Dr.A.P.J.Abdulkalam Technical University, UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

(Effective from the session: 2016-17)

S.No.	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective I**	2-0-0	15	10	25	50	75	2
2		**Open Elective II**	3-1-0	30	20	50	100	150	4
3	NECS-701	Distributed System	3-1-0	30	20	50	100	150	4
4	NECS-702	Artificial Intelligence	3-1-0	30	20	50	100	150	4
5		**Departmental Elective III**	3-1-0	30	20	50	100	150	4
Practical / Training /Projects									
6	NECS-751	Distributed System *	0-0-2	-	25	25	25	50	1
8	NECS-752	Project	0-0-8	-	50	50	100	150	4
9	NECS-753	Industrial Training	0-0-3	-	75	75	-	75	2
10	GP-701	General Proficiency	-	-	-	-	-	50	

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** *At least 10 problems are to be considered based on corresponding theory course.*

Dr.A.P.J.Abdulkalam Technical University,UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
YEAR forth, SEMESTER –VIII
(Effective from the session: 2016-17)

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective III**	3-1-0	30	20	50	100	150	**4**
2	NECS-801	Digital Image Processing	3-1-0	30	20	50	100	150	**4**
3		**Departmental Elective IV**	3-1-0	30	20	50	100	150	**4**
4		**Departmental Elective V**	3-1-0	30	20	50	100	150	**4**
Practical's / Training /Projects									
5	NECS-851	Digital Image Processing *	0-0-2	-	25	25	25	50	**1**
6	NECS-852	Project	0-0-12	-	100	100	200	300	**6**
7	GP-801	General Proficiency	-	-	-	-	-	50	

***** *At least 10 problems are to be considered based on corresponding theory course.*

Open Elective I

1. NEOE-070 Mobile Application Development
2. NEOE-071 Ethical Hacking and Prevention
3. NEOE-072Software Project Management

Open Elective II

1. NEOE-073Software Testing and Audit
2. NEOE-074 Neural Network
3. NEOE-075 Computer Vision

Open Elective III

1. NEOE-080 Internet of Things
2. NEOE-081 Cloud Computing
3. NEOE-082 Virtual Reality

Departmental Elective III

1. NECS-071High Speed Network
2. NECS-072 Android Operating System
3. NECS-073 Service Oriented Architecture
4. NEIT-701Cryptographic & Network Security

Departmental Elective IV

1. NECS-080 Pattern Recognition
2. NECS-081 High Performance Computing
3. NECS-082 Real Time System
4. NECS-083 Cluster Computing
5. NECS-084 Grid Computing

Departmental Elective V

1. NECS-085 Data Compression
2. NECS-086 Quantum Computing
3. NECS-087 Embedded Systems
4. NECS-088 Semantic Web and Web Services

MOBILE APPLICATION DEVELOPMENT

NEOE-070 **L T P**
2 0 0

UNIT I **5**

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II **10**

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III **10**

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV **10**

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V **10**

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

TOTAL LECTURE: 45

REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

ETHICAL HACKING AND PREVENTION

NEOE-071 **L T P**
2 0 0

Unit-I10

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms,

Unit-II10
Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering,System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

Unit-III 10
Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability,Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

Unit-IV15
Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking,MobilePhoneHackingBasic ethical hacking tools and usage of these tools in a professional environment.Legal, professional and ethical issues likely to face the domain of ethical hacking.ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

TOTAL LECTURE: 45

REFERENCES:

1. Dominic Chell , Tyrone Erasmus,ShaunColley,Oflie Whitehouse, The Mobile Application Hacker's Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. RafayBaloch, "Ethical Hacking and Penetration Testing Guide" CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams "Gray Hat Hacking The Ethical Hakers Handbook." TMH
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier
6. Jon Erickson "HACKING, The art of Exploitation", William Pollock.

SOFTWARE PROJECT MANAGEMENT

NEOE-072 **L T P**
2 0 0

UNIT-I:
Introduction and Software Project Planning5

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II:
Project Organization and Scheduling 10
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III:
Project Monitoring and Control10
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV:
Software Quality Assurance and Testing10

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V:
Project Management and Project Management Tools10
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

TOTAL LECTURE: 45

REFERENCES:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment “A Systems Approach to Planning, Scheduling, and Controlling” Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

SOFTWARE TESTING AND AUDIT

NEOE-073 **L T P**
3 1 0

Unit-I

Review of Software Engineering: **10**
Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths.
Verification:
Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

Unit –II
Functional Testing: **10**
Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.
Structural Testing:
Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, CyclomaticComplexity, Data Flow Testing, Mutation Testing.

Unit-III
Regression Testing:: **10**
What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique.
Reducing the number of test cases:
Prioritization guidelines, Priority category, Scheme, Risk Analysis.

Unit-IV: **10**
Software Testing Activities: Levels of Testing, Debugging, Testing techniques and theirApplicability, Exploratory Testing
Automated Test Data Generation:
Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

Unit-V: **5**
Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing.
Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. **(8 hrs)**

TOTAL LECTURE: 45

REFERENCES:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012
2. K..K. Aggarwal&Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi,2001.
4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, “Software System Testing and Quality Assurance”, Van NostrandReinhold, New York, 1984.

NEURAL NETWORKS

NECS-074 **L T P**
3 1 0

Unit-I:
Neuro Computing and Neuroscience **10**
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing **10**
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit-III **10**
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

Unit-IV **10**
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit-V **5**
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

TOTAL LECTURE: 45

REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD,Cengage Learning

COMPUTER VISION

NEOE-075 **L T P**
3 1 0

UNIT 1
IMAGE FORMATION MODEL **10**
Monocular Imaging System, Orthographic & Perspective Projection, Camera model and Camera calibration , Binocular imaging systems

UNIT 2
IMAGE PROCESSING AND FEATURE EXTRACTION **10**
Image representations (continuous and discrete), Edge detection

UNIT3
MOTION ESTIMATION **5**
Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

UNIT 4
SHAPE REPRESENTATION AND SEGMENTATION **10**
Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,Multiresolution analysis

UNIT 5
OBJECT RECOGNITION **10**
Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Principal component analysis , Shape priors for recognition

TOTAL LECTURE: 45

REFERENCES:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010,Springer
2. Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011 Springer
3. Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998 Prentice Hall
4. David A. Forsyth, "Computer Vision: : A Modern Approach", 2nd Edn, Pearson India 2015

DISTRIBUTED SYSTEMS

NECS-701 **L T P**
3 1 0

Unit–I **10**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.
Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks ,Lamport's& vectors logical clocks.
Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II **10**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III **10**

Agreement Protocols: Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.
Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit–IV **10**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recoveryin Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.
Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamicvotingprotocols.

Unit –V5

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols,Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.
Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

TOTAL LECTURE: 45

REFERENCES:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Compuitng , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI
6. Gerald Tel, "Distributed Algorithms", Cambridge University Press

ARTIFICIAL INTELLIGENCE

NECS-702 **L T P**

3 1 0

Unit-I **10**

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II **10**

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III **10**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV **10**

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V **5**

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

TOTAL LECTURE: 45

REFERENCES:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

HIGH SPEED NETWORKS

NECS-071 **L T P**
3 1 0

UNIT I 8
Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High SpeedLAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFiandWiMax Networks applications, requirements – Architecture of 802.11.

UNIT II 8
Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III12
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance ofTCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR ratecontrol, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT IV8
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline– FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT V 8
RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP– Protocol Architecture – Data Transfer Protocol– RTCP.

TOTAL: 44 PERIODS
.

REFERENCES:

1. William Stallings, "High speed networks and internet", Second Edition, PearsonEducation, 2002
2. Warland, PravinVaraiya, "High performance communication networks", SecondEdition , Jean Harcourt Asia Pvt. Ltd., , 2001
3. IrvanPepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", CiscoPress, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band TelecommunicationNetworks", CRC Press, New York, 2004

ANDROID OPERATING SYSTEM

NECS-072	**L**	**T**	**P**
	3	**1**	**0**

UNIT I **8**

Android OS

Android Software Stack, Activities and Applications, Activity Life Cycles, Activity Stacks, Activity States, Resources, Android OS vs. IOS

UNIT II **12**

User Interfaces

Views, Layouts, Android Widgets, UI XML Specifications, Explicit Intents, Implicit Intents, Event Broadcasting with Intents, Event Reception with Broadcast Receivers, Adapters and Data Binding.

UNIT III 8

Multimedia

Audio, Video, Camera, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

UNIT IV 8

Networking

Internet Access, HTML and XML Parsing, Wi-Fi

UNIT V8

Touchscreen

Capturing Touch Events, Touchscreen Gesture Recognition

TOTAL: 44 PERIODS

REFERENCES:

1. Rito Meier. "Professional Android 2 Application Development." Wiley Publishing, Inc.
2. SayedHashimi, SatyaKomatineni, Dave MacLean. "Pro Android 2." APRESS.
3. Mark Murphy. "Beginning Android 2." APRESS.
4. Carmen Delessio,LaurenDarcey ”Android Application Development” Pearson
5. J.F.DiMarzio “Android a programming guide” TMH

SERVICE ORIENTED ARCHITECTURE

NECS-073 **L T P**
3 1 0

UNIT I **10**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation

UNIT II **10**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration
Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III **10**

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Taskcentric business service design

UNIT IV **10**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

UNIT V **5**

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WSSecurity

TOTAL: 45 PERIODS

REFERENCES:

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, andDesign”,Pearson Education, 2005.
2. Newcomer, Lomow“ Understanding SOA with Web Services”, Pearson Education, 2005.
3. SandeepChatterjee, James Webber, “Developing Enterprise Web Services, AnArchitect’s Guide”, Pearson Education, 2005.
4. Dan Woods and Thomas Mattern,“ Enterprise SOA Designing IT for BusinessInnovation” O’REILLY, First Edition, 2006
5. Kambhampaty Service Oriented Architecture for Enterprise and cloud applications , Wiley

CRYPTOGRAPHY & NETWORK SECURITY

NEIT-701 **L T P**
3 1 0

Unit-I **10**

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.
Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II **10**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,
Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III **10**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)
Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV **10**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.
Authentication Applications:
Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V **10**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.
Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

TOTAL: 45 PERIODS

REFERENCES:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

DISTRIBUTED SYSTEM LAB

NECS-751	**L**	**T**	**P**
	2	**0**	**0**

The following programs may be developed preferably on 'UNIX' platform:-A part from the above other problems may be given as per Course Instructor.

1. Simulate the functioning of Lamport's Logical Clock in 'C'.
2. Simulate the Distributed Mutual Exclusion in 'C'.
3. Implement a Distributed Chat Server using TCP Sockets in 'C'.
4. Implement RPC mechanism for a file transfer across a network in 'C'
5. Implement 'Java RMI' mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in 'C'.
7. Implement CORBA mechanism by using 'C++' program at one end and 'Java program on the other.

INTERNET OF THINGS

NEOE-080	L	T	P
	2	0	0

Unit-I

IoT Web Technology **8**

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internetof Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications,Future Internet Technologies, Infrastructure, Networks and Communication, Processes,Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT RelatedStandardization, Recommendations on Research Topics.

Unit-II

IoT Applications for Value Creation **8**

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT,Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, ValueCreation from Big Data and Serialization, IoT for Retailing Industry, IoT for Oil and Gas Industry, Opinions on IoTApplication and Value for Industry, Home Management,eHealth.

Unit-III

Internet of Things Privacy, Security and Governance **8**

Introduction, Overview of Governance, Privacy and Security Issues, Contributionfrom FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for SmartCities, First Steps Towards a Secure Platform, Smarty Approach. DataAggregation for the IoT in Smart Cities, Security

Unit-IV

Architectural Approach for IoT Empowerment **12**

Introduction, Defining a Common Architectural Ground, IoT Standardization,M2M Service Layer Standardization, OGC Sensor Web for IoT, IEEE, IETF and ITU-TStandardization activities, Interoperability Challenges, Physical vs Virtual, Solve theBasic First, Data Interoperability, Semantic Interoperability, OrganizationalInteroperability, Eternal Interoperability, Importance of Standardization, Plan forValidation and testing, Important Economic Dimension, Research Roadmap for IoTTesting Methodologies. Semantic as an Interoperability Enabler and related work.

Unit-V

Identity Management Models in IoT 8

Introduction, Vulnerabilities of IoT, Security requirements, Challenges for a secureInternet of Things, identity management, Identity portrayal, Different identityManagement model: Local identity, Network identity, Federated identity, Global webidentity, Identity management in Internet of Things, User-centric identity management,Device-centric identity management, Hybrid identity management.

TOTAL: 44 PERIODS

REFERENCES:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi"The Internet of Things key applications and protocols", Wiley
2. Michael Miller "The Internet of Things" Pearson
3. Adrian McEwen,HakinCassimally"Designing the Internet of Things" Wiley India

CLOUD COMPUTING

NEOE-081	L	T	P
	2	0	0

Unit-I

Introduction to Cloud Computing 12

Cloud computing, Properties & Characteristics, Service models, Deployment models, Virtualization concepts

Unit-II

Cloud as IaaS(Infrastructure as a Service)8

Introduction to IaaS,Private Cloud Environment,Public Cloud Environment, Managing Hybrid Cloud environment

Unit-III

Platform as a Service (PaaS)8

Introduction to PaaS, Cloud platform & Management, Computation,Storage,Case studies

Unit-IV

Software as a Service (SaaS)8

Introduction to SaaS, Web services ,Web 2.0, Web OS, Case studies

Unit-V

Cloud issues and challenges8

Cloud provider Lock-in, Security and Privacy issues in the Cloud, VM-Ware ESX Memory Management Capacity Planning and Disaster Recovery in Cloud Computing

TOTAL: 44 PERIODS

REFERENCES:

1. KailashJayaswal,JagannathKallakurchi,Donald J. Houde, Dr. DevenShahCloud Computing Black Book Kogent Learning
2. Dr. Kumar Saurabh , Cloud Computing , Wiley
3. Cloud Computing, Das Gupta, et al., PHI Learning
4. Cloud Computing: Concepts, Technology & Architecture (The Prentice Hall Service Technology Series from Thomas Erl)Kindle Edition
5. Cloud Computing Explained: Implementation Handbook for Enterprises2nd ed. Edition by John Rhoton

VIRTUAL REALITY

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UNIT I

INTRODUCTION: 8

History of VRtechnology, commercial VR technology and the five classic componentsof a VR system.

UNIT II

INPUT DEVICES: 12

Trackers: Three-Dimensional Position Trackers, Navigation and Manipulation Interfaces: Tracker-Based Navigation Manipulation Interfaces, Trackballs, Three-Dimensional Probes, Gesture Interfaces: The Pinch Glove, The 5DT Data,TheDidjiglove.

UNIT III

OUTPUT DEVICES: 8

Graphics Displays: The Human Visual System, Personal Graphics Displays, Large-Volume Displays, Sound Displays: The Human Auditory System, the Convolvotron, Speaker-Based Three-Dimensional Sound, Haptic Displays: The Human Haptic System, Tactile Feedback Interfaces.

UNIT IV8

Modeling and Programming: Geometric modeling, kinematics modeling, physical modeling, behaviour modeling, model management, Introduction to JAVA 3D.

UNIT V 8

Human Factors in VR and applications of VR: Human Factors in VR : Methodology and Terminology, , User Performance Studies, VR Health and Safety Issues, VR and Society, Applications of VR: Medical Applications, Military, Manufacturing, Robotics, Information Visualization.

TOTAL: 44 PERIODS

REFERENCES:

1. Gregory C. Burdea& Philippe Coiffet, Virtual Reality Technology, Second Edition John Wiley & Sons, Inc
2. Steven M. LaValle, Virtual Reality, University of Illinois
3. Philippe Fuchs, Guillaume Moreau, Pascal Guitton, Virtual Reality: Concepts and Technologies, CRC Press, 2011
4. Tony Parisi, Learning Virtual Reality, O'Reilly Media

Digital Image Processing

NECS-801 **L T P**
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UNIT-I
Introduction and Fundamentals **10**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II **10**
Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration **10**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **10**
Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration **5**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

TOTAL: 45 PERIODS

REFERENCES:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.

3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4. Sonka, Digital Image Processing and Computer Vision, Cengage Learning
5. Gonzalez and Woods, Digital Image Processing, Addison Wesley.

PATTERN RECOGNITION

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Unit-I

Introduction: **8**

Basics of pattern recognition, Design principles of pattern recognition system,Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: **8**

Bayesian Decision Theory, Classifiers, Normal density anddiscriminant functions,

Unit – III

Parameter estimation methods: **12**

Maximum-Likelihood estimation, Bayesian Parameterestimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: **8**

Density Estimation, Parzen Windows, K-Nearest NeighborEstimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: **8**

Criterion functions for clustering, Clustering Techniques:Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

TOTAL: 44 PERIODS

REFERENCES:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.

HIGH PERFORMANCE COMPUTING

NECS-081

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UNIT I **10**

Overview of Grid Computing Technology, History of Grid Computing, High Performance Computing, Cluster Computing. Peer-to-Peer Computing, Internet Computing, Grid Computing Model and Protocols, Types of Grids: Desktop Grids, Cluster Grids, Data Grids, High- Performance Grids, Applications and Architectures of High Performance Grids, High Performance Application Development Environment.

UNIT II **10**

Open Grid Services Architecture, Introduction, Requirements, Capabilities, Security Considerations, GLOBUS Toolkit.

UNIT III **10**

Overview of Cluster Computing, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware and SSI, Resource Management and Scheduling, Programming, Environments and Tools, Cluster Applications, Cluster Systems,

UNIT IV **10**

Beowulf Cluster: The Beowulf Model, Application Domains, Beowulf System Architecture, Software Practices, Parallel Programming with MPL, Parallel Virtual Machine (PVM).

UNIT V5

Overview of Cloud Computing, Types of Cloud, Cyber infrastructure, Service Oriented Architecture Cloud Computing Components: Infrastructure, Storage, Platform, Application, Services, Clients, Cloud Computing Architecture.

TOTAL: 45 PERIODS

REFERENCES:

1. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley
2. Ahmar Abbas, “Grid Computing: Practical Guide to Technology & Applications”, Firewall Media, 2004.
3. Joshy Joseph and Craig Fellenstein , “Grid Computing” Pearson Education, 2004.
4. lan Foster, et al.,“The Open Grid Services Architecture”, Version 1.5 (GFD.80). Open Grid Forum, 2006.
5. Ian Foster. Globus Tool kit Version 4: Software for Service-Oriented Systems. IFIP International Conference on Network and Parallel Computing, Springer- Verlag LNCS 3779, pp 2-13,2006
6. RajkumarBuyya. High Performance Cluster Computing: Architectures and Systems. Prentice-Hall India, 1999.

REAL TIME SYSTEM

NECS-082 **L T P**
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UNIT-I:
Introduction **5**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II:
Real Time Scheduling **10**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:
Resources Sharing **10**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV:
Real Time Communication **10**
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V:
Real Time Operating Systems and Databases **10**
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

TOTAL: 45 PERIODS

REFERENCES:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

CLUSTER COMPUTING

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UNIT I:

Basic concepts in Distributed Systems

Notion of time Distributed Mutual exclusion, Consensus, Failure models Paradigms for process interaction in distributed programs, Programming Paradigms, Shared memory, Message passing, Workflows

UNIT II:

Introduction to Cluster Computing, Cluster Middleware: An Introduction, Early Cluster Architecture and High Throughput Computing Clusters, Networking, Protocols and I/O for Clusters, Setting Up and Administering a Cluster

UNIT III:

Cluster Technology for High Availability, Performance Models and Simulation, Process Scheduling, Load Sharing and Load Balancing, Distributed Shared Memory,

UNIT IV:

Introduction to Grid Architecture, Characterization of Grid, and Grid related standard bodies, Grid types, Topologies, Components and Layers, Comparison with other approaches.

UNIT V:

System Infrastructure, Traditional paradigms for distributed computing, Web Services, Grid standards: OGSA and WSRF, Case Studies of Cluster Systems: Beowulf, COMPaS, NanOS and PARAM

TOTAL: 45 PERIODS

REFERENCES:

1. Grid and Cluster Computing, Prabhu C.S.R, PHI Learning Private Limited
2. A networking Approach To Grid Computing by Daniel Minoli (Chapter 1) (John Wiley and Sons, INC Publication)
3. Distributed and Cloud Computing, First Edition, Geoffrey C. Fox, KaiHwang, Jack J. Dongarra, Elsevier India Pvt. Ltd.-New Delhi
4. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality
5. High Performance Cluster Computing: Architectures and Systems, Vol. 1, Prentice Hall
6. In search of clusters (2nd ed.), Gregory F. Pfister, IBM, Austin, TX, Prentice-Hall

GRID COMPUTING

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UNIT I

CONCEPTS AND ARCHITECTURE 10

Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

UNIT II

GRID MONITORING 10

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

UNIT III

GRID SECURITY AND RESOURCE MANAGEMENT 10

Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT IV

DATA MANAGEMENT AND GRID PORTALS 10

Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective, Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

UNIT V

GRID MIDDLEWARE 5

List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features

TOTAL: 45 PERIODS

REFERENCES:

1. JoshyJoseph, CraigFellenstein—Grid Computing, Pearson Education, 2004.
2. Vladimir Silva—Grid Computing for Developers,DreamtechPress, 2006.
3. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality, Wiley
4. AhmarAbbas--Grid Computing —A Practical Guide to Technology and Applications, Firewall Media, 2006.

DATA COMPRESSION

NECS-085

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Unit - I: **10**

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models,
Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II: **10**

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III: **10**

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV: **10**

Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V: **5**

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.

TOTAL: 45 PERIODS

REFERENCES:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition,KhalidSayood,The Morgan aufmannSeries
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

QUANTUM COMPUTING

NECS-086	L	T	P
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UNIT I 10
FUNDAMENTAL CONCEPTS
Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

UNIT II
QUANTUM COMPUTATION 10
Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.

UNIT III
QUANTUM COMPUTERS 10
Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.

UNIT IV
QUANTUM INFORMATIONS 10
Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.

UNIT V
QUANTUM ERROR CORRECTION 5
Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

TOTAL: 45 PERIODS

TEXT BOOK

1. Micheal A. Nielsen. &Issac L. Chiang, “Quantum Computation and Quantum Information”, Cambridge University Press, Fint South Asian edition, 2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , “Quantum Computing - A Gentle Introduction” (Scientific and Engineering Computation) Paperback – Import, 3 Oct 2014
3. Computing since Democritus by Scott Aaronson
4. Computer Science: An Introduction by N. DavidMermin
5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.

EMBEDDED SYSTEMS

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Unit-I **10**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II **10**

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III **10**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.Modeling and Characterization of Embedded Computation System.

Unit-IV **10**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V **5**

Fault-Tolerance, FormalVerification , Trends in Embedded Processor, OS,Development Language

References:

1. Prasad, Embedded /Real Time System,Concept,Design and Programming Black Book, Wiley India
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer
3. Shibu K.V., “Introduction to Embedded Systems”, TMH
4. Marwedel, “Embedded System Design”, Springer

SEMANTIC WEB AND WEB SERVICES

NECS-088

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UNIT I **12**

Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.

UNIT II **8**

Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, quering in RQL, URI**(8 Hrs.)**

UNIT III **8**

Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.

UNIT IV **8**

Semantics: Kinds of semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers.

UNIT V **8**

Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules.**(8 Hrs.)**

References:-

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

DIGITAL IMAGE PROCESSING LAB

NECS-851

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The following programs should be developed in 'C' language preferably on 'UNIX' platform. The graphical development environment can be created using some appropriate library like 'OpenGL':

1. Implement the spatial image enhancement functions on a bitmap image –
    a. Mirroring (Inversion) (b) Rotation (Clockwise) (c) Enlargement (Double Size)
2. Implement (a) Low Pass Filter (b) High Pass Filter
3. Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter
4. Implement Smoothing and Sharpening of an eight bit color image
5. Implement (a) Boundary Extraction Algorithm (b) Graham's Scan Algorithm
6. Implement (a) Edge Detection (b) Line Detection