IV/IV B.Tech., (COMPUTER SCIENCE & ENGINEERING)

(SEMESTER – VII)

IV YEAR I SEMESTER

Sl. No.	Course Details		Scheme of Instruction			Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week			Maximum Marks		Total Marks	
			L	T	P	Internal	External		
1.	CSE/IT 411	Data Engineering	4	-	-	40	60	100	3
2.	CSE/IT 412	Cloud Computing	4	1	-	40	60	100	4
3.	CSE/IT 413	Cyber Security	4	1	-	40	60	100	4
4.	CSE/IT 414	Design & Analysis of Parallel Algorithms	4	1	-	40	60	100	4
5.	CSE/IT 415	Machine Learning	4	1	-	40	60	100	4
6.	CSE/IT 416	Elective (Open)	4	0	-	40	60	100	3
7.	CSE/IT 451	Data Engineering Lab	-	--	3	40	60	100	2
8.	CSE/IT 452	Machine Learning Lab	-	-	3	40	60	100	2
9.	CSE/IT 453	Project work part-A and Internship(To be completed in summer at the end of 3/2)	--	-	4	40	60	100	2
	Total		24	5	10	360	540	900	28

IV/IV B.Tech., (COMPUTER SCIENCE & ENGINEERING)

(SEMESTER – VIII)

IV YEAR II SEMESTER

Sl. No.	Course Details		Scheme of Instruction			Scheme of Examination			Credits
	Code No.	Subject Name	Periods/week			Maximum Marks		Total Marks	
			L	T	P	Internal	External		
1.	CSE/IT 421	Industrial Economics	4	1	-	40	60	100	4
2.	CSE/IT 422	Mobile Computing	4	1	-	40	60	100	4
3.	CSE/IT 423	Elective III (Lab Oriented)	4	1	-	40	60	100	4
4.	CSE/IT 424	Elective IV	4	1	-	40	60	100	4
7.	CSE/IT 461	Elective III Lab	-	--	3	40	60	100	2
8.	CSE/IT 462	Project Work Part-B	-	-	12	80	120	200	10
	Total		16	4	15	280	420	700	28

Open Elective:

1. **Java**
2. **DBMS**

Syllabus for Java is available in CSE225 and syllabus for DBMS is available in CSE311.

Elective III

1. Soft Computing through MATLAB
2. Data analytics through R Programming
3. Internet of things through Arduino Programming
4. Image processing through Matlab

Elective IV

1. Computer Forensics
2. Social Network Analysis
3. High Performance Computing
4. Deep Learning

CSE/IT 411 **DATA ENGINEERING** **L T P M**
4 1 0 100

UNIT – I **(18 Periods)**

Data Warehouse – Introduction, A Multi-dimensional data model, Data Warehouse Architecture, Data Warehouse Implementation.

Data Mining – Introduction, Data Mining, Kinds of Data, Data Mining Functionalities, Classification of Data Mining Systems, Major issues in Data Mining.

UNIT – II **(18 Periods)**

Data Preprocessing – Data cleaning, Data Integration & Transformation, Data Reduction, Discretization & Concept Hierarchy Generation, Data Mining Primitives.

Mining Association roles in large databases – Association rule mining, mining single-dimensional Boolean Association rules from Transactional Databases, Mining Multi-dimensional Association rules from relational databases & Data Warehouses.

UNIT – III **(15 Periods)**

Cluster Analysis – Introduction, Types of data in Cluster analysis, A categorization of major clustering methods, partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN, Grid-based Method: STING; Model-based Clustering Method: Statistical approach, Outlier analysis.

UNIT – IV **(20 Periods)**

Classification & Prediction – Introduction, Classification by Decision tree induction, Bayesian Classification,Classification by Back propagation, Other Classification Methods, Prediction, Classifier accuracy.

Mining Complex Type of Data – Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Text Databases, Mining the World Wide Web.

Textbooks:

1.Data Mining Concepts & Techniques – Jiawei Han MichelineKamber – Morgan Kaufmann Publishers.

Reference Books:

1. Data Warehouse Toolkit – Ralph Kinball – John Wiley Publishers.

2. Data Mining (Introductory and Advanced Topics) – Margaret H.Dunham – Pearson Education.

3. Data Warehousing in the real world – A Practical guide for Building decision support systems – Sam Anahory, Dennis Murray – Pearson Education.

4. Introduction to Data Mining with case studies – G.K.Gupta, PHI Publications, 2006

CSE/IT 412 **CLOUD COMPUTING** **L T P M**
4 1 0100

UNIT- I **18 Periods**

Cloud Computing Basics- Cloud Computing Overview, Applications, Intranets andthe Cloud, First Movers in the Cloud.
Organization and Cloud Computing-When You Can Use Cloud Computing,Benefits, Limitations,Security Concerns, Regulatory Issues.
Cloud Computing with the Titans – Google, EMC, NetApp, Microsoft, Amazon, Salesforce.com, IBM, Partnerships.
The Business Case for Going to the Cloud- Cloud Computing Services, How ThoseApplications Help Your Business, Deleting Your Datacenter, Salesforce.com, Thomson Reuters.

UNIT - II **18 Periods**

Hardware and Infrastructure – Clients, Security, Network, Services.
Accessing the Cloud – Platforms, Web Applications, Web APIs and Web Browsers.
Cloud Storage – Overview, Cloud Storage Providers.
Standards – Application, Client, Infrastructure, Service.

UNIT - III **18 Periods**

Software as a Service – Overview, Driving Forces, Company Offerings, Industries Software plus Services – Overview, Mobile Device Integration, Providers, Microsoft Online.

Developing Applications – Google, Microsoft, Intuit QuickBase, Cast Iron Cloud, Bungee Connect,Development, Troubleshooting, Application Management.

UNIT - IV **18 Periods**

Local Clouds and Thin Clients- Virtualization in Your Organization, Server Solution,Thin Clients,Case Study: McNeilus Steel.

Migrating to the Cloud- Cloud Services for Individuals,

Cloud Services aimed at theMid-Market, Enterprise-Class Cloud Offerings, Migration.

Best Practices and the Future of Cloud Computing- Analyze Your Service, BestPractices, How Cloud Computing Might Evolve.

Text Book:-

1. Cloud Computing ”A Practical Approach” Anthony T. Velte, Toby J. Velte, Robert Elsenpeter. McGraw-Hill

CSE/IT 413 **CYBER SECURITY** **L T P M**
4 1 0100

Unit-I **18 Periods**

INTRODUCTION TO CYBER SECURITY : Introduction -Computer Security - Threats - Harm - Vulnerabilities - Controls - Authentication - Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks

Unit-II **18 Periods**

SECURITY IN OPERATING SYSTEM & NETWORKS: Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

Unit-III **18 Periods**

SECURITY COUNTERMEASURES: Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data

Unit-IV **18 Periods**

PRIVACY IN CYBERSPACE : Privacy Concepts -Privacy Principles and Policies - Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies - Where the Field Is Headed.

Reference Books:

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015
2. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
3. MarttiLehto, PekkaNeittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
4. Nelson Phillips and EnfingerSteuart, ―Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009

CSE 414	Design and Analysis of Parallel algorithms	L	T	P	M
		4	1	0	100

UNIT I **18 periods**

INTRODUCTION

Introduction to Parallel Algorithms – Models of Parallel Computation – Sorting on an EREWSIMD PRAM Computer – Relation between PRAM Models – SIMD Algorithms – MIMD Algorithms – Selection – Desirable Properties for Parallel Algorithms - Parallel Algorithm for Selection – Analysis ofParallel Algorithms.

UNIT II **15 periods**

SORTING AND SEARCHING

Merging on the EREW and CREW Models - Fast Merging on EREW - Sorting Networks – Sorting on a Linear Array – Sorting on CRCW, CREW, EREW Models – Searching a Sorted Sequence – Searching a Random Sequence.

UNIT III **15 periods**

ALGEBRAIC PROBLEMS

Generating Permutations and Combinations in Parallel – Matrix Transpositions – Matrix by Matrix Multiplications – Matrix by Vector multiplication.

UNIT IV **18 periods**

GRAPH THEORY AND COMPUTATIONAL GEOMETRY PROBLEMS

Connectivity Matrix – Connected Components – All Pairs Shortest Paths – Minimum Spanning Trees – Point Inclusion – Intersection, Proximity and Construction Problems - Sequential Tree Traversal - Basic Design Principles – Algorithm – Analysis.

DECISION AND OPTIMIZATION PROBLEMS

Computing Prefix Sums – Applications - Job Sequencing with Deadlines – Knapsack Problem- The Bit Complexity of Parallel Computations.

Text Books:

1. Selim G. Akl, “The Design and Analysis of Parallel Algorithms”, Prentice Hall, New Jersey, 1989

REFERENCES:

1. Michael J. Quinn, “Parallel Computing : Theory & Practice”, Tata McGraw Hill Edition, 2003.
2. Justin R. Smith, “The Design and Analysis of Parallel Algorithms”, Oxford University Press, USA , 1993.
3. Joseph JaJa, “Introduction to Parallel Algorithms”, Addison-Wesley, 1992.

CSE/IT 415 MACHINE LEARNING

L	T	P	M
4	1	0	100

UNIT – I (12 Periods)

Introduction to machine learning: Concept Learning and the General to Specific Ordering: Concept learning task,concept learning as search,Find-S: finding a Maximally Specific hypothesis,Version Spaces and the Candidate-Elimination algorithm,remarks on Version Spaces andCandidate-Elimination and inductive bias.

Decision Tree Learning: Decision Tree representation,appropriate problems for Decision Tree learning,hypothesis space search in Decision Tree learning,inductive bias in Decision Tree learning and issues in Decision Tree learning.

UNIT – II (18 Periods)

Artificial Neural Networks: Neural Network representations, appropriate problems for Neural Network learning, Perceptrons, Multilayer Networks and the Backpropagation algorithm and remarks on the Backpropagation algorithm.

Evaluating Hypotheses: Estimating hypothesis accuracy, basics of sampling theory, general approach for deriving confidence intervals, difference in error of two hypotheses and comparing learning algorithms.

UNIT – III (18 Periods)

Bayesian Learning: Bayes theorem and concept learning, maximum likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classier, Gibbs algorithm, Naive Bayes classier, Bayesian belief networks and EM algorithm.

Computational learning theory: Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis spaces and sample complexity for infinite hypothesis spaces and mistake bound model of learning.

UNIT – IV (16 Periods)

Instance Based Learning: Introduction, k-Nearest Neighbour learning, locally weighted regression,radial basis functions,Case Based Reasoning and remarks on Lazy and Eager learning.

Genetic Algorithms: Introduction,hypothesis space search,Genetic programming and models of evolution and learning.

TEXT BOOKS:

Tom M. Mitchell, “Machine Learning”, Mc. Graw Hill Publishing

CSE/IT 416-1 Object oriented programming using Java

L	T	P	M
4	0	0	100

UNIT-1

Introduction :Approaches to Software Design, Evolution of the Object Model, Benefits of Object Programming ;
Object Model: Objects, Classes, Subclassing and Inheritance, Polymorphism

Object Programming in Windowed Environments: Benefits of OOP in Windowed Application Environments, Application Frameworks and Class Libraries

UNIT-II

Overview of Java :Data types : Operators and Control statement Classes and Inheritance: Methods; contractors; Garbage collection; Access control; Multilevel hierarchy.
Packages and Interfaces : Access protections : Importing packages;
Implementation and applications of Interfaces
Exception handling :Fundamentals : Exception types; try, catch, throw,throws and finally; Nested try statements and propagation of thrown exception.

UNIT-III

Multithreaded programming : Thread model; Thread priorities; Synchronization and interthread communication.
I/O and Applets : Streams; File I/O; Applets; Parameter passing to applets.
Event Handling :Event model; Event Classes; Event listeners interfaces.
Abstract Window Toolkit :AWT Classes; Component; Container; Panel; Window; FrameCanvas; Graphics; AWT controls; Lay out Managers; Buttons; Check Boxes; Choices; Lists; Scroll Bars; Text fields; Text Areas; Menus; Dialog Boxes; GUI bases programs.
UNIT-IV

Java Library :String handling; Exploring java language; java io;java.utilities.
From Plan to Product: Developing a Plan, Identifying Software Requirements,Designing a General Class Structure, Building a General Application Framework, Implementing Features, Final Polishing Tools and Methodologies: Analysis and Design Methodologies, Notations
Object Programming for the Web: How Web Applications Work, Web Objects, Building a Simple Object-Oriented Program
Reference Books:

1.The Complete Reference Java 2, Seventh Edition - PatrikNaughton& Herbert Schidt , Tata McGraw Hill Publication
2.Just Java, Second Edition – Peter Vander Linden, Sun Soft Press
3.Special Edition Using Java 2 Platform – Weber, Practice Hall of India
4.Java How to Program, Third Edition – Detiel and Detiel, Peason Education Asia

CSE/IT 416-2 DATABASE MANAGEMENT SYSTEMS

L	T	P	M
4	0	0	100

UNIT – I **(18 Periods)**

Introduction - General introduction to database systems; Database - DBMS distinction, approaches to building a database, data models, database management system, three-schema architecture of a database, challenges in building a DBMS, various components of a DBMS.

E/R Model - Conceptual data modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, E/R diagram notation, examples.

UNIT – II **(20 Periods)**

Relational Data Model - Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators: selection, projection, cross product, various types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in E/R notation to the relational schema.

UNIT – III **(18 Periods)**

SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses embedded SQL.

Dependencies and Normal forms - Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

UNIT – IV **(18 Periods)**

Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees. Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

REFERENCE BOOKS:

1. Fundamentals of Database Systems, RamezElmasri and Navate PearsonEducation, 5th edition.
2. Introduction to Database Systems, C.J.Date Pearson Education
3. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke,TATAMcGrawHill 3rd Edition
4 Data base System Concepts, Silberschatz, Korth, McGraw hill, 5th edition.

CSE/IT 451 **DATA ENGINEERING LAB** **L T P M**
0 03100

I. Analyzing data with ROLLAP, CUBE.
II. Cube slicing – come up with 2-D view of data.
III. Drill-down or Roll-down- going from summary to more detailed data.

V. Dicing – projecting 2-D view of data.
VI. Creating Star Schema/snowflake Schema.

VII. Create and populate FACT table.

VIII. Building dimensions.

IX. ETL : Extraction Options

i. Full extraction
ii. Incremental extraction
iii. Change Data Capture(CDC)
X. ETL: Transformation Options

iv. Transformation: during extraction, in staging area, during load, etc.

v. Multi-state transformation
vi. Pipelined transformation
XI. ETL: DW Load options

vii. Loader: SQL(DML)
viii. Data Pump
XII. DW index design options

ix. B*tree index – how they work
x. Bitmapped index – how they work
xi. NULL value considerations

CSE/IT 452	Machine Learning LAB	L	T	P	M
0		**0**		**3**	100

Learn Python programming/R- language and implement one program on below topics

1. Conditional probability and Bayes rule
2. PMF,CDF and PDF
3. Classification: Identifying to which category an object belongs to.
4. Regression: Predicting a continuous-valued attribute associated with an object.
5. Clustering: Automatic grouping of similar objects into sets
6. Dimensionality reduction: Reducing the number of random variables to consider.
7. Pre-processing: Feature extraction and normalization.

CSE/IT 421	INDUSTRIAL ECONOMICS	L	T	P	M
		4	1	0	100

UNIT I: INTRODUCTION TO ECONOMICS **15hours**

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis – V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II: VALUE ENGINEERING **18 hours**

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor – Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III: CASH FLOW **15 hours**

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV: REPLACEMENT AND MAINTENANCE ANALYSIS **18 hours**

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

DEPRECIATION

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

References

- PanneerSelvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001.
- Chan S.Park, “Contemporary Engineering Economics”, Prentice Hall of India, 2011.
- Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics and analysis” Engg. Press, Texas, 2010.
- Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, New York, 2011.
- Zahid A khan: Engineering Economy, “Engineering Economy”, Dorling Kindersley, 2012

CSE/IT 422 MOBILE COMPUTING L T P M

4 1 0 100

UNIT-I 18 periods

Introduction: Mobility of Bits and Bytes – Wireless-The Beginning – Mobile Computing – Dialogue Control– Networks – Middleware and Gateways – Application and Services (Contents) – Developing Mobile Computing Application s- Security in Mobile Computing – Standards-Why is it Necessary? – Standard Bodies – Players in the Wireless Space.

Mobile Computing Architecture: Internet-The Ubiquitous Network – Architecture for Mobile Computing – Three-Tier Architecture – Design Considerations for Mobile Computing – Mobile Computing through Internet – Making Existing Applications Mobile-Enabled.

Mobile Computing Through Telephony: Evolution of Telephony – Multiple Access Procedures – Mobile Computing through Telephone – Developing an IVR Application – Voice XML – Telephony Application Programming Interface (TAPI).

Emerging Technologies: Introduction – Bluetooth – Radio Frequency Identification (RFID), WiMAX –Mobile IP – IPv6 – Java Card.

UNIT-II 15 periods

Global System for Mobile Communications (GSM): GSM Architecture – Entities – Call Routing in GSM –PLMN Interfaces – GSM Addresses and Identifiers – Network Aspects in GSM – GSM Frequency Allocation –Authentication and Security.

Short Message Service (SMS): Mobile Computing over SMS – SMS – Value Added Services through SMS –Accessing the SMS Bearer.

GPRS: Packet Data Network – Network Architecture – Network Operations – Data Services in GPRS –Applications for GPRS – Limitations – Billing and Charging.

Wireless Application Protocol (WAP): Introduction – WAP – MMS – GPRS Applications.

UNIT-III 158periods

CDMA and 3G: Introduction – Spread-Spectrum Technology – Is-95 – CDMA Vs GSM – Wireless Data – 3GNetworks & Applications

Wireless LAN: Introduction – Advantages – IEEE 802.11 Standards – Architecture – Mobility – Deploying –Mobile Ad Hoc Networks and Sensor Networks – Wireless LAN Security – Wi-Fi Vs 3G.

Internet Networks and Interworking: Introduction – Fundamentals of Call Processing – Intelligence in the Networks – SS#7 Signalling – IN Conceptual Model – Soft switch – Programmable Networks –Technologies and Interfaces for IN.

Client Programming: Introduction – Moving Beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile Phones – PDA – Design Constraints in Applications for Handheld Devices.

UNIT-IV **12 periods**

Android OS

Wireless Devices with Windows CE: Introduction – Different Flavors of Windows CE – Windows CE Architecture – Windows CE Development Environment.

TEXT BOOKS:

1. Asoke K Talukder & Roopa R.Yavagal, "Mobile Computing – Technology Applications and Service Creation", TMH 2006.

REFERENCE BOOKS:

1. Uwe Hansmann, Lother Merk, Martin S.Nicklous, Thomas Staber, "***Principles of Computing***", 2/e, Springer International Edition.

2. J.Schiller, "***Mobile communications***", Addison-Wesley, 2003

423(A) **SOFT COMPUTING** **L T P M**
4 1 0 100

UNIT I : INTRODUCTION 18 hours

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models – important technologies – applications.

Fuzzy logic: Introduction – crisp sets- fuzzy sets – crisp relations and fuzzy relations: Cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets.

Genetic algorithm- Introduction – biological background – traditional optimization and search techniques – Genetic basic concepts.

UNIT II : NEURAL NETWORKS 18 hours

McCulloch-Pitts neuron – linear separability – hebb network – supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, TDNN-associative memory network: auto-associative memory network, hetero-associative memory network, BAM, Hopfield networks, iterative autoassociative memory network & iterative associative memory network –unsupervised learning networks: Kohonen self-organizing feature maps, LVQ – CP networks, ART network.

UNIT III : FUZZY LOGIC 15 hours

Membership functions: features, fuzzification, methods of membership value assignments-Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

UNIT IV : GENETIC ALGORITHM 18 hours

Genetic algorithm and search space – general genetic algorithm – operators – Generational cycle – stopping condition – constraints – classification – genetic programming – multilevel optimization – real life problem- advances in GA

HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS

Neuro-fuzzy hybrid systems – genetic neuro hybrid systems – genetic fuzzy hybrid and fuzzy genetic hybrid systems – simplified fuzzy ARTMAP – Applications: A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, soft computing based hybrid fuzzy controllers.

Text Books:

1. Principles of Soft Computing, S.N. Deepa S.N. Sivanandam, 2ed - Wiley India
2. Foundations of Neural Networks, Fuzzy Systems, and Knowldge Engineering, Nikola K. Kasabov, MIT Press, 1998
3. Neural Networks, Fuzzy Logis and Genetic Algorithms : Synthesis, and Applications, S. Rajasekaran, and G. A. VijayalakshmiPai, Prentice Hall of India, 2007

423 (B) **Data Analytics** **L T P M**
4 1 0 100

UNIT I **18 Periods**

INTRODUCTION TO BIG DATA: Big Data – Definition, Characteristic Features – Big Data Applications - Big Data Vs Traditional Data - Risks of Big Data - Structure of Big Data - Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability - Evolution of Analytic Processes, Tools and methods - Analysis Vs Reporting - Modern Data Analytic Tools.

UNIT II **12 Periods**

HADOOP FRAMEWORK: Distributed File Systems - Large-Scale File Systemorganization – HDFS concepts - MapReduce Execution, Algorithms using MapReduce, Matrix-Vector Multiplication – Hadoop YARN

UNIT-III **18 Periods**

DATA ANALYSIS: Statistical Methods:Regression modelling, Multivariate Analysis - Classification: SVM & Kernel Methods - Rule Mining - Cluster Analysis, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods, Clustering High Dimensional Data - Predictive Analytics – Data analysis using R.

UNIT IV15 Periods

MINING DATA STREAMS: Concepts – Stream Data Model and Architecture - Sampling data in a stream - Mining Data Streams and Mining Time-series data - Real Time Analytics Platform (RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

References:

1. Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, Wiley and SAS Business Series, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.
3. Michael Berthold, David J. Hand, ―Intelligent Data Analysis‖, Springer, Second Edition, 2007.
4. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
5. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
6. Richard Cotton, "Learning R – A Step-by-step Function Guide to Data Analysis, , O‘Reilly Media, 2013.

423 (C) Internet of Things through Arduino programming **L T P M**
4 1 0 100

UNIT-I18 Periods

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs, IoT & M2M Machine to Machine, Difference between IoT and M2M, Software define Network

UNIT II **15 Periods**

Network & Communication aspects Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination, Challenges in IoT Design challenges, Development challenges, Security challenges, other challenges

UNIT-III12 Periods

Domain specific applications of IoT Home automation, Industry applications, Surveillance applications, Other IoT applications,

UNIT-IV 18 Periods

Developing IoTs Introduction to Python, Introduction to different IoT tools, developing applications through IoT tools, developing sensor based application through embedded system platform, Implementing IoT concepts with python

Text books:

1. From Internet of Things to Smart Cities: Enabling Technologies,Hongjian Sun, Chao Wang, Bashar I. Ahmad
2. Internet of Things: A Hands-On Approach,ArshdeepBahga, Vijay Madisetti ,universities press
3. Learning Internet of Things By Peter Waher Packt Publishing Ltd
4. Internet of Things with Python ,GastnCHillar,Packt Publishing Ltd

423 (D) **Digital Image Processing** **L T P M**
4 1 0 100

UNIT I **18 Periods**

IMAGE PROCESSING FOUNDATIONS: Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture

SHAPES AND REGIONS : Binary shape analysis – connectedness – object labelling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments

UNIT II **18 Periods**

HOUGH TRANSFORM: Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation

UNIT III **15 Periods**

3D VISION AND MOTION : Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline based motion – optical flow – layered motion

UNIT IV **18 Periods**

APPLICATIONS: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

REFERENCES:

1. E. R. Davies, “Computer & Machine Vision”, Fourth Edition, Academic Press, 2012.

2. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.

3. Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.

4. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Third Edition, Academic Press, 2012.

5. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packt Publishing, 2012.

6. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012

CSE 424 (A) **Computer Forensics** **L T P M**
4 1 0 100

UNIT-I **18 Periods**

Introduction to Computer Forensics: computer crimes, evidence, extraction, preservation, etc. **Overview of hardware and operating systems**: structure of storage media/devices; windows/Macintosh/ Linux -- registry, boot process, file systems, file metadata.

UNIT-II **15 Periods**

Data recovery: identifying hidden data, Encryption/Decryption, Steganography, recovering deleted files. Digital evidence controls: uncovering attacks that evade detection by Event Viewer, Task Manager, and other Windows GUI tools, data acquisition, disk imaging, recovering swap files, temporary &cache files

UNIT-III **18 Periods**

Computer Forensic tools: Encase, Helix, FTK, Autopsy, Sleuth kit Forensic Browser, FIRE, Found stone Forensic ToolKit, WinHex, Linux dd and other open source tools.

Network Forensic: Collecting and analyzing network-based evidence, reconstructing web browsing, email activity, and windows registry changes, intrusion detection, tracking offenders, etc.

Mobile Network Forensic: Introduction, Mobile Network Technology, Investigations, Collecting Evidence, Where to seek Digital Data for further Investigations, Interpretation of Digital Evidence on Mobile Network.

UNIT-IV **18 Periods**

Software Reverse Engineering: defend against software targets for viruses, worms and other malware, improving third-party software library, identifying hostile codes-buffer overflow, provision of unexpected inputs, etc.

Computer crime and Legal issues: Intellectual property, privacy issues, Criminal Justice system for forensic, audit/investigative situations and digital crime scene, investigative procedure/standards for extraction, preservation, and deposition of legal evidence in a court of law.

References

1. Digital Forensics with Open Source Tools. Cory Altheide and Harlan Carvey, ISBN: 978-1-59749- 586-8, Elsevier publication, April 2011
2. Network Forensics: Tracking Hackers Through Cyberspace, Sherri Davidoff, Jonathan Ham Prentice Hall, 2012
3. Guide to Computer Forensics and Investigations (4 th edition). By B. Nelson, A. Phillips, F. Enfinger, C. Steuart. ISBN 0-619-21706-5, Thomson, 2009. •
4. Computer Forensics: Hard Disk and Operating Systems, EC Council, September 17, 2009

CSE 424 (B) **Social Network Analysis** **L T P M**
4 1 0 100

UNIT-I **12 Periods**

Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily. Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks

UNIT-II **18 Periods**

Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Epidemics and information cascades , Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions, Ego networks, Weak ties, Structural holes

UNIT-III **18 Periods**

Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The Erdos Renyi Model, Clustering Models, Preferential Attachment , Navigation in Networks Revisited, Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory

UNIT-IV **15 Periods**

Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioural experiments, Spatial and agent-based models

Reference Books

1. S. Wasserman and K. Faust. Social Network Analysis: Methods and Applications (Cambridge, Cambridge University Press, 1994).
2. D. Easley and J. Kleinberg, Networks, Crowds and Markets: Reasoning about a highly connected world

CSE 424 (C) **High Performance Computing** **L T P M**
4 1 0 100

UNIT- I **15 Periods**

Algorithms and Data Structures: Introduction to vector, list, stack, queue, tree wrt. parallelism. Complexity of algorithms wrt. data structure, e.g., accessing, sorting.
Hashing functions. Realization in C/C++ (STL), C/Java. Object oriented programming (C++, Java).

UNIT-II **15 Periods**

Data structures and performance: complexity, memory hierarchies, and cache aware data structures. Code examples on PCs taking into account cache, vector units of recent CPUs.

UNIT-III **18 Periods**

HPC related Concepts and Architectures: The von-Neumann Computer concept. Flynn's Taxiometry (SISD, SIMD, MISD, MIMD), Topologies of computer/processor networks. , Concurrency and Correctness (data races, atomic operations, deadlock, live lock), shared memory; semaphores/mutex; distributed memory; hybrid environments. Partitioning; Communications; Synchronization; Data Dependencies; Granularity. Limits and Coast of Parallel Programming. Speedup, weak speedup, efficiency; Amdahl's law; Gustavson's law. Review of recent Multi–core processors.

UNIT-IV **18 Periods**

Compiler and Software support for parallel computer architectures : Concurrent and distributed programming based on C/C++/Java. Parallel processing based on Open source tools. Parallel processing based on OpenMP for shared memory systems. 5 Parallel processing based on MPI for distributed memory systems. Grid and Cloud computing. Recent parallel programming standards as OpenCL (CUDA)

References

1. Michael T. Goodrich and Roberto Tamassia. Algorithm Design: Foundations, Analysis and Internet Examples. Wiley, 2003.
[2] Michael T. Goodrich and Roberto Tamassia. Data Structures and Algorithms in Java. Wiley, 4 edition, 2006.
[3] Michael T. Goodrich, Roberto Tamassia, and David M. Mount. Data Structures and Algorithms in C++. Wiley, 2003.
[4] S.J. Hartley. Concurrent Programming – the Java programming language. Oxford University Press, 1998.
[5] John L. Hennessy and David A. Patterson. Computer Architecture: A Quantitative Approach. Morgan Kaufmann Publishers, 3rd edition, 2003.
[6] Maurice Herlihy and Nir Shavit. The Art of Multiprocessor Programming. Morgan Kaufmann, 2008

CSE 424 (D)	Deep Learning	L	T	P	M
		4	1	0	100

UNIT-I **18 Periods**

What is deep learning, Gradient descent, logistic regression, Probability, continuous and discrete distributions; maximum likelihood

UNIT-II **15 Periods**

Output Vs hidden layers; linear Vs nonlinear networks; Deep learning strategies II:RLU and dropouts

UNIT-III **15 Periods**

How to use the SCC cluster; introduction to Tensorflow. Please bring your laptop to class, this will be an interactive tutorial

UNIT-IV **18 Periods**

Convolutional neural networks, Deep Belief Nets, Recurrent neural networks, Other DNN variants (Kate)

References

1.Ian Goodfellow, Yoshua Bengio, Aaron Courville. Deep Learning.

2. Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classication. Wiley-Interscience. 2nd Edition. 2001.

3. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.

4. Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.

CSE 461 (A) **Soft Computing through MATLAB** **L T P M**
4 1 0 100

1. Create a perceptron with appropriate no. of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights.

2 Create a simple ADALINE network with appropriate no. of input and output nodes. Train it using delta learning rule until no change in weights is required. Output the final weights.

3 Train the autocorrelator by given patterns: A1=(-1,1,-1,1), A2=(1,1,1,-1), A3=(-1, -1, - 1, 1). Test it using patterns: Ax=(-1,1,-1,1), Ay=(1,1,1,1), Az=(-1,-1,-1,-1).

4 Train the hetrocorrelator using multiple training encoding strategy for given patterns: A1=(000111001) B1=(010000111), A2=(111001110) B2=(100000001), A3=(110110101) B3= (101001010). Test it using pattern A2.

5 Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform maxmin composition on any two fuzzy relations.

6 Solve Greg Viot's fuzzy cruise controller using MATLAB Fuzzy logic toolbox.

7. Solve Air Conditioner Controller using MATLAB Fuzzy logic toolbox 8 Implement TSP using GA.

CSE 461 (B)	Data Analytics through R Programming	L	T	P	M
		4	1	0	100

Hadoop

1. Install, configure and run Hadoop and HDFS
2. Implement word count / frequency programs using MapReduce
3. Implement an MR program that processes a weather dataset

R Language

4. Implement Linear and logistic Regression
5. Implement SVM / Decision tree classification techniques
6. Implement clustering techniques
7. Visualize data using any plotting framework
8. Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

CSE 461 (C) Internet of things through Arduino ProgrammingL T P M
4 1 0 100

Digital Sensors:

1. Write an arduino program for LED RED, GREEN and BLUE sensors
2. Write an arduino program for touch sensor
3. Write an arduino program for push button sensor
4. Write an arduino program for motion sensor
5. Write an arduino program for buzzer ringing based on the input

Analog Sensors:

4. Write an arduino program for temperature sensor
5. Write an arduino program for gas sensor
6. Write an arduino program for rotation sensor
7. Write an arduino program for light sensor
8. Write an arduino program for ultrasonic sensor
9. Write an arduino program for moisture sensor
10. Write an arduino program for sound sensor
11. Write an arduino program for magnetic sensor
12. Write an arduino program for sending message to the mobile

CSE 461 (D)	Image Processing through MATLAB	L	T	P	M
		4	1	0	100

1: Write a program for image enhancement
2: Write a program for image compression
3: Write a program for color image processing
4: Write a program for image segmentation
5: Write a program for image morphology
6: Image Restoration
7: Edge detection
8: Blurring 8 bit color versus monochrome

Mini Project (Select One)

1. Take a hand written document, Perform pre-processing and try to segment into characters
2. Take an image, design fuzzy rules for content based image retrieval.
3. Take an image, design a neural network for content based image retrieval.