SCHEME OF TEACHING AND EXAMINATION FOR M.TECH IN COMPUTER SCIENCE & ENGINEERING

AUTONOMOUS SCHEME & SYLLABUS

(2017-2019)

Semester I **Credit 25**

Sl. No.	Code	Subject	Hours	C.I.E	SEE	Credits
			Lect/Tut/Prac/Self Study			
1	17CSE101	Advances in DBMS	4+0+0+S	50	50	5
2	17CSE102	Advanced Algorithms	4+0+2+0	50	50	5
3	17CSE103	Wireless Networks	4+0+2+0	50	50	5
4	17CSE11X	Elective-I	4+0+0+0	50	50	4
5	17CSE12X	Elective-II	4+0+0+0	50	50	4
6	17CSE104	Research Experience through Practice-I	0+0+4+0	100	--	2
	Total			**350**	**250**	**25**

Elective – 1	Elective – II
1. Distributed Systems	1. Information Theory and Coding
2. Analysis of Computer networks	2. Cloud computing architecture and Implementation
3. Graphics, Multimedia and Gaming Techniques	3. Soft computing
4. Business Intelligence	4. VLSI and CAD

NOTE:
At the end of ***Research Experience through Practice-I*:**

- Students should be able to identify a research problem with clear objectives and methodologies backed by extensive literature review.
- Students may be asked to submit a research proposal and a presentation at the end of the first semester.

Semester II **Credit 25**

Sl. No.	Code	Subject	Hours	C.I.E	S.E.E	Credits
			Lect/Tut/Prac/Self Study			
1	17CSE201	Parallel Computing Architecture	4+0+2+0	50	50	5
2	17CSE202	Machine Learning	4+0+2+0	50	50	5
3	17CSE203	Software Engineering Practices	4+0+0+S	50	50	5
4	17CSE21X	Elective-III	4+0+0+0	50	50	4
5	17CSE22X	Elective-IV	4+0+0+0	50	50	4
6	17CSE204	Research Experience through Practice-II	0+0+4+0	100	-	2
	Total			**350**	**250**	**25**

Elective – III	Elective – IV
1. Big Data Analytics	1. Social And Web Analytics
2. Cryptography and Network Security	2. Internet of Things
3. Compiler Optimization & Multi-core Architecture	3. General Purpose Computation on GPU
4. Web Technologies	4. Digital Image Processing

NOTE:
At the end of ***Research Experience through Practice-II*:**

- Students are expected to write a full research paper based on the Mathematical modelling / Design calculations / computer simulations / Preliminary experimentation / testing carried out during second semester.

Semester III **Credit 20**

Sl. No.	Subject Code	Name of the Subject	Duration Practical/ Field work / Assignment	C.I.E	SEE	Credits
1	17CSE301	Industrial Training/ Mini Project/ Certification Exam	Full Time 8 weeks	50(Report) 50(Presentation)	--	8
2	17CSE302	Seminar	--	100	--	2
3	17CSE303	Project Part- I (Problem Statement, Literature Survey, Initial Design)	Remaining weeks of 3rd sem.	100(Report) 100(Presentation)	--	10
			Total	**400**	**-**	**20**

Semester IV **Credit 30**

Sl. No	Subject Code	Name of the Subject	Duration Practical/ Field work /	C.I.E.	SEE	Credits
1	17CSE401	Project Part II (Project Implementation, Testing and Report submission)	Full time	200 [PPE-I – 100 PPE-II – 100]	200	30
	TOTAL			**200**	**200**	**30**
	GRAND TOTAL From 1st to 4th semester : 100 credits					

ADVANCES IN DBMS

Subject Code: 17CSE101 **L-T-P-S: 4+0+0+S**
Teaching Hours: 50 **Credits: 5**

UNIT – I **10 Hrs**

Introduction to database systems: Overview of Database Systems, Terminology: model, schema, instance. Three levels of data abstraction. Entity-Relationship Model (Data Modeling): Entity-Relationship (ER) Model, Entities and Entity types, Relationship and Relationship type, Constraints, Weak Entity Types, ER Diagrams, The Enhanced Entity-Relationship (EER) Model.Database design: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations and Dealing with Constraint Violations; Relational Database Design Using ER- to-Relational Mapping, Theory of Normalization- Normal Forms: First, Second, Third Normal Forms.

UNIT – II **10 Hrs**

Transaction Management and Database Recovery: ACID properties, Concurrent execution of transactions: Lock Based concurrency control, Two phase locking protocol, Database recovery techniques: recovery techniques based on Differed update, Recovery techniques based on immediate update, Shadow paging

Query Optimization: Using Heuristics in Query Optimization, Using selectivity and cost estimates in Query Optimization, Overview of Query optimization in Oracle, Semantic Query Optimization.
Enhanced Data Models for Some Advanced Applications: Active database concepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts.

UNIT – III **10 Hrs**

Object and Object-Relational Databases: Overview of Object-Oriented Concepts – Objects, Encapsulation, Type and class hierarchies, complex objects; Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Conceptual design of Object database.

Distributed Databases: Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS; Distributed catalog management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery.

UNIT – IV **10 Hrs**

Data Warehousing – Introduction: Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses Design Issues, and Guidelines for Data Warehouse Implementation, Data Warehouse Metadata. Online Analytical Processing (OLAP): Introduction, Characteristics of OLAP systems, Multidimensional view and Data cube, Data Cube Implementations, Data Cube operations, Implementation of OLAP and overview on OLAP Softwares.
Data Mining: Introduction, Challenges, Data Mining Tasks, Types of Data, Data Preprocessing, Measures of Similarity and Dissimilarity, Data Mining Applications.

UNIT – V **10 Hrs**

Association Analysis - Basic Concepts and Algorithms: Frequent Itemset Generation, Rule Generation, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP Growth Algorithm, Evaluation of Association Patterns . Classification: Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.

Clustering Techniques: Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007
2. Raghu Ramakrishnan and Johannes Gehrke : Database Management Systems, 3rd Edition, McGraw-Hill, 2003
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson Education, 2007

Reference Books:

1. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI Learning, 2009
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition, McGraw Hill, 2010

ADVANCED ALGORITHMS

Course Code: 17CSE102 **L-T-P-S: 4+0+2+0**

Teaching Hours: 50 **Credits: 5**

UNIT-I **10 Hrs**

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

UNIT-II **10 Hrs**

Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching.

UNIT-III **10 Hrs**

Parallel Algorithms: Parallel Algorithm Models; Performance Metrics for Parallel Systems; Matrix Multiplication; Image dithering; Parallel Merge Sort; Searching a Random Sequence.

UNIT-IV **10 Hrs**

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

UNIT V **10Hrs**

Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

Text Books:

1. T Cormen, C Leiserson and R Rivest, Introduction to Algorithms, 2nd edition, PHI ,2000
2. M.J. Quinn, "Designing Efficient Algorithms for Parallel Computer" by Mc Graw Hill.

Reference Books:

1. Ellis Horowitz, SartajSahini,i, Fundamentals of Computer Algorithms, 2nd edition,Galgotia Publications
2. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.
3. S.G. Akl, "Design and Analysis of Parallel Algorithms", Prentice Hall.

WIRELESS NETWORKS

Subject Code: 17CSE103 **L-T-P-S: 4+0+2+0**

Teaching Hours: 50 **Credits: 5**

UNIT I **10 Hrs**

Applications and Requirements of Wireless Services: Introduction; Types of Services: Broadcast, Paging, Cellular Telephony, Wireless Local Area Networks, Personal Area Networks, Fixed Wireless Access, Ad hoc Networks and Sensor Networks; Requirements for the Services; Technical Challenges of Wireless Communications: Multipath Propagation; Spectrum Limitations; Limited Energy; User Mobility.

Hidden node and exposed node problems. Basics of CSMA/CA, Backoff procedure.

MAC Access Modes and Timing, Contention-Based Access Using the DCF, Fragmentation and Reassembly, Frame Format, Contention-Based Data Service, Frame Processing and Bridging.

UNIT II 10**Hrs**

802.11 Framing: Generic Data Frame. Control Frames: Generic Structure, RTS, CTS, ACK, PS-Poll, Beacon. Management Frames: Generic Structure, Fixed-length components, Information elements: SSID, TIM, ERP, RSN.

Management Operations: Management Architecture, Scanning, Authentication, Association, Power Conservation, Timer Synchronization.

UNIT III **10 Hrs**

Security: Wired Equivalent Privacy: Operations, Problems with WEP. 802.1x: The Extensible Authentication Protocol, EAP Methods, 802.1x Network Port Authentication, 802.1X on Wireless

LANs.802.11i: Robust Security Networks, Temporal Key Integrity Protocol (TKIP), Counter Mode with CBC-MAC (CCMP), Robust Security Network (RSN) Operations.

UNIT IV **10 Hrs**

802.11 Physical Layer: Overview, the Radio Link, RF propagation. Frequency-Hopping (FH) PHY: Frequency-Hopping Transmission, GFSK, PLCP frame format. Direct Sequence PHYs: Direct Sequence Transmission, DPSK, PLCP frame format, Complementary Code Keying, HR/DSSS PLCP framing.

UNIT V **10 Hrs**

Wireless LAN/PAN: HIPERLAN Standard: HIPERLAN/1, HIPERLAN/2. Bluetooth: Transport Protocol Group, Bluetooth Profiles.Wireless WAN/MAN: Cellular Concept: Capacity enhancement, Channel Allocation, Handoffs.Wireless Internet: Mobile IP: Basics, Route Optimization, Variations, handoffs, IPv6 Advancements. TCP in Wireless domain: Traditional TCP, Link layer solutions, Split approach based solutions, end-to-end solutions.Wireless Application Protocol: WAP Model and protocol stack. Optimizing web over wireless.

Text Books:

1. 802.11 Wireless Networks: The definitive guide, 2nd Edition, Matthew Gast, O'Reilly Publisher, 2005. (Chapter 2, 3, 4, 5, 6, 7, 8, 10, 11, 12)
2. Ad Hoc Wireless Networks: Architectures and Protocols, 2nd edition, C. Siva Ram Murthy and B S Manoj, Pearson Education, 2005. (Chapter 2, 3, 4)
3. Wireless Communications, 2nd Edition Andreas F. Molisch, John Wiley & Sons, 2011. (Chapter 2, 3)

DISTRIBUTED SYSTEMS

Subject Code: 17CSE111 **L-T-P-S: 4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT – I **10 Hrs**

Characterization of Distributed Systems: Introduction, Examples of distributed systems, Resource sharing and the Web Challenges.

System Models: Introduction, architectural models, Fundamental models

UNIT – II **10 Hrs**

Internet Communication; Introduction, API for the Internet protocols, External data representation and marshalling, Client-Server communication, Group Communication.

Distributed objects and Remote invocation: Introduction, Communication between distributed objects, Remote procedure call, Events and notifications.

UNIT – III **10 Hrs**

Distributed File Systems: Introduction, File Service architecture, Sun Network File System, Recent advances.

Time and Global States: Introduction, Clocks, events and process states, Synchronizing physical clocks, Logical time and logical clocks, Global states, distributed debugging.

UNIT – IV **10 Hrs**

Transactions and concurrent control: Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Time Stamp ordering

Distributed Transudations: Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks

UNIT-V **10 Hrs**

Distributed shared memory: Introduction, Design and implementation issues, Sequential consistency and Ivy.

Replication: Introduction to replication, System model and group communication, Fault-tolerant services, Highly available services.

Text Books:

1. Distributed Systems Concepts and Design, George Colulouris, Jean Dollimore, Time Kindberg, Pearson Education Asia, Third Edition 2001.
2. Principles of Distributed Database Systems, M Tamer Ozsu, Patrick Valduriez, Second Edition, PHI, 1999.

ANALYSIS OF COMPUTER NETWORKS

Subject Code: 17CSE112 **L-T-P-S: 4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT I **10 Hrs**

Introduction: Two examples of analysis: Efficient transport of packet voice calls, Achievable throughput in an input-queuing packet switch; The importance of quantitative modeling in the Engineering of Telecommunication Networks.

UNIT II **10 Hrs**

Multiplexing: Network performance and source characterization; Stream sessions in a packet network: Delay guarantees; Elastic transfers in a packet network; Packet multiplexing over Wireless networks.

UNIT III **10 Hrs**

Stream Sessions: Deterministic Network Analysis: Events and processes in packet multiplexer models: Universal concepts; Deterministic traffic models and Network Calculus; Scheduling; Application to a packet voice example; Connection setup: The RSVP approach; Scheduling (continued).

UNIT IV **10 Hrs**

Stream Sessions: Stochastic Analysis: Deterministic analysis can yield loose bounds; Stochastic traffic models; Additional notation; Performance measures; Little's theorem, Brumelle's theorem, and applications; Multiplexer analysis with stationary and ergodic traffic; The effective bandwidth approach for admission control; Application to the packet voice example; Stochastic analysis with shaped traffic; Multihop networks; Long-Range-Dependent traffic.

UNIT V **10 Hrs**

Adaptive Bandwidth Sharing for Elastic Traffic: Elastic transfers in a Network; Network parameters and performance objectives; Sharing a single link; Rate-Based Control; Window-Based Control: General Principles; TCP: The Internet's Adaptive Window Protocol; Bandwidth sharing in a Network.

Text Books:

1. Anurag Kumar, D. Manjunath, Joy Kuri: Communication Networking an Analytical Approach, Elsevier, 2004.

Reference Books:

1. M. Schwartz**:** Broadband Integrated Networks, Prentice Hall PTR, 1996.
2. J. Walrand, P. Varaiya: High Performance Communication Networks, 2nd Edition, Morgan Kaufmann, 1999.

GRAPHICS, MULTIMEDIA AND GAMING TECHNIQUES

Subject Code: 17CSE113 **L-T-P-S:4+0+0+0**

Teaching Hours: 50 **Credits: 4**

UNIT – I **10 Hrs**

Introduction, Raster and random scan displays, video controller, Applications of Computer Graphics, Open GL basics

Raster Graphics Algorithms: Scan converting lines, Scan converting circles, Filling rectangles, Filling Polygons, Clipping lines, Clipping polygons, Antialiasing.

Geometrical Transformations: 2D Transformations, Homogeneous coordinates and Matrix representation of 2D Transformations, composition of 2D Transformations.

Case study on OpenGL – Basic primitives

UNIT – II **10 Hrs**

Geometrical Transformations: The window to view port transformation. Matrix representation of 3D Transformations, Transformations as change in coordinate system.

Projections And Viewing In 3d: Projections specifying an arbitrary 3D view, Examples of 3D viewing.

Case study on OpenGL – Transformations & animations projections and viewing through camera

UNIT – III **10 Hrs**

Curves Fractals And Shading: Polygon surfaces, curved lines and surfaces, Quadratic surfaces, Bezier curves & surfaces, Fractal Geometry methods. Illumination models, Shading models for polygons, surface details and shadows.

Case study on OpenGL –fractals and lighting and shading

UNIT-IV **10 Hrs**

Visible Surface Determination: Functions of two variables, Techniques for efficient visible surface Algorithms, Algorithms for visible line determination. The Z-buffer Algorithm, List priority Algorithms, scan-line Algorithms, Area- subdivision Algorithms, Algorithms for curved surfaces, Visible-surfaces Ray tracing. Case study on OpenGL – Texture mapping

UNIT-V **10 Hrs**

Multimedia & Gaming Techniques

Introduction to Multimedia, File formats: TIFF, GIF, AVI, JPEG and MPEG formats, image compression basics, Gaming techniques.

Text Books:

1. "Computer Graphics"Addision-welesly 1997 by - James D. Foley, Andries Van Dam, Steven K feiner, John F. Huges .Clipping polygons, Generating characters, Antialiasing.
2. Computer Graphics by Newmann&Sproull.
3. Computer Graphics – A top down approach with Open GL by Edward Angel, Adison Wesley 2000.
4. Multimedia Fundamentals: Vol 1- Media Coding and Content Processing - Ralf Steinmetz, KlaraNarstedt, 2nd Edition, Pearson Education / PHI, 2003.

BUSINESS INTELLIGENCE

Subject Code: 17CSE112 **L-T-P-S: 4+0+0+0**

Teaching Hours: 50 **Credits: 04**

UNIT-I **10 Hrs**

Introduction to Business Intelligence: Types of digital data; Introduction to OLTP, OLAP and Data Mining; BI Definitions & Concepts; Business Applications of BI; BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities. Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non-Technical Infrastructure Evaluation

UNIT-II **10 Hrs**

Basics of Data Integration (Extraction Transformation Loading); Concepts of data integration; Need and advantages of using data integration; Introduction to common data integration approaches; Introduction to data quality, data profiling concepts and applications, Introduction to SSIS

Architecture, Introduction to ETL using SSIS tool. Data Warehouse and OLAP Technology – Definition.

UNIT-III **10 Hrs**

A Multidimensional Data Model - Concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema; Data Warehouse Architecture. Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multidimensional modeling; Introduction to business metrics and KPIs; Introduction to enterprise reporting; Concepts of dashboards, balanced scorecards; Applications of Data mining and Case studies of BI, Growth Management, Application Release Concept, Post Implementation Reviews, Release Evaluation Activities.

UNIT- IV **10 Hrs**

Data Mining—On What Kind of Data? Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Mining Association rules: Basic concepts, frequent item set mining methods. Definitions of classification, prediction and clustering.

UNIT-V **10 Hrs**

Classification and Prediction - Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Baysian classification, Rule base classification, Support vector machines, Prediction, Cluster Analysis - Types of Data in Cluster Analysis, K-means, hierarchical, density based clustering Methods.

Text Books:

1. R N Prasad and Seema Acharya “Fundamentals of Business Analytics”, Wiley-India, 2011
2. Larissa T Moss and ShakuAtre – Business Intelligence Roadmap: The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003.
3. Jiawei Han and MichelineKamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers, 2000 (ISBN: 1-55860-489-8).

INFORMATION THEORY AND CODING

Subject Code: 17CSE121 **L-T-P-S:4+0+0+0**

Teaching Hours: 50 **Credits: 4**

UNIT - I **10 Hrs**

Information Theory And Channel Capacity : Introduction , Measure of Information, Average Information Content of Symbols in Long Independent Sequences, Average Information Content of

Symbols in Long Dependent Sequences, Mark-off Statistical Model for Information Sources. Entropy and Information Rate of Mark-Off Sources.

UNIT – II **10 Hrs**

Encoding of the Source Output, Shannon's Encoding Algorithm, Communication Channels, discrete Communication Channels, Rate of Information Transmission over a Discrete Channel, Capacity of a Discrete Memory Less Channel, discrete Channels with Memory Continuous Channels, Shannon Hartely Law and its Implications. (Text 1: Chapter 4: Section 4.1)

UNIT – III **10 Hrs**

Fundamental Limits On Performance: Some Properties of Entropy, Extension of a DMS, Prefix Coding, Source Coding Theorem, Huffman Coding, Mutual Information, Properties of Mutual Information, Differential Entropy and Mutual Information for Continuous Ensembles.
(Text 2, Chapter 2: Section 2.1 to 2.9)

UNIT – IV **10 Hrs**

Error Control Coding: Rationale for Coding and Types of Code, Discrete Memory less channels, Examples of Error Control Coding, Methods of Controlling Errors, Types of Errors, Types of Codes , Linear Block Codes, Error Detection and Error Correction Capabilities of Linear block codes. Single Error Correcting Hamming Codes, Lookup Table (or Syndrome) Decoding using Standard Array, Binary Cyclic Codes, Algebraic Structures of Cyclic Codes.

UNIT– V **10 Hrs**

Encoding using an (n-k) Bit Shift Register, Syndrome Calculation, Error Detection and Error Correction, BCH Codes, RS Codes, Golay Codes, Shortened Cyclic Codes, Burst Error Correcting Codes, Shortened Cyclic Codes, Burst Error Correcting Codes. (Text 1, Chapter 9, Section 9.1 to 9.4) Convolution Codes, Time Domain Approach, Transfer Domain Approach , State, Tree and Trellis diagrams, Encoders and Decoders (using Viterbi algorithm only) for (n,k,l) Convolution Codes. (Text 2, Chapter 8: Section 8.5 to 8.6)

Text Books:

1. Digital and Analog Communication Systems – K Sam Shanmugam, John Wiley, 1996.
2. Digital Communication – Simon Haykin, John Wiley, 2003

Reference Books:

1. Digital Communication Fundamental and Applications Bernard Skla, 2e, Pearson Education, 2002.
2. Concepts of Information Theory and Coding – P.S. Sathyanarayana, 2e, Dynaram, 2004.

CLOUD COMPUTING ARCHITECTURE AND IMPLEMENTATION

Subject Code: 17CSE122 **L-T-P-S:4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT I **10 Hrs**

Classic data center and its elements, Challenges and benefits. Virtualization of compute, storage and network. Definition of cloud computing. Steps in transitioning to cloud- consolidation, automation, IT as a service.

Compute – Physical and logical components. Storage –Media and options, RAID and concept of LUN. Network – Physical components and Protocols

Storage networking technologies- DAS, FC SAN, IP SAN, FCoE, NAS, Object based storage. Business continuity – Need, Terminologies, solutions. Backup and Recovery – Overview, methods, components and operation, Data de-duplication. Replication- Overview, consistency, local and remote replication technologies, Data center management

UNIT II **10 Hrs**

Compute Virtualization – Challenges of x86 hardware virtualization, Hypervisor- Type 1 and 2. Full, para and hardware assisted virtualization. Virtual machine, VM disk files BIOS files and swap files, virtual machine hardware- CPU, memory, disk, network interface and other devices. Resource management. VMFS, Physical and virtual machine conversion- benefits, options process

Storage virtualization – LVM, NAS volume management- AVM, storage pool, Block and file level virtualization, Thin provisioning and automated storage tiring

Network virtualization – Networking in VDC, Virtual NIC, Switch, router, VLAN and VSAN technologies, VLASN tagging modes- VST, EST and VGT. Private VLAN, Network traffic management, NIC teaming, Network I/O control, Multipathing.

Application and Desktop virtualization - Application virtualization – different layers, user profile virtualization, application streaming and encapsulation, benefits. Desktop virtualization- methods – client based and compute based.

UNIT III **10 Hrs**

Business continuity in Virtual Data center – Fault tolerance mechanism, clustering, protecting network. Backup in VDC – approaches, array based backup of VM, Image based backup, De-duplication in VDC, Replication and migration, host based and storage array based, VM migration

Drivers for cloud computing, Grid and utility computing, virtualization, SOA. Characteristics of Cloud computing, Cloud service offering examples, economics of cloud computing – co-location, managed service provider and cloud. Cloud deployment models- public, private, hybrid and community cloud. Cloud service models – Saas, Paas and Iaas Examples.

UNIT IV **10 Hrs**

Cloud infrastructure and Management – Cloud infrastructure framework, Cloud OS, cloud services, security infrastructure, Stakeholders for cloud service – service provider, broker and consumer. Monitoring and management –service portfolio management, catalog management asset and configuration management, change management incident and availability management.

Migration to cloud – Migrating the existing applications, Migration considerations- cost saving, interoperability, SLA and transparency, security and compliance

UNIT V **10 Hrs**

Security, Basics, confidentiality, integrating and availability (CIA), Authentication, authorization and auditing (AAA), trusted computing base (TCB), Denial of service and distributed denial of service.

Cloud security concerns, challenges and threats- multi-tenancy, Hyper Jacking, Information assurance, data privacy and ownership, data leakage, cloud security reference model. Cloud infrastructure security – security at host level, application and network level – virtual firewall, DMZ virtualization, Intrusion detection and physical security. Access management- Role based, least privilege access policy and Single-sign-on., identity Management – One time password, multi factor authentication, identity federation, and management. Governance, risk and compliance. Security best practices in cloud- cloud security reference architecture, isolation of VMs, networks information and access, platform hardening, virtual firewall, audit logging

References:

1. Cloud computing – implementation, management and security – John Rittinghouse, CRC press, 1st edition, 2009
2. Cloud computing for dummies –Judith hurwitz
3. Grid Computing - Joshy Joseph, Craig Fellenstein, IBM Press, 2007.
4. Cloud Computing, A Practical Approach , Toby Velte, Anthony Velte, Robert Elsenpeter,PUBLISHER: Tata McGraw-Hill Authors
5. Grid and Cluster Computing - Prabhu, Prentice-Hall of India, 2007.

SOFT COMPUTING

Subject Code: 17CSE123 **L-T-P-S:4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT-I **10 Hrs**

Introduction to Soft Computing: Neural networks, Fuzzy logic, Genetic algorithms, Hybrid systems and its applications. Fundamental concept of ANN, Evolution, basic Model of ANN, Terminologies used in ANN, MP model, Hebb model.

UNIT-II **10 Hrs**

Perceptron Network: Adaptive linear neuron, Multiple adaptive linear neurons, Back propagation Network (Theory, Architecture, Algorithm for training, learning factors, testing and applications of all the above NN models).

UNIT-III **10 Hrs**

Introduction to classical sets and fuzzy sets: Classical relations and fuzzy relations, Membership functions.

UNIT-IV **10 Hrs**

Defuzzification: Fuzzy decision making, and applications**.**

UNIT-V **10 Hrs**

Genetic algorithms: Introduction, Basic operations, Traditional algorithms, Simple GA General genetic algorithms, the schema theorem, Genetic programming, applications.

Text Books:

1. Shivanandam, Deepa S. N., Principles of Soft computing, Wiley India, ISBN 13: 9788126527410, 2011. (Chapters 1, 2, 3(Upto 3.5), 7, 8, 9, 10, 13, 15 (upto 15.6 & 15.9, 15, 10)

Reference Book:

1. J.S.R. Jang, C.T. Sun, E. Mizutani, Neuro-fuzzy and soft computing, EEE edition, 2012.

VLSI & CAD

Subject Code: 17CSE124 **L-T-P-S: 4+0+0+0**

Teaching Hours: 50 **Credits: 4**

UNIT I **10 Hrs**

Overview of VLSI Design:- Overview of VLSI Design: Digital Systems and VLSI: Why Design Integrated Circuits, Integrated Circuit manufacturing, CMOS Technology, Integrated Circuit Design Techniques, Fabrication Process, Transistors, Wires and Vias, Design Rules, Layout Design and Tools, Static Complementary gates, Wires and delay, switch logic, layout design methods, Combinational Logic Testing, Sequential Machines: Introduction, latches and flipflops, FPGAs, PLAs**.**

UNIT II **10 Hrs**

High Level Synthesis: Synthesis, Y-chart Partitioning in High level Synthesis, Introduction, Partitioning, Basic Partitioning Methods: Random Selection,Clustering Growth, Hierarchical Clustering, Simulated Anneling.

The Min-Cut Partitioning , Scheduling in High level Synthesis, Introduction , Basic Scheduling Algorithms, Time-Constrained Scheduling, Integer Linear Programming Method, Force-Directed Heuristic Method, Resource-Constrained Scheduling, Path-Based Scheduling, DFG Restructuring.

Data Path Allocation in High level Synthesis, Introduction, Allocation Tasks, Unit Selection, Functional- Unit Binding, Storage Binding, Interconnection Binding, Interdependence and Ordering, Allocation Methods, Greedy Constructive Approaches, Decomposition Approaches, Clique Partitioning,, Left-Edge Algorithm, Weighted Bipartite-Matching Algorithm.

UNIT III **10 Hrs**

Logic Synthesis: Algebraic and Boolean Division Shannon's expansion theorem, Binary Decision Diagrams (BDD), ROBDD, ITE graphs, Combinational Optimization, PLAs, Two level optimization –PLA Folding, Multilevel logic circuits and Optimization.

UNIT IV **10 Hrs**

Physical Synthesis: Floor Planning Placement, Routing, Compaction Algorithms.

UNIT V **10 Hrs**

VHDL, languageconstructs, entity and architecture, behavioral description, structural description, examples, Testbenches.

Text & Reference Books:

1. VLSI CAD – NiranjanN.Chiplunkar&Manjunath Kothari, PHI Learning, 2011
2. Modern VLSI Design – Wayne Wolf, Prentice Hall , 2nd Edition
3. VHDL Programming: -Douglas Perry, TMH
4. High level synthesis Introduction to chip and system design – Daniel Gajski, Nikhil Dutt, Allen C-HWunand Steve Y-L Lin, Kluwer Academic
5. Logic synthesis and Verification Algorithms – Gary Hatchel and Fabio somenzi, Kluwer Academic
6. Algorithms for VLSI Physical Design Automation- 3rd edition, NaveedSherwani, Springer International.

PARALLEL COMPUTING ARCHITECTURE

Course Code: 17CSE201 **L-T-P-S: 4+0+2+0**

Teaching Hours: 50 **Credits: 5**

UNIT – I **10 Hrs**

Fundamentals of Computer Design: Introduction, Classes of Computers, Measuring, reporting and summarizingperformance, quantitative principles of computer design.

Computer Arithmetic: Introduction, Basic Techniques of Integer Arithmetic, Floating Point: Floating-Point Multiplication, Floating-Point Addition, Division and Remainder.

UNIT – II **10 Hrs**

Instruction Level Parallelism, Its Exploitation and Limits on ILP: Introduction to pipelining, the major hurdle of pipelining- pipeline hazards, How is pipelining implemented.

ILP and its exploitation: Concepts and Challenges, Basic compiler techniques for exposing ILP, Reducing branch cost with prediction, overcoming data hazards with dynamic scheduling, hardware based speculation, exploiting ILP using multiple issues and static scheduling, exploiting ILP using Dynamic scheduling, multiple issue and speculation, advanced techniques for instruction delivery and speculation. Case study of Pentium 4. Introduction to limits on ILP.

UNIT – III **10 Hrs**

Memory Hierarchy Design, Storage Systems: Review of basic concepts; Crosscutting issues in the design of memory hierarchies; Case study of AMD Opteron memory hierarchy**.**

Hardware and Software for VLIW and EPIC: Introduction: Exploiting Instruction-Level Parallelism Statically, Detecting and Enhancing Loop-Level Parallelism, Scheduling and Structuring Code for Parallelism, Hardware Support for Exposing Parallelism: Predicated Instructions, Hardware Support for Compiler Speculation, The Intel IA-64 Architecture and Itanium

Processor.

UNIT – IV **10 Hrs**

Introduction to High Performance Computing: What is high performance computing?
- Motivation, Applications, Challenges.

HPC Computer architecture models: SIMD, MIMD, SPMD;

HPC Communication models: Shared Address Space vs. Message Passing.

Distributed-Memory Parallelism: Parallel Algorithm Design, Parallel Programming with MPI, The Message Passing Programming Model, Blocking vs. Non-blocking communications, MPI program Anatomy & communicators, MPI program to Parallel Matrix Multiplication.

UNIT – V **10 Hrs**

Shared-Memory Parallelism: Basic Patterns in Pthreads, Mutual Exclusion in Pthreads, Basic Patterns in OpenMP, Mutual Exclusion in OpenMP.

Hybrids & Accelerators: Hybrid Architectures, MPI+OpenMP- Use MPI and OpenMP in the same application, Introduction to GPGPU computing with CUDA, Coprocessors- Overview of Intel's Xeon Phi architecture, introduction to programming Intel's Xeon Phi.

Text Books:

1. Computer Architecture, A Quantitative Approach– John L. Hennessey andDavid A. Patterson:, 4th Edition, Elsevier, 2007
2. Parallel Programming in C with MPI and OpenMP by Michael J. Quinn, McGraw-Hill Higher Education 2003
3. CUDA by Example: An Introduction to General-Purpose GPU Programming, Jason Sanders and Edward Kandrot

Reference Books:

1. Introduction to parallel computing, By AnanthGrama, Addison-Wesley 2nd ed. (2003)
2. Introduction to High-Performance Scientific Computing,Victor Eijkhout, 2011
3. **Online resources for MPI, OpenMP, CUDA and Xeon Phi programming**

MACHINE LEARNING

Course Code: 17CSE202 **L-T-P-S: 4+0+2+0**

Teaching Hours: 50 **Credits: 5**

UNIT-I **10Hrs**

Foundations of Machine Learning:

Introduction to Artificial Intelligence, What is machine learning? , Applications of Machine

leanring, Understand Data, Types of machine learning: Supervised, Unsupervised, Reinforcement Learning, Theory of learning: feasibility of learning, error and noise, training versus testing, theory of generalization, bias and variance, learning curve.

UNIT-II **10Hrs**

Supervised Learning-I

Linear Regression: Introduction, univariate linear regression, multivariate linear regression, regularized regression, Logistic regression: classification, Artificial Neural Networks, Support Vector Machines.

UNIT III **10Hrs**

Supervised Learning – II

Classification: Introduction, Decision Trees, Linear Discriminant Analysis, K-nearest neighbor model, Bayesian Learning, Introduction to Hidden Markov Models and deep learning.

UNIT IV **10Hrs**

Unsupervised Learning

Clustering: Introduction, K-means, Hierarchical clustering

Evaluation Measures and Combining Learners

Evaluation Measures: Cross-validation and Re-sampling, Measuring Error, Hypothesis Testing,
Combining Learners: Voting, Bagging, Boosting

UNIT V **10Hrs**

Reinforcement Learning

Introduction, K-armed Bandit, Elements of reinforcement learning, Model Based Learning, Policy Iteration , Temporal Difference Learning, Exploration Strategies.

Text Books:

1. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006
2. EthemAlpaydin, Introduction to Machine Learning, Second Edition, 2004

Reference Books:

1. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
2. R. O. Duda, P. E. Hart and D. G. Stork Pattern Classification, Wiley Publications, 2001
3. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2008.
4. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.
5. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.
7. S. Russel and P. Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition Prentice Hall, 2009.

SOFTWARE ENGINEERING PRACTICES

Course code: 17CSE203 **L-T-P-S**: **4+0+0+S**
Teaching Hours: **50** **Credits: 5**

UNIT I **10 Hrs**

Introduction and Software Process: Professional software development , Software engineering ethics , Case studies , Software processes , Software process models , Process activities , Coping with change , The rational unified process , UML.

UNIT II **10 Hrs**

Product metrics: Software Quality, A framework for product metrics, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance **Quality management:** Quality concepts, software quality assurance, software reviews, formal technical reviews, formal approaches to SQA , statistical SQA, Software reliability, the SQA plan

UNIT III **10 Hrs**

An agile view of process: Agility, agile process, Agile process models, Agile software development:Agile methods, Plan driven and agile development, Extreme programming, Agile project management, Scaling agile methods, **Software Testing**: Development testing, Test-driven development, Release testing, User testing.

UNIT IV **10 Hrs**

Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse.

Component-based software engineering: Components and component models, CBSE processes, Component composition.

Embedded software: Embedded systems design, Architectural patterns, Timing analysis, Real-time operating systems.

UNIT V **10 Hrs**

Project planning: Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques.

Configuration management: Change management, Version management, System building, Release management.

Process improvement: The process improvement process, Process measurement, Process analysis, Process change, the CMMI process improvement framework.

Text Books:

1. Roger S. pressman: Software Engineering – A practitioners approach, 6th edition, McGraw-Hill International Edition, 2005.
2. Ian Sommerville: Software Engineering, 9th edition, Pearson Education Ltd.

Reference Books:

1. Mall R., Fundamentals of Software Engineering, Prentice Hall of India.
2. Behferooz A. & Hudson F.J., Software Engineering Fundamentals, Oxford University Press
3. Jalote P., An Integrated Approach to Software Engineering, Narosa Publications.
4. Pfleeger, Software Engineering, Prentice Hall, 1999.

BIG DATA ANALYTICS

Subject Code: 17CSE211 **L-T-P-S: 4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT – I **10 Hrs**

Introduction to Big Data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, Working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment.

Big Data Analytics: Overview of business intelligence, Data science and Analytics, Meaning and Characteristics of big data analytics, Need of big data analytics, Classification of analytics, Challenges to big data analytics, Importance of big data analytics, Basic terminologies in big data environment.

UNIT – II **10 Hrs**

Big data technologies and Databases: Introduction to NoSQL, Uses, Features and Types, Need, Advantages, Disadvantages and Application of NoSQL, Overview of NewSQL, Comparing SQL, NoSQL and NewSQL.

Introduction to MongoDB: What is MongoDB? Terms used in RDBMS and MongoDB, Data Types in MongoDB, CRUD.

Introduction to Cassandra: Introduction, Features of Cassandra, CQL Data Types, CQLSH, Keyspaces, CRUD, collections, using a counter, Time to Live (TTL), Alter, Import and Export, System Tables.

UNIT – III **10 Hrs**

Jasper Report using Jasper Soft: Introduction to JapserReports, Jaspersoft studio, connecting to MongoDBNoSQL database, connecting to Cassandra NoSQL database.

Hadoop foundation for analytics: History, Needs, Features, Key advantage and Versions of Hadoop, Essential of Hadoop ecosystems, RDBMS versus Hadoop, Key aspects and Components of Hadoop, Hadoop architectures.

UNIT – IV **10 Hrs**

Hadoop MapReduce and YARN framework: Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application, Data serialization and Working with common serialization formats, Big data serialization formats.

UNIT – V **10 Hrs**

Big data with Hive and Pig: Overview of hive and its architecture, Hive data types and File format, Hive query language (HQL), Introduction to Pig, pig latin overview, Data types in Pig and Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval function, Complex data types, UDF, word count example, when to use Pig? When not to use Pig? Hive versus PIG.

Text Books:

1. Seema Acharya, SubhashiniChellappan – "Big Data and Analytics", Wiley.
   Alex Holmes-"Big Data Black Book", Dreamtech.

Reference Books:

1. Minelli, Chambers, Dhiray- "Big Data Big Analytics", Wiley.
2. Bart Baesens – "Analytics in a Big Data World", Wiley.
3. Boris Lublinsky, Kevin T. Smith – "Hadoop Solutions", Wrox.
   Chuck Lam – "Hadoop in Action", Dreamtech.

CRYPTOGRAPHY AND NETWORK SECURITY

Subject Code: 17CSE212 **L-T-P-S: 4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT I **10 Hrs**

Foundations of Cryptography and Security: Ciphers and Secret Messages; Security Attacks and Services. Conventional Symmetric Encryption Algorithms: Theory of Block Cipher Design; Feistel Cipher Network Structures; DES and Triple DES; Modes of Operation (ECB, CBC, OFB, CFB); Strength (or Not) of DES; Rijndael (AES).

UNIT II **10 Hrs**

Modern Symmetric Encryption Algorithms: Blowfish; Key Distribution. Public Key Cryptography: Prime Numbers and Testing for Primality; Factoring Large Numbers; RSA; Diffie-Hellman; Key Exchange Algorithm;

UNIT III **10 Hrs**

Hashes and Message Digests: Message Authentication; MD5; SHA; Digital Signatures: Certificates, User Authentication; Digital Signature Standard (DSS and DSA). Authentication of Systems: Kerberos V4 and V5; X.509 Authentication Service.

UNIT IV **10 Hrs**

Elliptic curve cryptography, Electronic Mail Security: Pretty Good Privacy (PGP); S/MIME. IP and Web Security: IPSec and Virtual Private Networks; Secure Sockets and Transport Layer (SSL and TLS).

UNIT V **10 Hrs**

Electronic Commerce Security: Electronic Payment Systems; Secure Electronic Transaction (SET); CyberCash, iKey Protocols; Digital Watermarking and Steganography, Intrusion detection, Viruses and worms, Firewalls

Text Book:

1. William Stallings, Cryptography and Network Security, Third Edition, Pearson Education, 2003.

Reference:

1. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private communication in a Public World, Second Edition, Pearsdon Education Asia, 2002.

COMPILER OPTIMIZATION AND MULTI-CORE ARCHITECTURES

Subject Code: 17CSE213 **L-T-P-S: 4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT-I **10 Hrs**

Programming principles: Reactive parallel programming. Synchronization strategies, critical regions, atomic updates, races, deadlock avoidance, prevention, livelock, starvation, scheduling fairness, virtualization, speculative parallelization, transactional memories.

UNIT-II **10 Hrs**

Optimizations: Basic compiler optimizations, Control and data flow analysis, Enhancing parallelism, dependence analysis. Tiling for locality and communication, Aggregation for communication, Load balancing strategies, Register Allocation: Coloring, Spilling & IPA, Pointer alias Analysis , Dynamic Code Optimizations and garbage collection, Recent research on Optimization I, Recent Research on Optimization II, Recent Research on optimization III.
Automatic Programming: Program transformation by pattern matching, Partial evaluation, Object-oriented and Aspect-oriented programming, Automatic Parallelization I and II.

UNIT-III **10 Hrs**

Overview of architectures: Architectural characterization of most important parallel systems today. Issues in effective programming of parallel architectures: exploitation of parallelism, locality (cache, registers), load balancing, communication, overhead, consistency, coherency, latency avoidance.

UNIT-IV **10 Hrs**

Programming paradigms: By the data: Partitioned data, global view of data, and no state. By control: Partitioned control, global view of control, functional control. Survey of programming languages/APIs: OpenMP and MPI.

UNIT-V **10 Hrs**

Tools and Models: Performance monitors, Debuggers. Simplified models of the issues mentioned above, Exploitation of parallelism (dependence graphs), communication (latency/ bandwidth), load balancing, (scheduling theory, practical scheduling algorithms), speedup, efficiency, redundancy, iso efficiency.

Text Books:

1. Muchnick, Steven S., Advanced Compiler Design and Implementation. Morgan Kaufmann, 1997

2. Lowry and McCartney, eds., Automating Software Design
3. John L. Hennessy and David A. Patterson, Computer Architecture: A Quantitative Approach

Supplementary Books:

1. Jones, Gomard, and Sestoft, Partial Evaluation and Automatic Program Generation
2. Czarnecki, K. and Eisenecker, U., Generative Programming: Methods, Tools and Applications, Pearson, 2000.
3. Maurice Herlihy and NirShavit, The Art of Multiprocessor Programming, Morgan Kaufmann
4. James Larus and Ravi Rajwar, Transactional Memory, Morgan & Claypool Publishers
5. KunleOlukotun, Lance Hammond and James Laudon, Chip Multiprocessor Architecture: Techniques to Improve Throughput and Latency, Morgan and Claypool Publishers
6. William James Dally and Brian Patrick Towles, Principles and Practices of Interconnection Networks, Morgan Kaufmann
7. SudeepPasricha and NikilDutt, On-Chip Communication Architectures: System on Chip Interconnect Morgan Kaufmann.

WEB TECHNOLOGIES

Subject Code: 17CSE214 **L-T-P-S: 4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT I **10 Hrs**

Web 2.0 and Client Side Technologies

What is Web 2.0? Folksonomies and Web 2.0. Software as a service (SaaS). Data and Web 2.0, Convergence, Iterative development, Rich User experience, Multiple Delivery Channels, Social Networking.

Web browsers and Web server, URL, MIME, HTTP, XHTML and HTML, Introduction to CSS, Levels of Style Sheets, Levels of Style Sheets, Style specification formats.

Overview of Java Script, Simple programs on Java script, JavaScript execution environment, Events and Event handling.

UNIT II **10 Hrs**

Server Side Technology – PHP

Introduction to PHP-Origins and uses of PHP, General Syntactic Characteristics, Output, Control statements, Arrays, Functions, Pattern Matching, Form Handling, Files ,Cookies, Session Tracking. Database Access through the Web-Relational Database, An Introduction to SQL, architecture for database access, The MySQL database system, Database Access with PHP and MySQL.

Servlet- Background, Life Cycle of a Servlet, Using Tomcat for Servlet Development, a Simple Servlet, the Servlet API, TheJavax.Servlet Package, Reading Servlet Parameters, Reading Initialization Parameters, The javax.Servlet.http package, Handling HTTP Requests and Responses, Using Cookies, Session Tracking.

UNIT-III **10 Hrs**

XML and Web Services

XML basics, the syntax of XML, XML document structure, Document type definitions. Working with Namespaces. XML schema, displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors.
SOAP, RPC style SOAP, Document style SOAP, WSDL, REST services, JSON format, What is JSON? Array literals, Object literals, Mixing literals, JSON syntax, JSON Encoding and Decoding. JSON versus XML.

UNIT-IV **10 Hrs**

Building Rich Internet Applications with AJAX

Limitation of Classic Web application model, AJAX principles, Technologies behind AJAX, Examples of usage of AJAX, Dynamic web applications through Hidden frames of both GET and POST methods, IFrames, Asynchronous communication and AJAX application model. XMLHTTP object – properties and methods, handling different browser implementations of XMLHTTP, The same origin policy, Cache control, AJAX patterns, predictive fetch patterns, submission throttling pattern, Periodic refresh, multi stage download, Fall back patterns, Introduction to Flex, Basic concepts of flex programming.

UNIT-V **10 Hrs**

Networking and Java beans

Introduction, Manipulating URLs, Reading a File on a Web Server, Establishing a Simple Server Using Stream Sockets, Establishing a Simple Client Using Stream Sockets, Client/Server Interaction with Stream Socket Connections, Connectionless Client/Server Interaction with Datagrams, Client/Server Tic-Tac-Toe Using a Multithreaded Server, Security and the Network, Case Study: DeitelMessenger Server and Client, Wrap-Up, Summary

What is a Java Bean, Advantages of Java Beans, Introspection, Using Bound and Constrained Properties, Persistence, Customizers, The Java Beans API, A Bean Example

Text books:

1. Harvey M. Deitel and Paul J. Deitel, Internet & World Wide Web How to Program, 4/e
2. Robert Sebesta , "Programming the World Wide Web", Pearson Education, 3rd Edition.
3. Herbert Schildt, The Complete Reference Java, Seventh Edition,2007,McGraw-Hill(Chapter 23,24,28,31)
4. H. M. Deitel and P. J. Deitel, Java How To Program, Sixth Edition,Prentice Hall (Chapter 11, 22, 21.5-21.8, 24)

SOCIAL AND WEB ANALYTICS

Subject Code: 17CSE221 **L-T-P-S**: **4+0+0+0**
Teaching Hours: 50 **Credits: 4**

UNIT I **10 Hrs**

Introduction to Web & Social Analytics

Overview of web & social media (Web sites, web apps, mobile apps and social media), Impact of social media on business, Social media environment, , How to leverage social media for better

services, Usability, user experience, customer experience, customer sentiments, web marketing, conversion rates, ROI, brand reputation, competitive advantages

Need of using analytics, Web analytics technical requirements., current analytics platforms, Open Sources licensed platform, choosing right specifications & optimal solution, Web analytics and a Web analytics 2.0 framework (clickstream, multiple outcomes, Data Mining, Data Mining Techniques- Association, Classification, Clustering.

UNIT II **10 Hrs**

Relevant Data And its Collection using statistical Programming language R.

Data (Structured data, unstructured data, metadata, Big Data and Linked Data), Participating with people centric approach, Data analysis basics (types of data, metrics and data, descriptive statistics, comparing.

Basic overview of R

R-Data Types, R-Decision Making, R-Loops, R-functions, R-Strings, Arrays, R-Lists, R-Data Frame, R-CSV Files, R-Pie Charts, R-Bar charts, R-Barplots. Basic Text Mining in R and Word cloud.

UNIT III **10 Hrs**

KPI/Metrics

Understand the discipline of social analytics, Aligning social objectives with business goals, Identify common social business objectives, developing KPIs; Standard vs Critical metrics. PULSE metrics (Page views, Uptime, Latency, Seven-day active users) on business and technical Issues, HEART metrics (Happiness, Engagement, Adoption, Retention, and Task success) on user behavior issues; Bounce rate, exit rate, conversion rate, engagement, strategically aligned KPIs, Measuring Macro & micro conversions, On-site web analytics, off-site web analytics, the goal-signal-metric process. Case study on Ready-made tools for Web and social media analytics (Key Google Analytics metrics, dashboard, social reports, Tableau Public and KNIME.

UNIT IV **10 Hrs**

Mining Twitter: Exploring Trending Topics, Discovering What People Are Talking About, and More

Why Is Twitter All the Rage?, Exploring Twitter's API, Fundamental Twitter Terminology, Creating a Twitter API Connection, Exploring Trending Topics, Searching for Tweets, Analysing the 140 Character, Extracting Tweet Entities, Analysing Tweets and Tweet Entities with Frequency Analysis, Computing the Lexical Diversity of Tweets, Examining Patterns in Retweets, Visualizing Frequency Data with Histograms.

Mining Facebook: Analysing Fan Pages, Examining Friendships, and More

Overview, Exploring Facebook's Social Graph API, Understanding the Social Graph API, Understanding the Open Graph Protocol, Analysing Social Graph Connections, Analysing Facebook Pages, Examining Friendships.

Mining LinkedIn: Faceting Job Titles, Clustering Colleagues, and More

Overview, Exploring the LinkedIn API, Making LinkedIn API Requests, Downloading LinkedIn Connections as a CSV File, Clustering Data, Clustering Enhances User Experiences, Normalizing Data to Enable Analysis, Measuring Similarity, Clustering Algorithms.

UNIT V **10 Hrs**

Data Mining in Social Media

Introduction, Data Mining in a Nutshell, Social Media, Motivations for Data Mining in Social Media, Data Mining Methods for Social Media, Data Representation, Data Mining - A Process, Social Networking Sites: Illustrative Examples, The Blogosphere: Illustrative Examples, Related Efforts, Ethnography and Netnography, Event Maps.

Text Mining in Social Networks

Introduction, Keyword Search, Query Semantics and Answer Ranking, Keyword search over XML and relational data, Keyword search over graph data, Classification Algorithms, Clustering Algorithms, and Transfer Learning in Heterogeneous Networks.

Text Books:

1. Matthew A. Russell, Mining of Social web, O′Reilly; 2 edition (8 October 2013), ISBN-13: 978-1449367619.
2. Charu C Agarwal, Social Network Data Analytics, Springer; 2011 edition (1 October 2014), 978-1489988935

Reference Books:

1. Hand, Mannila, and Smyth. *Principles of Data Mining*. Cambridge, MA: MIT Press, 2001. ISBN: 026208290X.
2. AvinashKaushik, Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity, John Wiley & Sons; Pap/Cdr edition (27 Oct 2009)
3. Tom Tullis, Bill Albert, Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics, Morgan Kaufmann; 1 edition (28 April 2008).
4. Jim Sterne, Social Media Metrics: How to Measure and Optimize Your Marketing Investment, John Wiley & Sons (16 April 2010)
   Brian Clifton, Advanced Web Metrics with Google Analytics, John Wiley & Sons; 3rd Edition edition (30 Mar 2012.

INTERNET OF THINGS

Subject Code: 17CSE222 **L-T-P-S: 4+0+0+0**
Teaching Hours: 50 **Credits: 4**

Course Objectives:

This course will enable students to:

1. Explore the IoT concept and Applications
2. Describe Security and Privacy Framework issues in IoT
3. Explain the IoT Architectures and requirements, smart office use case
4. Discuss the market aspects of IOT
5. Explain the cloud services to IOT

UNIT-I

Introduction, **Putting the Internet of Things Forward to the Next Level**

The Internet of Things Today, The Internet of Things Tomorrow, Potential Success Factors

Internet of Things Strategic Research and Innovation
Agenda - Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Smart-X Applications, Internet of Things and Related Future Internet Technologies, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Protocols Convergence.

10 Hours

UNIT-II

Internet of Things Global Standardization - State of Play – Introduction, IoT Vision, IoT Standardization Landscape, **Dynamic Context-Aware Scalable and Trust-based IoT Security, Privacy Framework –** Introduction, Main Concepts and Motivation of the Framework, A Policy-based Framework for Security and Privacy in Internet of Things.

10 Hours

UNIT-III

Scalable Integration Framework for Heterogeneous Smart Objects, Applications and Services – Introduction, IPv6 Potential, IoT6, IPv6 for IoT, Adapting IPv6 to IoT Requirements, IoT6 Architecture, DigCo Integration with the Cloud and EPICS, Enabling Heterogeneous Integration, IoT6 Smart Office Use-case, Scalability Perspective, Conclusions.

10 Hours

UNIT-IV

Internet of Things Applications - From Research and Innovation to Market Deployment – Introduction, OpenIoT, Icore, Compose, SmartSantander, Fitman, OSMOSE.

10Hours

UNIT-V

Insights on Federated Cloud Service Management and the Internet of Things, Introduction, Federated Cloud Services Management , Federated Management Service Life Cycle, Self-management Lifecycle.

10 Hours

Text Books:

1. Dr, OvidiuVermesan and Dr. Peter Friess, Internet of Things From Research Innovation to Market Development, SINTEF Norway, EU Belgium, River Publishers, Aalborg.

Reference Books:

1. Syed ZaeemHosain, the Definitive Guide to the Internet of Things for Business, 2nd Edition, CTO, Aeris.

GENERAL PURPOSE COMPUTATION ON GPU

Subject Code: 17CSE223 **L-T-P-S: 4+0+0+0**

Teaching Hours: 50 **Credits: 4**

UNIT I **10 Hrs**

Heterogeneous Architecture and Parallel Computing: Introduction to parallel programming, Introduction to heterogeneous architecture- GPU in particular. Introduction to GPU computing, Why GPU, evolution of GPU pipeline and general purpose computation on GPU, GPU architecture case studies: NVIDIA G80, GT200, Fermi, AMD Radeon, AMD Fusion APU etc.

UNIT II **10 Hrs**

Execution Model: Features of CUDA and OpenCL, Comparision of CUDA and OpenCL, Thread organization, Kernel, error handling, and execution in CUDA and OpenCL.

UNIT III **10 Hrs**

Programming Model: CUDA Introduction, basics of CUDA C, Complete CUDA structure, basic details of API and libraries, OpenCL overview, OpenCL basic specification, OpenCL C language, Vectorization.

UNIT IV **10 Hrs**

Memory Model: Introduction to memory model and GPU interaction with CPU, Memory model of CUDA and OpenCL, Memory hierarchy (local/register, shared and global) and optimizations, memory optimized programming, coding tips.

UNIT V **10 Hrs**

Tools and programming: Introduction to installation and compilation process, usage of tools, profilers and debuggers. CUDA by Examples and OpenCL by Examples, Future Directions.

Text Books:

1. Programming Masiively Parallel Processors: A Hands-on Approach by David B Kirk and Wen-Mei W. Hwu

2. CUDA by Example: An Introduction to General Purpose GPU Programming by Jason Sanders and Edward Kandrot
3. http://developer.amd.com/zones/OpenCLZone/courses/pages/Introduction-OpenCL-Programming-May2010
4. http://developer.amd.com/gpu/amdappsdk/documentation/pages/TutorialOpenCL.aspx

Reference Books:

1. T. Mattson, et al. Patterns of Parallel Programming, Addison Wesley, 2005
2. NVIDIA CUDA Programming Guide V3.0, NVIDIA
3. OpenCL Programming Guideby AaftabMunshi, Benedict R. Gaster, Timothy G. Mattson and James Fung(Jul 25, 2011)
4. Heterogeneous Computing with OpenCLby Benedict Gaster, David R. Kaeli, Lee Howes and Perhaad Mistry(Aug 26, 2011)
5. GPU Gems 3, H. Nguyen (ed.), Addison Wesley, 2007
6. GPU Gems 2, M. Pharr (ed.), Addison Wesley, 2005
7. NVIDIA and OpenCL: http://www.nvidia.com/content/cudazone/download/OpenCL/NVIDIA_OpenCL_ProgrammingGuide.pdf
8. http://www.nvidia.com/content/cudazone/CUDABrowser/do
9. Open CL at Khronos: http://www.khronos.org/developers/library/overview/opencl_overview.pdf
   http://www.khronos.org/registry/cl/specs/opencl-1.0.48.pdf

DIGITAL IMAGE PROCESSING

Subject Code: 17CSE224 **L-T-P-S: 4+0+0+0**

Teaching Hours: 50 **Credits: 4**

UNIT- I **10 Hrs**

Introduction - What Is Digital Image Processing? Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing , Components of an Image Processing System Digital Image Fundamentals - Elements of Visual Perception, Brightness Adaptation and Discrimination, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels Image Enhancement in the Spatial Domain - Background, Some Basic Gray Level Transformations, Histogram Processing.

UNIT- II **10 Hrs**

Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Image Enhancement in the Frequency Domain- Background, Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters,

UNIT- III **10 Hrs**

Sharpening Frequency Domain Filters, Homomorphic Filtering. Image Segmentation- Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds, the Use of Motion in Segmentation

UNIT- IV **10 Hrs**

Image Compression - Fundamentals Image Compression, Models Elements of Information, Theory Error-Free Compression, Lossy Compression, Image Compression Standards Morphological Image Processing - Preliminaries, Dilation and Erosion, Opening and Closing, the Hit-or-Miss Transformation Some Basic, Morphological Algorithms

UNIT- V **10 Hrs**

Color Image Processing - Color Fundamentals, Color Models, Pseudo color Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression. Introduction to wavelet based processing.

Text Books:

1. Rafel C Gonzalez and Richard E Woods, "Digital Image Processing", Pearson Education, 2nd Edition, 2003.

Reference Books:

1. Anil K Jain, "Fundamentals of Digital Image Processing", Prentice-Hall of India Pvt. Ltd., 1997.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Thomoson Learning, Brooks/Cole, 2nd Ed. 2001.
3. B.Chanda, D Dutta Majumder, "Digital Image Processing and Analysis", Prentice- Hall, India, 2002.
4. The Scientist and Engineers Guide to Digital Signal Processing – by Steven W. Smith 2nd Edition, 1999, California Technical Publishing