Integral University
STUDY & EVALUATION SCHEME
B.Tech Information Technology

Year 4th, **Semester** VIII

S. No	Course Code	Subject	Periods			Evaluation Scheme				Subject Total
						Sessional Exam			Exam ESE	
			L	T	P	CT	TA	Total		
Theory Subjects										
1.	IIT-801	Data Warehousing & Data Mining	3	1	0	30	20	50	100	150
2.	IIT-802	Human Computer Interaction	3	1	0	30	20	50	100	150
3.		Elective 3	3	1	0	30	20	50	100	150
4.		Elective 4	3	1	0	30	20	50	100	150
5.		Elective 5	3	1	0	30	20	50	100	150
Practicals/Training/Project										
5.	ICS-851	Industrial Interaction	-	-				50		50
6.	ICS-852	Project	-	-	12	-	-	100	150	250
8.	IGP-801	General Proficiency	-	-	-	-	-	50	-	50
		Total	**14**	**5**	**15**	**145**	**100**	**445**	**655**	**1100**

Integral University
STUDY & EVALUATION SCHEME
B.Tech Information Technology

List of Electives

Elective-3

1. Mobile Computing (ICS-031)
2. Expert Systems (IIT-032)
3. Advanced Concepts of TCP/IP (ICS-032)
4. Cloud Computing (IIT-031)

Elective-4

1. Robotic System (IIT-041)
2. Real Time Systems (ICS-041)
3. Fuzzy Logic & Neural Network (ICS-801)

Elective 5-

1. Data Compression (IIT-053)
2. Pattern Recognition (IIT-051)
3. Natural Language Processing (IIT-052)

DATA WAREHOUSING AND DATA MINING
IIT-801
w.e.f. Session 2015-16

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UNIT 1 **[8]**

Overview & Concepts- The Compelling Need for Data Warehousing: Introduction to Data Warehousing, Failures of Past Decision Support System, **Data Warehouse Building Blocks: -**Nature of data in data warehouse, **OLAP in the Data Warehouse:** Major Features and Functions, OLAP Models, Comparison between operational Data Base Systems & Data warehouse.

UNIT 2 **[10]**

Data Warehouses and Data Marts, Overview of Components, Meta data & its types, **Multidimensional Data Model: -** Data cubes, Schemas for multidimensional databases, concept hierarchies, OLAP operations in multidimensional data models, **Data Warehouse Architecture: -** 3-tier architecture, Data Extraction, Transformation, and Loading, **Data Quality:** Why is data Quality Critical? Data Quality Challenges.

UNIT 3 **[9]**

Data Mining: Introduction, Data Mining Functionalities, Classification of Data Mining System; Major Issues in Data Mining, **Data Preprocessing**: Preprocess, Descriptive Data Summarization, Data Cleaning, Data Integration & Transformation, Data Reduction, **Mining**

Frequent Patterns, Association, and Correlations, Basic Concept, Efficient & Scalable Frequent Item set Mining Methods, Mining Various Kinds of Association Rules.

UNIT 4 **[9]**

Classification & Prediction: Issues, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back Propagation, Associative Classification, nearest neighbor classification, Prediction.

UNIT 5 **[10]**

Cluster Analysis: What is Cluster Analysis, Types, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods- cure and chameleon, Density-Based Methods: DBSCAN & OPTICS, Wave Cluster, CLIQUE. **Current trends**: Text mining, web mining.

REFERENCES

1. "Data Warehousing Fundamental" by Paulraj Ponniah,John Wiley & Sons INC.
2. Data Mining,Second Edition; Concepts & Techniques by Jiawei Han & Michline Kamber.
3. Mallach,"Data Warehousing System",McGraw Hill
4. M.H.Dunham, "Data Mining:Introductory and Advanced Topics" Pearson Education

HUMAN COMPUTER INTERACTION
IIT-802
w.e.f. Session 2015-16

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OBJECTIVE
To acquaint with the analysis, design and development aspects of enhancing interactions between human and computer system keeping in view the behavioral and psychological factors of any human

UNIT 1
INTRODUCTION: Introduction to Human -Computer Interaction (HCI); history; human factors of interactive goals of software engineering, goals of user interface design; motivation for human factors in design; accommodation of human diversity.

UNIT 2
HUMAN INFORMATION PROCESSING: Human memory; thinking –reasoning and problem solving; skill acquisition; mental models; decision making; computer system interfaces: mechanics of input and output devices, review of computer architecture; performance characteristics of humans and systems

UNIT 3
PRINCIPLES BEHIND HUMAN – SYSTEM INTERACTION: Paradigms of interaction; principles to support usability. **USER CENTERED DESIGN OVERVIEW:** Software development life cycle – actual, three pillars of design; usability engineering; iterative design and prototyping; design rationale; usability testing

UNIT 4
TASK ANALYSIS: Basic concepts, task decomposition; knowledge based analysis; entity – relationship base analysis; sources of information; uses of task analysis

UNIT 5
SYSTEM DESIGN: Use cases; scenarios; structuring information; information architecture; process flows, wireframes. **DESIGN FOR UNIVERSAL ACCESS:** Access concepts; accessible software; factors driving software accessibility; universal accessibility principles, guidelines and recommendations; case studies.

REFERENCES:

1. Dix Alan, ―Human Computer Interaction‖, Pearson Education, 2002.
2. Carroll John, ―H CI Models, Theories, and Frameworks: Toward a Multidisciplinary Science, Morgan Kaufmann, 2003
3. Clark Ruth Colvin and Mayer Richard Pfeiffer, ―e Learning and the Science of Instruc - tion: Proven Guidelines for Consumers and Designers of Multimedia Learning ‖, 2002
4. Fulleton Tracy, Swain Christopher, and Hoffman Steve, ―Game Design Workshop: Designing, Prototyping , and Playtesting Games‖, CMP Books, USA, 2004
5. Garrett Jesse James, ―A Visual Vocabulary for Information Architecture‖, JJG .Net, USA, 2002
6. Garrett Jesse James, ―The Elements of User Experience‖, New Press Riders, USA, 2002
7. Krug Steve, ―Don't Make Me Think: A Common Sense Approach to Web Usability‖ , New Press Riders, USA, 2000
8. Meigs Tom, ―Ultimate Game Design‖, The McGraw - Hill Companies, USA, 2003
9. Nielsen Jakob, ―Designing Web Usability: The Practice of Simplicity‖, New Press Riders, USA, 1999

10. Salen Katie and Zimmerman Eric, ―Rules of Play: Game Design Fundamentals‖, The MIT Press, USA, 2003

MOBILE COMPUTING
ICS 031
w.e.f. Session 2015-16

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UNIT 1

Introduction to Wireless Communication: Application, Frequencies for radio transmission, Signals, Antennas, Signal propagation, Multiplexing: Space division multiplexing, Frequency division multiplexing, Time division multiplexing, Code division multiplexing, Modulation: Amplitude shift keying, Frequency shift keying, Phase shift keying, Advanced frequency shift keying, Advanced phase shift keying, Spread spectrum: Direct sequence spread spectrum, Frequency hopping spread spectrum, Cellular systems.

UNIT 2

Channel Allocation: Motivation for a specialized MAC, Hidden and exposed terminals, Near and far terminals, SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Carrier sense multiple access with collision detection, Multiple access with collision avoidance.

UNIT 3

Telecommunications systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security; Satellite systems: History, Applications, Basics of GEO, LEO and MEO, Routing, Localization, Handover, Examples; GPRS.

UNIT 4

Wireless LAN: Infra red vs radio transmission, Infrastructure and ad-hoc network, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, 802.11b, 802.11a, Bluetooth: User scenarios, Architecture, Radio layer, Baseband layer. Introduction to WAP architecture and Protocol stack.

UNIT 5

Mobile network layer: Mobile IP: Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6, Dynamic host configuration protocol.

Reference ::

1. Jochen Schiller, " Mobile Communications, Pearson Education, 2nd Edition, 2003.
2. Dharma Prakash Agrawal & Qing-An Zeng " Introduction to Wireless & MobileSystems", Thomson Brooks/Cole, 2nd Edition 2003.
3. Krzysztof Wesolowski, "Mobile Communication Systems ", John Wiley & Sons, Ltd.
4. Ron Olexa, "Implementing 802.11, 802.16 and 802.20 Wireless Networks, Elsevier

EXPERT SYSTEMS
IIT-032
w.e.f. Session 2015-16

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UNIT 1 [7]
Expert System: An Overview**:-** Introduction to Expert System, Major characteristics of Expert System ,Components of Expert System, Conventional Systems vs. Expert Systems, Advantages and limitations of Expert Systems.

UNIT 2 [7]
Architecture of Expert System, Rule Based Expert System, Non Production System, Expert System Development Life Cycle, Application of Expert System, Various Expert System Shell.

UNIT 3 [8]
Knowledge Base**-** Knowledge Engineering, Nature of Expert Knowledge, Knowledge Acquisition and Knowledge Representation, Predicate Logic, Reasoning Under Uncertainty, Semature Nets, Frames, Validity Nature Base, Working Memory.

UNIT 4 [10]
Inference Engine and User Interface, Techniques for Inference Mechanism, Forward Chaining and Backward Chaining, Interface Language, Terminal Interface, Inferencing and Explanation.

UNIT 5 [8]
Development of Expert Systems- Problem Formulation, Search Spaces, Task for Expert System, Application to Engineering Analysis and Design, Consideration, Case Studies of Typical Expert System.

REFERENCES:

1. A Guide to Expert System-Waterman D.A
2. Introduction to Expert System, Jackson, P, International Computer Science Series
3. Expert System: Design and Development, Macmillan.
4. Expert System: Design and Development, John Durkin, PHI

ADVANCED CONCEPTS OF TCP / IP
ICS-032
w.e.f. Session 2015-16

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UNIT 1 [8]
Introduction and Overview: The Motivation for Internetworking, The TCP/IP Internet. The Need to Understand Details, Complexity of Interactions Among Protocols, Use of TCP/IP, Designing Applications for a Distributed Environment Standard and Nonstandard Application Protocols, Application Protocols and Software Complexity, TCP/IP Protocol Suite, Addressing, TCP/IP Versions.

UNIT 2 [8]
IP Addresses: Introduction: Address Space, Notation, Classful Addressing: Recognizing Classes, Netid and Hostid, Classes and Blocks, Network Addresses, Mask, Address Depletion. Other Issues, Multihomed Devices, Location, Special Addresses, Private Addresses, Unicast, Multicast and Broadcast, Addresses, Sub Netting, Super Netting, Subnet Mask, Supernet Mask and Classless Addressing.

UNIT 3 [8]
ARP and RARP: ARP Packet Format, Encapsulation, Operation, ARP Over ATM, Proxy ARP, ARP Package, RARP-Packet Format, Encapsulation, Internet Control Message Protocol(ICMP), Message Format, Checksum, ICMP Package, Internet Group Management Protocol (IGMP), IGMP Messages, IGMP Operation, Encapsulation, IGMP Package, User Datagram Protocol(UDP), Process to Process Communication, Checksum, UDP Operation, UDP Package.

UNIT 4 [8]
Transmission Control Protocol (TCP): Process to Process Communication, TCP Services, TCP Timers, Connection, TCP Operation, TELNET, Concept, Network Virtual Terminal(NVT), File Transfer Protocol(FTP), Trivial File Transfer Protocol (TFTP), Messages, Connection, Data Transfer, Simple Mail Transfer Protocol (SMTP), User Agent, Addresses, Mail Transfer Phases, Multipurpose Internet Mail Extensions (MIME), Mail Delivery, Mail Access Protocol.

UNIT 5 [8]
IP Over ATM, ATM WANs, Carrying a Datagram in Cells, Routing the Cells, Mobile IP, Addressing, Agents, Data Transfer, Real-Time Traffic Over the Internet, Characteristics, Internet Security, Introduction, Privacy, Digital Signature, Firewalls, Private Networks, Virtual Private Networks(VPN), Network Address Transmission(NAT), IP Next Generation, Ipv6 Addresses, Ipv6 Packet Format.

REFERENCES

1. "TCP / IP Protocol Suite", 'Behrouz A. Forouzan', TMH
2. "Internetworking with TCP/ IP- vol-I", 'Douglas E. Comer', Third Edition, PHI
3. Internetworking with TCP/ IP- vol-II", 'Douglas E. Comer', Third Edition, PHI
4. Internetworking with TCP/ IP- vol-III", 'Douglas E. Comer', Second Edition, PHI

CLOUD COMPUTING
IIT-031
w.e.f. Session 2015-16

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COURSE OBJECTIVES:

_ To understand the concept of cloud and utility computing.
_ To understand the various issues in cloud computing.
_ To familiarize themselves with the lead players in cloud.

UNIT 1 **[8]**

INTRODUCTION: Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture -IaaS – On-demand Provisioning – Elasticity in Cloud – E.g.of IaaS Providers - PaaS – E.g. of PaaS Providers - SaaS – E.g. of SaaS Providers – Public ,Private and Hybrid Clouds.

UNIT 2 **[9]**

VIRTUALIZATION: Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization -Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices -Desktop Virtualization – Server Virtualization.

UNIT 3 **[9]**

CLOUD INFRASTRUCTURE : Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT 4 **[10]**

PROGRAMMING MODEL: Parallel and Distributed Programming Paradigms – Map Reduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack.

UNIT 5 **[9]**

SECURITY IN THE CLOUD: Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security.

COURSE LEARNING OUTCOME:

Upon Completion of the course, the students should be able to: _ Articulate the main concepts, key technologies, strengths and limitations of cloud computing _ Identify the architecture, infrastructure and delivery models of cloud computing _ Explain the core issues of cloud computing such as security, privacy and inter operability _ Choose the appropriate technologies, algorithms and approaches for the related issues.

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From
2. Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly, 2009.
6. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
7. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer, 2010.

ROBOTIC SYSTEM
IIT-041
w.e.f. Session 2015-16

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UNIT 1 **[8]**
Introduction: Classification of Robots, Basic Robot Components, Manipulator End Effectors, Controller, Power Unit, Sensing Devices, Specification of Robot System, Accuracy Precision and Repeatability. Coordinate Systems: Cartesian Coordinates, Transformation Matrices, Reference Frame Transformations, Orientation, Inverse Transformations, and Graphs.

UNIT 2 **[9]**
Robotic Sensing Devices: Position, Velocity and Acceleration Sensors, Proximity and Range Sensors, Touch and Slip Sensors, Tectile Sensors, Force and Torque Sensors. Robotic Vision System: Imaging Components Picture Coding, Object Recognition, Training and Vision Systems, Review of Existing System.

UNIT 3 **[9]**
Robotics Programming: Methods of Robotics Programming, Types of Programming, Robotics Programming Language, Artificial Intelligence. Robot Application: Material Transfer and Machine Loading Unloading, Processing Applications, Welding and Painting Assembly and Inspection, Future Robotic Application and Related Technologies Development.

UNIT 4 **[8]**
Image Identification: Lenses, Vidicon Tube, Solid-State Vision System, Image Process Binary Image Analysis Identification, The Transformation. Actuators and Power Transmission Devices: Pneumatic and Hydraulic Actuators, Electrical Actuators, Power Transmission Trajectory Planning & Control: Manipulator Equations of Motion Manipulator Control, The Measure of the Robot.

UNIT 5 **[8]**
Control: Basic Concepts in Control Systems, Digital Control for Positions. System Integration: Mechanism, Actuators and Sensors.

REFERENCES

1. Introduction to Robotics, J.craig, Addision Wesley
2. Robotics Engineering: Klafter, chemielwski and nagrin, Prentice hall.
3. Fundamental of Robotics analysis and control: Robert J. Schiling
4. Robotics: K. S. Fu, R.c. Gonzalez, C.S.g lee, TMH

REAL TIME SYSTEMS
ICS-041
w.e.f. Session 2015-16

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UNIT 1 [6]
Introduction- Introduction to Real Time Systems, Structure of Real Time System, Various Classification of Real Time Systems, Embedded System, Characterizing Real Time System & Task, Various Issues in Real Time System.

UNIT 2 [10]
Task Assignment & Scheduling- Classical Uniprocessor Scheduling Algo- Rate Monotonic, EDF. Uniprocessor Scheduling of IRIS Tasks, Identical and Nononidentical Linear & Concave Reward Function, 0/1 Reward Function. Task Assignment Algorithms- Utilization Balancing, A Next-Fit Algorithm for RM Scheduling, A Myopic Offline Scheduling FAB Algorithm & Buddy Strategy.

UNIT 3 [8]
Real Time Database: Real Time vs. General purpose Database, Main Memory database, Concurrency Control Issues , Real Time OS- Threads and Tasks, Kernel, Case Study of QNX, VRTX, Vx Works.

UNIT 4 [8]
Fault Tolerance Techniques- Introduction Fault, Fault Detection and Error Containment, Redundancy Data Diversity, Reversal Checks, Malicious & Integrated Failure Handling. Clock Synchronization: Introduction Clocks, A Nonfault Tolerant Synchronization Algorithms, Impact of Fault, Fault Tolerant Synchronization in H/Wand S/W.

UNIT 5 [8]
Real Time Communication- Introduction, N/W Topologies, Protocols: Internet & Resource Reservation Protocols, Real Time Protocol, Contention-Based Protocol.

REFERENCE

1. C.M. Krishna & Shin, “Real Time Systems”, Mc Graw Hill 1985.
2. Jane W.S. LIU, “Real Time Systems”, Pearson Education”.
3. Levi & Agarwal, “Real Time System”, McGraw Hill.

FUZZY LOGIC AND NEURAL NETWORKS
ICS-801
w.e.f. Session 2015-16

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UNIT 1 **[8]**

Introduction, History of Neural Networks, Structure and Function of a Single Neuron, Architectures and Their Applications, Supervised Learning: Single Layer Networks: Perceptrons, Linear Seperability, Perceptron Training Algorithms and Their Modifications: Pocket Algorithm and Adaline. **Supervised Learning**: Multiplayer Networks: Multilevel Discrimination, Preliminaries, and Backpropagation Algorithm, Setting the Parameters Values, Accelerating the Learning Process.

UNIT 2 **[8]**

Adaptive Multilayers Networks: Network Pruning Algorithms, Marchands Algorithm, Upstart Algorithm, Cascade Correlation. **Prediction Networks:** Feed Forward Networks for Forecasting, Recurrent Networks (Partially, Fully), Radial Basis Functions and Probabilistic Neural Networks.

UNIT 3 **[8]**

Unsupervised Learning: Winner-Take-All Networks: Hamming Networks, Maxnet; Learning Vector Quantization, Counter Propagation Networks(Forward Only Counter Propagation networks) , Adaptive Resonance Theory(ART1), K-Means Clustering Algorithms, Kohonens Self Organization Maps, Principle Component Analysis.

UNIT 4 **[8]**

Fuzzy Logic: Fuzzy Sets, Properties, Operation on Fuzzy Sets, Fuzzy Relations, Operation on Fuzzy Relations, Fuzzy IF-THEN Rules, Variable Inference Techniques, Fuzzification and Defuzzification Methods, Fuzzy System Design.

UNIT 5 **[8]**

Associative Models: Auto-Association, Hetro-Association, Hopefield Networks, Brain State-In-A-Box Networks, and Boltzman Machines. **Optimization Methods:** Optimization Using Hopefield Networks, Introduction to Simulated Annealing and Ant Colony Optimization and Evolutionary Computation, Introduction to Hybrid Systems.

REFERENCES:

1. Kishan Mehrotra, Chilukuri K. Mohan, Sanjay Ranka, Elements of Artificial Neural Networks, MIT Press/Penram International.
2. Simon Haykin, Neural Network a comprehensive Foundation, Macmillan College, proc, Con, Inc.
3. Ross T.J., Fuzzy Logic with Engineering Applications, McGraw-Hill.
4. Zurada J.M., Introduction to Artificial Neural Systems, Jaico Publishers.
5. Riza C. Berkiu and Trubatch, Fuzzy system Design Principles, Building Fuzzy IF-THEN Rule Bases, IEEE Press.
6. Goldberg D.E., Genetic Algorithms in Search Optimization and Machine Learning, Addison Wesley.
7. Dorigo and Thomas Stützle, Ant Colony Optimization, MIT Press.
8. Intelligent Hybrid Systems, Suran Goonatilake and Sukhdev Khebbal (Eds.), Intelligent Hybrid Systems, John Wiley.

DATA COMPRESSION
IIT-053
w.e.f. Session 2015-16

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UNIT 1 [7]
Introduction: 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 2 [7]
Huffman Coding: The Huffman Coding Algorithm: Minimum Variance Huffman Codes. Adaptive Huffman Coding: Update Procedure, Encoding procedure, Decoding Procedure, Golomb. Codes, Rice Codes, Tunstall codes. Application of Huffman Coding. Lossless image compression, Text compression, Audio Compression.

UNIT 3 [8]
Arithmetic Coding: 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.

UNIT 4 [8]
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, CALlC, JPEG-LS, Multiresolution Approaches, Facsimile Encoding, Dynamic Markov Compression.

UNIT 5 [12]
Mathematical Preliminaries for Lossy Coding: Distortion Criteria, Models. Scalar Quantization: The Quantization Problem, Uniform Quantizer, Adaptive Quantization, Non
Uniform Quantizaion.
Vector Quantization: Advantages of Vector Quantization Over Scalar Quantization, The Linde - Buzo-Gray Algorithm, Tree Structured Vector Quantizers, Structured Vector Quantizers.

REFERENCES:

1. Introduction to Data Compression, Khalid Sayood, Morgan Kaufmann Publishers.
2. Data Compression: The Complete Reference, Third Edition by David Salomon, Springer,New york, 2004

PATTERN RECOGNITION
IIT-051
w.e.f. Session 2015-16

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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 Patten 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 Neighbour Estimation, Nearest Neighbour Rule, Fuzzy classification.

UNIT - V
Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partition clustering – K-means, agglomerative hierarchical clustering, Cluster validation.

REFERENCES:

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

NATURAL LANGUAGE PROCESSING
IIT-052
w.e.f. Session 2015-16

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UNIT 1 **[8]**

Introduction to Natural Language Understanding. What is NLU? Evaluating Computational Models of Language Knowledge and Language. **Linguistic Background**: An Outline of English. Words. The Elements of Simple Noun Phrase. The Elements of Simple Sentences. Prepositional Phrases. Embedded Sentences. Complements. Adjective Phrases. **Representation and Ambiguity**.

UNIT 2 **[9]**

Morphology fundamentals; Morphological Diversity; Morphology Paradigms. **Structures:**

Theories of Parsing, Basic Parsing Techniques: Grammars and Sentence Structure. What Makes A Good Grammar, Top-Down Parsing Methods, Bottom-Up Parsing Methods, Mixed Mode Methods. Rule Based and Probabilistic Parsing.

UNIT 3 **[8]**

N-gram language models; smoothing; interpolation; backoff. **POS Tagging**; HMMs and POS, Viterbi Algorithm, techniques or algorithms for stemming, Porter stemmer, Evaluation of POS taggers. Concept of Stop words. Scope Ambiguity and Attachment Ambiguity resolution.

UNIT 4 **[8]**

Representing meanings: Semantics and a Logical Form: Computational semantics and lexical semantics, Semantic Interpretation: The Basic Operations for Semantic Interpretation. Lexical Knowledge Networks. The Interpretation Algorithm. An Example; Assigning Case Roles. Embedded and Non-Embedded Sentences. Rule Hierarchies.

UNIT 5 **[8]**

Applications of AI: Machine Translation, Sentiment Analysis, Query expansion, Information retrieval system, Word Sense Disambiguation.

REFERENCES

1. JAMES ALLEN, Natural Language Understanding, 2/e, Pearson Education, 2003.
2. D. JURAFSKY, J. H. MARTIN, Speech and Language Processing, Pearson Education, 2002.
3. CHRISTOPHER D. MANNING, HINRICH SCHOTZE, Foundations of Statistical Natural Language Processing, The MIT Press, Cambridge, Massachusetts.1999.
4. AKSHAR BHARATI, VINEET CHAITANYA, and RAJEEV SANGAL, NLP: A Paninian Perspective ,Prentice Hall, New Delhi, 1994.
5. T. WINOGRAD. Language as a Cognitive Process, Addison-Wesley, 1983.

PROJECT
ICS-852
w.e.f. Session 2015-16

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Students will complete the project identified in previous semester, coding, implementation etc of the project should be done in this semester. At the end of the semester, student will submit detail project report and soft copy of project work which will be evaluated by the expert from the University.