow graph – Control flow testing – Basis path testing – Linear Code Sequence And Jump (LCSAJ) coverage or JJ –path coverage – Loop testing – Data flow testing – Slice-based testing – Pitfalls of white box testing – Tools for white box testing.

Integration Testing :   Types of Integration testing – Functional Decomposition based Integration – Call graph-based Integration – Path-based Integration – Smoke testing.

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UNIT – III   FUNCTIONAL & NON-FUNCTIONAL TESTING
Functional Testing : Logic-based Testing – State Transition Testing – Use Case-based Testing – Syntax Testing – Domain Testing – Petry Net-based testing – Tools used in Functional testing.
Non-functional, Acceptance and Regression Testing : Non-functional Testing – Acceptance Testing - Regression Testing.   **(10L)**

UNIT – IV   INCORPORATING SPECIALIZED TESTING TECHNIQUES
Testing of OO Software and Agile Testing : Basics of OO system – Overview of UML diagram – OO Testing – Quality Metrics for OO Software – Agile Testing.
 Test Management: Activities in Test Management – Evaluation of Test Effectiveness – Release Management – Tools used in Test management.
Cloud Testing :   Introduction to Cloud computing – Cloud testing – Testing as a Service(TaaS).   **(12L)**

UNIT – V TEST AUTOMATION & QUALITY METRICS
Test Automation :   Advantages and disadvantages of test automation – Activities in test Automation - Test Automation Frame work – Tools for Test Automation – Script languages in Test Automation.
Metrics for Software Quality : Categories of Software metrics – Metrics program – Types of Metrics – Some Commonly used Software Metrics.
Tools for Quality Improvement: Basic Quality Control Tool – Check sheet – Cause and effect Diagram – Pareto Diagram – Histogram – Scatter Plot – Run chart – Control Chart – Orthogonal defect Classification.   **(12L)**
                                                                       (TOTAL : 60L)

OUTCOMES
- Get an insight into the process of various software testing techniques
- Able to measure the performance of the using various metrics
- Able to evaluate the system with various testing techniques and strategies

REFERENCES
1) Anirban Basu, "Software Quality Assurance, Testing and Metrics", PHI, 2015.
2) Sandeep Desai, Abhishek Srivastava, "Software Testing A Practical Approach", PHI , 2016.
3) Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing Principles and practices", Pearson, 2012.
4) Aditya P Mathur, "Foundations of Software Testing", Pearson, 2011

RESEARCH METHODOLOGY

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OBJECTIVES
- To enable the students to know about the information needs of the research domain
- To introduce the concept of scientific research and the methods of conducting scientific enquiry

UNIT – I   INTRODUCTION TO RESEARCH

Research Methodology : Introduction -– Objectives of Research – Types of Research –– Research approaches – Significance of Research – Research Methods versus Methodology – Research and Scientific method – Research process – Criteria of good Research – Problems encountered by Researchers in India. Defining the Research problem : What is a Research problem - Selecting the Problem – Techniques involved in defining a problem.   **(13L)**

UNIT – II   RESEARCH AND SAMPLE DESIGN

Research design : Meaning of research design – Need for Research Design – Features of Good Design – Important concepts relating to Research design – Different Research designs – Basic Principles of Experimental Designs – Important Experimental designs – Informal Experimental designs – Formal Experimental designs. Design of sample surveys : Introduction - Sample design - Types of sampling designs – Non probability sampling – Probability sampling.   **(11L)**

UNIT – III   SCALING, DATA COLLECTION

Measurements and scaling: Quantitative and qualitative data – Classifications of measurement scales **–** Goodness of measurement scales –Sources of error in measurement – Scaling – Scale classification bases – Scaling techniques – Comparative Scaling Techniques – Non- Comparative Scaling Techniques.

Data Collection : Collection of Primary Data –– Observation Method – Interview method – Collection of data through Questionnaires – Collection of data through Schedules – Difference between Questionnaire and schedule – Guidelines for constructing Questionnaire/schedule – Some other methods of data collection – Collection of secondary data – Selection of Appropriate method for data collection   **(13L)**

UNIT – IV   ANOVA

Data Preparation : Data preparation process – Questionnaire checking – Editing – coding – classification – tabulation – Graphical representation – Data cleaning – Data adjusting – Some problems in preparation process – Types of analysis – Statistics in research.
Analysis of variance: The ANOVA technique – One way ANOVA – Two way ANOVA

(12L)

UNIT – V   REPORT WRITING, ALGORITHMIC RESEARCH

Interpretation and Report Writing : Meaning of interpretation –Technique of interpretation – Precaution in Interpretation – Significance of Report Writing – Different Steps in Writing Report – Layout of the Research Report – Types of Reports – Mechanics of Writing a Research Report.

Algorithmic Research : Algorithmic Research Problems – Types of Solution Procedure/ Algorithm – Steps of Development of Algorithm – Comparison of Algorithms - Computer and Researchers.   **(11L)**

(TOTAL : 60L)

OUTCOMES

- Get a view of how to choose research problem
- Able to design the research and samples
- Explore the features of data collection and data preparation
- Aware about report writing

REFERENCES

1. C.R.Kothari, "Research Methodology, Methods and Techniques", Third edition, New Age International Publishers, 2010.
2. R.Panneerselvam, "Research Methodology", PHI, 2009.
3. D.K.Bhattacharyya, "Research Methodology", First Edition, EBP, 2003.

1. PRINCIPLES OF COMPILER DESIGN

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OBJECTIVES
- To discover principles and techniques that can be used to construct various phases of compiler.
- To explore knowledge about parsers, optimization technique

UNIT – I   LEXICAL ANALYSIS

Introduction to Compiling : Language Processors, The Structure of a Compiler.
Lexical Analysis : The role of the lexical analyzer - Input buffering - Specification of tokens - Recognition of tokens – The Lexical Analyzer Generator Lex - Finite automata - Regular expression to finite automata – Design of Lexical Analyzer Generator - Optimization of DFA - based pattern matchers.   **(12L)**

UNIT – II   SYNTAX ANALYSIS

Syntax Analysis : The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- Parser Generators. Run time environment : Storage Organization – Static Allocation of space.   **(10L)**

UNIT – III   INTERMEDIATE CODE GENERATION

Intermediate Code Generation : Variants of Syntax trees – Three Address code – Types and Declarations - Translation of Expressions – Type checking - Control flow - Back patching - Switch Statements - Procedure calls.   **(12L)**

UNIT – IV CODE GENERATION

Code Generation : Issues in the design of a code generator - The target language – Address in the Target Code – Basic Block and Flow graphs – Optimization of Basic Blocks - A simple code generator – Peephole Optimization.   **(13L)**

UNIT – V OPTIMIZATION TECHNIQUES

Machine Independent Optimizations: Introduction to Optimization Techniques - Introduction to Data Flow analysis – Foundations of data flow analysis – Partial Redundancy Elimination - Loops in flow graph   **(13L)**

(TOTAL : 60L)

OUTCOMES
- Able to understand various phases of a compiler
- Explore the features of code generation and optimization techniques
- Able to design a compiler

REFERENCES

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi and Jeffrey D. Ullman, "Compilers- Principles, Techniques,and Tools", Pearson Education Asia, 2011.

2. Fischer Leblanc, Crafting Compiler, Benjamin Cummings, Menlo Park, 1988.

3. Kennath C.Louden, Compiler Construction Principles and Practice, Vikas publishing House, 2004.

4. Allen I. Holub, Compiler Design in C, Prentice Hall of India, 2001.

BIG DATA ANALYTICS

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4 0 0 3

OBJECTIVES

- To understand the fundamental concepts of big data analytics
- To explore the knowledge about big data computing and data mining, Data integration and extraction
- To develop state-of-the-art Big Data platform in research, education and industrial applications

UNIT – I INTRODUCTION TO BIG DATA

A new paradigm for big data: Scaling with a traditional database – Desired properties of a Big Data System-The problems with fully incremental architectures-Lambda Architecture-Recent Trends in Technology.

Batch Layer: DATA model for Big DATA - The properties of data- the fact-based model for representing data- Graph schemas.Data Model for Big Data: Why serialization framework? - Apache thrift – Limitations of serialization frameworks.   **(13L)**

UNIT – II MINING DATA SET

Data Storage on the batch layer: Storage requirements for the master dataset – Choosing a storage solution for the batch layer – How distributed file systems work – Storing a master dataset with distributed file system – Vertical partitioning – Low-level nature of distributed file systems – Storing the SuperWebAnalytics.com master dataset on a distributed file system.   **(11L)**

UNIT – III HADOOP, MAPREDUCE

Data storage on the batch layer : Illustration - Using the Hadoop Distributed File System – Data storage in the batch layer with Pail – Storing the master dataset for SuperWebAnalytics.com.

Batch layer : Motivating examples – Computing on the batch layer – Recomputation algorithms vs. incremental algorithms –Scalability in the batch layer – MapReduce: a paradigm for Big Data computing – Low-level nature of MapReduce-Pipe diagrams: a higher-level way of thinking about batch computation   **(12L)**

UNIT – IV SERVING LAYER

Serving layer: Performance metrics for the serving layer- The serving layer solution to the normalization/denormalization problem- Requirements for a serving layer database-

Designing a serving layer for Super WebAnalytics.com – Contrasting with a fully incremental solution.

Serving layer: Illustration: Basics of ElephantDB – Building the serving layer for SuperWebAnalytics.com   **(11L)**

UNIT - V SPEED LAYER

Speed Layer Realtime views: Computing realtime views – Storing realtime views – Challenges of incremental computation – Asynchronous versus Synchronous updates – Expiring realtime views. Queuing and stream processing: Illustration: Defining topologies with Apache Storm – Apache Storm clusters and deployment –Guaranteeing message processing – Implementing the SuperWebAnalytics.com unique-over-time speed layer. Lambda Architecture in depth: Defining data systems – batch and serving layers – Speed layer – Query layer.   **(13L)**

(TOTAL : 60L)

OUTCOMES

- Able to work with big data platform
- Explore design efficient algorithms for mining data for large volumes
- Able to analyze HADOOP and MapReduce technologies
- Get an insight into the issues in Serving layer and Speed layer

REFERENCES

1. Nathan Marz and James Warren, "Big Data Principles and best practices of scalable real-time data systems", Manning publications co., Dreamtech Press, Edition 2016.
2. Viktor Mayer-Schonberger and Kenneth Cukier, "Big Data: A Revolution That Will Transform How We Live, Work, and Think", Houghton Mifflin Harcourt, 2013
3.Zikopoulos, Paul and Chris Eaton, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, TMH, 2011.
4. Glenn J.Myatt, "Making Sense of Data", John Wiley&Sons, 2007.

MOBILE COMPUTING

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4 0 0 3

OBJECTIVES
- To understand fundamental concepts of mobile computing
- To impart knowledge about PALM OS & Symbian OS
- To provide a computer, system perspective on the converging areas of wireless networking

UNIT – I WIRELESS COMMUNICATION FUNDAMENTALS, ARCHITECTURE
Introduction : Mobility of bits and bytes – Wireless the beginning – Mobile Computing – Dialogue control – Networks – Middleware and gateways – Applications and services – Developing mobile computing applications.

Mobile Computing Architecture : Architecture of Mobile Computing – Three Tire Architecture.

Mobile Computing Through Telephony : Multiple Access procedure – Satellite Communication System - Mobile Computing Through Telephone – Developing an IVR Application.   **(11L)**

UNIT – II GSM, SMS
Emerging Technologies : Introduction – Bluetooth – Radio Frequency Identification(RFID) – Wireless Broadband(WIMAX) – Mobile IP .

Global System for Mobile Communication : Introduction – GSM Architecture –Network Aspects in GSM – Mobility Management – GSM frequency allocation – Personal Communication service – Authentication and Security.

Short Message Service : Mobile Computing over SMS - Short Message Service(SMS) – Value added Services through SMS – Accessing the SMS bearer.   **(13L)**

UNIT – III GPRS, WAP
General Packet Radio Service (GPRS) : Introduction – GPRS and Packet data Networking – GPRS Network Architecture - GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS.

Wireless Application Protocol : Introduction – WAP – MMS-GPRS applications.

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UNIT – IV WIRELESS LAN, INTELLIGENT NETWORKS
Wireless LAN : Wireless LAN Architecture – Mobility in Wireless LAN – Deploying Wireless LAN – Mobile Adhoc Networks and Sensor Networks – Wireless LAN security.
Intelligent Networks and Interworking : Fundamentals of Call Processing – Intelligence in the

Networks — IN Conceptual Model (INCM) – Softswitch –Technologies and Interfaces for IN.

Client Programming : Mobile Phones – Features of Mobile phones – PDA – Design constraints in Applications for Handheld devices **(13L)**

UNIT – V MOBILE APPLICATION DEVELOPMENT

Programming for the PALM OS : History of PALM OS – PALM OS architecture – Application Development.

Wireless Devices with Symbian OS : Introduction to Symbian OS - Symbian OS Architecture – Security on Symbian OS.

Security Issues in Mobile Computing : Information Security – Security Techniques and Algorithms. **(12L)**

(TOTAL : 60L)

OUTCOMES

- Gain knowledge about various types of wireless communication networks
- Understand the architectures, challenges and solutions of wireless communication network
- Able to develop simple mobile application

REFERENCES

1. Asoke K Talukder , Hasan Ahmed and Roopa R Yavagal, "Mobile Computing : Technology, Applications and Service Creation", Second Edition , TMH, 2010

2.T.G. Palanivelu, R. Nakkeeran, Wireless and Mobile Communication, PHI Learning Private Limited, 2009

3.Raj Kamal, "Mobile Computing" ,Second Edition, Oxford University Press, 2012

4.Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2007

5. William Stallings, "Wireless Communication and Networks", Pearson Education Asia, 2002

IMAGE PROCESSING USING MATLAB

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OBJECTIVES

      To understand the basic structure of MATLAB and to implement the image processing concepts

PROGRAMS SHOULD INCLUDE BUT NOT LIMITED TO

1. Read and display digital Images.
2. Image Arithmetic Operations
3. Image Logical Operations
4. Geometric transformation of Image
5. Histogram Equalization.
6. Non-linear Filtering.
7. Edge detection using Operators.
8. 2-D DFT and DCT.
9. Filtering in frequency domain.
10. Conversion between color spaces.
11. DWT of images.
12. Segmentation.

Core - 19
MINI PROJECT

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It is mandatory that the student should submit a report based on the software (Mini Project) developed on any one of the below mentioned topics:

- Android Applications
- Image Processing Applications
- Web Applications Using ASP.NET with C#

The internal mark shall be distributed as given below:

Internal Assessment Component	Marks
System Study	20
Execution	20
Report	10
Total	50

The external mark shall be distributed as given below:

External Assessment Component	Marks
Execution	20
Report	15
Viva-voce	15
Total	50

MAJOR PROJECT

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The objective of the project is to enable the students to work in a project of latest topic / research area / industrial applications. Each student shall have a guide from the Department.

During this semester the students are expected to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. Also during this semester, the students are expected to complete the project and submit a full-fledged report comprising of the complete system developed along with implementation and test results. The departmental committee shall examine the students for 50 marks and the evaluation is based on continuous internal assessment comprising of two reviews.

Internal Assessment Component	Marks
I Review on 50% Completion	20
Final Review	20
Report	10
Total	50

A Viva-voce will be conducted by two External Examiners and the marks shall be contributed as per the under mentioned components.

External Assessment Component	Marks
Report	15
Presentation	20
Viva-voce	15
Total	50