

COURSE NAME : ARTIFICIAL INTELLIGENCE

COURSE CODE: CS 465

CREDITS: 4

L T P: 4 0 0

LECTURE WISE BREAKUP NO. OF LECTURES

AI Techniques, Importance, functions, advantages, as well as the limitations of AI
(04)

Use of Artificial Intelligence and Intelligent Agents **(04)**

State, Space, Search, Control strategies, Heuristic search, Problems characteristics,
(04)

Production system characteristics.

Approaches to knowledge representation, Predicate logic, Resolution in predicate logic,
(04)

Semantic nets, Frame, Conceptual dependency, Scripts

Procedural v/s Declarative knowledge, Matching, Conflict resolution,
commonsense reasoning **(04)**

Non-monotonic reasoning, Default reasoning, Statistical reasoning, Knowledge **(04)**
extraction, Expert system concept, Differences with regard to conventional software
systems, Players in expert system development, some examples of expert systems
Investigate the roles and advance methods of artificial intelligence in decision making
processes **(04)**

Neural network resources, Cognitive science, Role of neural network in computer science
(04)

AI languages, LISP **(04)**

AI problems: Pattern (biological sequence) recognition, Voice recognition,
Feature extraction **(04)**

BOOK:

1. Artificial Intelligence by Rich and Kinght, TMH

REFERENCES:

1. Introduction to Artificial Intelligence by Charniak and Mcdermott, Addison-Wesley
2. Artificial Intelligence : A new synthesis by Nils and Nilson, Elsevier
3. Artificial Intelligence by Luger, Pearson Education
4. Artificial Intelligence by Padhy, Oxford Press
5. Artificial Intelligence: A modern approach by Stuart Russel, Pearson Education

CS 465H, ARTIFICIAL INTELLIGENCE

Commonsense reasoning, Planning, Baysian networks,Markov Chain and Monte Carlo sampling, Support vector machines(SVMs), computational graph theory, probabilistic inference and learning.

COURSE NAME : **MULTIMEDIA COMMUNICATIONS & TECHNOLOGY**
COURSE CODE : **CS 466**
CREDITS : **4**
PREQ : **COMPUTER NETWORKS**
LTP : **4 0 0**

LECTURE WITH BREAKUP **NO. OF LECTURES**
Foundation **(04)**

Benefits and problems associated with multimedia, elements of Multimedia System, Technology for multimedia, Multimedia Hardware and Software, Application of Multimedia, Issues and Objectives of multimedia, Structural Multimedia Development & User Interfaces.

Audio-visual and image processing **(10)**

Media interaction, audio visual mapping, challenges of multimedia processing, image, audio and video coding in multimedia, audio, video and image capture and their compression standards and techniques, speech and audio sampling and quantization, frequency domain characterization and processing of speech and audio signals, speech and audio coding standards, color perception and representation, basic image processing tools, image coding standards

Image and Video coding standards: **(10)**

Image coding: DCT/subband/VQ, Image coding: JPEG, Video coding: ITU-T H.261, H.263, H.263 Version 2, Video coding: ISO MPEG-1, MPEG-2, Systems: MPEG-1, MPEG-2, MPEG-4 Systems

Multimedia communications **(08)**

Multimedia communication model, user and network requirements, signal processing in networks, video on demand broadcasting protocols, IP telephony technology and standards, VOIP, building multimedia networks with cable and broadcast communication. Networking issues: error resilience, network characteristics, Quality of Service (QoS) Error resilience in video codecs: H.26x and MPEG, Multimedia over IP: Multicast, RTP/RTCP, packetization, streaming, Multimedia transport over the Internet and wireless network

Distributed multimedia systems **(08)**

Features and resource management of distributed management systems, networking in DMS, multimedia operating systems, applications

Storage for multimedia **(04)**

Types of storage - analog and digital media and Optical devices, Standards and processing parameters, Multimedia servers

BOOK:

1. K. R. Rao, Z. S. Bojkovic, D. A. Milovanovic, *Multimedia Communication Systems: Techniques, Standards, and Networks*, Prentice Hall PTR, 2002.

REFERENCES:

- 1) J. McClellan, R. Shafer and M. Yoder, DSP First: A Multimedia Approach, Prentice Hall, 1997.
- 2) Gonzalez and Woods, Digital Image Processing, 2nd ed., Prentice Hall, 2002.
- 3) Multimedia Making it work: Von Haughan, TMH
- 4) Multimedia Communications: Jerry D. Gibson, Harcourt India Private Limited
- 5) Multimedia Technology & Application, David Hillman, Galgotia Publication, 1998

CS 466H, MULTIMEDIA COMMUNICATIONS & TECHNOLOGY

Introduction to Scientific Visualization and Virtual Reality, 3D interaction; immersive and non-immersive systems, CASE study of multimedia work stations, scalable video coding, Multimedia Networking: End-to-End QoS for video delivery, Wireless video, Error control in Video streaming, multimedia in Mobile networks, Content based retrieval in digital library, Video on demand, Video conferencing.

COURSE NAME : DEPARTMENTAL LAB VI
COURSE CODE : CS 467
CREDITS : 02
L T P : 0 04

Programs and problems based on the courses of Artificial Intelligence.

COURSE NAME : DEPARTMENTAL LAB VII
COURSE CODE : CS468
CREDITS : 02
L T P : 0 04

Programs and problems based on the courses of Multimedia Communication and Technologies.

COURSE NAME : CAPSTONE PROJECT-II
COURSE CODE : CS 499

COURSE NAME : UNIX NETWORK PROGRAMMING
COURSE CODE : CS 469
CREDITS : 4
L T P : 4 0 0

LECTURE WISE BREAKUP **NO. OF LECTURES**

UNIX MODEL **(4)**
Introduction, Basic Definitions, Input and Output, Signals, Process Control, Daemon Processes

THE UNIX FILE SYSTEM AND SHELL INTRODUCTION **(4)**
The Shell:Executing commands and command options; Interactive features: job control, history; The UNIX file system; File Utilities (cp, mv, rm, etc.); comm, cmp, diff; Tree walking: find, xargs

INTER PROCESS COMMUNICATION **(4)**
Introduction, Pipes and FIFOs, Message Queues, Read-Write Locks, Record Locking, Semaphores, Shared Memory.

COMMUNICATION PROTOCOLS **(4)**
XNS, SNA, NETBIOS, OSI Protocols, UUCP

INTRODUCTION TO TCP/IP, THE TRANSPORT LAYER **(4)**
TCP, UDP and SCTP, TCP Connection Establishment and Termination, SCTP Association Establishment and Termination, Port Numbers, Buffer Sizes and limitations.

SOCKETS **(4)**
Sockets Introduction, TCP Sockets, UDP Sockets, SCTP Sockets,

SOCKETS PARTII **(4)**
I/O Multiplexing, Socket Options, Name and Address conversions, TCP, UDP and SCTP Examples.

Introduction to Ipv4 and Ipv6 Interoperability, Daemon Processes, Advanced I/O Functions. **(4)**

UNIX Domain Protocols, Nonblocking I/O, Routing Sockets, Out-of-band data. **(4)**

Signal Driven I/O, Threads, Raw Sockets **(4)**

Remote Login, Remote Command execution, Remote Tape drive access, Remote procedure calls. **(4)**

BOOK:

UNIX Network programming by W. Richard Stevens

REFERENCES:

1. UNIX Network programming – The sockets networking API Vol 1 by W. Richard Stevens
2. UNIX Network programming – Interprocess Communications by W. Richard Stevens
3. UNIX Network programming Vol – 1 by W. Richard Stevens
4. Internet working with TCP/IP Vol III by Douglas
5. The protocols by W.Richard Stevens

6. Internet working with TCP/IP Vol I, principles and Architecture by Douglas

COURSE NAME : **COMPUTER GRAPHICS**
COURSE CODE : **CS 470**
CREDITS : **04**
L T P : **4 0 0**

LECTURE WISE BREAKUP

NO. OF LECTURES

Graphics Hardware: (6)
Introduction, Application areas of Computer Graphics, overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and workstations and input devices.

Output primitives: (4)
Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms.

Filled area primitives: (4)
Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

2-D geometrical transforms: (4)
Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D viewing: (6)
The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Liang-Barsky line clipping algorithms, Sutherland –Hodgeman and Weiler-Atherton polygon clipping algorithm.

3-D object representation: (6)
Polygon surfaces, quadric surfaces, spline representation, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon-rendering methods..

3-D Geometric transformations: (6)
Translation, rotation, scaling, reflection and shear transformations, composite transformations. 3-D projections.

Visible surface detection methods: (4)
Classification, back-face detection, Hidden surface removal algorithms.

Illumination Models and Shading: (5)
Gouraud Shading, Phong Shading.

Interactive Computer Graphics techniques (5)

BOOKS:

1. “Computer Graphics C version”, Donald Hearn and M.Pauline Baker, Pearson Education
2. “Computer Graphics Principles & practice”, second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

REFERENCES:

1. "Computer Graphics", second Edition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education.
2. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition.
3. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
4. "Principles of Interactive Computer Graphics", Newman and Sproul, TMH.
5. Computer Graphics, Steven Harrington, TMH.

COURSE NAME : COMPILER DESIGN
COURSE CODE : CS 471
CREDITS : 04
L T P : 4 0 0

LECTURE WISE BREAKUP

NO. OF LECTURES

COMPILER STRUCTURE	(6)
Analysis-synthesis model of compilation, various phases of a compiler, passes of compilers, bootstrapping, tool based approach to compiler construction.	
PHASES OF COMPILERS	(6)
Lexical analysis: Interface with input, parser and symbol table, token, patterns. Difficulties in lexical analysis. Error reporting. Implementation. Regular definition, One-pass compilation techniques, Transition diagrams, implementation techniques, use of lexical analyzer generators LEX, specific source language issues.	
SYNTAX ANALYSIS AND BASIC PARSING TECHNIQUES	(8)
Syntax directed definitions like Inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions. CFGs, derivations and parse trees, ambiguity, associativity, precedence, use of syntax analyzer generators, top down parsing, shift reduce parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence grammars, LR(k) parsing (SLR, LALR, LR), YACC.	
AUTOMATIC CONSTRUCTION OF SOME EFFICIENT PARSERS	(8)
Canonical collection of LR(0) items, constructing SLR parsing tables, constructing LR parsing table, constructing LALR parsing tables, ambiguous grammars usages, implementation of LR parsing tables, constructing LALR sets of items.	
INTERMEDIATE CODE GENERATION	(4)
Syntax directed translation schemes and their implementation, Intermediate languages, quadruples and triples, assignment statements, boolean expressions, array references, procedure calls, declarations, case statements.	
SEMANTIC ANALYSIS	(4)
Type checking, type system, type expressions, structural and name equivalence of types, type conversion, overloaded functions and operators, polymorphic functions.	
RUN TIME SYSTEM AND OPTIMIZATION	(4)

Storage organization, activation tree, activation record, parameter passing, symbol tables, data structures for symbol tables, handling recursive calls, global optimization through flow graph analysis, dynamic storage allocation, local optimization techniques, loop optimization techniques, loop-invariant, peephole optimization.

ERROR DETECTION AND RECOVERY (4)

Introduction to errors in all phases of compilers, lexical-phase errors, synthetic phase errors, semantic errors and various recovery methods.

CODE GENERATION AND INSTRUCTION SELECTION (6)

Issues, basic blocks and flow graphs, register allocation, code generation, DAG representation of programs, code generation from dags, code generator generators, specifications of machine, Compiler-Compilers, Parser generators, machine independent code generation

COMPILER HONOURS:

Study of LEX, Study of YACC, Study of design of various code optimization techniques used in the advanced compilers, Study of parallelism and Garbage collection techniques.

BOOK:

1. V. Aho, R. Sethi, and J. D. Ullman. *Compilers: Principles, Techniques and Tools* , Addison-Wesley.

REFERENCES:

1. C. Fischer and R. LeBlanc. *Crafting a Compiler* , Benjamin Cummings, 1991.
2. A. C. Holub. *Compiler Design in C* , Prentice-Hall Inc., 1993.
3. Dhamdhare. *Compiler Construction* , McMillan India.
4. Dick Grune, Henri E Bal .*Modern Compiler Design*, Wiley
5. Wirth. *Compiler Construction* , Addison-Wesley.

COURSE NAME : KNOWLEDGE BASED SYSTEM & ROBOTICS

COURSE CODE: CS 472

CREDITS: 4

L T P: 4 0 0

LECTURE WISE BREAKUP

NO. OF LECTURES

A brief history of expert systems, Expert system concept, Differences with regard to conventional software systems (04)

Applications of Expert Systems, Knowledge Engineering (04)

Inference engine, Knowledge base, Knowledge acquisition components, Expert system shell (04)

Classification of knowledge, Knowledge representation and reasoning approaches (declarative, procedural, combined) (04)

Hierarchical classification, Scripts, Object-oriented approaches, Hybrid (04)

Approaches, Predicate logic, Rule based systems, Forward and Backward chaining, Semantic nets, Conceptual graphs, Frames (04)

Participants in expert system development, Process of expert system development, Rapid prototyping, Knowledge acquisition methods (04)

Effective knowledge base implementation approaches, Inference engines (04)
 An introduction of robotics, Need of control programs and the uses of robots in (04)
 industrial situations, Examples of Pick and Place, Gantry and Arm type Robots in
 typical set-ups, Robotic arms and End Effectors
 Application of robotics (04)

BOOK:

1. Knowledge-based systems & AI by: George Luger, Pearson Education

REFERENCES:

1. Expert Systems : Principles and Programming by J. Giarratano and G. Riley, PWS Publishing Company
2. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig Prentice Hall
3. Building Large Knowledge-Based Systems by Douglas B. Lenat, R.V. Guha
4. Fundamentals of Robotics : Analysis and Control by Robert J Schilling, PHI
5. Computer Vision for Robotic Systems by Fairhunt, PHI

COURSE NAME : SOFT COMPUTING

COURSE CODE: CS 473

CREDITS: 4

L T P: 4 0 0

LECTURE WISE BREAKUP NO. OF LECTURES

Fundamentals of Artificial Neural Networks & Applications,	(04)
Characteristics of ANNs The Biological Prototype, Perceptron, Multilayer NN	(04)
Learning Methods	(04)
Backpropagation, Counterpropagation, ART, BAM, Associative memories	(04)
Introduction to Fuzzy Logic, Fuzzy sets, Fuzzy model, Fuzzy rule generation	(04)
Fuzzy inference systems, Defuzzification.	(04)
Introduction to Neuro Fuzzy Systems, Architecture of a Neuro Fuzzy system and its applications	(04)
GENETIC ALGORITHM: An overview, Problem solving using GA	(04)
Implementation of GA and GP	(04)
Applications of GA & GP, Hybrid systems	(04)

BOOK:

1. Neuro fuzzy and soft computing by Jang, Pearson Education

REFERENCES:

1. Learning and Soft Computing by Kecman, Pearson Education
2. Fuzzy Sets and Fuzzy Logic - Klir and Yuan, PHI
3. Neurocomputing: Theory & Practice by Philip D.Wasserman, VanNostrand Reinhold
5. Neural Network in computer Intelligence by Fu, TMH
6. Neural Networks and Fuzzy Systems by Bart Kosko, PHI
7. An Introduction to Genetic Algorithm -Melaine Mitchell, PHI

COURSE NAME : ADVANCED DATABASE MANAGEMENT SYSTEMS

COURSE CODE : CS 474

CREDITS : 04

L T P : 4 0 0

LECTURE WISE BREAKUP

NO. OF LECTURES

REPRESENTING DATA ELEMENTS 4

Data Elements and Fields, Representing Relational Database Elements, Records, Representing Block and Record Addresses, Client-Server Systems, Logical and Structured Addresses, Record Modifications, Index Structures, Indexes on Sequential Files, Secondary Indexes, B-Trees, Hash Tables.

RELATIONAL ALGEBRA 5

Relational Algebra: Basics of Relational Algebra, Set Operations on Relations, Extended Operators of Relational Algebra, Constraints on Relations, Modification of the Database, Views Relational Calculus, Tuple Relational Calculus, Domain Relational Calculus.

NORMALIZATION 4

Database design process, Relational database design, Relation Schema, Anomalies in a database , Functional dependencies, Membership and minimal covers, Normal forms, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Multivalued dependencies, Fourth Normal Form, Join dependencies, Fifth Normal Form, Inclusion dependencies , Effect of de-normalization on database performance.

SQL 4

Use Of SQL, DDL Statements, DML Statements, View Definitions, Constraints and Triggers Keys and Foreign Keys, Constraints on Attributes and Tuples, Modification of Constraints Cursors, Dynamic SQL.

CONCURRENCY CONTROL 5

Serialisability, Enforcing Serializability by Locks, Locking Systems With Several Lock Modes, Architecture for a Locking Scheduler Managing Hierarchies of Database Elements, Concurrency Control by Timestamps, Concurrency Control by Validation.

TRANSACTION MANAGEMENT 4

Introduction of Transaction management, Serializability and Recoverability, View Serializability, Resolving Deadlocks, Distributed Databases, Distributed Commit, Distributed Locking.

DISTRIBUTED DATABASE 3

Homogeneous And Heterogeneous Database, Distributed Data Storage, Distributed Transaction, Commit Protocols, Concurrency Control In Distributed Databases.

DATABASE SECURITY: 4

Database security issues, Discretionary access control, Mandatory & role based access control, Database audit.

ADVANCED DATABASE APPLICATION: 5

Evolution of an Information system, Decision making and MIS, MIS as a technique for making programmed decisions, Navigation Database System Architecture Overview, Data Mining, Data warehouse, Types of transaction processing system :OLAP,OLTP,DSS

EMERGING TECHNOLOGIES:**8**

Data mining: Data mining concepts, Association rules, Classification, Clustering, Application of data mining. Data warehousing: Characteristics of Data warehouses, Data modelling of data warehouses, Typical functionality of data warehouses., XML & Internet databases, Object relationalDatabases.

BOOK:

1. Data base system concepts , Abraham Silberschatz , Henry .F .Korth , S. Sudarshan , Fourth Edition , TMH

REFERENCES:

1. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw-Hill International
2. BC Desai, An Introduction to Database Systems, Galgotia Publications
3. An Introduction to database systems, Sixth Edition C. J. Date Addison Wesley
4. Fundamentals of database system , Fourth Edition , Elmasri , Navathe , Fourth Edition , Pearson.
5. Computer Data Base Organization by Martin J. (Latest edition), PHI
6. Principles of data base systems. (Latest edition) by J.D.Ullman, Narosa Publishers

COURSE NAME : CLOUD COMPUTING & SERVICES
COURSE CODE : CS 475
CREDITS : 04
LTP : 4 0 0

LECTURE WITH BREAKUP**NO. OF LECTURES**

Introduction to Cloud Computing (05)

Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing

Cloud Computing Architecture (10)

Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization A discussion on Hypervisors

Storage Virtualization A discussion on SAN, ISCSI, Network Virtualization A discussion on VLAN

Cloud Computing Architecture Amazon Case study (08)

Introduction to Amazon Cloud Computing services, Amazon EC2, Amazon S3, Amazon DB, Queues and Cloud Front, Practical Amazon

Introduction to Distributed Computing (04)

Fallacies of Distributed Computing, Sources of failure in distributed computing, Large Data sets and the handling issues, Moore Law & relationship to storage, CPU speed, etc,

Introduction to MapReduce (08)

Discussion of Google Paper, Discussion of BigTables, GFS, HDFS, MapReduce Hadoop Framework, Map Reduce – Hadoop Framework examples, Hadoop and related Projects, HBase, Pig, Mahout, etc.

Challenges in Cloud Computing (08)

Security, Privacy, and Trust management issues, Cloud Economics and Business Models, Resource management and scheduling, Interoperability between Clouds, Internetworking between Clouds (InterClouds), Building and Deploying Social Network Applications on Clouds. Portability of applications and data between different cloud providers

Project Presentations (05)

REFERENCES:

- 1) Dean, Jeffrey and Sanjay Ghemawat. (2004) MapReduce: Simplified Data Processing on Large Clusters. Proceedings of the 6th Symposium on Operating System Design and Implementation (OSDI 2004).
- 2) Chang, Fay, Jeffrey Dean, Sanjay Ghemawat, Wilson C. Hsieh, Deborah A. Wallach, Michael Burrows, Tushar Chandra, Andrew Fikes, and Robert Gruber. (2006) Bigtable: A Distributed Storage System for Structured Data. Proceedings of the 7th Symposium on Operating System Design and Implementation (OSDI 2004).
- 3) Ghemawat, Sanjay, Howard Gobioff, and Shun-Tak Leung. (2003) The Google File System. Proceedings of the 19th ACM Symposium on Operating Systems Principles.
- 4) Pike, Rob, Sean Dorward, Robert Griesemer, and Sean Quinlan. (2005) Interpreting the Data: Parallel Analysis with Sawzall. Scientific Programming Journal, 13(4):277-298.
- 5) Above the Clouds: A Berkeley View of Cloud Computing, M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. H. Katz, A. Konwinski, G. Lee, D. A. Patterson, A. Rabkin, I. Stoica and M. Zaharia, Berkeley Tech Report
- 6) Somniloquy: Augmenting Network Interfaces to Reduce PC Energy Usage, Yuvraj Agarwal, Steve Hodges, Ranveer Chandra, James Scott, and Paramvir Bahl, Rajesh Gupta, NSDI'09
- 7) A Scalable, Commodity Data Center Network Architecture, Mohammad Al-Fares, Alexander Loukissa, Amin Vahdat, SIGCOMM'08
- 8) Xen and the Art of Virtualization, P. Barham, B. Dragovic, K. Fraser, S. Hand, T. Harris, A.Ho, R. Neugebauer, I. Pratt, A. Warfield, SOSP'03
- 9) Interactive WiFi Connectivity For Moving Vehicles, Aruna Balasubramanian, Ratul Mahajan, Arun Venkataramani, Brian Levine, John Zahorjan, MobiCom'08
- 10) Pnuts: Yahoo's Hosted Data Serving Platform, B. F. Cooper, R. Ramakrishnan, U. Srivastava, A. Silberstein, P. Bohannon, H. Jacobsen, N. Puz, D. Weaver, R. Yerneni, VLDB'08
- 11) MapReduce: Simplified Data Processing on Large Clusters, Jeffrey Dean and Sanjay

- Ghemawat, OSDI'08
- 12) Dynamo: Amazon's Highly Available Key-value Store, Giuseppe DeCandia, Deniz Hastorun, Madan Jampani, Gunavardhan Kakulapati, Avinash Lakshman, Alex Pilchin, Swaminathan Sivasubramanian, Peter Vosshall and Werner Vogels, SOSP'07
 - 13) DCell: A Scalable and Fault-Tolerant Network Structure for Data Centers, Chuanxiong Guo, Haitao Wu, Kun Tan, Lei Shi, Yongguang Zhang, Songwu Lu, SIGCOMM'08
 - 14) Learning to Share: Narrowband-Friendly Wideband Networks, Hariharan Rahul, Nate Kushman, Dina Katabi, Charles Sodini, and Farinaz Edalat, SIGCOMM'08
 - 15) Dryad: Distributed Data-Parallel Programs from Sequential Building Blocks, Michael Isard, Mihai Budiu, Yuan Yu, Andrew Birrell, and Dennis Fetterly, EuroSys'07
 - 16) Measurement and Analysis of Online Social Networks, Alan Mislove, Massimiliano Marcon, Krishna P. Gummadi, Peter Druschel, Bobby Bhattacharjee, IMC'07
 - 17) Skilled in the Art of Being Idle: Reducing Energy Waste in Networked Systems, Sergiu Nedeveschi, Sylvia Ratnasamy, Jaideep Chandrashekar, Bruce Nordman, Nina Taft, NSDI'09
 - 18) Pig Latin: A Not-So-Foreign Language for Data Processing, C. Olston, B. Reed, U. Srivastava, R. Kumar and A. Tomkins, SIGMOD'08
 - 19) User Interactions in Social Networks and their Implications, Christo Wilson, Bryce Boe, Alessandra Sala, Krishna P. N. Puttaswamy and Ben Y. Zhao, EuroSys'09
 - 20) Improving MapReduce Performance in Heterogeneous Environments, Matei Zaharia, Andy Konwinski, Anthony D. Joseph, Randy H. Katz, Ion Stoica, OSDI'08
 - 21) eBay in the Sky: Strategy-Proof Wireless Spectrum Auctions, Xia Zhou, Sorabh Gandhi, Subhash Suri, Haitao Zheng, MobiCom 2008
 - 22) TRUST: A General Framework for Truthful Double Spectrum Auctions, Xia Zhou, Haitao Zheng, INFOCOM'09

COURSE CODE : **CS 476**
COURSE NAME : **DATA MINING & WARE HOUSING**
CREDITS : **4**
L T P : **4 0 0**
LECTURE WISE BREAKUP **NO. OF LECTURES**

DATA WAREHOUSE AND OLAP TECHNOLOGY (10)
 Data ware housing Definition and characteristics, need for data warehousing DBMS vs. data warehouse, OLAP
 Multidimensional data model, data cubes, Schemas for multidimensional databases, OLAP operations
 Data Marts, Metadata, data warehouse architecture

DATA PREPROCESSING (5)
 Cleaning, integration and transformation, Data reduction, Data discretization

DATA MINING (10)
 Data mining definition, issues in data mining, Data mining primitives and functionalities
 Data Mining query language

DATA MINING TECHNIQUES (4)

Concept description and data generalization
ASSOCIATION RULE MINING (4)
 Apriori Algorithm, generating frequent item sets, Multi-level and Multidimensional Mining
CLASSIFICATION (4)
 decision tree, Bayesian, neural networks, Genetic algorithm, Support vector machines, Fuzzy techniques
CLUSTERING (3)
 Cluster Analysis and its Various Techniques for cluster analysis
APPLICATIONS AND TRENDS IN DATA MINING (10)
 Mining multimedia databases, Text databases, web mining
 Commercial Importance of DW, applications of data mining, data mining, data mining in business process, embedded data mining.

BOOK:

Data Mining Concepts and Techniques by Jiawei Han and Micheline Kamber.

REFERENCES:

Data Warehousing, Data Mining and OLAP by Alex Berson and Stephen J. Smith.

COURSE NAME : **IMAGE PROCESSING AND COMPUTER VISION**
COURSE CODE : **CS 477**
CREDITS : **04**
L T P : **4 0 0**

LECTURE WISE BREAKUP

NO. OF LECTURES

INTRODUCTION AND DIGITAL IMAGE FUNDAMENTALS (6)
 Digital Image Representation, Fundamental Steps in Image Processing, Elements of Digital image processing systems, Sampling and quantization, some basic relationships like neighbors, connectivity, Distance measure between pixels, Imaging Geometry
IMAGE TRANSFORMS (4)
 Discrete Fourier Transform, Some properties of the two-dimensional Fourier transform, Fast Fourier transform, Inverse FFT
IMAGE ENHANCEMENT (8)
 Point Operations, Histograms, Spatial domain methods, Frequency domain methods, Enhancement by point processing, Spatial filtering, Low pass filtering, High pass filtering, Homomorphic filtering, Colour Image Processing
IMAGE RESTORATION (8)
 Degradation model, Algebraic Approach to Restoration, Inverse filtering, Wiener filter, Constrained Least Square Restoration, Interactive Restoration, Restoration in Spatial Domain
IMAGE COMPRESSION (6)
 Coding, Interpixel and Psycho visual Redundancy, Image Compression models, Error free comparison, Lossy compression, Image compression standards
IMAGE SEGMENTATION (6)

Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation

REPRESENTATION AND DESCRIPTION (4)

Representations schemes like chain coding, Polygonal Approximation, Signatures, Boundary Segments, Skeleton of region, Boundary description, Regional descriptors, Morphology

INTRODUCTION TO COMPUTER VISION (8)

Computation approach to stereopsis, Distance computation from disparity, Correspondence problem.

BOOKS:

1. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", Pearson Education.
2. A.K. Jain, "Fundamental of Digital Image Processing", Pearson Education

REFERENCE:

1. Forsyth and Pounce, "Computer Vision", Pearson Education.

COURSE NAME : WIRELESS SENSOR NETWORKS
COURSE CODE : CS 478
CREDIT : 04
L T P : 4 0 0

LECTURE WISE BREAKUP	NO. OF LECTURES
INTRODUCTION TO WIRELESS SENSOR NETWORKS	5
Applications and motivation, network performance objectives, opportunities and challenges in wireless sensor networks, sensor network architectures and applications, sensor network architecture, tiered architectures in sensor networks,	
THE DEVELOPMENT OF WIRELESS SENSOR NETWORKS	5
Early wireless networks, wireless data networks, wireless sensor and related networks, next generation technologies to enable sensor networks, models for programmability in sensor networks, coverage in wireless sensor networks	
THE PHYSICAL LAYER	5
Introduction, some physical layer examples, a practical physical layer for wireless sensor networks, simulations and results, miniaturizing sensor network with MEMS	
THE DATA LINK LAYER	5
Introduction, medium access control techniques, the mediation device, system analysis and simulation, overview of communication protocols for sensor networks, communication architecture and programming abstractions for realtime embedded sensor networks, energy efficient MAC protocols	
THE NETWORK LAYER	5
Introduction, some network design examples, a wireless sensor network design employing a cluster tree architecture, simulations and results, a taxonomy of routing techniques in wireless sensor networks, energy efficient protocols in sensor networks	

DATA AGGREGATION	5
Introduction, directed diffusion, low energy adaptive clustering hierarchy, tiny aggregation, greedy aggregation	
PRACTICAL IMPLEMENTATION ISSUES	5
Introduction, the partitioning decision, transducer interfaces, time base accuracy and average power consumption, a practical perspective on wireless sensor networks, a sensor network for biological data acquisition	
POWER MANAGEMENT	5
Introduction, power sources, loads, voltage converters and regulators, power management strategy, sensor network management, power efficient topologies for wireless sensor networks, dynamic power management in sensor networks	

ANTENNAS AND THE DEFINITION OF RF PERFORMANCE	5
Introduction, antennas, RF performance definition, location management in wsn, positioning and location tracking in wireless sensor networks, protocols for gathering information, reliability in sensor networks, fault tolerance in sensor networks	
WIRELESS SENSOR NETWORK STANDARDS	5
Introduction, introduction to industrial sensor networking, the IEEE 802.15.4 low rate WPAN standard, the Zigbee alliance, the IEEE 1451.5 wireless smart transducer interface standard	
Architecture and modeling of dynamic wireless sensor networks	

BOOK:

1. Wireless Sensor Networks: Architectures and Protocols, by Edgar H. Callaway

REFERENCES:

1. Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems by Mohammad Ilyas and Imad Mahgoub
2. Wireless Sensor Networks and applications by Yingshu Li, My T. Thai and Weili Wu
3. Wireless sensor networks: signal processing and communication perspectives by Ananthram Swami, Qing Zhao, Yao-Win Hong and Lang Tong
4. Adhoc and sensor networks by C.M. Cordeiro and D.P. Agrawal

COURSE NAME	:	ERP
COURSE CODE	:	CS 479
CREDIT	:	04
L T P	:	4 0 0

LECTURE WISE BREAKUP	NO. OF LECTURES
AN INTRODUCTION TO ERP	(3)

Basic ERP Concepts, Risks and Benefits of ERP, Justifying ERP Investments, RoadMap for successful ERP Implementation, Importance of ERP, ERP Package Selection issues.

ERP AND RELATED TECHNOLOGIES (5)

Business Process Re-engineering, Data Warehousing, Data Mining, OLAP, Product Life Cycle Management, Supply Chain Management, Customer Relationship Management, Advanced Technology and ERP Security.

ERP FUNCTIONAL MODULES (7)

HRD, Personnel Management, Training and Development, Skill Inventory, Finance, Manufacturing, Plant Maintenance, Material Management, Quality Management, Marketing, Sales-Distribution and Service.

MATERIAL PLANNING AND PRODUCTION PLANNING (5)

Material Planning and Control, Inventory, Forecasting, Manufacturing, Production Planning, Production Scheduling, Production Control, Sales and Distribution.

ERP IMPLEMENTATION (5)

Implementation Challenges, Requirements and process definition, Pre-Post Implementation Activities, ERP implementation life cycle, Data migration, Measuring performance of the ERP system.

ERP – KEY MANAGERIAL ISSUES (10)

Concept Selling, IT Infrastructure, Implication of ERP system on Business Organization, Critical Success factors in ERP system, Critical Failure factors in ERP system, ERP Culture Implementation Issues, Resistance to Change, Return on Investment, Future Directions and Trends in ERP, Case Studies of Big Business houses adopting ERP.

BOOKS:

1. ERP Demystified by Alexis Leon, TMH.
2. Enterprise Resource Planning by Alexis Leon, TMH.

REFERENCES:

Enterprise Resource Planning by Mary Sumner

COURSE NAME : WIRELESS & MOBILE NETWORKS
COURSE CODE : CS 481
CREDITS : 4
PREQ : COMPUTER NETWORKS
LTP : 4 0 0

LECTURE WITH BREAKUP NO. OF LECTURES

BASICS OF WIRELESS NETWORKS (06)

Channel Assignments, Interference and System Capacity, Frequency reuse, Radio Propagation, Free space Propagation Model, Propagation modeling, Propagation and Measurements Parameters of Mobile Path Channels

MULTIPLE ACCESS TECHNIQUES (03)

FDMA, TDMA, CDMA, SDMA, Spread Spectrum Technologies

Wireless LANs (15)

Wireless LANs Physical & MAC layer, IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues, energy efficient protocols, Case Studies, Encryption and Authentication, Denial of service attacks, Key exchange, WEP, IEEE 802.11i, research challenges in security

Wireless – Mesh Technologies (05)

Introduction to Wi-Mesh, routing in wi-mesh, standards, Secure routing, applications and research challenges.

Wi-Max: (03)

Wi-Max protocol stack and specifications, standards (IEEE 802.16), applications and deployment issues

Special Topics: (08)

Wireless PANs: Bluetooth AND Zigbee

Introduction to Wireless Sensors

Introduction to Vehicular Adhoc Networks

MOBILE NETWORKS (08)

1G, 2G, and 3G wireless systems (AMPS, GSM, GPRS)

Overview of GSM network building blocks, GSM service areas, MSC / VLR service areas, location areas, GSM frequency allocation, Cell planning concepts and process, security in Mobile networks

Project presentations (04)

BOOK:

1. Mobile Communications, Joschen Schiller, Pearson Education

REFERENCES:

1. Wireless Communications, Principles & Practices: S. Rappaport, Pearson Education
2. Mobile and Wireless design essentials, Martyn Mallick, John Wiley
3. Wireless communications & Networks, By William Stallings, PHI
4. Couch II, L. W. Digital and Analog Communication Systems. Prentice-Hall, 1996
5. Building Microsoft® ASP.NET Applications for Mobile Devices, Andy Wigley and Peter Roxburgh, MS Press
6. IEEE Wireless LAN medium access control (MAC) and physical layer (PHY) specifications. IEEE Standard 802.11, 1997.
7. G.A.Halls. HIPERLAN: the high performance radio local area network standard. Electronics and Communication Engineering Journal, 6:289–296, December 1994.
8. IEEE Wireless LAN medium access control (MAC) and physical layer (PHY) specifications Amendment 4: Further higher speed physical layer extension in the 2.4 GHz band. IEEE Standard 802.11g, 2003.
9. The Changing Usage of a Mature Campus-wide Wireless Network Tristan Henderson, David Kotz, Ilya Abyzov (Dartmouth College, USA), Mobicom 2004

COURSE NAME: NATURAL LANGUAGE PROCESSING

COURSE CODE: CS 480

CREDITS: 4
L T P: 4 0 0

LECTURE WISE BREAKUP	NO. OF LECTURES
Introduction and overview of NLP, Finite state techniques for NLP,	(05)
A computational framework for Natural Languages	
Partial description of English or an Indian language in the frame work, Lexicon,	(05)
Algorithms and data structures for implementation of the framework	
Error-tolerant lexical processing , Transducers for the design of morphological	(05)
Analyzers	
POS tagging, Efficient representations for linguistic resources	(05)
Machine-readable dictionaries and lexical databases	(05)
Recursive Transition Networks - theory and its implementation	(05)
Augmented Transition Networks - theory and its implementation	(05)
Augmenting context-free grammars with features, Ambiguity in NLP	(05)
Statistical/Corpus-based NLP, Connectionist NLP	(05)
Applications like Machine translation, Database interface	(05)

BOOK:

1. Natural Language understanding by James Allen, Pearson Education

REFERENCES:

1. NLP: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal, Prentice Hall
2. Meaning and Grammar by G. Chirchia and S. McConnell Ginet, MIT Press
3. An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition by Daniel Jurafsky and James H. Martin, Pearson Education
4. Natural language processing in Prolog by Gazdar, & Mellish, Addison-Wesley

COURSE NAME : **NETWORK TECHNOLOGY**
COURSE CODE : **CS 482**
CREDIT : **04**
L T P : **4 0 0**

LECTURE WISE BREAKUP	NO. OF LECTURES
-----------------------------	------------------------

INTRODUCTION	5
Overview of Local Area Networks: Basic LAN terminology, LAN Standards, How LANs operate, LAN Topologies, Example Applications of LANs.	
Overview of wide area networks: WAN Architecture, WAN Transmission Mechanism, WAN Addressing.	
LAN ACCESS TECHNIQUES	5
Performance measures and Notation, Random Access Overview, ALOHA, CSMA, CSMA/CD Controlled Access Schemes, Switched Access Methods.	

LAN TECHNOLOGIES

15

Ethernet: Overview of Ethernet (IEEE 802.3), Standard Ethernet, Fast Ethernet, Switched Ethernet, Gigabit Ethernet, Ten Gigabit Ethernet

Token Passing LANs: Token Bus (IEEE 802.4), Token Ring (IEEE 802.5), FDDI, RPR

ATM LANs: ATM LAN Architecture, LAN Emulation (LANE), Client Server Model, LANE Operation, Frame Format

Storage area networks

NETWORK INTERCONNECTIONS

5

Internetworking Concepts, Repeaters, Hubs, Bridges, Routers, Switches, Gateways, Virtual LANs

WAN TECHNOLOGIES

6

Frame Relay: Introduction, Frame Relay Operation, Frame Relay Layers

ATM: Introduction, ATM Architecture, ATM Cell Structure, Switching, ATM Layers, ATM Service Categories

WIRELESS TECHNOLOGIES

7

Wireless links and network characteristics, wireless LANs, PANs, MANs and WANs

MULTIMEDIA NETWORK TECHNOLOGIES

7

Streaming stored audio and video, best effort service, protocols for realtime interactive applications, content distribution networks, scheduling and policing mechanisms, integrated services and differentiated services, RSVP.

BOOKS:

1. G. Keiser, "Local Area Networks", 2nd Edition, TMH, 2002.

REFERENCES:

1. B.A. Forouzan, "Local area networks", 1st Edition, TMH, 2003
2. A.L. Garcia and I. Widraja, "Communication networks", TMH, 2nd ed, 2004.
3. W. Stallings, "Data and Computer Communications", 6th Edition, Pearson Education Asia, 2001
4. A.S. Godbole, "Data Communications and Networks", TMH, 2002.
5. James F. Kurose and Keith W. Ross, "Computer Networking: A top down approach featuring the Internet", Pearson Education, third ed.
6. B.A. Forouzan, "Data Communications and Networking", 2nd Edition, TMH, 2003.

Course Name: HUMANITIES III (BUSINESS ENVIRONMENT & INDUSTRIAL LEGISLATION)

Course Code: HU 402

Credits: 4

L T P : 4-0-0

Pre Req:

Lecture Wise Breakup

No. of Lectures

- 1. INTRODUCTION (07)**
Scope of business, Characteristics of business and its forms.
- 2. BUSINESS ENVIRONMENT (07)**
Economic, Political and Technological.
- 3. SOCIAL RESPONSIBILITY OF BUSINESS (05)**
Ecological and Global Environment and their relevance in present scenario.
- 4. GLOBALIZATION (07)**
Concept, Social Responsibility toward different interest groups and Business Ethics.
- 5. WTO (07)**
Meaning, Rationale for globalization, features of current globalization, Pros and Cons of globalization.
- 6. CORPORATE GOVERNANCE (05)**
Functions of WTO. WTO structure, and Implications for India.
- 7. CONTRACT ACT (05)**
Concept, Essentials of good Corporate Governance, One case study.
- 8. SALE OF GOOD ACT (05)**
Concept of Contract, types and its essentials.
- 9. SALE OF GOOD ACT (05)**
Essential of sale of goods Act.

BOOKS:

- 1 Francis Cherunilam, Business Environment, Himalaya Publications.
- 2 K.C.Garg, V.K.Sareen, Mukesh Sharma and R.C.Chawla, Commercial & Labour Laws, Kalyani Publishers.

REFERENCES:

1. K Aswathappa, Essential of Business Environment, Himalaya Publication.
2. S.S.Gulshan, Mercantile Law, Excel Books.
3. S.S. Gulshan & G.K. Kapoor, Business Law, New Age International (p) Ltd., Publisher.
4. S Singh, Corporate Governance – Global Concepts & Practices, Excel Books.
5. Roger Benett, International Business, Addison Wesley Longhran, Delhi.
6. Y K Bhushan, Business Organization & Management, Sultan Chand & Sons.

HU402H (Humanities III) -In addition to the contents of HU402, additional topics:

Cluster Growth Model Vs SEZ
Innovative Dynamics of the Company
Foreign Market Entry Strategies
Competition Policy and Law
Corporate Social Responsibility-Two Case Studies

Course Name: HUMANITIES III (CORPORATE FINANCE)

Course Code : HU 404

Credits-4 : L T P: 4-0-0

Pre Req:

Lecture wise breakup

No. of Lectures

- | | |
|---|-------------|
| 1. INTRODUCTION | (07) |
| Finance, Financial Decisions, Objectives of Corporate Financial Decisions and factors influencing financial decisions. | |
| 2. INDIAN FINANCIAL SYSTEM | (07) |
| Nature and role of financial system in Indian Economy. | |
| 3. FINANCIAL MARKETS | (08) |
| Concepts, Type of markets and their relevance in present scenario. | |
| 4. FINANCIAL INSTRUMENTS AND FINANCIAL SERVICES | (08) |
| Capital and Money Market Instruments, Services. | |
| 5. WORKING CAPITAL | (05) |
| Types and factors affecting the requirements of working capital. | |
| 6. SOURCES OF FINANCE | (05) |
| Short term and long term. | |
| 7. TIME VALUE OF MONEY AND CAPITAL BUDGETING | (05) |
| Concept of Compounding and Discounting, Nature of Investment Decisions, Investment, Evaluation Criteria: Pay Back Period Method, Accounting Rate of Return Method, Internal Rate of Return Method and Net Present Value Method. | |
| 8. FINANCIAL LEVERAGE | (03) |
| Meaning (trading on equity) and measures. | |
| 9. DIVIDEND POLICY | (05) |
| Objectives of Dividend Policy, factors influencing firm's dividend policy. | |
| 10. CAPITAL STRUCTURE | (03) |
| Essentials of Capital Structure, Approaches to establish target capital structure. | |

BOOKS:

1. Pandey I.M., Financial Management, Vikas Publishing House Pvt.Ltd.
2. Khan M Y, Indian Financial System, Tata McGraw Hill.
3. Bhole LM and Mahakud Jitendra, Financial Institutions and Markets,

Tata McGraw Hill

REFERENCES:

1. Chandra Prasanna, Financial Management Theory and Practice, Tata McGraw Hill
2. Lasher William R., Practical financial Management, Thomson
3. Van Horne J.C., Financial Management and Policy, Prentice Hall
4. Apte, P.G., International Financial Management, Tata McGraw Hill

HU404H (Humanities III) -In addition to the contents of HU404, additional topics:

Capital Market Intermediaries and their Regulation.

Functions and Operations of Money Market.

Foreign Exchange Market –From FERA to FEMA.

Role of Banks and Financial Institutions in Economic Development.