ODISHA UNIVERSITY OF TECHNOLOGY AND RESEARCH

Techno Campus, Mahalaxmi Vihar, Ghatikia, Bhubaneswar-751029.

Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

Abbreviation used:

AC	Audit course	LC	Lab Course	PA	Practical Assessment
PC	Professional Core	PR	Project/ Practical/ Internship	L	Lecture
PE	Professional Elective	SE	Seminar/ Expert Lecture/ Etc.	T	Tutorial
OE	Open Elective	IA*	Internal Assessment	P	Practical
MC	Mandatory/ Common Course	EA	End-Semester Assessment		

Subject Code Format:

A1	A2	B3	C4	C5	C6
School/ Dept. (Offering) **BH:** Basic Sciences and Humanities **CS:** Computer Sciences **EE:** Electrical Sciences **EI:** Electronic Sciences **IP:** Infrastructure and Planning **MS:** Mechanical Sciences **BT:** Biotechnology **TE:** Textile Engineering		**Level** **1:** UG/ Int. Msc. (1st Year) **2:** UG/ Int. Msc. (2nd Year) **3:** UG/ Int. Msc. (3rd Year) **4:** UG/ Int. Msc. (4th Year) **5:** UG/ Int. Msc. (5th Year) **6:** PG (1st Year) **7:** PG (2nd Year) **8:** Ph.D.	**0:** AC **1:** PC **2:** PE **3:** OE **4:** MC **5:** LC **6:** PR **7:** SE **8:** **9:**	**Serial Number (01 to 99)** 01/ 03/…/ 19: Odd Sem. (CSE) 21/ 23/…/ 39: Odd Sem. (IT) 41/ 43/…/ 59: Odd Sem. (MCA) 61/ 63/…/ 79: Odd Sem. (Prog-4) 81/ 83/…/ 99: Odd Sem. (Prog-5) 02/ 04/…/ 20: Even Sem. (CSE) 22/ 24/…/ 40: Even Sem. (IT) 42/ 44/…/ 60: Even Sem. (MCA) 62/ 64/…/ 80: Even Sem. (Prog-4) 82/ 84/…/ 98: Even Sem. (Prog-5)	

1st Semester

Sl. No.	Subject Type	Subject Code	Subject Name	Teaching Hours			Credit	Maximum Marks			
				L	T	P		IA	EA	PA	Total
1	PC 1	CS6121	Data Mining	3	0	0	3	40	60	-	100
2	PC 2	CS6123	Advanced Algorithm Design	3	0	0	3	40	60	-	100
3	PE 1 (Any One)	CS6221	Computational Intelligence	3	0	0	3	40	60	-	100
		CS6223	Wireless Sensor Network								
		CS6225	Internet of Things								
4	MC 1	BH6401	Mathematical Methods in Engineering	3	0	0	3	40	60	-	100
5	MC 2	MS6403	Research Methodology and IPR	2	0	0	2	40	60	-	100
6	LC 1	CS6521	Computing Lab - I	0	0	4	2	-	-	100	100
7	LC 2	CS6523	Advanced Algorithms Design Lab	0	0	4	2	-	-	100	100
8	AC 1	Any One from the List of AC 1 (Appendix-I)		2	0	0	0	40	60	-	100
			Total	**16**	**0**	**8**	**18**	**240**	**360**	**200**	**800**

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2nd Semester

Sl. No.	Subject Type	Subject Code	Subject Name	Teaching Hours			Credit	Maximum Marks			
				L	T	P		IA	EA	PA	Total
1	PC 3	CS6122	Software Engineering	3	0	0	3	40	60	-	100
2	PC 4	CS6124	Mobile Computing	3	0	0	3	40	60	-	100
3	PE 2 (Any One)	CS6222	Network and System Security	3	0	0	3	40	60	-	100
		CS6224	Advanced Computer Architecture								
		CS6226	Information Retrieval								
4	PE 3 (Any One)	CS6228	Cloud Computing	3	0	0	3	40	60	-	100
		CS6230	Big Data Analytics								
		CS6232	Digital Forensics								
5	OE 1	Any One from the List of OE 1 (Appendix-I)		3	0	0	3	40	60	-	100
6	PR 1	CS6622	Project (Specialization Related)	0	0	4	2	-	-	100	100
7	LC 3	CS6522	Computing Lab - II	0	0	4	2	-	-	100	100
8	AC 2	Any One from the List of AC 2 (Appendix-I)		2	0	0	0	40	60	-	100
			Total	**17**	**0**	**8**	**19**	**240**	**360**	**200**	**800**

3rd Semester

Sl. No.	Subject Type	Subject Code	Subject Name	Teaching Hours			Credit	Maximum Marks			
				L	T	P		IA	EA	PA	Total
1	PE 4* (Any One)	CS7221	Software Testing	3	0	0	3	40	60	-	100
		CS7223	Human Computer Interaction								
		CS7225	Real Time Systems								
2	PR 2	CS7621	Dissertation (Phase-I)	0	0	24	12	-	-	100	100
			Total	**3**	**0**	**24**	**15**	**40**	**60**	**100**	**200**

* Virtual/Online Course either offered by OUTR or available in MOOCs platform (No physical class)

4th Semester

Sl. No.	Subject Type	Subject Code	Subject Name	Teaching Hours			Credit	Maximum Marks			
				L	T	P		IA	EA	PA	Total
1	PR 3	CS7622	Dissertation (Phase-II)	0	0	32	16	-	-	100	100
			Total	**0**	**0**	**32**	**16**	**-**	**-**	**100**	**100**

Credits and Maximum Marks

Sl. No.	Semester	Credits	Maximum Marks
1	1st	18	800
2	2nd	19	800
3	3rd	15	200
4	4th	16	100
Total		68	1900

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1st Semester

PC 1	CS6121	Data Mining	3	0	0	3

Prerequisites

Data Structures and Algorithms, Database, SQL

Course Outcomes

1. Understand the fundamentals of data warehousing and data mining
2. Design data warehouses and define specific OLAP operations for analysis
3. Apply data mining techniques like classification, prediction, clustering
4. Gain knowledge about complex data types and spatial data mining.

Module - I

Introduction to Data warehousing: Definition and Characteristic, Need for data warehousing, Evolution of Decision support System, Building blocks of data warehouse, data warehouses and data marts, metadata in the data warehouse, Data warehousing Architecture, Data warehousing implementation, Business and data warehouse

Data Warehouse Modelling and Design: Multidimensional data model, Data cube, Schemas for multidimensional data models (Star, Snowflake, Fact Constellation), OLAP, OLAP Operations, OLAP Models(ROLAP, MOLAP, HOLAP), OLAP vs OLTP, Benefits of Data Warehousing

Module - II

Introduction to Data Mining: KDD Process, Data mining Functionalities, Classification of data mining systems, data mining task primitives, Integration of data mining system with data warehouse, Data Preprocessing (data summarization, data cleaning, data integration and transformation, data reduction, data discretization)

Association Rule Mining: Mining frequent patterns, associations, correlations (market basket analysis), Frequent Itemset Mining, (Apriori algorithm, FP-Growth), Correlation Analysis (Chi-square, Lift), Kinds of association rules

Module - III

Classification: Classification vs Prediction, issues, Decision tree induction, Attribute Selection Measures, Tree Pruning, Rule based classification, classification by Back Propagation, Bayseian Classification, Support Vector Machines

Cluster Analysis: Data in cluster analysis, Categorization of clustering methods, partitioning methods (k-means, k-medoids), hierarchical methods (AGNES, DIANA, BIRCH), density based methods (DBSCAN, OPTICS), Outlier Analysis

Advanced Techniques: Web Mining, Spatial Mining, Multimedia Datamining, temporal mining, Data mining applications (financial data Analysis, retail industry, telecommunication industry, Biological data analysis, intrusion detection), Social Impacts of Data Mining

Text Books:

1. Data Mining: Concepts and techniques: Han, Camber and Pei, Elsevier (3rd Edition).
2. Data Mining & Data Warehousing Using OLAP: Alex & Stephen, McGraw Hill

Reference books:

1. Data Mining Techniques and Applications by Hongbo Du, Cengage
2. Data Mining: Arun Pujari, University Press
3. Data Mining –a Tutorial based primer by R.J.Roiger, M.W.Geatz, Pearson Education.
4. Data Warehousing: Reema Thareja, Oxford University Press
5. Data warehousing Fundamentals: Paulraj Ponniah, Willey India.

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PC 2	CS6123	Advanced Algorithm Design	3	0	0	3

Prerequisites

Data Structure, Discrete Mathematics

Course Outcomes

1. To analyze the performance of algorithms.
2. To use the advanced data structures for better processing of data
3. To design the algorithms for different applications
4. To use the algorithms studied at appropriate area and to improve the performance f the application.

Module I

Algorithm Analysis Notation: Asymptotic Analysis, Recurrence Relation, Amortized Analysis
Advanced Data Structures: Min-Max heap, Binomial heap, Fibonacci heap, Binary Search Tree, AVL tree, B+ Tree, Red-Black Tree

Divide-and-Conquer Technique: Quick Sort, Strassen's algorithm for matrix multiplication, Convex hull algorithm

Module II

Dynamic Programming Technique: Floyd-Warshall algorithm, 0/1 Knapsack algorithm

Greedy Technique: Fractional Knapsack algorithm, Minimum Cost Spanning Tree algorithms (Kruskal's algorithm, Prim's algorithm), Single-source shortest path algorithms (Bellman-ford algorithm, Dijkstra's algorithm)

String Matching Algorithms: Knuth-Moris-Pratt Algorithm, Naive string-matching algorithm
Backtracking Technique: N-Queen problem

Module III

Branch & Bound Technique: Algorithms for 15-Puzzle Problem and Travelling Salesman Problem

Maximum Flow: - Flow networks, The Ford-Fulkerson method

NP Completeness: Polynomial Time, Polynomial-Time Verification, NP Completeness & reducibility, NP Completeness proofs, Cook's theorem

Text Book:

1. Introduction to Algorithms by T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein, 4th Edition (2022), PHI Learning Pvt. Ltd.
2. H. Bhasin: Algorithms, Design and Analysis, First Edition (2015), Oxford Higher Education.

Reference Books:

1. E. Horowitz, S. Sahani and Dinesh Mehta, Fundamentals of Data Structures in C++, First Edition (2009), Galgotia.
2. Mark Allen Weiss, "Data Structures & Algorithm Analysis in C/C++", 3rd Edition (2009), Pearson Education India.
3. Adam Drozdex, Data Structures and algorithms in C++, Third Edition (2013), Thomson learning

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PE 1	CS6221	Computational Intelligence	3	0	0	3

Prerequisites

Neural Networks, Fuzzy Logic, Genetic Algorithms

Course Outcomes

1. Learn Computational Intelligence (CI) and their applications.
2. Analyze Various Neural Network Architectures.
3. Define Fuzzy System.
4. Analyze Genetic Algorithms and their applications.
5. Understand the concepts of Hybrid system.

Module I

Neural Networks: Introduction to CI, Fundamentals of Neural Network, Models of Artificial Neuron, Architecture, Learning Rules, Knowledge representation and Acquisition, Learning methods (Supervised, unsupervised, Competitive), Taxonomy of Neural Network systems: Single layer neural network, Multilayer neural network, Application of neural network in relevant fields.

Neural Network Algorithms: Back propagation, Feed Forward error back propagation, Associative memory, Auto associative memory, Hetero associative memory, Bidirectional associative memory, Kohonen Feature Map, Adaptive Resonance Theory, RBFN, k-means clustering.

Module II

Fuzzy Logic: Basic Concepts of Fuzzy Logic, Introduction to Fuzzy set theory, Fuzzy vs Crisp set, Fuzzy variables, Membership function, Operation, Properties, Fuzzy If-Then Rules, Variable Inference algorithm, Defuzzification, Fuzzy system design

Module III

Genetic Algorithms: Introduction, Basic of GA and genetic Engineering, Encoding, decoding, Operation of GA (Selection, Crossover, Mutation), Hybrid systems, Integration of Neural networks, fuzzy logic and genetic algorithm, Finite Element based optimisation, PSO, BFO, Hybridization of Optimization Techniques

Text Book

1. Neural networks, Fuzzy logic and Genetic Algorithm, Synthesis and Application by S. Rajasekaran, G.A.Vijayalakshami, PHI.
2. Introduction to Neural Networks by S.N. Sivanandam, S. Sumathi, S. N. Deepa (McGrawHill)

Reference Book

1. Neural Networks and Learning Machines by Simon Haykin (Pearson)
2. Neuro Fuzzy and Soft Computing by Jang, Sun, Mizutani (PHI)
3. Neural Networks and Deep Learning by Charu C Agarwal (Springer)

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PE 1	CS6223	Wireless Sensor Network	3	0	0	3

Prerequisites

Computer Networks, Operating system, Mobile Computing

Course Outcomes

1. Understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems and provide a survey of sensor technology
2. Learn key routing protocols for sensor networks and main design issues
3. Learn transport layer protocols for sensor networks, and design requirements
4. Understand the Sensor management, sensor network middleware, operating systems

Module I

Introduction: Introduction to Wireless Sensor Networks, Node architecture, Operating System, Advantages of Sensor Networks, Application of Sensor Networks, Challenges and Constraints.

Network deployment: Structured vs randomized deployment, Network topology, Connectivity in geometric random graphs, Connectivity using power control, Coverage metrics, Mobile deployment.

Localization: Issues and approaches, Coarse-grained and Fine-grained node localization, Network-wide localization.

Time Synchronization: Reasons and challenges for time synchronization, Basics of time synchronization, Time synchronization protocols – Receiver Broadcast Synchronization, Timing-Sync Protocol for Sensor Networks and Flooding Time Synchronization Protocol.

Module Il

Physical Layer: Basic components, Source and Channel Encoding, Modulation, Signal Propagation.

MAC Layer: Wireless MAC Protocols (CSMA, MACA, MACAW), Characteristics of MAC protocols in Sensor Networks, Contention-Free MAC protocols (TRAMA, YMAC, LEACH), Contention-Based MAC protocols(PAMAS, SMAC, TMAC), Hybrid MAC protocols.

Network Layer: Classification of Routing Protocol, Routing metrics, Flooding and gossiping, Data-Centric routing (SPIN, Directed Diffusion, Gradient), Proactive routing (DSDV, OLSR), On-Demand routing (AODV, DSR), Hierarchical routing, Location-Based routing (UNICAST, MULTICAST, GAF), QoS-Based routing protocols

Module III

Reliability and congestion control: Basic mechanisms, Reliability guarantees, Congestion control, Real-time scheduling.

Security: Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks.

Text Books:

1. Fundamentals of Wireless Sensor Network: Theory and Practice: Waltenegus Dargie and Christian Poellabauer, Wiley Publication, 2010.
2. Networking Wireless Sensors: Bhaskar Krismachari, Cambridge University Press

References Books:

1. Wireless Sensor Networks: An Information Processing Approach- by Feng Zhao, Leonidas Guibas, Morgan Kaufmann Series in Networking 2004
2. Wireless Sensor Networks: Edited by C.S Raghavendra, Krishna M, Sivalingam, TaiebZnati, Springer

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PE 1	CS6225	Internet of Things	3	0	0	3

Prerequisites: Computer Networks Fundamentals, Socket programming, Python (Optional)

Course Outcomes

1. Know how about implementation of devices connected over Internet
2. Design tools for IoT
3. Analyze data collected from IoT devices

Module-I:

What is the Internet of Things?: History of IoT, About IoT, Overview and Motivations, Examples of Applications, Internet of Things Definitions and Frameworks: IoT Definitions, IoT Architecture, General Observations, Working Definition, IoT Frameworks

Physical Design of IoT- Things in IoT, IoT Protocols, Logical Design of IoT- IoT Functional Blocks, IoT Communication Models, IoT Communication APIs, IoT Enabling Technologies- Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems, IoT Levels & Deployment Templates Introduction, M2M-Difference between IoT and M2M.

Module-II:

RFID: Introduction, Principle of RFID, Components of an RFID system, Issues EPC Global Architecture Framework: EPCIS & ONS, Design issues, Technological challenges, Security challenges, IP for IoT, Web of Things.

Wireless Sensor Networks: History and context, WSN Architecture, the node, Connecting nodes, Networking Nodes, Securing Communication WSN specific IoT applications, challenges: Security, QoS, Configuration, Various integration approaches, Data link layer protocols, routing protocols and infrastructure establishment.

Clustering, Software Agents, Clustering Principles in an Internet of Things Architecture, Design Guidelines, and Software Agents for Object Representation, Data Synchronization.

Module-III:

Vulnerabilities of IoT, Security requirements, Threat analysis, Use cases and misuse cases, IoT security tomography and layered attacker model, Identity establishment, Access control, Message integrity, Non-repudiation and availability, Security model for IoT.

BUSINESS MODELS FOR THE INTERNET OF THINGS

Business Models and Business Model Innovation, Value Creation in the Internet of Things, Business Model Scenarios for the Internet of Things. Internet of Things Application: Smart Metering Advanced Metering Infrastructure, e-Health Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards Use of Big Data and Visualization in IoT, Industry 4.0 Concepts. Low-power design (Bluetooth Low Energy),

Text Books

1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World ofM2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
3. Parikshit N. Mahalle& Poonam N. Railkar, “Identity Management for Internet of Things”, River
4. Publishers, ISBN: 978-87-93102-90-3 (Hard Copy), 978-87-93102-91-0 (eBook).

Reference Books

1. Hakima Chaouchi, “The Internet of Things Connecting Objects to the Web” ISBN: 978-1-84821-140-7, Willy Publications
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications andProtocols, ISBN: 978-1-119-99435-0, 2nd Edition, Willy Publications
3. Daniel Kellmereit, Daniel Obodovski, “The Silent Intelligence: The Internet of Things”,Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978-0989973700.
4. Fang Zhaho, Leonidas Guibas, “Wireless Sensor Network: An information processing approach”, Elsevier, ISBN: 978-81-8147-642-5.

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MC 1	BH6401	Mathematical Methods in Engineering	3	0	0	3

Refer Appendix-I for detailed Syllabus.

MC 2	MS6403	Research Methodology and IPR	2	0	0	2

Refer Appendix-I for detailed Syllabus.

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LC 1	CS6521	Computing Lab - I	0	0	4	2

Prerequisites

Knowledge of networking and programming fundamentals.

Course Outcomes

1. Students will gain knowledge about networking experiments and simulation.
2. Exposure to hands on coding.

Experiment 1 Analyzing Number of Transmitting Nodes Vs Collision count, Mean Delay for an Ethernet LAN

Experiment 2 Analyzing Bus Vs Star topology with respect to number of collisions (for a fixed number of transmitting nodes) for Ethernet LAN

Experiment 3 Analyzing the difference between Hub vs Switch transmission with respect to throughput and delay.

Experiment 4 Analyzing the performance of Token Ring with Number of Nodes vs Response Time, Mean Delay using NETSIM.

Experiment 5 Comparing CSMA/CA vs CSMA/CD protocol with respect to throughput and collision count (for a fixed number of transmitting nodes).

Experiment 6
a) Verification of Stop and Wait Protocol.
b) Verification of Go Back N Protocol.
c)Verification of Selective Repeat Protocol.

Experiment 7 Matlab basics and elementary calculations.

Experiment 8 Implementation of various matrix operations using Matlab:
a) Matrix addition
b) Matrix subtraction
c) Matrix multiplication
d) Transpose of a matrix
e) Inverse of a matrix.

Experiment 9 Built in Function for matrix operation using Matlab.

Experiment 10 Plotting graphs in 2D and 3D IN line graph, bar graph and pie chart using Matlab.

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LC 2	CS6523	Advanced Algorithms Design Lab	0	0	4	2

Prerequisites

Programming Languages, Data Structure

Course Outcomes

1. Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high-level language.
2. Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
3. Apply and implement learned algorithm design techniques and data structures to solve real world problems

Experiment 1 Sort a given set of elements using the Quick sort method and determine the time required to sort the elements

Experiment 2 Write a program to perform the following operations on AVL Tree: i) Creation ii) Insertion iii) Deletion

Experiment 3 Write a program to perform the following operations on min-max heap: i) Creation ii) Insertion iii) Deletion

Experiment 4 Implement 0/1 Knapsack problem using Dynamic Programming

Experiment 5 From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

Experiment 6 Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's Algorithm.

Experiment 7 Find Minimum Cost Spanning Tree of a given undirected graph using Prim’s algorithm.

Experiment 8 Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

Experiment 9 Implement N Queen's problem using Back Tracking

Experiment 10 Write a program for Naive string-matching algorithm

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AC 1	Any One from the List of AC 1 (Appendix-I)	2	0	0	0

Refer Appendix-I for detailed Syllabus.

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2nd Semester

PC 3	CS6122	Software Engineering	3	0	0	3

Prerequisites

Computer Programming, Program Design, Computer Systems Analysis.

Course Outcomes

1. Define various software application domains and remember different process model used in software development.
2. Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.
3. Convert the requirements model into the design model and demonstrate use of software and user-interface design principles.
4. Generate project schedule and can construct, design and develop network diagram for different type of Projects. They can also organize different activities of project as per Risk impact factor.

MODULE-I:

Evolution of Software Design Technique: Adhoc Base, Control Base, Data Structure, Data Flow, Objective Oriented, Product and Process. Process Model: SDLC, Waterfall model, Incremental Process Model, Evolutionary Process Model, Prototype, Spiral, Agile Model, Unified Process. Component Base Software Developer Model: Y model, V model, X model, W model, Fountain Model. 4P Approach (People, Process, Project, Product)

MODULE-II:

Software Cost Estimation: Basics of cost estimation, Software Cost Estimation Process, Decomposition Techniques, Software Estimation Model, Software Metrics: Guidelines for software Metrics, Designing Software Metrics, Classification of Software Metrics, COCOMO, COCOMO-II, Metrics for Design Model: Architectural Design Metrics, Metrics for OO Design, Class Oriented Metric, Component-Level Design Metric, Metrics for Testing, Metrics in the Process and Project Domains.
Software Measurement: Size-Oriented Metrics, Function-Oriented Metrics, Object-Oriented Metrics, Use-Case Oriented Metrics, Web Engineering Project Metrics. Booch Notation, Rumbaugh Object Modeling Technique, Jacabson Model, Overview of Object-Oriented Concept, UML Diagram: Use Case Diagram, Class Diagram, Object Diagram, Sequence Diagram, Collaboration Diagram, Activity Diagram, State Chart Diagram, Component Diagram, Deployment Diagram

MODULE-III:

Testing: Stress testing, volume testing, compatibility testing, recovery testing, and regression testing, user Interface testing, Configuration Testing, Security testing, Software Quality Assurance, Software Reliability, Change Management: SCM, SCM repository, SCM Process, Cleanroom Software Engineering, Re-engineering: Software reengineering, Restructuring, Forward Engineering

Text Books:

1. Software Engineering, A Practitioner's Approach, Roger S. Pressman, 6th edition, TMH
2. Fundamentals of Software Engineering, Rajib Mall, 5th edition, PHI

Reference Books:

1. Ali Behforooz, Frederick J. Hudson, Software Engineering Fundamentals, 8th Edition, Oxford University Press
2. Software Engineering, I. Sommerville, 9th Edition, Pearson Education
3. Software Engineering, Jibitesh Mishra & Ashok Mohanty, Pearson Education, 2012

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PC 4	CS6124	Mobile Computing	3	0	0	3

Prerequisites

Computer Network, Data Communication, Operating System

Course Outcomes

1. Explain the basic concepts of wireless network and wireless generations.
2. Demonstrate the different wireless technologies such as CDMA, GSM, GPRS etc
3. Describe and judge the emerging wireless technologies standards such as WLL, WLAN, WPAN, WMAN.
4. Explain the design considerations for deploying the wireless network infrastructure.

Module – I:

Introduction: Three Tier Architecture Mobile Computing Architecture, Evolution of Wireless Technology
Wireless Transmission: Signal, Antenna, Signal Propagation, Multiplexing, Modulation, Spread Spectrum
Cellular System: Cell, Cluster, Cell Splitting, Frequency Reuse, Frequency Management, Channel Assignment Strategies, Components of Cellular System, Operation of Cellular System

Module – II:

Global System for Mobile Communication (GSM): Overview, Architecture, Addresses and identifiers, Network signaling, Radio interfaces, Channels, Mobility Management.
General Packet Radio Services (GPRS): Architecture, GPRS Interfaces, Network Protocols, GPRS Handsets
Wireless LAN (WLAN): Application, Requirement, IEEE 802.11(Ad-hoc Mode, Infrastructure Mode, Protocol Architecture), Bluetooth (Piconet, Scatternet, Protocol Stack, Bluetooth Profile)
Mobile Ad-Hoc Network: Types, Topology, Applications, Proactive Routing (DSDV, OLSR), Reactive Routing (AODV, DSR), Hybrid Routing (ZRP)

Module – III:

Wireless Application Protocol (WAP): WAP Gateway and Protocols, Wireless Markup Languages (WML)
Mobile IP: Terminology, Operations, Location Management, Mobility Management
IMT 2000: Vision, IMT-2000 Family, UMTS (Architecture, Interfaces)
Emerging Technologies: WiFi, WiMax, LTE

Text Books:

1. Mobile Communication: J. Schiller, 2ND Edition, Pearson Education
2. Mobile Computing: Asoke Talukdar, 2nd Edition, TMH.

Reference Books:

1. Mobile Computing: P.K. Patra, S.K. Dash, 2nd Edition, Scitech Publications.
2. Fundamentals of Mobile Computing, Prashanta Kumar Patnaik and Rajib Mall, PHI, 2nd Edition, 2015
3. Mobile Computing, Raj Kamal, 2nd Edition, Oxford University Press
4. Wireless Communications, T.L. Singhal, TMH

ODISHA UNIVERSITY OF TECHNOLOGY AND RESEARCH

Techno Campus, Mahalaxmi Vihar, Ghatikia, Bhubaneswar-751029.

Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PE 2	CS6222	Network and System Security	3	0	0	3

Prerequisites

Discrete logarithms, Elliptic curves, Computer networking, Finite field, Number Theory, Security protocol

Course Outcomes

1. Understand theory of fundamental cryptography, encryption and decryption algorithms.
2. Understand the Public-Key Infrastructure ·
3. Understand security protocols for protecting data on networks.
4. Evaluate the authentication and hash algorithms.

Module I:

Introduction to Information Security: The meaning of computer security, computer criminals, methods of defense, Security Goals, Attacks, Security services and Mechanism. Cryptography: Plain Text and Cipher Text, Encryption and Decryption, Substitution cipher, Transposition Cipher, Stream and Block Cipher, Modern block ciphers, Modern stream Ciphers, Data Encryption Standard (DES), Advanced Encryption Standard (AES),

Module II:

Public key cryptography: Principles of public key cryptosystems-The RSA Algorithm-Key management – Diffie Hellman Key exchange. Hash Functions, Digital Signatures. Network security: Electronic mail security: E-mail, PGP, S/MIME. IPsec: IP security overview, architecture, Internet key exchange, ISAKMP, Encapsulating security payload.

Module III:

Web security: secure socket layer (SSL), Transport layer security. System Security: Description of the system, worms, viruses, IDS. Firewalls: Definitions, construction & working principles. Entity authentication: Passwords, challenge-response algorithms, zero-knowledge protocols. Legal & ethical issues in computer security: protecting programs & data, Information & law, rights of employees & employers.

Text Book

1. Security in computing, Charles P, Pfleeger, Shari Lawrence Pfleeger, 4th edition, PHI
2. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata Mc Graw Hill, 2007.

Reference book

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education,
2. Neal Koblitz, A course in number theory and cryptography, Springer.
3. Johannes A. Buchmann, Introduction to Cryptography, Undergraduate Text in Mathematics, Springer.
4. Doug Stinson, Cryptography Theory and Practice, CRC Press.

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PE 2	CS6224	Advanced Computer Architecture	3	0	0	3

Prerequisites

Programming and Data Structures, Discrete Mathematics, Computer Organization

Course Outcomes

1. Design basic and intermediate RISC pipelines, including the instruction set, data paths, and ways of dealing with pipeline hazards.
2. Consider various techniques of instruction-level parallelism, including super scalar execution, branch prediction, and speculation, in design of high-performance processors.
3. State and understand memory hierarchy design, memory access time formula, performance improvement techniques, and trade-offs.
4. Learn from additional topics in computer architecture, such as multi-core processors, thread-level parallelism, and warehouse computing.

Module – I:

Principles of Processor Performance, Amdahl' Law, Basic Multiprocessor Architecture: Flynn's Classification, Share Memory Architecture (UMA, NUMA, NORMA, COMA), Distributed Memory Architecture, Array Processor, Vector Processors, Associative Processor, Systolic architecture, RISC and CISC Architectures.

Module – II:

Pipelining Fundamentals, Linear Pipelining (Arithmetic and Instruction Pipeline), Pipeline Hazards, Superscalar Architecture, Super Pipelined Architecture, Instruction Level Parallelism (ILP): ILP Hazards, VLIW Architecture. Interconnection Networks: Crossbar Switches, Suffle Transformation, Omega Network (Butterfly Network), Static Networks, Dynamic Networks, Network Topologies.

Module –III:

Hierarchical Memory Technology: Data and Instruction Caches, Multi-level Caches, Cache memory mapping policies, Cache Coherence Problem (Hit Time, Miss Rate), Snoopy Bus protocol, Direct Bus Protocol, Hardware Synchronization Mechanism, Memory Inter leaving, Memory Management Hardware.

Data Flow Computer Architecture: Static Data Flow computer, Dynamic Data Flow computer, Cluster computers, Distributed computing, Case Studies: ARMs and SPARC Processor.

Text Books:

1. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach, 6th Edition, Morgan Kaufmann
2. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability, Programmability, 3rd Edition, McGrawHill.

Reference Books:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design, 5th edition, 2013, Morgan Kaufmann.
2. V. Carl Hamacher, Zvonko G. Vranesic, Safwat G. Zaky Snippet, Computer Organization, 5th edition, 2002, McGraw Hill.
3. K. Hwang and F. A. Briggs, Computer Architecture and Parallel Processing, McGraw Hill.

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PE 2	CS6226	Information Retrieval	3	0	0	3

Prerequisites

File and storage systems, Data Structures, Data Mining, Query Processing Strategies

Course Outcomes

1. Understand retrieval of various categories of data from web
2. Understand the concept of recommender systems
3. Understand the concept of multimedia and distributed data retrieval

Module I:

Information Retrieval: Information Retrieval using Boolean model, processing Boolean queries, Tolerant Retrieval, Wildcard queries, Spelling Correction, Phonetic correction.

Information search: Index construction, Dynamic indexing, Index compression, vector space retrieval, Evaluation in information retrieval, Similarity search

Module II:

Probabilistic IR: Probabilistic Information retrieval, Language model of information retrieval, bottom up and Top down partitioning paradigms, Clustering and visualization via embedding

Module III:

Learning in IR: Supervised Learning, Evaluating Text classifiers, Nearest Neighbors Learners, Bayesian Learners, Hypertext Classification, Semi supervised Learning.

Cross lingual Query Management: Query Analysis, Machine Translation, Conceptual Machine Translation using WordNet, Case study on Cross Lingual Information Retrieval.

Text Book:

1. Introduction to Information Retrieval by Manning, Raghavan and Schutze, Cambridge University press, 2008.
2. Mining the Web, Discovering Knowledge from Hypertext Data, Soumen Chakrabarti, Allied Elsevier Publication, 2007

Reference Book:

1. Information Retrieval: Algorithms and Heuristics by David A. Grossman, Ophir Frieder, Second Edition, SPRINGER
2. Information Retrieval: Implementing and Evaluating Search Engines by Stefan Büttcher, Charles L. A. Clarke, Gordon V. Cormack, MIT Press, 2010
3. Information Retrieval: Searching in the 21st Century by Ayse Goker, John Davies, WILEY, 2009

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PE 3	CS6228	Cloud Computing	3	0	0	3

Prerequisites

Computer Networking, Distributed Computing, Web Technology, Service-Oriented Architecture, Virtualization

Course Outcomes

1. Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.
2. Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
3. Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds
4. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application.

Module-I

Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing – Cloud Architecture – Types of Clouds – Business models around Clouds – Major Players in Cloud Computing – issues in Clouds, Risks Involved in Cloud Computing.

Cloud Services: Types of Cloud services: Software as a service – Platform as a Service – Infrastructure as a Service – database as a Service – Monitoring as a Service – Communication as services, Service providers – Google, Amazon, Microsoft Azure, IBM, Salesforce.

Module-II

Collaborating Using Cloud Services: Email Communication over the Cloud – CRM Management – Project Management – Event Management – Task Management **Virtualization For Cloud:** Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties – Interpretation and binary translation, HLL VM – Hypervisors – Xen, KVM, VMWare, Virtual Box, Hyper-V.

Module-III

Data & Cloud Storage: Enterprise Data Storage (SAN, NAS), Cloud File System, Cloud Data stores & Data management for cloud storage.

Security, Standards and Applications: Security in Cloud: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed Management Task Force – Standards for application Developer – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud

Other Ways to Collaborate Online: Collaborating via Web - Based Communication Tools - Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis. Cloud Computing Platforms & tools: Eucalyptus – Nimbus – Open Nebula, CloudSim, Apache, Hadoop, Map Reduce

Text Books:

2. John Rittinghouse and James Ransome, “Cloud Computing, Implementation, Management and Strategy”, CRC Press, 2009.
3. Cloud Computing Principles & Paradigms by Buyya,Brobery & Goscinni(Wiley).
4. Cloud Computing by Srinivasan & Suresh(Pearson).

References:

1. Cloud Computing by Bagha & Madisetti, University Press
2. Anthony T Velte, Toby J Velte and Robert Elsenpeter, “Cloud Computing: A Practical Approach”, Tata McGraw-Hill, 2009.
3. David E. Y. Sarna, “Implementing and Developing Cloud Application”, CRC press 2011.

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PE 3	CS6230	Big Data Analytics	3	0	0	3

Prerequisites

Programming Languages, Data Structure and Algorithms

Course Outcomes

1. Identify Big Data and its Business Implications.
2. Understand components of Hadoop and Hadoop Eco-System
3. Access and Process Data on Distributed File System
4. Develop Big Data Solutions using Hadoop Eco System

Module I:

Introduction to Big Data Analytics: Big Data Overview, Characteristics, Traditional versus Big Data Approaches, State of the Practice in Analytics, Key Roles for the New Big Data Ecosystem and its Challenges, Example of Big Data Analytics, Data Analytics Lifecycle: Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results

Module II:

Advanced Analytical Theory and Methods: Overview of Clustering Techniques, K-Means, Hierarchical Clustering, Partitioning Methods, Clustering Streams, Overview of Association Rules, Apriori Algorithm, Applications of Association Rules, Transactions in Grocery Store Example, Classification: Decision Trees - Overview of a Decision Tree -The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes – Bayes' Theorem - Naïve Bayes Classifier.

Module III:

Advanced Analytics – Technology and Tools: Introduction to Hadoop, Core Hadoop Components, Hadoop Ecosystem, Physical Architecture, Limitations of Hadoop, Introduction to NoSQL, NoSQL Business Drivers, NoSQL Case Studies (Amazon DynamoDB, Googles' BigTable, MangoDB), NoSQL Data Architectural Patterns, Using NoSQL to Manage Big Data, Introduction to MapReduce, Algorithms using MapReduce.

Text Books:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering,Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. RadhaShankarmaniand M Vijayalakshmi, Big Data Analytics, 2nd Edition, Wiley India Pvt. Ltd., 2017.

Reference Books:

1. AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
2. Dan McCreary and Ann Kelly "Making Sense of NoSQL" – A guide for managersand the rest of us, Manning Press.

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PE 3	CS6232	Digital Forensics	3	0	0	3

Module-I:

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

Module-II:

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case

Module-III:

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Text Books:

1. Warren G.Kruse II andJay G.Heiser**, "**Computer Forensics: Incident ResponseEssentials", Addison Wesley, 2002.
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics andInvestigations, 2nd**ed.**, Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

Reference Books:

1. Vacca, J, *Computer Forensics, Computer Crime Scene Investigation*, 2nd Ed, CharlesRiver Media, 2005, ISBN: 1-58450-389.

OE 1	Any One from the List of OE 1 (Appendix-I)	3	0	0	3

Refer Appendix-I for detailed Syllabus.

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PR 1	CS6622	Project (Specialization Related)	0	0	4	2

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

LC 3	CS6522	Computing Lab - II	0	0	4	2

Prerequisites

Basic programming fundamentals, knowledge of spreadsheets, understanding of probability and statistics

Course Outcomes

1. Understanding the basics of Python programming
2. Developing problem-solving skills
3. Learning how to use Python libraries and frameworks
4. Building real-world applications

List of Experiments

1. Write a Python program to print your name and registration number.
2. Devise a Python program to implement arithmetic operations.
3. Write a Python program to demonstrate use of conditional statements.
4. Devise a Python program to illustrate loop statements.
5. Write a Python program to exhibit function components.
6. Write a Python program to demonstrate use of string manipulations.
7. Display recursion of a function using a Python program.
8. Create a list using a Python program for a given problem.
9. Construct a dictionary using a Python program for a given problem.
10. Demonstrate use of file operations using a Python program.

AC 2	Any One from the List of AC 2 (Appendix-I)	2	0	0	0

Refer Appendix-I for detailed Syllabus.

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

3rd Semester

PE 4	CS7221	Software Testing	3	0	0	3

Course Outcomes:

1. Analyze requirements to determine appropriate testing strategies.
2. Apply a wide variety of testing techniques in an effective and efficient manner.
3. Compute test coverage and yield according to a variety of criteria.
4. Evaluate the limitations of a given testing process and provide a succinct summary of those limitations.
5. Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.
6. Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods
7. Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems
8. Have an ability to use software testing methods and modern software testing tools for their testing projects.

Module-I:

INTRODUCTION: Testing as an Engineering Activity–Testing as a Process– Testing axioms–Basic definition– Software Testing Principles–The Tester's Role in a Software Development Organization–Origins of Defects–Cost of defects–Defect Classes–The Defect Repository and Test Design–Defect Examples–Developer/Tester Support of Developing a Defect Repository –Defect Prevention strategies.

TESTCASEDESIGN: Test case Design Strategies– Using Black Bod Approach to Test Case Design– Random Testing– Requirements based testing–Boundary Value Analysis–Equivalence Class Partitioning–State- based testing–Cause-effect graphing–Compatibility testing–user documentation testing–domain testing–Using WhiteBoxApproachtoTestdesign– TestAdequacyCriteria–statictestingvs. Structural testing–code functional testing–Coverage and Control Flow Graphs– Covering Code Logic– Paths–code complexity testing–Evaluating Test Adequacy Criteria.

Module-II:

LEVELSOFTESTING: The need for Levers of Testing–Unit Test –Unit Test Planning–Designing the Unit Tests–The Test Harness– Running the Unit tests and Recording results– Integration tests– Designing Integration Tests–Integration Test Planning–Scenario testing–Defect bash elimination

System Testing – Acceptance testing – Performance testing– Regression Testing– Inter nationalization testing– Ad-hoc testing–Alpha, Beta Tests–Testing OO systems–Usability and Accessibility testing–Configuration testing–Compatibility testing–Testing the documentation–Web site testing.

Module-III:

TESTMANAGEMENT: People and organizational issues in testing– Organization structures for testing teams– testing services– Test Planning – Test Plan Components– Test Plan Attachments– Locating Test Items– test management–test process–Reporting Test Results– The role of three groups in Test Planning and Policy Development–Introducing the test specialist–Skills needed by a test specialist–Building a Testing Group.

TEST AUTOMATION: Software test automation – skill needed for automation – scope of automation – design and architecture for automation–requirements for test tool–challenges in automation–Test metrics and measurements –project, progress and productivity metrics.

TEXTBOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles andPractices", PearsonEducation,2006.
2. RonPatton, "Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.
2. Edward Kit," Software Testing in the Real World – Improving the Process", Pearson Education, 1995.
3. Boris Beizer," Software Testing Techniques" – 2 nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur, "Foundations of Software Testing _ Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PE 4	CS7223	Human Computer Interaction	3	0	0	3

Module-I

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Module-II

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW. Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Module-III

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

TEXT BOOKS:

- Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
- Brian Fling, “Mobile Design and Development”, First Edition, O’Reilly Media Inc., 2009
- Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O’Reilly, 2009.

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

PE 4	CS7225	Real Time Systems	3	0	0	3

Prerequisites

Operating Systems, Computer Networks, Database

Course Outcomes

1. Develop real-time algorithm for task scheduling.
2. To understand the working of real-time operating systems and real-time database.
3. To work on design and development of protocols related to real-time communication.

Module-I

Introduction: What is real time, Applications of Real-Time systems, A basic model of Real-time system, Characteristics of Real-time system, Safety and Reliability, Types of Real-time tasks, timing constraints, Modeling timing constraints

Real-Time Task Scheduling: Some important concepts, Types of Real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA). Some issues Associated with RMA. Issues in using RMA practical situations

Module-II

Handling Resource Sharing and dependencies among Real-time Tasks: Resource sharing among real-time tasks, Priority inversion. Priority Inheritance Protocol (PIP), Highest Locker Protocol (HLP). Priority Ceiling Protocol (PCP). Different types of priority inversions under PCP. Important features of PCP, some issues in using a resource sharing protocol. Handling task dependencies

Scheduling Real-time tasks in multiprocessor and distributed systems: Multiprocessor task allocation, Dynamic allocation of tasks. Fault tolerant scheduling of tasks. Clock in distributed Real-time systems, Centralized clock synchronization

Module-III

Commercial Real-time operating systems: Time services, features of a Real-time operating system, Unix as a Real-time operating system, Unix-based Real-time operating systems, Windows as a Real-time operating system, POSIX-RT, A survey of contemporary Real-time operating systems. Benchmarking real-time systems

Real time Communication: Basic concepts, Examples of applications, Real-time communication in a LAN, Bounded Access protocol for LAN: IEEE 802.4, REHER, Real-time communication over packet switched networks, Routing, Resource Reservation

Real-time Databases: Example applications of Real-time databases. Review of basic database concepts, Real-time databases, Characteristics of temporal data. Concurrency control in real-time databases, Commercial real-time databases

Text Book:

1. Real-time Systems Theory and Practice by Rajib Mall, Pearson Publication, 2008.

Reference Book:

1. Real-Time Systems by Jane W. S. Liu, Pearson Education, 2009.
2. Real-Time Systems by C.M. Krishna and K.G. Shin, TMH, 2010.

PR 2	CS7621	Dissertation (Phase-I)	0	0	24	12

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Syllabus (Effective from 2023-24)

School/ Department: School of Computer Sciences
Course: M. Tech. (SSP), Programme: Information Technology (IT),
Duration: 2 years (Four Semesters)

4th Semester

PR 3	CS7622	Dissertation (Phase-II)	0	0	32	16