GOVERNMENT OF PUDUCHERRY
KANCHI MAMUNIVAR GOVERNMENT INSTITUTE FOR POSTGRADUATE STUDIES AND RESEARCH
(AUTONOMOUS)
A COLLEGE WITH POTENTIAL FOR EXCELLENCE
Re-accredited with NACC – 'B++' Grade by NAAC
(AFFILIATED TO PONDICHERRY UNIVERSITY)
PUDUCHERRY- 605 008

DEPARTMENT OF COMPUTER SCIENCE

M.Sc. (Computer Science)
(Full Time Programme – Duration 2 years)

RULES, REGULATIONS AND COURSE CONTENTS
(With Effective from 2022-2023 Batch)

August 2022

KANCHI MAMUNIVAR GOVERNMENT INSTITUTE FOR POSTGRADUATE STUDIES AND RESEARCH
(AUTONOMOUS)
A COLLEGE WITH POTENTIAL FOR EXCELLENCE
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PUDUCHERRY- 605 008

DEPARTMENT OF COMPUTER SCIENCE

MINUTES OF THE BOARD OF STUDIES MEETING HELD ON 19.08.2022

Board of Studies meeting was held on 19th August 2022 at 11 AM for revising and approving I, II, III and IV semester courses of M.Sc. Computer Science Programme to be followed from the academic year 2022-2023 onwards.

The following members attended the Board of Studies meeting.

Mrs.V.K.Mixymol
(Head of the Department)

Dr.S.Sivasathya & HOD
Professor, Department of Computer Science,
Pondicherry University,
Puducherry-605014.
(Member Nominated by VC)

Dr.N.Kannathasan
(Member)

Dr. T.Chithralekha,
Professor,
Department of Computer Science,
School of Engineering and Technology,
Pondicherry University, Puducherry.
(Member Nominated by AC)

Dr.C.Manju
(Member)

Dr.V.Prasanna Venkatesan,
Professor,
Department of Banking Technology,
School of Management, Pondicherry University,
Puducherry. **(Member Nominated by AC)**

Mr.S.Rajabathar
(Member)

Mrs.V.Yamunarani,
Assistant Professor, IGCASC, Kathirkamam,
Puducherry. **(Meritorious Alumnus)**

Dr.P.Dinadayalan
(Member)

Mr.Tangaiarasane, Technical Head,
Senior Manager, Engineering Aruba,
An HP Company, Chennai.
(Industry/Placement Representative)

Mrs. N.Vimala
(Member)

The Chairman introduced the members and explained the M.Sc. Computer Science revised syllabus under CBCS. She distributed the schemes and draft syllabi for all four semester courses of M.Sc. Computer Science (w.e.f. 2022-2023 batch).

The draft of the syllabi for all the four Semesters of M.Sc. Computer Science under CBCS system was discussed and after the deliberations, consensus was arrived and resolved the following recommendations. The total credit of the course is 72 with 59 as Hard-Core Credit and 13 as Soft-Core Credit.

Recommended Scheme for M.Sc. Computer Science course offered under CBCS with effect from 2022-2023 batch is attached.

12/9/2022

Mrs.V.K.Mixymol, H.O.D.,

Members

Dr.S.Sivasathya 15/9/22

Dr.T.Chithralekha T. 15/9/2022

Dr.V.Prasanna Venkatesan V.P 16/09/2022

Mrs.V.Yamunarani 16/9/2022

Mr.Tanigaiarassane

Dr.N.Kannathasan N 13.09.2022

Dr.C.Manju 13/9/22

Mr.S.Rajabathar 13/9/22

Dr.P.Dinadalayan 13/9/22

Mrs.N.Vimala 13/9/22

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GOVERNMENT OF PUDUCHERRY
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PUDUCHERRY – 605 008

DEPARTMENT OF COMPUTER SCIENCE
M.Sc. Computer Science
BOARD OF STUDIES MEETING – August 2022
(List of Members)

S.No.	Status in the Board	Name & Designation	Signature
1.	Chairman	Mrs.V.K.Mixymol Assistant Professor & HOD, Dept. of CS, KMCPGS	20.8.2022
2.	Member	Dr.N.Kannathasan Assistant Professor of Computer Science, KMCPGS	19/08/2022
3.	Member	Dr.C.Manju Assistant Professor of Computer Science, KMCPGS	20.8.2022
5.	Member	Mr.S.Rajabathar Assistant Professor of Computer Science, KMCPGS	
6.	Member	Dr.P.Dinadayalan Assistant Professor of Computer Science, KMCPGS	
7.	Member	Mrs.N.Vimala Assistant Professor of Computer Science, KMCPGS	19/08/2022
8.	Member-VC Nominee-Pondicherry University	Dr.S.Sivasathya Professor, Department of Computer Science, Pondicherry University, Puducherry-605014.	19/8/2022
9.	Member-Expert Nominated by AC	Dr.T.Chithralekha Professor, Department of Computer Science, School of Engineering and Technology, Pondicherry University, Puducherry	19/8/2022
10.	Member-Expert Nominated by AC	Dr.V.Prasanna Venkatesan Professor, Department of Banking Technology, School of Management, Pondicherry University, Puducherry.	19/08/2022
11.	Member-Meritorious Alumnus	Mrs.V.Yamunarani Assistant Professor, Department of Computer Science, IGCASC, Kathirkamam, Puducherry.	19/8/2022
12.	Member-Industry/ Placement Representative	Mr.Tanigaiarassane, Senior Manager, Engineering Aruba, An HP Company Anna Salai Chennai.	—

KANCHI MAMUNIAVAR GOVERNMENT INSTITUTE FOR POSTGRADUATE STUDIES AND RESEARCH, PUDUCHERRY

DEPARTMENT OF COMPUTER SCIENCE

Scheme for M.Sc. Computer Science Programme offered under CBCS (with effective from 2022-2023 batch)

Paper No.	Semester	Course Code	Course Title	Credits	Total Credits			Hours /Week		
					HC	SC	Total	L	T	Total
1	I	CSHT22101	Database Systems	3	3		19	3	1	30
2		CSHT22102	Programming,Data Structures and Algorithms using Python	3	3			3	1	
3		CSHT22103	Data Warehousing and Data Mining	3	3			3	1	
4		CSHT22104	Operating System Design	3	3			3	1	
5		CSSC22105	SOFT CORE-Elective-I	3		3		3	1	
6		CSHP22106	Data Structures and Algorithms using Python Lab	2	2			4		
7		CSHP22107	RDBMS Lab	2	2			4		
			MOOCs e-certification/Seminar / Test / Library/Case Study/Bridge Courses					2		
	TOTAL CREDIT				16	3		23	5	
8	II	CSHT22208	Data Communications and Networking	3	3		19	3	1	30
9		CSHT22209	Distributed Systems	3	3			3	1	
10		CSHT22210	Visual Programming using Python	3	3			3	1	
11		CSHT22211	Soft Computing	3	3			3	1	
12		Soft Core	SOFT CORE-Elective-II	3		3		3	1	
13		CSHP22213	Networking & Distributed Computing Lab	2	2			4		

14		**CSHP22214**	Visual Programming using Python Lab	2	2			4		
			MOOCs e-certification/Seminar/ Test / Library					**2**		
	TOTAL CREDIT				**16**	**3**		**23**	**5**	
15	**III**	**CSHT22315**	Artificial Intelligence and Machine Learning	3	3			3	1	**30**
16		**CSHT22316**	Software Engineering	3	3			3	1	
17		**CSHT22317**	Web Technology	3	3			3	1	
18		**CSSC22318**	SOFT CORE -Elective-III	3		3		3	1	
19		**CSSC22319**	SOFT CORE -Elective-IV	3		3	**20**	3	1	
20		**CSHP22320**	AI & Machine Learning Lab	2	2			4		
21		**CSHP22321**	Web Technology Lab	2	2			4		
22		**Soft Core**	Outreach Programme (Conferences / Symposiums / Technical Meets / Workshops / MOOCs e-certification Etc.,)	1		1		2		
TOTAL CREDIT					**13**	**7**		**23**	**5**	
23	**IV**	**CSHT22423**	Big Data and Cloud Computing	4	4			4	1	**30**
24		**CSHP22424**	Project Work and Viva-Voce	10	10		**14**	20	3	
			MOOCs e-certification/Seminar / Test / Library					**2**		
TOTAL CREDIT					**14**	**0**		**24**	**4**	
OVERALL CREDIT				**72**	**59**	**13**	**72**			

List of Soft Core Courses(Electives) offered by the Department

Level-I: Semester-I & Semester-II	
Course Code	**Course Title**
	Automata Theory and Computation
	Probability and Statistics
	Bioinformatics
	Computer Graphics and Multimedia Systems
	Object Oriented System Design
	Modeling and Simulation
	Principles of Compiler Design
	Principles of Programming Languages
	Optimization Techniques
	Natural Language Processing
	Level-II: Semester-III & Semester-IV
Course Code	**Course Title**
	Linear Programming
	Blockchain and Bitcoin
	Digital Image Processing
	Information Retrieval Systems
	Internet of Things
	Mobile Application Development
	Professional Ethics
	Web Services and SOA
	Software Testing and Quality Management

	Cyber Security
	Research Methodology
	Data Mining & Data Visualization Tools

Semester wise Credit details:

Semester	No. of Hard Core Courses	No. of Soft Core Courses	Hard Core Credits	Soft Core Credits	Total Credits
I	6	1	16	3	**19**
II	6	1	16	3	**19**
III	5	3	13	7	**20**
IV	2	0	14		**14**
Total	19	5	**59**	**13**	**72**

Evaluation and Examination Pattern:

The evaluation scheme for each course shall contain two parts; (a) internal evaluation and (b) external evaluation. 40% weightage shall be given to internal evaluation and the remaining 60% to external evaluation.

Each Course (Theory & Practical) will have 100 Marks with CIA 40 Marks & End Semester Examination 60 Marks.

Internal evaluation:

The internal evaluation for theory courses shall be based on predetermined transparent system involving periodic written tests, assignments and mid semester examination. The internal evaluation for practical courses shall be based on performance in the Laboratory Involvement, skill /records/viva and model practical examination.

The weightage assigned to various components for internal evaluation of theory course is as follows.

Internal Assessment Components:

Sl. No.	**Component**	**Maximum Marks**
1	Three Tests (Best 2 out of 3)	15
2	Mid Semester Examination	15
3	Seminar/ Assignment / Observation etc.	10
TOTAL		**40**

End Semester Examination - Pattern of Question Paper:

Section	No. of Questions	Marks for Each Question	Total
A	**10 (MCQs)** Two Questions from each Unit	1	10
B	**5** (One Question from each Unit, with Internal Choice)	4	20
C	**3** 3 out of 5 (One from each unit)	10	30
TOTAL			**60**

KANCHI MAMUNIVAR GOVERNMENT INSTITUTE FOR POSTGRADUATE STUDIES AND RESEARCH PUDUCHERRY

MSc. Computer Science
(Full Time Programme – Duration 2 years)

I) Programme Outcomes (PO):

M.Sc. in Computer Science programme enables the students to attain the following ability to

- Apply knowledge of computing and mathematics appropriate to the discipline.
- Design, implement, and evaluate a computational system to meet desired needs within realistic constraints.
- Use design and development principles in software systems, software development tools, and modern computing platform.

II) Programme Specific Outcomes (PSO):

A graduate with a M.Sc. in Computer Science will have the ability to

- Communicate computer science concepts, designs, and solutions effectively and professionally.
- Apply knowledge of computing to produce effective designs and solutions for specific problems.
- Use software development tools, software systems, and modern computing platforms.

III) Course Learning Outcome:

Course Code	Course Title	Course Learning Outcomes
Semester-I		
CSHT22101	Database Systems	• Ability to build a solid foundation for advanced studies in database area.
CSHT22102	Programming, Data Structures and Algorithms using Python	• Ability to design efficient algorithms using various algorithm designing strategies using Python. • Ability to classify the problem and apply the appropriate design strategy to develop algorithm using Python.
CSHT22103	Data Warehousing and Data Mining	• Ability to understand the basic concepts and techniques of Data Mining. • Ability to develop skills of using recent data mining software for solving practical problems. • Ability to gain experience of doing independent study and research.

CSHT22104	Operating System Design	• Ability to analyze the various device and resource management techniques for time sharing and distributed systems. • Ability to know the components and management aspects of operating systems.
CSSC22105	SOFT CORE-ELECTIVE-I	• --
CSHP22106	Data Structures and Algorithmsusing Python Lab	• --
CSHP22107	RDBMS Lab	• --
Semester-II		
CSHT22207	Data Communications and Networking	• Ability to design the new protocols for modern networks. • Ability to get familiarized with next generation networks.
CSHT22208	Distributed Systems	• Ability to design and implement sample distributed systems.
CSHT22209	Visual Programming using Python	• Ability Develop GUI using Python.
CSHT22210	Soft Computing	• Ability to use ANN in various AI problems. • Ability to explore the concepts in various AI problems using Fuzzy Logic. • Ability to explore the concepts in various AI problems using Genetic Algorithms. • Ability to apply these techniques in applications which involve perception, reasoning and learning.
CSSC22211	SOFT CORE- ELECTIVE-II	• --
(Other Major Elective) SC22212	SOFT CORE- ELECTIVE-III	• --
CSHP22212	Networking & Distributed Computing Lab	• --
CSHP22213	Visual Programming using Python Lab	• --

Semester-III		
CSHT22315	Artificial Intelligence and Machine Learning	• Ability to explore logic for solving various AI problems. • Understand a wide variety of learning algorithms. Understand how to evaluate models generated from data. Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
CSHT22316	Software Engineering	• Ability to understand the concepts of Software Engineering and Software Engineering Methods.
CSHT22317	Web Technology	Ability to design an innovative application for web.
CSSC22318	SOFT CORE-ELECTIVE-IV	--
CSSC22319	SOFT CORE- ELECTIVE-V	--
CSHP22320	AI & Machine Learning Lab	--
CSHP22321	Web Technology Lab	--
Soft Core	Outreach Programme (Conferences / Symposiums / Technical Meets / Workshops / MOOCs e-certification Etc.,)	• To get various skill enhancements in the field of Computer Science.
Semester-IV		
CSHT22421	Big Data and Cloud Computing	• Ability to do a simple project in Hadoop API. • Ability to use the concepts in developing new applications.
CSHP22422	Project Work and Viva-Voce	• Ability to do problem formulation, design, implementation and testing phases that typically explores various phases of problem solving. • Ability to utilize the knowledge gained through various courses studied in this programme. • Ability to inculcate the ability in integrating and releasing a prototype (Working model) of the solution to the problem taken.

List of Soft-Core Courses (Electives) offered by the Department		
Level-I: Semester-I & Semester-II		
Course Code	**Course Title**	**Course Learning Outcomes**
	Automata Theory and Computation	• Ability to get familiar with computability and complexity measures.
	Probability and Statistics	• Ability to understand mathematical descriptions of random variables including Probability Mass Functions (PMFs), Cumulative Distribution Functions (CDFs), Probability Distribution Functions (PDFs), Conditional Mass, Conditional Distribution and Conditional Density Functions.
	Bioinformatics	• Ability to understand Bio Informatics Algorithms & Implementation using Machine Learning approaches.
	Computer Graphics and Multimedia Systems	• Ability to understand Computer Graphics. • Algorithms and Multimedia Systems and Applications.
	Object Oriented System Design	• Ability to understand the fundamentals and concepts of object-oriented system design. • Acquiring skills to develop object-oriented system design.
	Modeling and Simulation	• Ability to understand various Simulation Modeling Methodologies.
	Principles of Compiler Design	• Ability to understand Principles, Techniques and Tools of Compiler Design.
	Principles of Programming Languages	Ability to: • Prepare themselves to think about programming languages analytically. • Separate syntax from semantics. • Understand how language features work like Data types, Control flow, Subroutines,Data abstraction, etc., • Learn new languages more quickly and use standard vocabulary when discussing languages. • Develop a greater understanding of the issues involved in programming language design and implementation. • Know how to analyze semantic issues associate with function implementations, including various binding, scoping rules, parameter passing.
	Optimization Techniques	• Ability to apply the concepts of various classical and modern methods for constrained and unconstrained problems in both single and multivariable problems.
	Natural Language Processing	• Ability to get Natural Language. • Understanding& Speech and Language processing.

SOFT CORE-ELECTIVE		
Level-II: Semester-III & Semester-IV		
Course Code	**Course Title**	**Learning Outcomes**
	Linear Programming	• Ability to apply the concepts in the many real time applications.
	Blockchain and Bitcoin	• Ability to get Blockchain and Bitcoin technologies.
	Digital Image Processing	• Ability to get Digital Image Fundamentals. • Ability to understand Image Enhancement, Image Restoration, Image Segmentation & Image Compression techniques. • Ability to apply above techniques for implementation.
	Information Retrieval Systems	• Ability to get Information Retrieval Systems methodologies and Implementation.
	Internet of Things	• Ability to develop small applications using IoT.
	Mobile Application Development	Ability to: • Create android project from XML Layout. • Debug android apps and create UI fragments. • Pass data between fragments. • Design apps with audio play back. • Create database and communicate with mobile apps.
	Professional Ethics	• Ability to understand Ethical, legal and professional issues in computing.
	Web Services and SOA	• Get familiarized with various software architectures and emerging technologies.
	Software Testing and Quality Management	• Ability to understand various software testing techniques. • Ability to incorporate specialize testing responsibilities. • Ability to understand SQA components and project life cycle. • Ability to understand software quality management and apply various metrics.
	Cyber Security	• Ability to understand various Cyber Security issues and Cyber Security algorithms.
	Research Methodology	• Demonstrate the ability to choose methods appropriate to research aims and objectives. Understand the limitations of particular research methods. • Develop skills in qualitative and quantitative data analysis and presentation. • Develop advanced critical thinking skills.
	Data Mining & Data Visualization Tools	• Ability to use the tools for data analysis. • Ability to use the tools for data visualization.

SEMESTER - I

DATABASE SYSTEMS

UNIT- I

Introduction – Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture – Database users and Administrator, Data Mining and Information Retrieval, Speciality Databases, Database Users and Administrators, History of Database Systems.

UNIT- II

Introduction to the Relational Model and SQL: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations.
INTRODUCTION TO SQL- Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database.

UNIT -III

Database Design - Relational Database Design- Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms, Database-Design Process, Modeling Temporal Data.

UNIT-IV

Transaction Management – Transactions – Transaction Concept, A Simple Transaction Model, Transaction Atomicity and Durability, Transaction Isolation, Serializability. Concurrency Control- Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols.

UNIT-V

System Architecture-Distributed Databases- Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Concurrency Control in Distributed Databases, Distributed Query Processing.

TEXT BOOK:

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, McGraw Hill Education (India) Edition, 2013.

REFERENCE BOOKS:

1. S.K.Singh, "Database Systems Concepts, Design and Applications", First Edition, Pearson Education, 2006.
2. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
3. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson / Addison Wesley, 2007.

PROGRAMMING, DATA STRUCTURES AND ALGORITHMS USING PYTHON

UNIT- I

Python overview – Objects in Python-Expressions, Operators and Precedence-Control flow, Functions – simple Input and Output handling-Exception Handling- Modules and Import statement, Object oriented programming-Class and Modules-Creating Instances-Methods and Special Methods-Inheritance and Polymorphism.

UNIT- II

Recursion: Factorial function, Array- Low level arrays, Dynamic Array and Amortization-SearchTrees: Binary Search Trees-Balanced Search Trees Sorting and Selection: Merge Sort, Quick Sort.

UNIT- III

Stacks, Queues and Dequeues – Stacks- The Stack- Abstract data type, Simple array-based implementation- Reversing data using Stack-Queues, Linked list- Singly Linked list- Circular Linked list – Doubly Linked list.

UNIT- IV

Tree Traversal Algorithm- General trees – Binary trees-Implementing trees –- Pre-order and post order traversals of General Trees- Breath First tree Traversal – In order traversal of Binary tree -Priority Queue-Abstract data type- Heaps – The Heap data structure – Implementing a Priority queue using a Heap.

UNIT- V

Dynamic Programming: Matrix-Chain Product, DNA and Text Sequence Alignment. Text Compression and the Greedy Method: The Huffmann Coding Algorithm, The Greedy Method

Graphs Algorithms: Graphs- Data structure for Graphs – Graph traversals-shortest path – weighted Graph, Dijkstra's algorithm – Minimum spanning Trees-Prim-Jarnik Algorithm, Kruskal's Algorithm.

TEXT BOOK:

1. Data Structures and Algorithms in Python, Micheal T Goodrich,Oberto Tamassia, Micheal H Goldwasser Wiley Publications.

REFERENCE BOOKS:

1. Problem Solving in Data Structures and Algorithms Using Python: Programming Overview, Hemant Jain.
2. Data Structure and Algorithmic thinking with Python, Narasimha Karumanchi, CarreerMork Publications.

DATA WAREHOUSING AND DATA MINING

UNIT -I

INTRODUCTION- Why Data Mining-What is Data Mining-What Kinds of Data Can Be Mined-What Kinds of Patterns Can Be Mined-Which Technologies Are Used-What Kinds of Applications Are Targeted- Major Issues in Data Mining- Relation to Statistics, Databases-Data Mining Functionalities-Steps in Data Mining Process-Architecture of A Typical Data Mining Systems- Classification of Data Mining Systems - Overview of Data Mining Techniques.

UNIT – II

DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING - Data Warehouse: Basic Concepts-Data Warehouse Modeling: Data Cube and OLAP-Data Warehouse Design and Usage-Data Warehouse Implementation-Data Generalization by Attribute-Oriented Induction.

UNIT – III

DATA PREPROCESSING AND MINING FREQUENT PATTERNS - Data Pre-processing: An Overview-Data Cleaning, Data Integration, Data Reduction- Data Transformation.
Data Mining Frequent Patterns, Associations, and correlations: Basic Concepts-Frequent Itemset Mining Methods.

UNIT – IV

CLASSIFICATION & CLUSTERING – Classification: Basic Concepts- Decision Tree Induction-Bayes Classification Methods- Rule-Based Classification-Cluster Analysis: What is Cluster Analysis? Partitioning Methods-Hierarchical Methods.

UNIT – V

DATA MINING TRENDS AND RESEARCH FRONTIERS- Mining Complex Data Types-Other Methodologies of Data Mining- Data Mining Applications-Data Mining and Society-Data Mining Trends.

TEXT BOOK:

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining-Concepts and Techniques", - Third Edition, Morgan Kaufmann Publishers, 2012.

REFERENCE BOOKS:

1. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
2. Sean Kelly, "Data Warehousing in Action", John Wiley & Sons Inc., 1997.
3. Alex Berson, Stephen J. Smith, “Data Warehousing, Data Mining, & OLAP”, Tata McGraw- Hill, 2004.
4. Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, "Advances in Knowledge Discovery and Data Mining", The M.I.T Press, 1996.
5. W. H. Inmon Building the Data Warehouse Wiley Computer Publishing Third Edition, 2002.

OPERATING SYSTEM DESIGN

UNIT-I

Operating System Overview: Operating System Objectives and Functions – Evolution of Operating System – Process Description and Control: Process States – Process Description – Process Control- Execution of OS- Threads-Process and Threads – Types of Threads – Multicore and Multithreading.

UNIT-II

Memory Management: Memory management Requirements – Memory partitioning – Paging – Segmentation- Virtual memory – Hardware control structure-Operating System Software
I/O management and Disk scheduling: I/O Devices – Organization of the I/O Functions – Operating System Design Issues – I/O Buffering – Disk Scheduling –RAID- Disk Cache.

UNIT-III

File Management: Overview – File Organization - File Directories – File Sharing – Record Blocking – Secondary storage management -Computer Security Techniques – Authentication – Access Control – Intrusion Detection – Malware Défense – Dealing with Buffer Overflow Attacks.

UNIT-IV

Real-Time Systems- Overview- Real-Time CPU Scheduling- Features of Real-Time Kernels-Implementing Real-Time Operating Systems- 5 Real-Time CPU Scheduling- An Example: VxWorks 5.x
Multiprocessor Systems—Multiprocessor Hardware-Multiprocessor operating system types- -Multiprocessor Scheduling-Multiprocessor Synchronization.

UNIT-V

Case Study: UNIX, LINUX, ANDROID-History of UNIX and LINUX-Overview of LINUX-Memory Management LINUX File System in LINUX—ANDROID-ANDROID Architecture-LINUX Extensions-Dalvik-Binder IPC.

TEXT BOOKS:

1. William Stallings, Operating Systems Internals and Design Principles, Prentice Hall India Private Limited, Seventh Edition, 2016. (UNIT -I to III).
2. Andrew S. Tanenbaum and Herbert Bos, Modern Operating Systems, Prentice Hall, Fourth Edition, 2014 (UNIT IV (Second half) and UNIT V).
3. Abraham Silber Schatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, Wiley, Eighth edition, 2008 (UNIT IV).

REFERENCE BOOKS:

1. H. M. Deitel, Operating Systems, Addison-Wesley, Second Edition.
2. Charles Crowley, Operating Systems. A Design Oriented Approach, TMH, 1998.
3. Andrew S. Tanenbaum & Albert S. Woodhull, Operating Systems Design and Implementation, Prentice-Hall, India, Second Edition.

DATA STRUCTURES AND ALGORITHMS USING PYTHON LAB

1. Program to count number of vowels in a given character string
2. Create a python class Account that has three instances of variables Account no, Customer name and Balance. Write a program to create methods for deposit and Withdrawal of amount from the account
3. Program for Binary search using recursion
4. Program for implementing Selection sort
5. Program for array-based Stack implementation
6. Program for array-based Queue implementation
7. Program for Implementing Stack with singly Linked List
8. Program for Implementing Queue with singly Linked List
9. Program for Implementing tree traversals
10. Program for Implementing Priority Queue using Heap

RDBMS LAB

1. Use of DDL, DML commands and retrieval of values from multiple tables
2. Creation of index, views and sequences
3. Perform Join operation on relational tables
4. Apply set operators
5. Use aggregate functions in SQL
6. Write Subqueries
7. Granting system privilege
8. PL/SQL blocks conditional, iterative and unconditional controls for making programs
9. Use of transactions
10. Processing of SQL statements using cursors
11. Use of Procedures and Functions
12. Use of database triggers
13. Use of Exception handling

Application: Design and develop any two of the following:

A. Library Information System
B. Students' Information System
C. Ticket Reservation System
D. Hotel Management System
E. Hospital Management System
F. Employee Information System

SEMESTER – II

DATA COMMUNICATION AND NETWORKING

UNIT- I

Introduction – Data communications – Networks –Network Types- Standards and Administration— OSI Model – TCP/IP protocol suite - Bandwidth Utilization: Multiplexing - FTD-TDM-WDM- Transmission Media – Guided media – Unguided media.

UNIT- II

Data Link Layer- - Data link Control: DLC services, Data Link Layer protocols–Wireless LANs: IEEE 802.11 Project.

Network Layer –IPV4 Address- Forwarding of Packets- Network-Layer Protocols- Internet Protocol (IP)- ICMPv4- Unicast Routing.

Transport Layer-Introduction, Transport layer protocols- UDP-TCP- TCP Services, -TCP Features- Segment- TCP Connection-, State Transition Diagram- Windows in TCP.

UNIT- III

Application layer – Introduction-Client-Server programming – Iterative Programming using TCP - Iterative Programming Using UDP--DNS- Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS Messages.

UNIT- IV

Cryptography and Network Security-Introduction-confidentiality-Other aspects of Security-Internet Security- Network Layer Security- Two Modes - Two Security Protocols - Services Provided by IPsec - Internet Key Exchange (IKE)- Virtual Private Network (VPN) – Transport Layer Security- SSL architecture - Four Protocols, Application Layer Security- E-mail Security - Pretty Good Privacy (PGP) - FIREWALLS - Packet-Filter Firewall - Proxy Firewall.

UNIT- V

Wireless and Mobile Networks- Introduction-Wireless Links and Network Characterstics-WiFi:802.11 Wireless LANs-Cellular Internet Access-Mobility Management Principles-Mobile IP-Managing Mobility in Cellular Networks.

TEXT BOOKS:

1. Behrouz A. Fourouzan, “Data Communications & Networking”, McGraw Hill (India), Fifth Edition.
2. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, Keith W. Ross, Third Edition, Pearson Education, 2007.

REFERENCE BOOKS:

1. Larry L. Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012.
2. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

DISTRIBUTED SYSTEMS

UNIT-I

Introduction: Definition of a distributed System, Goals, Types of Distributed Systems, Architectures: Architectural Styles, System Architectures, Architectures verses Middleware, Processes: Threads, Virtualization, Clients, Servers, Code Migration.

UNIT-II

Communications: Fundamentals, Remote Procedure Call, Message oriented Communication, Stream-oriented Communication, Multicast Communication, Naming: Names, Identifier and Addresses, Flat naming, Structured naming, attribute-based naming.

UNIT-III

Synchronization: Clock Synchronization, Logical Clock, Mutual Exclusion, Global Positioning of nodes, Election Algorithms, Consistency and Replication: Introduction, Data-centric consistency model, Client-centric consistency model, Replica Management, Consistency Protocol.

UNIT-IV

Fault Tolerance: Introduction to Fault Tolerance, Process Resilience, Reliable Client-Server communication, Reliable Group Communication, Distributed Commit, Recovery, Security: Introduction to security, Secure Channel, Access control, Security Management.

UNIT-V

Distributed Object-based System: Architecture, Processes, Communication, Distributed File System: Architecture, Processes, Communication, Naming, Distributed Web-based System: Architecture, Processes, Communication, naming, synchronization Distributed Co-ordination based system: Architecture, Processes and Communication.

TEXT BOOK:

1. Distributed Systems Principles and Paradigms by Andrew S Tanenbaum and Marteen Van Steen

VISUAL PROGRAMMING USING PYTHON

UNIT – I

Basic GUI Programming -Introduction to GUI Programming -Dialogs -Dumb Dialogs - Standard Dialogs - Smart Dialogs- Main Windows - Creating a Main Window Handling User Actions

UNIT – II

Using Qt Designer - Data Handling and Custom File Formats - Main Window Responsibilities - Data Container Responsibilities - Saving and Loading Binary Files- Saving and Loading Text Files- Saving and Loading XML Files.

UNIT – III

Intermediate GUI Programming - Layouts and Multiple Documents - Layout Policies- Tab Widgets and Stacked Widgets – Splitters - Single Document Interface (SDI) - Multiple Document Interface (MDI)-

UNIT – IV

Events, the Clipboard, and Drag and Drop - The Event-Handling Mechanism – Re-implementing Event Handlers - Drag and Drop - Custom Widgets.

UNIT – V

Model/View Programming - Using the Convenience Item Widgets - Creating Custom Models - Creating Custom Delegates - Databases - Connecting to the Database - Executing SQL Queries - Using Database Form Views - Using Database Table Views.

TEXT BOOK:

1. Mark Summerfield," Rapid GUI Programming with Python and Qt: The Definitive Guide to PyQt Programming", Prentice Hall, 2008.

SOFT COMPUTING

UNIT-I

Fuzzy Logic: Fuzzy Set Theory – Fuzzy versus Crisp, Crisp sets, Fuzzy Sets, Crisp Relations, Fuzzy Relations. Neural Networks: Fundamentals of Neural Networks: Basic concepts of Neural Networks, Human Brain, Model of an Artificial Neuron, Neural Network Architectures, Learning Methods, Characteristics of Neural Networks – Taxonomy of Neural Network Architectures – Some Application Domains.

UNIT-II

Fuzzy Logic: Fuzzy Systems – Crisp Logic, Predicate Logic, Fuzzy logic, Fuzzy Rule Based System – Defuzzification – Applications.

UNIT-III

Neural Networks: Backpropagation Networks – Architecture of a Backpropagation Network, Backpropagation Learning, Applications, Associative Memory- Autocorrelators, Heterocorrelators: Kosko's Discrete BAM, Adaptive Resonance Theory- Cluster Structure, Vector Quantization, Classical ART Networks, Simplified ART Architecture.

UNIT-IV

Genetic Algorithms: Fundamentals of Genetic Algorithms – Basic Concepts – Creation of Offsprings – Working Principle – Encoding – Fitness Function – Reproduction – Roulette-wheel Selection, Boltzmann Selection. Genetic Modelling: Inheritance Operators – Cross over – Inversion and Deletion – Mutation Operator.

UNIT-V

Hybrid Systems: Hybrid Systems-Sequential Hybrid Systems, Auxiliary Systems, Embedded Hybrid systems, Neural Networks, Fuzzy Logic and Genetic Algorithms Hybrids – Soft Computing tools.

TEXT BOOK:

1. S. Rajasekaran, G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms, 2003, 1st Edition, PHI.

REFERENCE BOOK:

1. J. S.R. Jang, C.T. Sun, E.Mizutani, Neuro-Fuzzy and Soft Computing, 1997, PHI.

NETWORKING AND DISTRIBUTED COMPUTING LAB

1. Implementation of a socket program for Echo/Ping/Talk commands.
2. Creation of a socket between two computers and enable file transfer between them.
   using (a.) TCP (b.) UDP
3. Implementation of a program for Remote Command Execution (Two M/Cs may be used).
4. Implementation of a program for CRC and Hamming code for error handling.
5. Writing a code for simulating Sliding Window Protocols.
6. Create a socket for HTTP for web page Upload & Download.
7. Write a program for TCP module Implementation (TCP services).
8. Developing network applications using RMI technology in Java.
9. Developing a program to simulate the Distributed Mutual Exclusion.
10. Program to implement a Distributed chat server using TCP sockets.

VISUAL PROGRAMMING USING PYTHON LAB

1. Signals-and-slot
2. Dialogs
3. Main Windows
4. Designing User Interfaces using Qt Designer
5. Layouts and Multiple Documents
6. Event Handling
7. Custom Widgets
8. Databases

SEMESTER-III

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

UNIT – I

Artificial Intelligence – Introduction - History of AI – Agents - Knowledge-Based Systems- Propositional Logic- First-order Predicate Logic - Limitations of Logic.

UNIT – II

Search, Games and Problem Solving – Introduction- Uninformed Search - Heuristic Search - Games with Opponents - Heuristic Evaluation Functions - Reasoning with Uncertainty - Computing with Probabilities - The Principle of Maximum Entropy - Reasoning with Bayesian Networks.

UNIT – III

Logic Programming with PROLOG - PROLOG Systems and Implementations – Simple Examples - Execution Control and Procedural Elements – Lists - Self-modifying Programs - A Planning Example - Constraint Logic Programming.

UNIT – IV

Machine Learning and Data Mining - Data Analysis - Perceptron, a Linear Classifier - Nearest Neighbor Method - Decision Tree Learning- Learning of Bayesian Networks - Clustering- Exercises.

UNIT – V

Neural Networks - From Biology to Simulation- Hopfield Networks- Neural Associative Memory- Linear Networks with Minimal Errors- Back propagation Algorithm - Support Vector Machines – Applications.

TEXT BOOK:

1. Wolfgang Ertel, "Introduction to Artificial Intelligence", Springer, 2011.

REFERENCE BOOKS:

1. Kevin Night, Elaine Rich, Nair B., "*Artificial Intelligence (SIE)*", McGraw Hill-2008.
2. Dan W. Patterson, "*Introduction to AI and ES*", Pearson Education, 2007.
3. Stuart Russel, Peter Norvig "*AI – A Modern Approach*", 2nd Edition, Pearson Education 2007.
4. W.F. Clocksin · C.S.Mellish, "Programming in Prolog", Springer, 2003.

SOFTWARE ENGINEERING

UNIT-I

The nature of software – software engineering – software process - software myths - process models - a generic process model - process assessment and improvement - prescriptive process model - component based development – product and process –- Agility and the cost of change –an agile process.

UNIT-II

Requirements engineering – identifying stakeholders –recognising multiple viewpoints – working toward collaborations – collaborative requirements gathering – building the requirements model – negotiating and validating requirements – requirement analysis – scenario-based modelling – data modelling concepts – class-based modelling.

UNIT-III

Design process – design concepts - abstraction – patterns – modularity – information hiding – functional independence - design model - data design elements – interface design elements – overview of object-oriented system development – object basics- object oriented systems development life cycle.

UNIT-IV

Achieving software quality –software reliability - a strategic approach to software testing – test strategies for conventional software – system testing –black box testing – white box testing - art of debugging – basic principles of project scheduling – software reengineering and reverse engineering - capability maturity model (CMMI).

UNIT-V

CASE STUDY: A sample Project work - Report creation and submission using software engineering concepts.

TEXT BOOK:

1. Roger Pressman, "Software Engineering A Practitioner's Approach", McGraw Hill (India), 10th reprint, 2015.

REFERENCE BOOKS:

1. Jan Sommerville, "Software Engineering", 8th Edition, Pearson Education, 2008.
2. Richard Fairley, "Software Engineering Concepts", McGraw Hill, 2004.
3. Stephan Schach, "Software Engineering", Tata McGraw Hill, 2007.

WEB TECHNOLOGY

UNIT - I

Web Essentials: Clients, Servers, and Communication - The Internet ,Basic Internet Protocols - HTTP Request Message - HTTP Response Message - Web Clients - Web Servers - Markup Languages: XHTML - HTML's History and Versions - Basic XHTML Syntax and Semantics - Some Fundamental HTML Elements – Lists, Tables, Frames, Forms - Introduction to Cascading Style Sheets - JavaScript – Functions , Arrays, Global Object - Host Objects: Browsers and the DOM - Introduction - DOM History and Levels - DOM Event Handling.

UNIT - II

Server-side programming – Introduction to CGI, ASP, ASP.NET, PHP – Comparison between CGI & Servlet - Java Servlets - Servlet Architecture Overview, Servlets Generating Dynamic Content, Servlet Life Cycle, Parameter Data, Sessions, Cookies, URL Rewriting, Servlets and Concurrency.

UNIT – III

Separating Programming and Presentation: JSP Technology - Introduction to Java Server Pages, JSP and Servlets, Basic JSP, JavaBeans Classes and JSP- JavaBeans Technology Basics, Instantiating Bean Objects, using JavaBeans Objects, Getters/Setters on Non bean Objects - Support for the Model-View-Controller Paradigm.

UNIT – IV

Building Blocks of PHP- Flow Control Functions in PHP - Working with Functions - Working with Arrays - Working with Forms Working with Cookies and User Sessions Interacting with MySQL Using PHP.

UNIT – V

Representing Web Data: XML - XML Documents and Vocabularies - XML Versions and the XML Declaration - XML Namespaces.

Introduction to Ruby-Variables- types-simple I/O-Control-Arrays-Methods- Classes-Iterators-Ruby Scripting-Ruby on rails-Files and databases

TEXT BOOKS:

1. Jeffrey C. Jackson, "WEB TECHNOLOGIES: A Computer Science Perspective", Pearson Prentice Hall, 2007.
2. Uttam K. Roy, Web Technologies, Oxford University Press, 2010.
3. Julie C. Meloni, Sams Teach Yourself PHP, MySQL® and Apache All in One", Pearson Education, 2012. (for IV unit).
4. Ruby on Rails Up and Running, Lightning-fast Web development, Bruce Tate, Curt Hibbs, O'Reilly (2006) (V Unit)

REFERENCE BOOKS:

1. Ivan Bayross," HTML, DHTML, JavaScript, Perl CGI", BPB publication, 2006.
2. Marty Hall, Larry Brown, "Core Servlets and Java Server Pages: Core Technologies, Vol. 1", 2007.
3. Jim Keogh, Kem Davidson, "XML Demystified", Tata McGraw Hill, 2005.
4. Steven Holzer, "AJAX: A Beginner's Guide", McGraw Hill, 2009.

AI & MACHINE LEARNING LAB

1. PROLOG program for the farmer–wolf–goat–cabbage problem
2. Sampling Distributions
3. Statistical Inference
4. Regression Modeling
5. Multivariate analysis
6. K Means-Clustering
7. Bayesian Modeling
8. Neural Networks: Learning and Generalization
9. Principal Component Analysis
10. Fuzzy Logic
11. Mining Frequent Item sets

WEB TECHNOLOGY LAB

1. Develop static pages (using only HTML) of an online Book store. The website should consist the following pages. Home page, Registration and user Login, User profile page, Books catalogue, Shopping cart, Payment By credit card, order confirmation.

2. Develop a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.

3. Develop a JavaScript code that displays two advertisements alternately. When the user clicks on one of the advertisements, he/she is redirected to "www.amazon.com", and the other advertisement redirects the user to "www.fabmart.com". The weight age of the Amazon advertisement is 50 and that of the other one is 40. The advertisement should be cantered horizontally and should cover 60% of the width of the screen. Its height should be 80 units. The width of the border should be 5 units.

4. Develop a JavaScript for calculating income tax of an employee.

5. Develop ASP application to compute employee salary.

6. Develop a Servlet program to create and manipulate session.

7. Develop a JSP program for online book store.

8. Develop a JSP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

9. Create a table which should contain at least the following fields: name, password, email-id, phone Number (these should hold the data from the registration form). Write a PHP program to connect to that database and extract data from the tables and display them, Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.

10. Develop a PHP program to do necessary operations on the student records which are stored in the database using MYSQL.

11. User Authentication: a) Assume four users user1, user2, user3 and user4 having the passwords pwd1,pwd2,pwd3 and pwd4 respectively. Write a PHP for doing the following. 1. Create a Cookie and add these four user ID"s and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies. If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user".

12. Design an XML document to store information about a student in an arts and science college affiliated to Pondicherry University. The information must include student-id, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 10 students. Create a CSS style sheet and use it to display the document.

MOOCs e-certification / Journal Publication/Conference Presentation/Attending Internship Program

Guidelines:

Any one of the following:

Taken one MOOCs course (with e-certification)
OR
Research publication (One No.) in National/International peer reviewed Journal
OR
Presentation (Two research papers) in International Conferences
OR
Attending an internship program for 4 weeks duration.

Evaluation Guidelines:

Viva-Voce Examination by Internal Examiner only.
Max. Marks:40 (Internal Marks only) for 1 credit.

SEMESTER-IV

BIG DATA & CLOUD COMPUTING

UNIT – I

Big Data Science - Introduction. - Historical Review of Big Data - Historical Interpretation of Big Data - Defining Big Data From 3Vs to 32Vs. - Big Data Analytics and Machine Learning - Big Data Analytics and Cloud Computing - Hadoop, HDFS, MapReduce, Spark, and Flink.

UNIT – II

Real-Time Analytics – Introduction - Computing Abstractions for Real-Time Analytics- Characteristics of Real-Time Systems - Real-Time Processing for Big Data — Concepts and Platforms - Data Stream Processing Platforms - Data Stream Analytics Platforms - Data Analysis and Analytic Techniques.

UNIT – III

Computing Paradigms - Cloud Computing Fundamentals - Motivation for Cloud Computing - Defining Cloud Computing - Principles of Cloud computing - Cloud Ecosystem - Requirements for Cloud Services - Cloud Application - Benefits and Drawbacks.

UNIT – IV

Cloud Computing Architecture and Management – Introduction - Cloud Architecture - Anatomy of the Cloud - Network Connectivity in Cloud Computing - Applications on the Cloud - Managing the Cloud - Migrating Application to Cloud - Cloud Service Models- Infrastructure as a Service Platform as a Service- Software as a Service.

UNIT – V

Technological Drivers for Cloud Computing – Introduction - SOA and Cloud – Virtualization- Multicore Technology- Memory and Storage Technologies - Networking Technologies - Web 2.0 - Web 3.0 - Software Process Models for Cloud Programming Models - Operating System- Application Environment - Virtualization – Introduction - Virtualization Opportunities - Approaches to Virtualization – Hypervisors- From Virtualization to Cloud Computing.

TEXT BOOKS:

1. Rajkumar Buyya, Rodrigo N. Calheiros, Amir Vahid Dastjerdi, "Big Data: Principles and Paradigms", Elsevier, 2016. (for I & II Units).
2. K. Chandrasekaran, "Essentials of CLOUD COMPUTING", CRC Press, Taylor & Francis Group LLC, 2015. (for III, IV & V Units).

PROJECT WORK AND VIVA-VOCE

Evaluation of the Project:

The candidate shall expect to take up an independent project involving problem formulation, design, implementation and testing phases that typically explores various phases of problem solving. He /She is Expected to utilize the knowledge gained through various subjects studied in this programme. Further, the candidate has to inculcate the ability in integrating and releasing a prototype (working model) of the solution to the problem taken. The Project should be prepared and submitted for evaluation.

Project - Internal Assessment:

The following components are considered during the internal assessment:

For each project, Review team is constituted with three members of the department including the project guide. At least two reviews are to be scheduled and evaluated by the team and the average of the marks awarded by the members is taken as the project seminar mark.

Component	Internal Assessment (150 Marks)
Project Work	80 Marks – Given at the time of End Semester Examination by the Project Guide.
Project Review 1	20 Marks - Given by the review team members as evaluation of continuous progress.
Project Review 2	25 Marks - Given by the review team members as evaluation of continuous progress.
Project Review 3	25 Marks - Given by the review team members as evaluation of continuous progress.

Project – External Assessment:

External examiner evaluates the project out of 150 marks for the Project Work, Project Report and Project Viva.

Component	External Assessment (150 Marks)
Project Work	80
Project Report	40
Project Viva-Voce	30

List of Soft-Core Courses offered by the Department

Level-I: Semester-I & Semester-II

1. Automata Theory and Computations
2. Probability and Statistics
3. Bioinformatics
4. Computer Graphics and Multimedia Systems
5. Object Oriented System Design
6. Modeling and Simulation
7. Principles of Compiler Design
8. Principles of Programming Languages
9. Optimization Techniques
10. Natural Language Processing

Level-II: Semester-III & Semester-IV

1. Linear Programming
2. Blockchain and Bitcoin
3. Digital Image Processing
4. Information Retrieval Systems
5. Internet of Things
6. Mobile Application Development
7. Professional Ethics
8. Web Services and SOA
9. Software Testing and Quality Management
10. Cyber Security
11. Research Methodology
12. Data Mining & Data Visualization Tools

AUTOMATA THEORY AND COMPUTATIONS

UNIT-I

Automata Theory: Finite State Systems – Definition of an Automaton - Non- Deterministic Finite Automaton - Equivalence of DFA and NFA - Finite automata with output (Mealy and Moore Models) - Minimization of Finite Automata – Regular Expressions.

UNIT-II

Push Down Automata Theory: Context-Free Languages and Derivation Trees – Ambiguity in Context-Free Grammars – Chomsky Normal Form – Greibach Normal Form. Push Down Automata – Definition, Acceptance by Push Down Automata – Push Down Automata and Context Free Languages.

UNIT-III

Turing Theory: Turing Machines – Computable Language and Functions – Techniques For TM Construction – Modification of TM.

UNIT-IV

Chomsky Hierarchy: Regular Grammars – Unrestricted Grammars – Context Sensitive Languages. Linear Bounded Automata – Definition – Linear Bounded Automata and Context Sensitive Languages.

Undecidability: Properties of recursive and recursively enumerable languages – Turing Machine Codes – Universal Turing Machine.

UNIT-V

Computational Complexity Theory: Space Complexity – Time complexity – Nondeterministic Time and Space Complexity – Complexity Classes. Computability: Basic Concepts – Primitive Recursive Functions – Recursive Functions. Case Studies: Application of Finite Automata – Parsing.

TEXT BOOKS:

1. Daniel I.A. Cohen, ―Introduction to Computation Theory, John Wiley & sons, 2nd edition.
2. John E. Hopcraft and Jeffery D. Ullman, "Introduction to Automata theory, languages and computations", Narosa, First edition.
3. "K.L.P. Mishra & N. Chandrasekaran "Theory of Computer Science (Automata, Languages and Computation), PHI.

REFERENCE BOOK:

1. A.Puntambekar – "Theory of Computation" –Technical.

PROBABILITY AND STATISTICS

UNIT-I: Introduction
Combinatorial methods- Principles of counting – Permutation – Combination – Binomial theorem problems.

UNIT- II: Probability
Probability: Classical - relative frequency and axiomatic definitions of probability - addition rule and conditional probability - multiplication rule - total probability - Bayes' Theorem and independence – problems.

UNIT - III: Random Variables
Random Variables: Discrete - continuous random variables - probability mass - probability density and cumulative distribution functions - mathematical expectation – Variance-Moments - Joint Distribution: Joint - marginal and conditional distribution - correlation - problems.

UNIT- IV: Special Distributions and Sampling Distributions
Special Distributions: Discrete uniform – binomial – geometric - negative binomial – Poisson - continuous uniform – exponential – Normal Distribution.
Sampling Distribution: The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-square, T and F distributions, problems.

UNIT - V: Testing of Hypotheses
Testing of Hypotheses: Null and alternative hypotheses, the critical regions, two types of error, level of significance, power of the test, tests for mean for one sample and two sample problems from normal populations, Tests for single mean, difference of means using T, paired T test.

TEXT BOOK:
1. Gupta, S.C. and Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons, Tenth Edition, 2000.

REFERENCE BOOKS:
1. Irwin Miller and Marlyees Miller, John E Freund's Mathematical Statistics with Applications, PHI Learning, Eight Edition, 2012.
2. S.M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier, Fourth Edition, 2009.

BIO INFORMATICS

UNIT – I

The Central Dogma - Killer Application – Parallel Universes – Watson's Definition –Top Down Vs. Bottom-Up Approach – Information Flow –Conversance – Communications.

UNIT – II

Definition – Data Management –Data Life Cycle – Database Technology –Interfaces – Implementation –Networks: Communication Models – Transmission Technology – Protocols – Bandwidth – Topology – Contents – Security – Ownership – Implementation.

UNIT – III

Search Process – Technologies – Searching and Information Theory – Computational Methods – Knowledge Management – Sequence Visualizations – Structure Visualizations – User Interfaces – Animation Vs. Simulation.

UNIT – IV

Statistical Concepts –Micro Arrays – Imperfect Data – Basics – Quantifying – Randomness – Data Analysis – Tools selection – Alignment – Clustering – Classification – Data Mining Methods – Technology – Infrastructure Pattern Recognition – Discovery – Machine Learning – Text Mining – Pattern Matching Fundamentals – Dot Matrix Analysis – Substitution Matrix – Dynamic Programming – Word Method – Bayesian Method – Multiple Sequence Alignment Tools.

UNIT – V

Drug Discovery Fundamentals – Protein Structure – System Biology Tools – Collaboration and Communication – Standards – Issues – Case study.

TEXT BOOKS:

1. Bryan Bergeron, "Bio Informatics Computing", Prentice Hall, 2003.
2. T.K. Affward, D.J. Parry Smith, "Introduction to Bio Informatics", Pearson Education, 2001.
3. Pierre Baldi, Soren Brunak, "Bio Informatics – The Machine Learning Approach", 2nd Edition, First East West Press, 2003.

REFERENCE BOOK:

1. Neil C.Jones Pavel Pevzner – An Introduction to Bioinformatics Algorithms – MIT Press.

COMPUTER GRAPHICS AND MULTIMEDIA SYSTEMS

UNIT-I

INTRODUCTION-Overview of Graphics System – Bresenham technique – Line Drawing and Circle Drawing Algorithms – DDA – Line Clipping – Text clipping.

UNIT-II

2D TRANSFORMATIONS-Two dimensional transformations – Scaling and Rotations – Interactive Input methods – Polygons – Splines – Bezier Curves – Window view port mapping transformation.

UNIT-III

3D TRANSFORMATIONS-3D Concepts – Projections – Parallel Projection – Perspective Projection – Visible Surface Detection Methods – Visualization and polygon rendering – Color models – XYZ-RGB-YIQ-CMY-HSV Models – Animation – Key Frame system – General animation functions – morphing.

UNIT- IV

OVERVIEW OF MULTIMEDIA-Multimedia hardware & software – Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring.

UNIT-V

MULTIMEDIA SYSTEMS AND APPLICATIONS-Multimedia communication systems – Data base systems – Synchronization Issues – Presentation requirements – Applications – Video conferencing – Virtual reality – Interactive video – video on demand.

TEXT BOOKS:

1. Hearn D and Baker M.P, "Computer graphics – C Version", 2nd Edition, Pearson Education, 2004(Unit 1, 2& 3).
2. Ralf Steinmetz, Klara stein Metz," Multimedia Computing, Communications and Application", Pearson Education, 2004(Unit 4&5).

OBJECT ORIENTED SYSTEM DESIGN

UNIT - I

Introduction – overview of object-oriented systems development – Object basics – Object-Oriented Systems Development Life cycle.

UNIT - II

Methodology, Modeling and Unified Modeling Language – Object-Oriented Methodologies – Pattern and Frameworks - Describing Design patterns – Catalog of Design patterns – Organizing the Catalog – Creational pattern, (Abstract Factory) Structural pattern (Adapter) and Behavioural Pattern (Chain of Responsibility)- Frameworks – Unified Modeling Language.

UNIT - III

Object-Oriented Analysis: Use Case Driven – Object Oriented Analysis Process: identifying Use Cases, Object Analysis: Classification.

UNIT - IV

Object-Oriented Design – Object-Oriented Design Process and Design Axioms, Designing Classes.

UNIT -V

Access Layer: Object storage and Object interoperability – Distributed Databases and Client-Server Computing, Distributed Objects Computing, Object-Oriented Database Management Systems, Object – Relational systems, Designing Access layer Classes – View Layer – Designing Interface Objects.

TEXT BOOKS:

1. Ali Bahrami, "Object Oriented System Development", McGraw Hill International Edition, 1999.
2. Raul Sidnei Wazlawick, "Object-Oriented Analysis and Design for Information Systems Modeling with UML, OCL, and IFML", Elsevier Inc., 2014.
3. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, "Design Patterns – Elements of reusable Object-Oriented Software", Addison Wesley Professional Computing Series, Pearson Education, 2003.

REFERENCE BOOKS:

1. Craig Larman, "Applying UML and Patterns", Addison Wesley, 2000.
2. Fowler, "Analysis Patterns", Addison Wesley, 1996.
3. Grady Booch, James Rumbaugh, Ivan Jacobson, "The Unified Modeling Language, User Guide", Addison Wesley Longman, 1999.

MODELING AND SIMULATION

UNIT-I-SYSTEMS AND ENVIRONMENT: Concept of model and model building, model classification and representation, Use of simulation as a tool, steps in simulation study.

UNIT-II-CONTINUOUS TIME AND DISCRETE-TIME SYSTEMS: Laplace transform, transfer functions, state-space models, order of systems, z-transform, feedback systems, stability, observability, and controllability. Statistical Models in Simulation: Common discrete and continuous distributions, Poisson process, and empirical distributions.

UNIT-III- RANDOM NUMBERS- Properties of random numbers, generation of pseudo random numbers, techniques of random number generation, tests for randomness, random variate generation using inverse transformation, direct transformation, convolution method, acceptance-rejection.

UNIT-IV-DESIGN AND ANALYSIS OF SIMULATION EXPERIMENTS: Data Collection, identifying distributions with data, parameter estimation, goodness of fit tests, selecting input models without data, multivariate a time series input models, verification and validation of models, static and dynamic simulation output analysis, steady-state simulation, terminating simulation, confidence interval estimation, Output analysis for steady state simulation, variance reduction techniques.

UNIT-V-QUEUING MODELS & LARGRE SCALE SYSTEMS: Characteristics of queuing systems, notation, transient and steady-state behaviour, performance, network of queues, Model reduction, hierarchical control, decentralized control, structural properties of large-scale systems.

TEXT BOOK:

1. Narsingh Deo, System Simulation with Digital Computer, PHI.1999.

REFERENCE BOOKS:

1. Averill Law, Simulation Modeling and Analysis (3rd Edition), Tata McGraw Hill, 2007.
2. Gordan, System Simulation (2nd Edition), Pearson Education, 2007.
3. J.Banks, J.S.Carson, B.L.Nelson, Discrete Event System Simulation (4th Ed.), PHI, 2004.
4. N.A. Kheir, Systems Modeling and Computer Simulation, Marcel Dekker, 1988.

PRINCIPLES OF COMPILER DESIGN

UNIT - I

Introduction to Complier - Analysis of the source program- Phase of a compiler- Cousins of the compiler - The grouping of phases- Compiler-construction tools- Simple One-pass Compiler – Overview - Syntax definition- Syntax-directed translation – Parsing - A translator for simple expressions - Lexical analysis - Incorporating a symbol table.

UNIT - II

Lexical Analysis - role of the lexical analyzer - Input buffering- Specification of tokens - Recognition of tokens - Language for specifying lexical analyzer - Finite automata -From a regular expression to an NFA.

UNIT - III

Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar – Top-down parsing - Bottom-up parsing.

UNIT - IV

Intermediate Code Generators - Intermediate languages – Declarations - Assignment statements - Boolean expression - Case statement - The target machine - Run-time storage management - Basic blocks and flow graph - The dag representation of basic blocks - Peephole optimist ion - Generating code from dag.

UNIT - V

Code Optimization – Introduction - The principal sources of optimization - Optimization of basic blocks - Loops in flow graphs - introduction to global data-flow analysis - lterative solution of data-flow equation - Data-flow analysis of structured flow graphs - Efficient data-flow algorithms.

TEXT BOOK:

1. Alffred V. Aho, Revi Sethi, Jeffery D. Ullman," Compilers: Principles, Techniques & Tools", Pearson Education Asia, 2007.

PRINCIPLES OF PROGRAMMING LANGUAGES

UNIT-I

The challenge of programming language design: Criteria for language design-some possible solutions. Defining syntax: General problem of describing syntax, formal methods of describing syntax, BNF, Syntax Graphs. Syntax and program Reliability.

UNIT- II

Variables, Expressions and statements: Variables and assignment statement, Binding Time and Storage Allocation, Constants and initialization, Expressions, Statements- Conditional, Iteration. GOTO and Labels. Types: Data types and Typing. Enumerated and elementary, pointer, structured Data types, Type coercion & Equivalence. Scope and Extent: Basics, Run-time implementation, an extended Example, Binding, scope & Extent.

UNIT- III

Procedures: General features, Parameter evaluation & passing, Call-By-Name, Specification of objects in a procedure, aliasing, Overloading, Generic functions, Co routines. Abstract data types: concept of abstraction, Encapsulation, Introduction to data abstraction, design issues, parameterized abstract data types.

UNIT- IV

Exception Handling: Introduction, Exception Handling in PL/I, Exception Handling in Ada, Exception Handling in C++. Concurrency: Basic concepts, subprogram-level concurrency, statement-level concurrency, semaphore, Monitors, Message passing.

UNIT-V

CASE STUDIES: Functional programming Languages- Introduction- Mathematical functions- fundamentals of functional programming languages –the first functional programming language LISP - Application of functional languages- Logic programming Languages – Introduction to predicate Calculus- An overview of logic programming- Applications of logic programming - Object-oriented programming Languages -Introduction – Object oriented programming- Support for object-oriented programming in C++.

TEXT BOOKS:

1. Ellis Horowitz, “Fundamentals of programming languages”, Galgotia Publications, 1998.
2. Robert W. Sebesta, “Concepts of programming languages”, Addison-Wesley, 1996.

REFERENCE BOOK:

1. Greg Perry - Absolute Beginner's Guide to Programming – Que publishers 3rd Edition.

OPTIMIZATION TECHNIQUES

UNIT- I: Classical Methods & Linear Programming Problems Terminology

Introduction to Classical Methods & Linear Programming Problems Terminology: Design Variables – Constraints. Objective Function - Problem Formulation. Calculus method - Kuhn Tucker conditions - Method of Multipliers. Linear Programming Problem - Simplex method - Concept of Duality.

UNIT- II: Single Variable Optimization

Single Variable Optimization: Problems Optimality Criterion - Bracketing Method - Region Elimination Methods - Interval Halving Method - Fibonacci Search Method - Golden Section Method. Gradient Based Methods: Newton Raphson Method - Bisection Method - Secant Method - Application to Root finding.

UNIT- III: Multivariable Optimization Algorithms

Multivariable Optimization Algorithms Optimality: Criteria - Unidirectional Search. Direct Search Methods: Hooke-Jeeves pattern search method - Powell's Conjugate Direction Method. Gradient Based Methods: Cauchy's Steepest Descent Method - Newton's method - Marquardt's Method.

UNIT- IV: Advance Optimization Techniques

Quadratics Programming – sequential quadratic programming - Integer Programming - Penalty Function Method. Branch and Bound Method - Geometric Programming.

UNIT- V: Dynamic Programming

Dynamic Programming: Genetic algorithm - Problem formulation and application in Design of continuous beam and Optimal geometric layout of a truss - Capacity expansion and Reservoir operation.

TEXT BOOKS:

1. S. S. Rao: Engineering Optimization: Theory and Practice, New Age International, Third Edition 2013.
2. E. J. Haug and J.S. Arora, Applied Optimal Design: Mechanical and Structural Systems, Wiley, 1979.

REFERENCE BOOKS:

1. Kalyanmoy Deb, Optimization for Engineering Design: Algorithms and Examples, Prentice Hall of India, Second Edition, 2012.
2. Ravindran and K.M. Rogsdell, G.V. Reklaites, Engineering Optimization: Methods and Applications, Wiley, Second Edition, 2006.

NATURAL LANGUAGE PROCESSING

UNIT I – INTRODUCTION

Speech and Language Processing- Ambiguity-Models and algorithms-Language-Thought-Understanding-Brief History-Regular Expressions-Automata-Morphology and Finite State Transducers-Computational Phonology and Text-to-Speech.

UNIT-II - PROBABILISTIC MODELS AND SPEECH RECOGNITION

Spelling-Bayesian method-Weighted Automata-N-grams-Smoothing-Entropy-HMMs and speech Recognition-Speech Recognition Architecture-Hidden Markov models-Decoding-Acoustic processing-Speech recognizer-Speech synthesis.

UNIT-III - SYNTAX

Word classes and part-of-Speech Tagging-Tagsets-Transformation based tagging-Context free rules and trees-The noun Phrase-Co-ordination-Verb Phrase-Finite state and context free grammars-Parsing with context free grammars.

UNIT-IV- UNIFICATION AND PROBABILITISTIC PARSING

Features-Implementing Unification-Unification Constraints-Probabilistic context free grammars-Problems-Lexicalized context free grammars-Dependency Grammars-Human Parsing-Language and Complexity.

UNIT-V-SEMANTICS

Representing meaning-First order predicate calculus-Semantic analysis-Attachments-Idioms-Compositionality-Robust semantic analysis-Lexical semantics-Selectional restrictions-Machine learning approaches-Dictionary based approaches-Information retrieval.

TEXT BOOK:

1. Daniel Jurafsky and James H.Martin, “Speech and Language Processing”, Pearson Educaion, 2002.

REFERENE BOOKS:

1. Michael W. Berry, “Survey of Text Mining: Clustering, Classification and Retrieval Systems”, Springer Verlilag, 2003.
2. James Allen, “Natural Language Understanding”, Benjamin Cummings Publishing Co. 1995.

LINEAR PROGRAMMING

UNIT- I: Linear Programming Problem

Operations Research: Introduction – Applications of OR – Linear Programming Problem: LPP Introduction – Formulation of Linear Programming Model- Illustration on Mathematical Formulation of LPP – Graphical Solution-General LPP – Canonical and Standard forms of LPP.

UNIT- II: LPP Simplex Method

Introduction – Fundamental Properties of Solution – The Computational Procedure – Use of Artificial Variables – Degeneracy in LPP – Solutions of Simultaneous Linear Equations– Big M Method- Applications of Simplex Method.

UNIT- III: Duality in Linear Programming

Duality LPP – General Prime-Dual Pair – Formulating a Dual Problem – Primal-Dual Pair in Matrix Form – Duality Theorems– Dual Simplex Method – Two-Phase Method.

UNIT - IV: Dynamic Programming

Dynamic Programming: Introduction – The Recursive Equation Approach – Characteristics of DPP – Dynamic Programming Algorithm - Applications of DPP.

UNIT- V: Network Routing and Scheduling

Network Routing: Network Flow Problems – Minimal Spanning Tree Problem – Shortest Route Problems – Applications of Shortest Route Problem. Network Scheduling: Introduction– Logical Sequencing – Concurrent Activities – Critical Path Analysis – PERT – CPM.

TEXT BOOKS:

1. R. Panneerselvam, Operations Research, PHI Learning, Second Edition, 2006.
2. Kanti Swaroop, Man Mohan and P.K. Gupta, Operations Research, Sultan Chand and Sons, 2005.
3. Hamdy A Taha, Operations Research –An Introduction, Prentice Hall India, 2003.

REFERENCE BOOKS:

1. Philips, Ravindran and Solberg, Operations Research, John Wiley, 2002.
2. Ronald L.Rardin, Optimization in Operation Research, Pearson Education Pvt. Ltd. New Delhi, 2005.

BLOCKCHAIN AND BITCOIN

UNIT – I

Blockchain - Distributed systems - history of blockchain - Introduction to blockchain - Types of blockchain - CAP theorem and blockchain - Benefits and limitations of blockchain - Decentralization - Decentralization using blockchain - Methods of decentralization- Routes to decentralization- Blockchain and full ecosystem decentralization- Smart contract - Decentralized applications - Platforms for decentralization.

UNIT – II

Cryptography and Technical Foundations – Introduction - Cryptographic primitives - Asymmetric cryptography- Public and private keys - Financial markets and trading.

UNIT – III

Bitcoin – Bitcoin definition - Transactions – transaction life cycle - transaction structure - Types of transaction - Blockchain - structure of a block - structure of a block header - genesis block - bitcoin network - Bitcoin payments.

UNIT – IV

Alternative Coins - Theoretical foundations - Bitcoin limitations – Namecoin – Litecoin – Primecoin – Zcash.

UNIT – V

Ethereum 101 – Introduction - Ethereum blockchain - Elements of the Ethereum blockchain- Precompiled contracts – Accounts – Block – Ether – Messages – Mining - Clients and wallets.

TEXT BOOK:

1. Imran Bashir, ‘Mastering Blockchain’, Packt Publishing, 2017.

DIGITAL IMAGE PROCESSING

UNIT I -DIGITAL IMAGE FUNDAMENTALS

Elements of digital image processing systems, Vidicon and Digital Camera working, principles, Elements of visual perception, brightness, contrast, hue, saturation, Mach, band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT,DCT, KLT, SVD.

UNIT II - IMAGE ENHANCEMENT

Histogram equalization and specification techniques, Noise distributions, Spatial, averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean, filters, Homomorphic filtering, Color image enhancement.

UNIT III - IMAGE RESTORATION

Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier, and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear, motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT IV - IMAGE SEGMENTATION

Edge detection, Edge linking via Hough transform – Thresholding - Region based, segmentation – Region growing – Region splitting and merging – Segmentation by, morphological watersheds – basic concepts – Dam construction – Watershed, segmentation algorithm.

UNIT V - IMAGE COMPRESSION

Need for data compression, Huffman, Run Length Encoding, shift codes, Arithmetic, coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002.

REFERENCE BOOKS:

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D, E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, Digital Image Processing', John Wiley, New York, 2002.
5. Milan Sonka et al., 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.

INFORMATION RETRIEVAL SYSTEMS

UNIT-I

Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital Libraries and Data Warehouses, Information Retrieval System Capabilities: Search, Browse, Miscellaneous.

UNIT-II

Cataloging and Indexing: Objectives, Indexing process, Automatic Indexing, Information Extraction. Data Structures: Introduction, Stemming Algorithms, Inverted file structure, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT-III

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural Language, Concept indexing, Hypertext linkages. Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

UNIT-IV

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback. Selective dissemination of information search, weighted searches of Boolean systems, searching the Internet and hypertext information.

UNIT-V

Visualization: Introduction, Cognition and perception, Information visualization technologies.

TEXT BOOKS:

1. Kowalski, Gerlad; Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.
2. Frakes, W.B. Rcaedo Baeza-Yates; Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.

INTERNET OF THINGS

UNIT – I

Internet of Things – Introduction - Internet of Things Definition Evolution- IoT Architectures- Resource Management - IoT Data Management and Analytics - Communication Protocols - Internet of Things Applications – Security - Identity Management and Authentication- Privacy - Standardization and Regulatory Limitations.

UNIT – II

Open-Source Semantic Web Infrastructure for Managing IoT - Resources in the Cloud – Background/Related Work - OpenIoT Architecture for IoT/Cloud Convergence - Scheduling Process and IoT Services Lifecycle - Validating Applications and Use Cases.

UNIT – III

Programming Frameworks for Internet of Things – Introduction – Background - Survey of IoT Programming Frameworks.

UNIT – IV

Stream Processing in IoT - Foundations, State-of-the-Art, and Future Directions – Introduction - The Foundations of Stream Processing in IoT - Continuous Logic Processing System - Challenges and Future Directions - A Framework for Distributed Data Analysis for IoT – Introduction – Preliminaries- Anomaly Detection - Problem Statement and Definitions - Distributed Anomaly Detection - Efficient Incremental Local Modeling.

UNIT – V

Security and Privacy in the Internet of Things – Concepts - IoT Security Overview - Security Frameworks for IoT - Privacy in IoT Networks - Applied Internet of Things – Introduction – Scenario - Architecture Overview – Sensors - The Gateway - Data Transmission - m Internet of Vehicles and Applications - Basics of IoV - Characteristics and Challenges - Enabling Technologies – Applications.

TEXT BOOK:

1. Rajkumar Buyya, Amir Vahid Dastjerdi, “Internet of Things: Principles and Paradigms”, Elsevier, 2016.

MOBILE APPLICATION DEVELOPMENT

UNIT-I- HISTORY OF MOBILE

The Evolution of Devices- the mobile ecosystem-Operators-Networks-Devices-Platforms-Operating Systems-Application Frameworks-Applications-Services-Size and Scope of the Mobile Market-The Addressable Mobile Market-Mobile As a Medium-The Eighth Mass Medium-Ubiquity Starts with the Mobile Web.

UNIT-II-MOBILE DESIGN

Thinking in Context-Taking the Next Steps-Developing a Mobile Strategy-New Rules-Types of Mobile Applications-Mobile Application Medium Types-Mobile Information Architecture-The Design myth-Interpreting Design-the mobile design tent-pole-designing for the best possible experience-the elements of mobile design-mobile design tools-designing for the right device-designing for different screen sizes.

UNIT-III-MOBILE APPLICATION DEVELOPMENT

Mobile web apps versus native applications-the ubiquity principle-when to make a native application-when to make a mobile web application-what is mobile 2.0? Mobile web development-web standards-designing for multiple mobile browsers-device plans-markup-css: cascading style sheets-JavaScript.

UNIT-IV-INTRODUCTION TO ANDROID

Background-an open platform for mobile development-native android applications-android sdk features-introducing the open handset alliance-what does android run on? Why develop for android? Introducing the development framework.

UNIT-V-APPLICATION DEVELOPMENT

Developing for android-Developing for mobile devices-to do list example-android development tools-what makes an android application? Introducing the application manifest-using the manifest editor-the android application life cycle-understanding application priority and process states-externalizing r-sources-a closer look at android activities.

TEXT BOOKS:

1. Mobile Design and Development Practical concepts and techniques for creating mobile sites and web pages By Brian Fling Publisher: O'Reilly Media (Unit I, II, III).
2. Professional android Application Development by Reto Meier (Unit IV and Unit V).

PROFESSIONAL ETHICS

UNIT-I- COMPUTER ETHICS INTRODCUTION AND COMPUTER HACKING

A general Introduction – Computer ethics: an overview – Identifying an ethical issue – Ethics and law – Ethical theories - Professional Code of conduct – An ethical dilemma – A framework for ethical decision making - Computer hacking – Introduction – definition of hacking – Destructive programs –hacker ethics - Professional constraints – BCS code of conduct – To hack or not to hack? – Ethical positions on hacking.

UNIT- II-ASPECTS OF COMPUTER CRIME AND INTELLECTUAL PROPERTY RIGHTS

Aspects of computer crime - Introduction - What is computer crime – computer security measures – Professional duties and obligations - Intellectual Property Rights – The nature of Intellectual property – Intellectual Property – Patents, Trademarks, Trade Secrets, Software Issues, Copyright - The extent and nature of software piracy – Ethical and professional issues – free software and open-source code.

UNIT- III- REGULATING INTERNET CONTENT, TECHNOLOGY AND SAFETY

Introduction – In defence of freedom expression – censorship – laws upholding free speech – Free speech and the Internet - Ethical and professional issues - Internet technologies and privacy – Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk.

UNIT- IV-COMPUTER TECHNOLOGIES ACCESSIBILITY ISSUES

Introduction – Principle of equal access – Obstacles to access for individuals – professional responsibility - Empowering computers in the workplace – Introduction – computers and employment – computers and the quality of work – computerized monitoring in the work place – telecommuting –social, legal and professional issues - Use of Software, Computers and Internet-based Tools - Liability for Software errors - Documentation Authentication and Control – Software engineering code of ethics and practices – IEEE-CS – ACM Joint task force.

UNIT-V- SOFTWARE DEVELOPMENT AND SOCIAL NETWORKING

Software Development – strategies for engineering quality standards – Quality management Standards – Social Networking – Company owned social network web site – the use of social networks in the hiring process – Social Networking ethical issues – Cyber bullying – cyber stalking – Online virtual world – Crime in virtual world - digital rights management - Online defamation – Piracy – Fraud.

REFRENCE BOOKS:

1. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical, legal and professional issues in computing", Middlesex University Press, 2008.
2. George Reynolds, "Ethics in Information Technology", Cengage Learning, 2011.
3. Caroline Whitback," Ethics in Engineering Practice and Research ", Cambridge University Press, 2011.
4. Richard Spinello, "Case Studies in Information and Computer Ethics", Prentice Hall, 1997.
5. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press, 1997.
6. Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet", 3rd Edition, Prentice Hall, 2008.
7. http://www.infosectoday.com/Articles/Intro_Computer_Ethics.html

WEB SERVICES & SOA

UNIT – I

Web service and SOA fundamentals- Introduction - The concept of software as service (SaaS)- Web services versus Web based applications- Definition of Web services - Characteristics of Web services- Service interface and implementation.

UNIT - II

The Service Oriented Architecture - SOA operations - SOA entry points - Layers in an SOA - The Web service technology stack - Quality of service (QoS) - Web service interoperability - Web services versus components - RESTful services -Impact and shortcomings of Web services.

UNIT - III

Brief overview of XML - XML document structure -XML namespaces - Defining structure in XML documents - Reuse of XML schemas - Document navigation and transformation.

UNIT – IV

Core functionality and standards - SOAP: Simple Object Access Protocol - Inter-application communication and wire protocols - SOAP as a messaging protocol - Structure of a SOAP message - SOAP communication model - Error handling in SOAP - Advantages and disadvantages of SOAP - Describing Web services - Why is a service description needed? - WSDL: Web Services Description Language - Non-functional service descriptions - WSDL 1.1 versus WSDL 2.0.

UNIT - V

Registering and discovering services - The role of service registries - Service discovery - Universal Description, Discovery and Integration (UDDI) - The UDDI data structures - Mapping WSDL to UDDI - The UDDI API - Querying the UDDI model - SOA security and policies - Securing SOA and Web services - Network level security mechanisms - Application level security mechanisms - SOA development lifecycle- Unravelling the nature of SOA based applications - Rationale for SOA based application development- Typical SOA development pitfalls - Software development Lifecycle - Elements of SOA based applications - Best practices for developing SOA based applications - Reference model for SOA development - Guiding principles of SOA application development.

TEXT BOOK:

1.Michael P. Papazoglou, “Web services & SOA : principles and technology”, Prentice Hall, 2012.

SOFTWARE TESTING AND QUALITY MANAGEMENT

UNIT-I TESTING METHODOLOGY- Introduction, Evolution of Software Testing, Software Testing- Myths and facts, Goals of Software Testing, Software testing Definitions, Model for Software Testing, Software Testing Life Cycle (STLC), Verification and Validation - V&V Activities, Verification of Requirements, Verification of High - level Design, Verification of Low - level Design.

UNIT-II TESTING TECHNIQUES - Dynamic Testing: Black-Box Testing Techniques - Boundary Value Analysis (BVA), Equivalence Class Testing, State Tables-Based Testing. White Box Testing Techniques - Need of White-Box Testing, Logic Coverage Criteria, Basis Path Testing, Loop Testing. Static Testing: Structural Walkthroughs. Validation Activities: Unit Validation Testing, Integration Testing, Function Testing, System Testing, and Acceptance testing. Regression Testing: Objectives of Regression Testing, Regression Testing Types, Regression Testing Techniques.

UNIT-III MANAGING THE TESTING PROCESS - Test Management: Test Organization - Structure of Testing Group -Test Planning. Software Metrics: Need of software Measurement, Definition of Software Metrics, Classification of Software Metrics, Entities to be Measured, Size Metrics. Efficient Test Suite Management: Minimizing the Test Suite and its Benefits, Defining Test Suite Minimization Problems, Test Suite Prioritization, Types of Test Case Prioritization, Prioritization Techniques.

UNIT-IV QUALITY MANAGEMENT-Software Quality Management: Software Quality, Broadening the Concept of Quality, Quality Cost, Benefits of Investment on Quality, Quality control and quality Assurance, Quality management, QM and Project Management, Quality Factors, Methods of Quality Management, Software Quality Metrics, SQA Models. Testing Process Maturity Models.

UNIT-V TEST AUTOMATION - Automation and Testing Tools: Need for Automation, Categorization of Testing Tools, Selection of Testing Tools, Costs Incurred in Testing Tools, Guidelines for Automated Testing. Testing for specialization Environment: Testing Web-based System, Web based System, Web Technology Evolution.

TEXT BOOK:

1. Naresh Chauhan, "Software Testing: Principles & Practices", Oxford University Press, 2012.

REFERENCE BOOKS:

1. Roger, S. Pressman (2005), "Software Engineering: A Practitioners' Approach", McGraw-Hill.
2. Black, R., "Managing the Testing Process", John Willy & Sons, Second Edition.

CYBER SECURITY

UNIT-I-SECURITY CONCEPTS AND MECHANISMS

Networking Concepts Overview-Basics of Communication Systems-Wireless Networks-Internet-Information Security Concepts-Overview and services-Types of Attacks-Security Goal-E-commerce security-Security Threats and vulnerabilities-Hacking Techniques-Password cracking-Malicious code-Programming Bugs-Cryptography-Digital Signatures-PKI-Diffe-Hellman key exchange protocol-Applications.

UNIT-II-NETWORK SECURITY

Access Control and Intrusion Detection-Identification and Authorization Techniques-Intrusion Detection System-Intrusion Prevention System-Intrusion Recovery System-Server Management and Firewalls-Security for VPN and Next Generation Networks-Security in Multimedia Networks-Link Encryption Devices.

UNIT-III-SYSTEM AND APPLICATION SECURITY

Security Architectures and Models-Designing Secure Operating Systems-Controls to enforce security services-Information flow model and Biba Model-System Security –Web security-Web Authentication-Secure Socket Layer (SSL)-Secure Electronic Transaction (SET)-OS Security-OS Security Vulnerabilities, updates and patches-OS integrity checks-Anti Virus Software-Design of secure OS and OS hardening-Configuring the OS for security-Trusted OS.

UNIT-IV-SECURITY MANAGEMENT

Security Management Practices-security policies, procedures and guidelines-Risk Management-Business continuity Planning and Disaster Recovery Management-Risk Management-Change Management-Privilege Management-Security Laws and Standards-Security Assurance-Security Laws-Security Audit-International standards.

UNIT-V-CYBER DEFENSE TECHNIQUES

E-Mail Security-Web security - Web Injection Attack-Cross Site Scripting (XSS)-Secure Software Development-Cybercrime and cyber terrorism-Cyber operations and Défense Techniques-Phases of cyber-attack-Information warfare and surveillance-Steganography-Security Engineering-Computer Forensics-Legal Issues and Ethics-Case studies.

TEXT BOOKS:

1. Ross J.Anderson, Security Engineering: A Guide to Building Dependable Distributed Systems. John Wiley, New York, NY, 2001, ISBN: 0471389226.
2. Matt Bishop, Computer Security: Art and Science, Addison Wesley, Boston, MA, 2003. ISBN: 0-201-44099-7.

REFERENCE BOOKS:

1. Frank Stajano, Security for Ubiquitous Computing, John Wiley, 2002, ISBN: 0470844930.
2. McClure, Stuart & Scambray, Joel, et al (2005), Hacking Exposed 5th Edition, McGraw-Hill Osborne Media.
3. Ortmeier, P.J. (2005), Security Management: An Introduction, 2nd Edition, Prentice Hall.
4. Skoudis, Ed & Zeltser, Lenny (2004), Malware: Fighting Malicious Code, Second Ed. Prentice Hall.

RESEARCH METHODOLOGY

UNIT – I

Research Methodology: An Introduction - Defining the Research Problem - Research Design - Meaning of Research Design - Features of a Good Design - Important Concepts Relating to Research Design - Different Research Designs - Basic Principles of Experimental Designs.

UNIT – II

Sampling Design - Census and Sample Survey - Steps in Sampling Design- Criteria of Selecting a Sampling Procedure - Characteristics of a Good Sample Design- Different Types of Sample Designs - Measurement in Research - Measurement Scales - Technique of Developing Measurement Tools – Scaling.

UNIT – III

Methods of Data Collection- Processing and Analysis of Data - Processing Operations - Some Problems in Processing - Elements/Types of Analysis - Statistics in Research - Measures of Central Tendency, Dispersion, Asymmetry (Skewness) - Simple Regression Analysis - Multiple Correlation and Regression - Partial Correlation.

UNIT – IV

Testing of Hypotheses-I - Define Hypothesis - Basic Concepts Concerning Testing of Hypotheses - Procedure for Hypothesis Testing - Flow Diagram for Hypothesis Testing- Measuring the Power of a Hypothesis Test - Tests of Hypotheses - Important Parametric Tests - Chi-square Test - Chi-square as a Test for Comparing Variance - Chi-square as a Non-parametric Test - Conditions for the Application of c2 Test - Steps Involved in Applying Chi-square Test.

UNIT – V

Analysis of Variance and Covariance - Analysis of Variance (ANOVA) – Define ANOVA - The Basic Principles of ANOVA- ANOVA Technique - Setting up Analysis of Variance Table – Short Two-way ANOVA - Interpretation and Report Writing - Meaning of Interpretation – Need for Interpretation - Technique of Interpretation - Precaution in Interpretation - Significance of Report Writing - Different Steps in Writing Report - Layout of the Research Report - Types of Reports - Oral Presentation - Mechanics of Writing a Research Report - Precautions for Writing Research Reports.

TEXT BOOK:

1. C.R. Kothari, “Research Methodology: Methods & Techniques”, New Age International (P) Ltd., 2004.

REFERENCE BOOKS:

1. R. Panner Selvam, “Research Methodology”, PHI, 2009.
2. Ajai S. Gaur, Sanjaya S. Gaur, Statistical Methods for Practice and Research: A guide to data analysis using SPSS”, Response Books (Business books from SAGE), New Delhi, 2009.

DATA MINING AND DATA VISUALIZATION TOOLS

UNIT - I

Introduction to Data Mining - Related technologies - Machine Learning, DBMS, OLAP, Statistics - Discretization and generating concept hierarchies - Installing Weka 3 Data Mining System - Experiments with Weka - filters, discretization - Data mining knowledge representation - Task relevant data - Background knowledge - Interestingness measures Representing input data and output knowledge Visualization techniques- Experiments with Weka - visualization - Attribute-oriented analysis - Attribute generalization - Attribute relevance Class comparison Statistical measures - Experiments with Weka - using filters and statistics.

UNIT - II

Experiments with Weka - training and testing - Mining real data - Pre-processing data from a real medical domain. Applying various data mining techniques to create a comprehensive and accurate model of the data. Clustering - Basic issues in clustering First conceptual clustering system: Cluster/2 - Partitioning methods: k-means, expectation maximization (EM) - Hierarchical methods: distance-based agglomerative and divisible clustering - Conceptual clustering: Cobweb.

UNIT-III

CORE SKILLS FOR VISUAL ANALYSIS: Information visualization - effective data analysis - traits of meaningful data - visual perception - making abstract data visible - building blocks of information visualization - analytical interaction - analytical navigation - optimal quantitative scales - reference lines and regions - trellises and crosstabs - multiple concurrent views - focus and context-details on demand - over-plotting reduction - analytical patterns – pattern examples.

UNIT-IV

TIME-SERIES, RANKING, AND DEVIATION ANALYSIS: Time-series analysis - time-series patterns - time-series displays - time-series best practices- part-to-whole and ranking patterns - part-to-whole and ranking displays - best practices - deviation analysis - deviation analysis displays - deviation analysis best practices.

UNIT-V

DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS: Distribution analysis - describing distributions - distribution patterns - distribution displays - distribution analysis best practices - correlation analysis - describing correlations – correlation patterns - correlation displays - correlation analysis techniques and best practices – multivariate analysis - multivariate patterns - multivariate displays - multivariate analysis techniques and best practices.

Required Software:

Weka - Data Mining System with Free Open-Source Machine Learning Software in Java.

Data Mining software and Data Sets:

- WEKA (Source: Java)
- RapidMiner
- MLC++ (Source: C++)
- SIPINA

- List from KDNuggets (Various)
- List from Data Management Center (Various)

Data Sets:

- IDS data sets
- Data Sets for Data Mining
- Competition Data Set
- UCI Machine learning repository
- Quest data repository
- KDNuggets

REFERENCE BOOKS:

1. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, Introduction to Data Mining, 2005.
2. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, 2000.
3. Stephen Few, Now you see it: Simple Visualization techniques for quantitative analysis, Analytics Press, 2009.
4. Stephen Few, Information Dashboard Design: The effective visual communication of data, O'Reilly, 2006.
5. Edward R. Tufte, The visual display of quantitative information, Second Edition, Graphics Press, 2001.
6. Nathan Yau, Data Points: Visualization that means something, Wiley, 2013.
7. Ben Fry, visualizing data: Exploring and explaining data with the processing environment, O'Reilly, 2008.
8. Gert H. N. Laursen and Jesper Thorlund, Business Analytics for Managers: Taking business intelligence beyond reporting, Wiley, 2010.
9. Evan Stubbs, The value of business analytics: Identifying the path to profitability, Wiley, 2011.

List of Soft-Core Courses for Other Major Programmes
offered by the Computer Science Department (w.e.f. 2022-2023)

1. Introduction to Information Technology
2. Multimedia Systems
3. Data Base Management System
4. Introduction to Web Programming

Credit: 3 Credit in Soft Core Category Total Teaching Hrs.:4 Hrs. (2 Hrs. in Theory and 2 Hrs. in Practical)

Evaluation and Examination Pattern:

The evaluation scheme for each course shall contain two parts; (a) internal evaluation and (b) external evaluation. 40% weightage shall be given to internal evaluation and the remaining 60% to external evaluation.

Each Course will have 100 Marks with CIA 40 Marks & End Semester Examination 60 Marks.

Internal evaluation:

The internal evaluation shall be based on predetermined transparent system involving periodic written tests, mid semester examination, performance in the Laboratory Involvement, skill /records/viva and model practical examination.

The weightage assigned to various components for internal evaluation of theory course is as follows:

Internal Assessment Components:

Sl. No.	Component	Maximum Marks
1	Three Tests (Best 2 out of 3)	15
2	Mid Semester Examination	15
3	Performance in the Laboratory Involvement, skill/records/viva and model practical examination.	10
TOTAL		**40**

End Semester Examination - Pattern of Question Paper:

Section	No. of Questions	Marks for Each Question	Total
A	**10 (MCQs)** Two Questions from each Unit	1	10
B	**5** (One Question from each Unit, with Internal Choice)	4	20
C	**3** 3 out of 5 (One from each unit)	10	30
TOTAL			**60**

INTRODUCTION TO INFORMATION TECHNOLOGY

UNIT – I INTRODUCTION

Types of computers, Characteristics of computers, Classification of computers, Anatomy of a digital computer, Memory unit, Input devices, Output devices.

UNIT – II OPERATING SYSTEM

Introduction, Functions of an operating system, Classification of operating systems, DOS, UNIX, Windows.

UNIT – III WORD PROCESSING WITH STYLE

Creating, saving, opening and printing documents- Formatting - Page layout - Graphic Image - Working with Tables – Columns - Mailing.

UNIT- IV WORKING WITH SPREADSHEETS

Working & editing with workbooks - Formatting a worksheet and applying formulas - Creating charts (Graphs) - Analysis the data - Importing & Exporting data.

UNIT-V WORKING WITH PRESENTATIONS AND INTRODUCTION TO INTERNET

Creating presentation - Types of view - Adding picture and graph - Adding sound & video - Animating the slides and objects.

Internet basics – Internet Protocols – Internet Addressing – Web Browsers – Electronic mail – Introduction to intranet and extranet.

TEXT BOOKS:

1. INTRODUCTION TO COMPUTERS, ALEXIS LEON, MATHEWS LEON, Leon Tech World.
2. Microsoft office 2007 Professional Edition.
3. LibreOffice, Writer Guide, Calc Guide & Impress Guide, Special Print Edition by FOSSEE and Spoken Tutorials, http://libreoffice.org/get-help/documentation/

REFERENCE BOOK:

1. Using Information Technology, Brain K. Williams, et. al. Third Edition, TMH, 2000.

MULTIMEDIA SYSTEMS

UNIT-I

Introduction- Introduction to Multimedia: Components of Multimedia-Multimedia and Hypermedia-World Wide Web-Overview of Multimedia Software tools.

UNIT-II

Multimedia Authoring and Tools-Multimedia Authoring Metaphors-Frame Metaphore, Card Metaphor, Cast/Score/Scripting Metaphor-Multimedia Production-Multimedia Presentation-Sprite Animations-Video transitions-Editing and authoring tools-Macromedia Flash, Dream Weaver.

UNIT-III

Graphic and Image Data Representation-Image Data Types-8-bit color images,24-bit color images, Color lookup table-Popular File Formats – GIF, JPEG, PNG.

UNIT-IV

Fundamental Concept in Video-Types of Video signals-Analog Video-Digital Video.

UNIT-V

Basics of Digital Audio: Digitization of Sound-Audio Filtering-MIDI overview-Hardware aspects of MIDI-Structure of MIDI messages.

TEXT BOOK:

1. Z-N. Li, M.S. Drew, Fundamentals of Multimedia, Pearson Prentice Hall Upper Saddle River, NJ, 2004.

REFERENCE BOOK:

1. R. Steinmettz and K. Nahrstedt, Multimedia: Computing, Communications and Applications, Prentice Hall, 1995.

DATA BASE MANAGEMENT SYSTEM

UNIT-I

Introduction to Database System-Objectives-Entities and Attributes- Data Models Database Management System-Tree Structure- Plex Structure-Data Description Languages, Relational Databases- Third Normal Form.

UNIT-II

MS-Access

Creating a database, creating and modifying tables, relating tables, entering and editing data.

UNIT-III

Retrieve and present information – Sorting, filtering and printing records- extraction information with queries-advanced queries.

UNIT-IV

Understating form – creating new forms-using the form for data entry- modifying controls – adding other objects and special controls – creating a hierarchical form.

UNIT-V

Report design basic – Starting a new report- modifying the report design-sorting and grouping records in a report –adding a sub report - preview and print the report

TEXT BOOKS:

1. James Martin, Computer Database Organization, 2-nd Edition-PHI, 2001.
2. Virginia Andersen, Access 2002, TATA McGraw HILL Edition.

INTRODUCTION TO WEB PROGRAMMING

UNIT-I

Introduction to Internet-Resource of Internet- H/W & S/W requirement of Internet- Domain naming system, registering our domain name- URL- protocols server name-port-relative URLs. Overview of web browsers-Internet service providers- Internet services protocols concepts, Internet client and Internet servers.

UNIT-II

Introduction to HTML- Elementary tags in HTML- List in HTML -Displaying Text in lists- Using ordered lists -Using unordered lists- Directory list- Definition Lists- Combining List Types- Graphics and image- Format Graphics and HTML Documents.

UNIT-III

Images and Hyperlink anchors-Image maps- Tables - Frames – Forms.

UNIT-IV

Introduction to DHTML- Introduction to style sheets, Setting the default style sheet language, Cascading Style sheets, Inline style information, External Style sheets.

UNIT-V

Introduction to VB Script- Declaring variables- Adding data and Time Function to scripts- Using mathematical operators and functions- Using conditional statements. Creating functions using logical connectives and operators. A simple page VB Script and forms. Introduction to server-side scripts.

TEXT BOOKS:

1. Ian Graham- HTML 4.0 Source Book – A complete guide to HTML and HTML extension
2. Ernest Ackermann, Learning to use the Internet - Franklin Beadle & Associates (January 1995)
3. Mary Jane Mara, VB Script Source Book - Wiley (November 10, 1997)