

## **CS-801 – Soft Computing**

### **Unit – I**

Soft Computing : Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

Artificial Intelligence : Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A\* algorithm, AO\* Algorithms and various types of control strategies. Knowledge representation issues, Propositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.

### **Unit – II**

Neural Network : Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb's learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA,

### **Unit – III**

Counter propagation network, architecture, functioning & characteristics of counter Propagation network, Hopfield/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.

### **Unit – IV**

Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

### **Unit – V**

Genetic algorithm : Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

### **References :**

- S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication.
- S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications
- Rich E and Knight K, Artificial Intelligence, TMH, New Delhi.
- Bose, Neural Network fundamental with Graph , Algo.& Appl, TMH
- Kosko: Neural Network & Fuzzy System, PHI Publication
- Klir & Yuan ,Fuzzy sets & Fuzzy Logic: Theory & Appli.,PHI Pub.
- Hagen, Neural Network Design, Cengage Learning

## **CS-802 – Web Engineering**

### **UNIT-1**

**Web Engineering:** Introduction, History, Evolution and Need, Time line, Motivation, Categories & Characteristics of Web Applications, Web Engineering Models, Software Engineering v/s Web Engineering. World Wide Web: Introduction to TCP/IP and WAP, DNS, Email, TelNet, HTTP and FTP.

**Browser and search engines:** Introduction, Search fundamentals, Search strategies, Directories search engines and Meta search engines, Working of the search engines.

**Web Servers:** Introduction, Features, caching, case study-IIS, Apache.

### **UNIT- 2**

**Information Architecture:** Role, Collaboration and Communication, Organizing Information, Organizational Challenges, Organizing Web sites parameters and Intranets

**Website Design:** Development, Development phases, Design issues, Conceptual Design, High-Level Design, Indexing the Right Stuff, Grouping Content. Architectural Page Mockups, Design Sketches, Navigation Systems. Searching Systems, Good & bad web design, Process of Web Publishing. Web-site enhancement, submission of website to search engines.

**Web security:** issues, security audit. Web effort estimation, Productivity Measurement, Quality usability and reliability. **Requirements Engineering for Web Applications:** Introduction, Fundamentals, Requirement Source, Type, ,Notations Tools. Principles Requirements Engineering Activities, Adapting RE Methods to Web Application.

### **UNIT- 3**

#### **Technologies for Web Applications I:**

**HTML and DHTML:** Introduction, Structure of documents, Elements, Linking, Anchor Attributes, Image Maps, Meta Information, Image Preliminaries, Layouts, Backgrounds, Colors and Text, Fonts, Tables, Frames and layers, Audio and Video Support with HTML Database integration, CSS, Positioning with Style sheets, Forms Control, Form Elements.

Introduction to CGI, PERL, JAVA SCRIPT, JSP, PHP, ASP & AJAX.

Cookies: Creating and Reading

### **UNIT-4**

#### **Technologies for Web Applications II:**

**XML:** Introduction, HTML Vs XML, Validation of documents, DTD, Ways to use, XML for data files, Embedding XML into HTML documents, Converting XML to HTML for Display, Displaying XML using CSS and XSL, Rewriting HTML as XML, Relationship between HTML, SGML and XML, web personalization , Semantic web, Semantic Web Services, Ontology.

### **UNIT- 5**

**E- Commerce:** Business Models, Infrastructure, Creating an E-commerce Web Site, Environment and Opportunities. Modes & Approaches, Marketing & Advertising Concepts. Electronic Publishing issues, approaches, legalities and technologies,

Secure Web document, Digital Signatures and Firewalls, Cyber crime and laws, IT Act.

Electronic Cash, **Electronic Payment Systems:** RTGS, NEFT, Internet Banking, Credit/Debit Card. **Security:** Digital Certificates & Signatures, SSL, SET, 3D Secure Protocol.

### **Suggested Experiments:**

At least ten practical experiments based on above syllabus and a mini project is desirable to be completed by a group of three that cover following.

1. HTML/ DHTML
2. PHP
3. XML
4. Java Script, CGI, PERL
5. ASP
6. Configuration of Web Servers.

### **Recommended Books:**

1. Roger S.Pressman, David Lowe, "Web Engineering", Tata Mc Graw Hill Publication, 2007
2. Achyut S Godbole and Atul Kahate, "Web Technologies", Tata McGraw Hill
3. Gopalan N P , Akilandeswari, "Web Technology: A Developer s Perspective" , PHI
4. Neil Gray, "Web server Programming" Wiley
5. Chris Bates, "Web Programming: Building Internet applications" Wiley
6. Moller, "An Introduction to XML and Web Technologies", Pearson Education New Delhi, 2009
7. "Web Technologies: Black Book", Kogent, Dreamtech
8. Internet & World Wide Web How to Program, Pearson education, 3rd edition, by: H.M. Deitel, P.J. Deitel, A.B. Goldberg.
9. C. Xavier, "Web Technology & Design ", Tata McGraw Hill.
- 10 Ivan Bay Ross, "HTML,DHTML,Java script,Perl CGI" , BPB

## **CS-8201 – Network Management**

### **Unit-I**

Introduction to Network Managements, Network Management Framework, Network Based Managements, Evolution of Network Management: SGMP, CMIP, SNMP. Network Implementation and Management Strategies, Network Management Categories: Performance Management, Fault Management, Configuration Management, Security Managements, Accounting Managements. Network Management Configuration: Centralized Configuration, Distributed Configuration. Selected Management Strategy.

### **Unit –II**

Management Information Base (MIB), Structure of Management Information, NMS Presentation of the SMI, NMS Meter-ware Network View. Remote Monitoring (RMON), RMON Group. Desktop Management: Desktop Management Interface(DMI), DMI Architecture, DMI Browser, DMI/SNMP Mapping, Desktop SNMP Extension Agents. Setting up LAN Access, SNMP Configuration.

### **Unit-III**

Introduction, layering, OSI Layering, TCP/IP Layering, Protocols & Standards, Internet standards, Internet administration, Internet Addresses, Internet protocol: introduction, IP header, IP routing, subnet addressing, subnet mask, special case of IP addresses, Comparative Study of IPV4 & IPV6, port numbers Address Resolution Protocol, ARP packet format, Proxy ARP, ARP command, ARP Example, Reverse Address Resolution Protocol (RARP): Introduction, RARP Packet format, RARP Examples, RARP server design

### **Unit-IV**

Delivery and Routing of IP Packets, Routing Methods, Static versus Dynamic Routing, Routing table and Routing Module, Classless Addressing: CIDR. Internet Protocol (IP), Datagram, Fragmentation, Options, IP Package. Interior and Exterior Routing, Routing information protocol (RIP), Open shortest path first protocol (OSPF), BGP, GGP. Private Networks. Virtual Private Network (VPN), Network Address Translation (NAT).

### **Unit –V**

Internet Control Message Protocols (ICMP):- Types of message, message format, error reporting, query, checksum, ICMP Package. IGMP, IGMP Message and its Operation, IGMP Package. Transmission control protocol, Process-to-Process Communication, TCP Services Flow Control, TCP Timers. TCP Operation, TCP Package.. Application layers protocol, Telnet Protocol, File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP), X-Window system protocol, Remote procedure call, and Network file system.

### **References:**

- Forouzan, TCP/IP Protocol Suite 4th edition, TMH
- J.Richard Burkey, Network Management Concept and Practice, PHI
- Stevens, TCP/IP Illustrated Volume-I, Pearson
- Tittel: TCP/IP, Cenage Learning
- Uyless Black, TCP/IP and related protocols, McGraw Hill.
- Doughals E. Comer, Internetworking with TCP/IP Vol. I, Principles, Protocols, and Architecture, Prentice Hall, India.

## **CS-8202 – Cyber Security**

### **UNIT 1**

Introduction of Cyber Crime, Challenges of cyber crime, Classifications of Cybercrimes: E-Mail Spoofing, Spamming, Internet Time Theft, Salami attack/Salami Technique, Data Diddling, Web jacking, Online Frauds, Software Piracy, Computer Network Intrusions, Password Sniffing, Identity Theft, cyber terrorism, Virtual Crime , Perception of cyber criminals: hackers, insurgents and extremist group etc. Web servers hacking, session hijacking.

### **UNIT 2**

**Cybercrime on Mobile and Wireless Device:** Proliferation of Mobile and Wireless Devices, trends in Mobility Credit Card Frauds in Wireless Computing, Types and techniques of Credit Card Frauds, Attacks on Mobiles: Mobile Viruses, Mishing, Vishing, Smishing & Hacking Bluetooth. Web servers hacking, session hijacking.

### **UNIT 3**

**Tools and Methods in Cybercrime:** Proxy Servers and Anonymizers, Password Cracking, Keyloggers and Spyware, virus and worms, Trojan Horses, Backdoors, DoS and DDoS Attacks , Buffer and Overflow, Attack on Wireless Networks, Phishing : Method of Phishing, Phishing Techniques.

### **UNIT 4**

**Cyber Crime and Criminal justice:** Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cheating, Defamation, Harassment and E-mail Abuse, Other IT Act Offences, Monetary Penalties, jurisdiction and Cyber Crimes, Nature of Criminality, Strategies to tackle Cyber Crime and Trends.

**The Indian Evidence Act of 1872 v. Information Technology Act, 2000:** Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages.

### **UNIT 5**

**Introduction to Cyber Forensics:** Information Security Investigations, Corporate Cyber Forensics, Scientific Method in Forensic analysis, investigating large scale Data breach cases. Analyzing Malicious software. Types of Computer Forensics Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques.

### **References**

1. Principles of Cyber crime, Jonathan Clough Cambridge University Press
2. John R. Vacca, Computer Forensics:Computer Crime Scene Investigation, 2<sup>nd</sup> Edition, CharlesRiver Media, 2005
3. Cyber Law Simplified, Vivek Sood, Pub: TMH.
4. Cyber Security by Nina Godbole, Sunit Belapure Pub: Willey-India
5. Information Warfare : Corporate attack and defense in digital world, William Hutchinson, Mathew Warren, Elsevier.
6. Cyber Laws and IT Protection, Harish Chander, Pub:PHI.

**CS-8203 – Data Mining and Knowledge Discovery**

**Unit-I**

Introduction, to Data warehousing, needs for developing data Warehouse, Data warehouse systems and its Components, Design of Data Warehouse, Dimension and Measures, Data Marts:-Dependent Data Marts, Independents Data Marts & Distributed Data Marts, Conceptual Modeling of Data Warehouses:-Star Schema, Snowflake Schema, Fact Constellations. Multidimensional Data Model & Aggregates.

**Unit-II**

OLAP, Characteristics of OLAP System, Motivation for using OLAP, Multidimensional View and Data Cube, Data Cube Implementations, Data Cube Operations, Guidelines for OLAP Implementation, Difference between OLAP & OLTP, OLAP Servers:-ROLAP, MOLAP, HOLAP Queries.

**UNIT-III**

Introduction to Data Mining, Knowledge Discovery, Data Mining Functionalities, Data Mining System categorization and its Issues. Data Processing :- Data Cleaning, Data Integration and Transformation. Data Reduction, Data Mining Statistics. Guidelines for Successful Data Mining.

**Unit-IV**

Association Rule Mining:-Introduction, Basic, The Task and a Naïve Algorithm, Apriori Algorithms, Improving the efficiency of the Apriori Algorithm, Apriori-Tid, Direct Hasing and Pruning(DHP),Dynamic Itemset Counting (DIC), Mining Frequent Patterns without Candidate Generation(FP-Growth),Performance Evaluation of Algorithms,.

**Unit-V**

Classification:-Introduction, Decision Tree, The Tree Induction Algorithm, Split Algorithms Based on Information Theory, Split Algorithm Based on the Gini Index, Overfitting and Pruning, Decision Trees Rules, Naïve Bayes Method.

Cluster Analysis:- Introduction, Desired Features of Cluster Analysis, Types of Cluster Analysis Methods:- Partitional Methods, Hierarchical Methods, Density- Based Methods, Dealing with Large Databases. Quality and Validity of Cluster Analysis Methods.

**References:**

1. Berson: Data Warehousing & Data Mining &OLAP , TMH
2. Jiawei Han and Micheline Kamber, Data Mining Concepts & Techniques, Elsevier Pub.
3. Arun.K.Pujari, Data Mining Techniques, University Press.
4. N.P Gopalan: Data Mining Technique & Trend, PHI
5. Hand, Mannila & Smith: Principle of Data Mining, PHI
6. Tan, Introduction to Data Mining, Pearson Pub.

**CS-8204 – Semantic Web & Ontologies**

**Unit-I**

**Semantic Web:** Building Models , Calculating with knowledge, Exchanging Information, Semantic Web Technologies ,Types of Web :Smart Web & Dumb Web, Applications ,Semantic Data ,Search Engine for Semantic Web

**Unit-II**

**Semantic Modeling:** Modeling for human communication, Explanation and prediction, Mediating Variability: Variation & Classes, Variation & Layers, Expressivity in Modeling.

**Unit-III**

**Resource Description Language RDF :** Introduction , Advanced features , simple ontologies in RDF Schema , encoding of special data structures, RDF formal semantics ,syntactic reasoning with deduction rules ,Distributing data across web , Managing data from multiple sources .

**Unit-IV**

**Web Ontology Language OWL :** OWL syntax and Intuitive semantics , OWL species , **Owl formal semantics** : Description Logics , Model-Theoretic Semantics of OWL, Automated reasoning with OWL ,Ontology Matching and Distributed Information .

**Unit-V**

**Semantic Web Application Architecture:** RDF Parser/Serializer, RDF store: RDF data standards and Interoperability of RDF stores , RDF query engines , SPARQL: Query language for RDF , conjunctive Queries for OWL DL ,RDF backed web portals , Data federation .

**Ontology Engineering:** Constructing Ontologies manually, Reusing Existing Ontologies, Semiautomatic Ontology Acquisition, Ontology Mapping

**Text Books:**

1. Hitzler, Markus, Rudolph , “ Foundations of Semantic Web Technologies” , Chapman & Hall/CRC,2009,ISBN 9781420090505
2. Allemang , Hendler , “ Semantic Web for the working Ontologist” 2<sup>nd</sup> ed. Elsevier Pub
3. Liang Yu , “ Introduction to the Semantic Web and Semantic Web Services”, Chapman & Hall/CRC
4. Antoniou , Harmelen , “A semantic Web Primer”, PHI Pub.
5. Rajendra Akerkar ,“ Foundations of Semantic Web” , Narosa Publishing ,NewDelhi

## **CS-8301 – Bioinformatics**

### **Unit-I Introduction**

Introduction to bioinformatics, objectives of bioinformatics, Basic chemistry of nucleic acids, structure of DNA & RNA, Genes, structure of bacterial chromosome, cloning methodology, Data maintenance and Integrity Tasks.

### **Unit-II Bioinformatics Databases & Image Processing**

Types of databases, Nucleotide sequence databases, Protein sequence databases, Protein structure databases, Normalization, Data cleaning and transformation, Protein folding, protein function, protein purification and characterization, Introduction to Java clients, CORBA, Using MYSQL, Feature Extraction.

### **Unit-III Sequence Alignment and database searching**

Introduction to sequence analysis, Models for sequence analysis, Methods of optimal alignment, Tools for sequence alignment, Dynamic Programming, Heuristic Methods, Multiple sequence Alignment

### **Unit-IV Gene Finding and Expression**

Cracking the Genome, Biological decoder ring, finding genes through mathematics & learning, Genes prediction tools, Gene Mapping, Application of Mapping, Modes of Gene Expression data, Mining the Gene Expression Data

### **Unit-V Proteomics & Problem solving in Bioinformatics**

Proteome analysis, tools for proteome analysis, Genetic networks, Network properties and analysis, complete pathway simulation: E-cell, Genomic analysis for DNA & Protein sequences, Strategies and options for similarity search, flowcharts for protein structure prediction.

### **List of References**

1. Gopal & Jones, BIOINFORMATICS with fundamentals of Genomics & Proteomics, TMH Pub
2. Rastogi, Bioinformatics – Concepts, skills & Applications, CBS Pub
3. Bergeron, Bioinformatics computing, PHI
4. Claverie, Bioinformatics, Wiley pub
5. Baxevanis, Bioinformatics, Wiley Pub
6. Stekel, Microarray Bioinformatics, Cambridge



**CS-8302 – Digital Image Processing**

**Unit-I**

Digital Image fundamentals, A simple image model, Sampling and Quantization. Relationship between pixels. Imaging geometry. Image acquisition systems, Different types of digital images

**Unit-II**

Image transformations, Introduction to Fourier transforms, Discrete Fourier transforms, Fast Fourier transform, Walsh transformation, Hadmord transformation, Discrete Cosine Transformation.

**Unit-III**

Image enhancement, Filters in spatial and frequency domains, Histogram based processing. Image subtraction, Averaging, Image smoothing, Nedion filtering, Low pass filtering, Image sharpening by High pass filtering.

**Unit-IV**

Image encoding and segmentation, Encoding: Mapping, Quantizer, Coder. Error free compression, Lossy Compression schemes. JPEG Compression standard. Detection of discontinuation by point detection, Line detection, edge detection, Edge linking and boundary detection, Local analysis, Global processing via Hough transforms and graph theoretic techniques

**Unit-V**

Mathematical morphology- Binary, Dilation, crosses, Opening and closing, Simple methods of representation, Signatures, Boundary segments, Skeleton of a region, Polynomial approximation

**References:**

1. Rafael C Gonzalez, Richard E Woods 3rd Edition, Digital Image Processing Pearson.
2. Rafael C Gonzalez, Richard E Woods 3rd Edition, Digital Image Processing using Matlab – TMH.
3. Sonka, Digital Image Processing & Computer Vision , Cengage Learning
- 4 Jayaraman, Digital Image Processing, TMH.
5. Pratt, Digital Image Processing, Wiley India
- 6 Annadurai, Fundamentals of Digital Image Processing ,Pearson Education .

## **CS-8303 – Wireless Network**

### **Unit 1**

Introduction of Wireless Networks, Different Generations of Wireless Networks.

Characteristics of the Wireless Medium: Radio Propagation Mechanisms, Path Loss Modelling and Signal Coverage, Effect of Multipath and Doppler, Channel Measurement and Modelling Techniques.

### **Unit 2**

Network Planning: Introduction, Wireless Network Topologies, Cellular Topology, Cell Fundamentals, Signal to Interferences Radio Calculations, Network Planning for CDMA Systems.

Wireless Network Operations: Mobility Management, Radio Resources and Power Management

### **Unit 3**

Multiple Division Techniques: FDMA, TDMA, CDMA, OFDM, SDMA. Comparison of Multiple Division Techniques, Modulation Techniques – AM, FM, FSK, PSK, QPSK, QAM, 16QAM

Mobile Data Networks: Introduction, Data Oriented CDPD Network, GPRS, EDGE and High Data Rates, SMS in GSM, Mobile Application Protocols.

### **Unit 4**

Introduction to Wireless LAN, Evolution of WLAN, Wireless Home Networking, Technologies for Home Area Network (HAN), Overview of IEEE 802.11, Reference Architecture, PHY and MAC Layer, Wireless ATM, HIPERLAN.

### **UNIT 5**

IEEE 802.15 WPAN, HomeRF, Bluetooth, Interference between Bluetooth and 802.11, Adhoc Networks, Introduction to 2.5 G and 3 G Networks.

### **References**

1. Kaveh Pahlavan, Prashant Krishnamurthy “principles of Wireless Networks”, PHI.
2. Qing- An Zeng, Dharma Prakash Agrawal “Introduction to Wireless and Mobile Systems” CENGAGE Learning.
3. Sumit Kasper, Nishit Narang, A P Priyanka “2.5 G Mobile Networks: GPRS and EDGE”, TMH
4. Dr. KAMILO FEHER “Wireless Digital Communications” , PHI
5. Jochen Schiller “ Mobile Communications”, PEARSON

**CS-8304 – Quantum Computing**

**UNIT I**

**Introduction to quantum mechanics :**

Postulates of quantum mechanics, Qubit and quantum states, Vector Spaces, Single Qubit Gates, multiple Qubit Gates, Controlled Gates, Composite Gates, Matrices and operators.

**UNIT II**

**Density operators :**

Density Operator for a Pure State, Density Operator for a Mixed State, Properties of a Density Operator, Characterizing Mixed States, Completely Mixed States, Partial Trace and Reduced Density Operator.

**Quantum measurement theory:**

Distinguishing Quantum States and Measurement, Projective Measurements, Measurements on Composite Systems, Generalized Measurements, Positive Operator Valued Measures.

**UNIT III**

**Entanglement:**

Quantum state entanglement, Bell's Theorem, The Pauli Representation, Using Bell States For Density Operator Representation, Quantum gates and circuits: Single Qubit Gates, The Z Y Decomposition, Basic Quantum Circuit Diagrams, Controlled Gates, Application of Entanglement in teleportation and super dense coding., Distributed quantum communication

**UNIT III**

**Quantum Computer :**

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 Algorithm:**

Hadamard Gates, The Phase Gate, Matrix Representation of Serial and Parallel Operations, Quantum Interference, Quantum Parallelism and Function Evaluation, Deutsch -Jozsa Algorithm, Quantum Fourier Transform, Phase Estimation, Shor's Algorithm, Quantum Searching and Grover's Algorithm

**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.

**TEXTBOOK:**

1. Quantum Computing Explained: David McMahon, Wiley Interscience (IEEE Computer Science).
2. Quantum Computing without Magic Devices : Zdzislaw Meglicki; PHI .
3. Quantum Computation and Quantum Information: M.A. Nielsen & Isaac L. Chuang, Cambridge University Press .
4. Quantum Computing and communications: An Engineering Approach: Sandor Imre and Ferenc Balazs, Wiley.