

**B.TECH COMPUTER ENGINEERING****IV YEAR SYLLABUS****VII SEMESTER**

SR.NO	SUBJECT CODE	SUBJECT	PERIOD			CREDIT
			L	T	P	
1	ECS-701	DISTRIBUTED SYSTEM	3	1	0	4
2	ECS-702	ARTIFICIAL INTELLIGENCE	3	1	0	4
3	-----	OPEN ELECTIVE - I	3	1	0	4
4	-----	ELECTIVE - III	3	1	0	3
5	-----	ELECTIVE - IV	3	1	0	4
6	ECS-751	DISTRIBUTED SYSTEM LAB	0	0	2	1
7	ECS-752	PROJECT	0	0	6	4
8	ECS-753	INDUSTRIAL TRAINING & VIVA	0	0	2	1
9	GP-701	GENERAL PROFICIENCY	-	-	-	0
<b>Total</b>			<b>15</b>	<b>5</b>	<b>8</b>	<b>25</b>

**VIII SEMESTER**

SR. NO	SUBJECT CODE	SUBJECT	PERIOD			CREDIT
			L	T	P	
1	ECS-801	DIGITAL IMAGE PROCESSING	3	1	0	4
2	-----	OPEN ELECTIVE - II	3	1	0	4
3	-----	ELECTIVE - V	3	1	0	4
4	-----	ELECTIVE - VI	3	1	0	4
5	ECS-851	DIGITAL IMAGE PROCESSING LAB	0	0	2	1
6	ECS-852	PROJECT	0	0	12	8
7	GP-801	GENERAL PROFICIENCY	-	-	-	0
<b>Total</b>			<b>12</b>	<b>4</b>	<b>14</b>	<b>25</b>

### **Open Elective I**

1. EOE-071 Entrepreneurship Development
2. EOE-072 Quality Management
3. EOE-073 Operations Research
4. EOE-074 Introduction to Bio Technology
5. EOE-075 Mobile Application Development
6. EOE-076 Ethical Hacking and Prevention
7. EOE-077 Software Project Management

### **Open Elective II**

1. EOE-081 Non Conventional Energy Resources
2. EOE-082 Non Linear Dynamics Systems
3. EOE-083 Product Development
4. EOE-084 Automation and Robotics

### **Departmental Elective III**

1. ECS-071 Software Testing and Audit
2. ECS-072 Neural Network
3. ECS-073 Computer Vision

### **Departmental Elective IV**

1. ECS-074 High Speed Network
2. ECS-075 Android Operating System
3. ECS-076 Service Oriented Architecture
4. ECS-077 Cryptographic & Network Security

### **Departmental Elective V**

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

### **Departmental Elective VI**

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

## **ECS-701 DISTRIBUTED SYSTEMS**

### **Unit-I**

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**

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, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

### **Unit-III**

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 building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

### **Unit-IV**

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

### **Unit -V**

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency 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 Computing, Wiley

4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI

## **ECS-702 ARTIFICIAL INTELLIGENCE**

### **Unit-I**

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**

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**

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**

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**

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,

## **ECS-751 DISTRIBUTED SYSTEM LAB**

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.

## **OPEN ELECTIVE – 1**

### **EOE-071 ENTREPRENEURSHIP DEVELOPMENT**

#### **UNIT -I**

Entrepreneurship-definition.growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

#### **UNIT -II**

Project identification-assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods

#### **UNIT -III**

Accountancy-Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies

#### **UNIT -IV**

Project Planning and control:

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The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication

#### **UNIT -V**

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. 5 Role of various national and state agencies which render assistance to small scale industries

Text / Reference Books:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

### **EOE-072 QUALITY MANAGEMENT**

#### **UNIT-I**

Quality Concepts: Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design Review of design, Evolution of proto type. Control on Purchased Product Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure Manufacturing Quality Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims

#### **UNIT-II**

Quality Management

Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods

#### **UNIT-III**

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. Attributes of Control Chart Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts

#### **UNIT -IV**

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability,

building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability zero defects, quality circle

#### **UNIT -V**

ISO-9000 and its concept of Quality Management

7 ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

### **EOE-073 OPERATIONS RESEARCH**

#### **UNIT-I**

Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study. Linear Programming Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

#### **UNIT-II**

Transportation Problems:

Types of transportation problems, mathematical models, transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.

#### **UNIT-III**

Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management: Phases of project management, guidelines for network construction, CPM and PERT.

#### **UNIT-IV**

Theory of Games :

Rectangular games, Minimax theorem, graphical solution of  $2 \times n$  or  $m \times 2$  games, game with mixed strategies, reduction to linear programming model

.Quality Systems:

Elements of Queuing model, generalized poisson queuing model, single server models.

## **UNIT-V**

Inventory Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

### **Text / Reference Books:**

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. PanneerSeevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

## **EOE-074 INTRODUCTION TO BIOTECHNOLOGY**

### **UNIT-I**

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis.

### **UNIT-II**

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication

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### **UNIT-III**

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries ,Transgenics, DNA fingerprinting, genomics.

### **UNIT-IV**

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention.

### **UNIT-V**

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies.



**Text Books/ Reference Books:**

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

**EOE-075 MOBILE APPLICATION DEVELOPMENT****UNIT I**

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**

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**

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**

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**

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.

## **EOE-076 ETHICAL HACKING AND PREVENTION**

### **Unit-1**

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

### **Unit-II**

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**

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-IV**

Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic 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, Shaun Colley, Ofie 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

1. Jon Erickson "HACKING, The art of Exploitation", William Pollock.

## **EOE-077 SOFTWARE PROJECT MANAGEMENT**

### **UNIT-I:**

Introduction and Software Project Planning

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

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 Control

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 Testing

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 Tools

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.
2. Mohapatra, Software Project Management, Cengage Learning.

**Departmental Elective III**

**ECS-071 SOFTWARE TESTING AND AUDIT**

**Unit-I**

**Review of Software Engineering:**

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:**

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:**

**Software Testing Activities:** Levels of Testing, Debugging, Testing techniques and their Applicability, 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:**

**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.

**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 Nostrand Reinhold, New York, 1984.

## **ECS-072 NEURAL NETWORKS**

### **Unit-I:**

#### **Neuro Computing and Neuroscience**

Historical notes, human Brain, neuron Model, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

#### **Data processing**

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 benchmark problems in NN.

### **Unit-III**

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 perceptron.

### **Unit-IV**

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**

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

## **ECS-073 COMPUTER VISION**

### **UNIT 1**

#### **IMAGE FORMATION MODEL**

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

## **Departmental Elective IV**

### **ECS-074 HIGH SPEED NETWORKS**

#### **UNIT I**

Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture, ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, Wi-Fi and WiMax Networks applications, requirements – Architecture of 802.11.

#### **UNIT II**

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 III**

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

#### **UNIT IV**

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

#### **UNIT V**

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, Pearson Education, 2002
2. Warland, Pravin Varaiya, “High performance communication networks”, Second Edition, Jean Harcourt Asia Pvt. Ltd., , 2001
3. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, “MPLS and VPN architecture”, Cisco Press, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, “ATM Technology for Broad Band Telecommunication Networks”, CRC Press, New York, 2004

**ECS-075 ANDROID OPERATING SYSTEM**

**UNIT I**

**Android OS**

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

**UNIT II**

**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**

**Multimedia**

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

**UNIT IV**

**Networking**

Internet Access, HTML and XML Parsing, Wi-Fi

**UNIT V**

**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, Lauren Darcey "Android Application Development" Pearson
5. J.F.DiMarzio "Android a programming guide" TMH

## **ECS-076 SERVICE ORIENTED ARCHITECTURE**

### **UNIT I**

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**

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**

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**

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**

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

**TOTAL: 45 PERIODS**

### **REFERENCES:**

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", 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

## **ECS-077 CRYPTOGRAPHY & NETWORK SECURITY**

### **Unit-I**

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**

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**

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**

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**

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.Padmabhan Cryptography and Security ,Wiley

4. Bruce Schneier, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes, "Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

## **Open Elective II**

### **EOE- 081 NON CONVENTIONAL ENERGY RESOURCES**

#### **UNIT- I**

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

#### **UNIT-II**

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

#### **UNIT-III**

Geothermal Energy:

Resources of geothermal energy, thermodynamics of geo- thermal energy conversion- electrical conversion, non-electrical conversion, environmental considerations.

Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

#### **UNIT- IV**

Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems

#### **UNIT-V**

Bio-mass:

Availability of bio-mass and its conversion theory.

Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants

#### **Text/References Books:**

1. Raja et al, "Introduction to Non- Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non- Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non- conventional Energy Resources" New Age International. 5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

## **EOE-082 NON-LINEAR DYNAMIC SYSTEMS**

### **UNIT-I**

Dynamic systems:

Concept of dynamic systems, importance of non- linearity, nonlinear dynamics of flows in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity. Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories.

### **UNIT-II**

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle.

### **UNIT-III**

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems

### **UNIT-IV**

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension

### **UNIT-V**

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos.

### **Reference Books:**

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge

University press, London, 1990.

2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System"

Springer Verlag, 1997.

3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.

4. R. R. Mohler, "Non linear systems, Vol- I: Dynamics and Control" Prentice Hall, 1991.

5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.

6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

## **EOE- 083 PRODUCT DEVELOPMENT**

### **UNIT-1**

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical reliability & economic feasibility of design concepts

### **UNIT -II**

Morphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour. Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list

### **UNIT -III**

Transformations, Brainstorming& Syntetics, Morphological techniques.

Utility Concept, Utility Value, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break- even analysis.

### **UNIT-IV**

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthropometric data and its importance in design.

Application of Computers in Product development & design

### **UNIT-V**

Existing techniques, such as work- study, SQC etc. for improving method & quality of product. Innovation versus Invention. Technological Forecasting. Use of Standards for Design

### **Text/Reference Books:**

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

## **EOE- 084 AUTOMATION AND ROBOTICS**

### **UNIT-1**

Introduction: Definition, Classification of Robots, geometric classification and control classification.

### **UNIT-1**

Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.

### **UNIT-III**

Robot Coordinate Systems and Manipulator Kinematics: Robot co- ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world. Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators

### **UNIT-IV**

Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision

Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.

### **UNIT-V**

Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection

### **Text/Reference Books:**

1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison- Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automat

## **Departmental Elective V**

### **ECS-080 PATTERN RECOGNITION**

#### **Unit-I**

#### **Introduction:**



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 Pattern Recognition:**

Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

## **Unit – III**

### **Parameter estimation methods:**

Maximum-Likelihood estimation, Bayesian Parameter estimation, 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:**

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

## **Unit - V**

### **Unsupervised Learning & Clustering:**

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.

## **ECS-081 HIGH PERFORMANCE COMPUTING**

### **UNIT I**

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**

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

#### **UNIT III**

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**

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

#### **UNIT V**

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. Ian 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.

### **ECS-082 REAL TIME SYSTEM**

#### **UNIT-I:**

#### **Introduction**

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**

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**

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**

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**

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, Seppo J. 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.

### **ECS-083 CLUSTER COMPUTING**

#### **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

**ECS-084 GRID COMPUTING**

**UNIT I**

**CONCEPTS AND ARCHITECTURE10**

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

## **UNIT II**

### **GRID MONITORING**

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**

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**

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**

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.

## **Departmental Elective VI**

### **ECS-085 DATA COMPRESSION**

**Unit - I:**

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:**

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:**

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 Markov Compression.

**Unit – IV:**

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

**Unit-V:**

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

**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, Khalid Sayood, The Morgan Kaufmann Series
4. Data Compression: The Complete Reference 4<sup>th</sup> Edition by David Salomon, Springer
5. Text Compression 1<sup>st</sup> Edition by Timothy C. Bell Prentice Hall

**ECS-086 QUANTUM COMPUTING****UNIT I**

## **FUNDAMENTAL CONCEPTS**

Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

## **UNIT II**

### **QUANTUM COMPUTATION**

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**

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**

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**

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.

## **ECS-087 EMBEDDED SYSTEMS**

### **Unit-I**

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

### **Unit-II**

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

### **Unit-III**

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

### **Unit-IV**

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

### **Unit-V**

Fault-Tolerance, Formal Verification , 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

## **ECS-088 SEMANTIC WEB AND WEB SERVICES**

### **UNIT I**

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**

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

### **UNIT III**

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**

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**

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.

#### **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.

### **ECS-801Digital Image Processing**

#### **UNIT-I**

##### **Introduction and Fundamentals**

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**

##### **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**

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**

##### **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**

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.

### **ECS-851 DIGITAL IMAGE PROCESSING LAB**

#### **List of Practical's:-**

1. To display the Gray scale images.
2. Implement the spatial image enhancement functions on a bitmap image – **Rotation (Clockwise), Enlargement (Double Size)**.
3. Write a program for image enhancement.
4. To apply Laplacian Transformation on Image.
5. To Apply Low Pass Filter on the image.
6. Write a program for image segmentation.
7. To enhance contrast using Histogram Equalization.
8. Program to Implement Edge Detection on an image(Edge detection).
9. Write a program for image morphology(**boundary extraction, interior filling**).
10. Implement of Image Restoration.

**REFERENCE:**

1. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.