Department of Computer Science and Engineering

The following shall be the scheme of instruction and examination for

B. Tech Final Year Computer Science and Engineering

From Academic year 2017-18

Type/ Code	Name of the Course	Credits	Lectures/ Week	Tutorials/ Week	Practical/ Week
Semester – I					
CS422	Advanced Database Management Systems	05	03	01	02
CS423	TCP/IP Networking	05	04	--	02
CS424	Cryptography and Network Security	05	03	01	02
CS431	Distributed Computing	05	03	01	02
CS440X	Elective – III	05	04	--	02
CS441X	Elective –IV	05	04	--	02
CS442	Industrial Training / Internship / Reputed Certificate Course	01 * Additional Credit (Over and Above)	---	--	02
	Total	30/31	21	03	14
Semester – II					
CS443	Project	16	---	---	32
	Total	16	---	--	32

The list of Electives offered:

Elective – III		**Elective – IV**	
CS440A	Artificial Neural Network	CS441A	Machine Learning
CS440B	Artificial Intelligence	CS441B	Multimedia Systems
CS440C	Computer Graphics	CS441C	Mobile Computing
CS440D	Human Computer Interaction	CS441D	Big Data Analytics
CS440E	Data Mining	CS441E	Computer Vision
CS440F	Cloud Computing	CS441F	Real-time Systems
CS440G	Information Security	CS441G	High Performance Computing
CS440H	Digital Image Processing	CS441H	Embedded Systems

Semester – I

CS422 : Advanced Database Management Systems (CR-5, L-3,T-1,P-2)

Distributed Databases: Introduction, Promises of DDBSs, Complicating factors, problem areas of DDBSs, Architectural models for Distributed DBMS, Distributed DBMS architecture, Distributed database Design: Alternative Design Strategies, Distribution Design issues.

Distributed Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operation, Characterization of Query Processors, Layers of Query Processing. Distributed Transactions**,** Commit Protocols, Concurrency Control in Distributed Databases, Failures and Fault Tolerance in Distributed Databases.

Parallel Databases: Database Servers, Parallel Architectures, Parallel DBMS Techniques, Parallel Execution Problems, Parallel Execution for Hierarchical Architecture.

Application development and administration: Web Interfaces To Databases, Performance Tuning, Performance Benchmarks, Standardization, E-Commerce, and Legacy Systems

Advanced Querying and Information Retrieval: Decision Support Systems, In-Formation Integration: Modes Of Information, Wrappers In Mediator Based Systems, Data Analysis And OLAP, Data Mining, Data Warehousing, And Information Retrieval Systems, and Applications.

Advanced Data Types and New Applications: Motivation, Time In Databases, Spatial And Geo-Graphic Data, Multimedia Databases, Mobility And Personal Databases .

Advanced Transaction Processing: Transaction Processing Monitors, Transactional Workflows, Main Memory Databases, Real Time Transaction Systems, Long Duration Transactions, Transaction Management In Multidatabases.

Multidimensional Indexes: Application Needing Multiple Dimensions, Hash Like Structures For Multidimensional Data, Tree Like Structures For Multidimensional Data, Bitmap Indexes.

XML: Background, Structure of Xml Data, Xml Document Schema, Querying And Trans-Formation, Api, Storage Of Xml Data, Xml Applications.

References:

1. Naveen Prakash, “Introduction to database management”, *TMH*
2. Rob and Coronel, “Database Systems”, Fifth Edition, *Thomson*
3. Molino, Ullman and Widom, “Database System Implementation”, *Pearson Ed-ucation Asia*
4. Ozsu and Valduriez, “Principles of Distributed Database Systems”, *Pearson Education Asia*
5. Database management, Objectives, system functions and administration, Gor-don Everest
6. Ramkrishnan and Gehrke, “Database Management Systems”, *MGH Interna-tional Edition*
7. Silberchatz, Korth and Sudarshan, “Data base systems concepts”, *MGH*, 4th edition

CS423 : TCP/IP Networking (CR-5, L-4,T-0,P-2)

Introduction And Underlying Technologies: Introduction, The OSI Model and The TCP/IP Protocol Suite, Underlying Technologies.

Network Layer: Introduction to Network Layer, Ipv4 Addresses, Delivery and Forwarding of IP Packets, Internet Protocol Version 4 (Ipv4), Address Resolution Protocol (ARP), Internet Control Message Protocol Version 4 (ICMPV4), Unicast Routing Protocols (RIP, OSPF, and BGP), Multicasting and Multicast Routing Protocols.

Transport Layer: Introduction to the Transport Layer, User Datagram Protocol (Udp), Transmission Control Protocol (TCP), And Stream Control Transmission Protocol (SCTP).

Application Layer: Introduction to the Application Layer, Host Configuration: DHCP, Domain Name System (DNS), Remote Login: Telnet and SSH, File Transfer: FTP And TFTP, World Wide Web And HTTP, Electronic Mail: SMTP, POP, IMAP, and MIME, Network Management: SNMP, Multimedia. IPv6 Addressing

References:

1. Internetworking with TCP/IP(5th Edition), Douglas E. Comer
2. TCP/IP Protocol Suite, 4/e, Forouzan
3. Computer Networks, 4/e, Andrew S. Tanenbaum

CS424 : Cryptography and Network Security (CR-5, L-3,T-1,P-2)

Introduction to cryptography: What is Cryptography, Encryption Schemes, Functions, Secret Key Cryptography, Public Key Cryptography, Hash Algorithms

Mathematical Background for Cryptography: Modulo arithmetic, Euclid's algorithm, algebraic structures- groups, rings, fields-Polynomial fields, prime numbers, Fermat's theorem, Eyler's totient function, Euler's theorem, testing for primality- Probabilistic Considerations, Chinese reminder theorem, Discrete Logarithms – the powers of an integer, Modulo n, Indices, calculation of Discrete Logarithms

Conventional Encryption: Classical techniques, Modern Techniques, Algorithms, Confidentiality using conventional encryption

Public Key encryption and Hash Function: Public Key Cryptography, Message authentication and hash function, Digital Signatures and authentication protocols

System Security: Kerberos, Web security SSL, TSL, Firewalls.

References:

1. Bernard Menezes, “Network Security and Cryptography”, Cengage Learning.
2. William Stalling, “Cryptography and Network and Network Security-Principals and practices”, Pearson Education.
3. King, Dalton, and Osmanoglu, “Security Architecture”, TMH edition Kaufman, Perlman, and Spenciner, “Network Security”, PHI

CS431 : Distributed Computing (C-5,L-3,T-1,P-2)

Introduction Distributed Computing: Definition of a distributed system, goals, architecture.

Processes: Threads, virtualization, clients, servers, code migration Case study: Mobile Agents**.**

Communication: Remote procedure call, message-oriented communication, stream oriented communication, Case, Study: RMI, MPI.

Naming: flat naming, structured naming, attribute-based naming Case study: LDAP

Synchronization: clock synchronization, mutual exclusion, election algorithms

Consistency and replication: Data-centric consistency models, client-centric consistency models, consistency protocols.

Distributed object-based systems: Distributed Objects, Object Servers, Binding a Client to an Object, Java RMI, Common Object Request, Broker Architecture (CORBA) Case Studies: Enterprise Java Beans.

Distributed file systems: architecture, NFS, synchronization, consistency and replication, Case Studies: Hadoop Distributed File System (HDFS) .

Distributed web-based systems: Web-Based Systems ,Web Services, Web Server /Client, Web Server Clusters ,Web Proxy Caching, Case Study: Apache Web Server, Squid.

Programming Models for Distributed Systems: MapReduce: Simplified data processing on large clusters.

References:

1. Distributed Systems. Principles and Paradigms. (2nd Ed.) Prentice Hall, 2007. Andrew S. Tanenbaum, Vrije University, Amsterdam, The Netherlands, Maarten Van Steen
2. Distributed System Concepts and Design(5th Ed.), George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair,
3. Hadoop, The Definitive Guide, Oreilly, 2010. Tom White

CS440X : Elective – III (CR-5, L-4,T-0,P-2)

CS440A : Artificial Neural Network

Feedforward Networks: Fundamental Concepts Models of Artificial Neural Network (Ann); Learning and Adaption, Learning Rules, Classification Model, Features and Decision Regions, Perceptron Networks, Delta Learning Rules for Multi Perceptron Layer, Generalized Learning Rule, Error Backpropagation Training, Learning Factors.

Recurrent networks: Mathematical Foundation Of Discrete Time and Gradient Type Hope field Networks, Transient Response and Relaxation Modeling.

Self-organizing networks: Hamming net and MAXNET, Unsupervised learning of clusters, Counter propagation network, Feature mapping, Self organizing feature maps, Cluster discovery network (ART1).

Fuzzy Neural Networks: Fuzzy set theory, Operations on fuzzy sets, Fuzzy neural networks, Fuzzy min-max neural networks, General fuzzy min-max neural network

Applications: Handwritten character recognition, Face recognition, Image compression

References:

1. Jacek Zurada, "Introduction to ANN", Jaico Publishing House
2. Bose and Liang, "Neural network fundamentals with Graphs, Algorithms, and Applications", TMH Edition.
3. Ham and Kostanic, "Principles of Neurocomputing for Science and Engineering", TMH edition

CS440B : Artificial Intelligence

Introduction: General, Developments in Artificial Intelligence, Developments in Expert Systems, Role of AI and Expert Systems in Engineering.

Search Techniques: Problem Definition and Solution Process, Production Systems, Search Techniques, Problem Decomposition and AND-OR Graphs.

Knowledge-Based Expert System: What is KBES? Architecture of KBES.

Engineering Design Synthesis: Synthesis, Decomposition Model for Synthesis, Role of Synthesizer in KBES Environment, An Architecture for a Synthesizer a Generic Tool Generic Synthesis Tool-GENSYNT

Criticism and Evaluation: Methodologies Used in Knowledge Based Environment, a Frame-work for Critiquing and Evaluation, Generic Critiquing Tool GENCRIT

Case-Based Reasoning: Applications of Case-Based Reasoning, Case Based Reasoning Process, A Framework for CBR in Engineering Design (CASETOOL), Architecture of CASETOOL Application Example

Process Models and Knowledge-Based System: Expert Systems for Diagnosis, Blackboard Model of Problem Solving, ODESSY an Integrated System for Preliminary Design of Reinforced Concrete Multistory Office Buildings, Conceptual Design of a Car Body Shape, SETHU-An Integrated KBES for Concrete Road Bridge Design.

References:

1. C.S. Krishnamoorthy, S. Rajeev: Artificial Intelligence and Expert Systems for Engineers
2. Stuart E. Savory, Artificial Intelligence & Expert Systems, Ellis Horwood Ltd

CS440C : Computer Graphics

Introduction to Computer Graphics: Overview of Computer Graphics, Graphics Displays, Output Devices and Physical Interactive Devices, Graphical User Interfaces, Graphics Image File Formats.

Raster Scan Graphics: Line Drawing Algorithms, DDA, Bresenham's Algorithm, Circle Generations, Scan Conversion Generation of Displays, Image Compression, Displaying Lines, Characters and Polygons, Polygon Filling Algorithms, Fundamentals of Antialiasing, Halftoning

Geometrical Transformations: 2-D Transformations, Linear Transformations, other transformations, combined Transformation, Coordinate Systems, 3-D Transformations, Rotation, Scaling and Translation, Reflection about any Arbitrary Axis.

Windowing and Clipping: Viewing Transformations, Parallel Projections, Perspective Projection, Perspective Transform, Two Dimensional Clipping, Simple Visibility Algorithm, Polygon Clipping, 3-Dimensional Clipping

Hidden surface elimination: Floating Horizon, Back Face Removal Algorithms, Z-Buffer Algorithm, Painter's Algorithm, Warnock Algorithm, BSP Tree Methods.

Rendering: Introduction, Illumination Models, Transparency, Shadows, Phongs and Gouraud Shading.

Curve Design: Properties of curves, Bezier and B-Splines.

References:

1. David f. Rogers, "Procedural elements of computer graphics", TMH.
2. Foley, Van dam, feiner hughes, "Computer graphics principles and practice", Addison Wesley Indian Edition.
3. Newman sproull, "Principles of Interactive computer graphics", McGraw Hill Company.

CS440D : Human Computer Interaction

The Scope and Challenges of HCI and Interaction Design.

Visual Representation. Segmentation and Variables of The Display Plane. Modes of Correspondence.

Text and Gesture Interaction. Evolution of Interaction Hardware. Measurement and Assessment of Novel Methods.

Inference Based Approaches. Bayesian Strategies for Data Entry, and Programming by Example.

Augmented Reality and Tangible User Interfaces. Machine Vision, Fiducial Markers, Paper Interfaces, Mixed Reality

Usability of Programming Languages. End User Programming, Programming for Children, Cognitive Dimensions of Notations.

User Centered Design Research. Contextual Observation, Prototyping, Think-Aloud Protocols, Qualitative Data in The Design Cycle.

Usability Evaluation Methods. Formative and Summative Methods. Empirical Measures. Evaluation of Part II Projects.

References:

1. Sharp, H., Rogers, Y. & Preece, J. (2007). Interaction design: beyond human-computer interaction. Wiley (2nd ed.).
2. Carroll, J.M. (ed.) (2003). HCI models, theories and frameworks: toward a multi-disciplinary science. Morgan Kaufmann.
3. Cairns, P. & Cox, A. (eds.) (2008). Research methods for human-computer interaction. Cambridge University Press.

CS440E : Data Mining

Introduction to Data Mining: What is data mining?, Related technologies - Machine Learning, DBMS, OLAP, Statistics, Data Mining Goals, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications , Example: weather data.

Data Warehouse and OLAP: Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

Data preprocessing: Data cleaning, Data transformation, Data reduction , Discretization and generating concept hierarchies , Installing Weka3 Data Mining System.

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

Mining Streams, Time Series and Sequence Data: Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data, Graph Mining.

Social Network Analysis and Multi relational Data Mining: Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

References :

1. Data Mining Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier,2nd Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.
3. Data Mining Techniques – Arun K Pujari,2nd edition, Universities Press.
4. Data Warehousing in the Real World – Sam Aanhory & Dennis Murray Pearson Edn Asia.

CS440F : Cloud Computing

Overview of Distributed: Computing Trends Of Computing, Introduction To Distributed Computing, Next Big Thing: Cloud Computing.

Introduction To Cloud Computing: What's Cloud Computing, Properties & Characteristics, Service Models, Deployment Models.

Infrastructure As A Service (Iaas): Introduction to IAAS, Resource Virtualization, Server, Storage, Network, Case Studies

Platform As A Service (Paas): Introduction To Paas**,** Cloud Platform & Management**,** Computation, Storage, Case Studies.

Software As A Service (Saas): Introduction To Saas**,** Web Services**,** Web 2.0, Web OS, Case Studies

Cloud Issues and Challenges: Cloud Provider Lock In, Security

References:

1. Executive's Guide to Cloud Computing by Eric A. Marks.
2. Cloud Computing by Anthony T. Velte.

CS440G : Information Security

Introduction: History, what is Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.
Security Investigation: Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk
Logical Design: Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799 / BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity
Physical Design: Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.
Security and Attacks: Firewalls, Security on the Internet and the World Wide Web, Attack Techniques, IDS, Security in Windows, Linux, Social & Ethical issues of Information Security, Information Security management, Case studies, topics on security in OS, databases and current trends.

References:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003
2. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
3. Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2002.

CS440H : Digital Image Processing

Digital Image Fundamentals: Elements of digital image processing systems, Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.
Image Enhancement: Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Homomorphic filtering, Color image enhancement.
Image Restoration: Image Restoration ,degradation model, Unconstrained restoration , Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.
Image Segmentation: Edge detection, Edge linking via Hough Transform , Thresholding Region based segmentation, Region growing, Region splitting and Merging, Segmentation by morphological watersheds.
Image Compression: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

References:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002.
3. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004

CS441X : Elective – IV(CR-5, L-4,T-0,P-2)

CS441A : Machine Learning

Basic Principles: Introduction, The concept learning task. General-to-specific ordering of hypotheses. Vapnik - Chervonenkis dimension. Experimental Evaluation: Over-fitting, Cross-Validation. Loss Regularization Framework for Classification.

Supervised Learning: Decision Tree Learning. Instance-Based Learning: k-Nearest neighbour algorithm, Support Vector Machines. Ensemble learning: boosting, bagging, random forests. Artificial Neural Networks: Linear threshold units, Perceptrons, Multilayer networks and back-propagation.

Probabilistic Models: Maximum Likelihood Estimation, MAP, Bayes Classifiers: Naive Bayes. Bayes optimal classifiers. Minimum description length principle. Bayesian Networks, Inference in Bayesian Networks, Bayes Net Structure Learning.

Unsupervised Learning: K-means and Hierarchical Clustering, Gaussian Mixture Models, EM algorithm, Hidden Markov Models. Dimensionality Reduction: PCA and kernel PCA.

Computational Learning Theory: probably approximately correct (PAC) learning. Sample complexity. Computational complexity of training.

Learning Methodologies: Reinforcement Learning, Representation Learning, Semi-supervised Learning, Active Learning.

References:

1. Tom Mitchell. Machine Learning. McGraw Hill, 1997.
2. Christopher M. Bishop. Pattern Recognition and Machine Learning. Springer 2006.
3. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern Classification. John Wiley & Sons, 2006.
4. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
5. Hal Daumé III, A Course in Machine Learning, 2015.
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009.

CS441B : Multimedia Systems

Introduction: Multimedia Elements And Applications, Architecture, Evolving Technologies, Defining Objects, Data Interface Standards, Multimedia Databases

Compression And Decompression: Types Of Compression, Binary Image Compression Schemes, Color, Gray Scale And Still Video Image Compression, Video Image And Audio Compression

Data And File Format Standards: RTF, TIFF, BMP, RIFF, MIDI, JPEG DIB, AVI And MPEG

Multimedia Input / Output Technologies: Issues, Pen Input, Video and Image Display Systems, Print Output Technologies, Image Scanners, Digital Voice and Audio, Digital Camera, Video Images And Animation, and Full Motion Video

Storage And Retrieval Technologies: Magnetic Media Technologies, Optical Media, Hierarchical Storage and Cache Management

Architectural And Telecommunications Considerations: Specialized Computational Processors, Memory Systems, Multimedia Board Solutions, LAN/WAN Connectivity, Distributed Object Model

Multimedia Application Design: Application Classes, Types of Multimedia Systems, Virtual Reality Design, Components Of Multimedia Systems, Organizing Multimedia Databases, Application Workflow and Distributed Application Design Issues

Multimedia Authoring and User Interface: Multimedia Authoring Systems, Hyper-Media Application Design Considerations, User Interface Design, Information Access, and Object Display/ Playback Issues

Multimedia Messaging: Mobile Messaging, Hypermedia Message Components, Hypermedia Linking and Embedding, Creating Hypermedia Messages, Integrated Multimedia Message Standards and Document Management

Distributed Multimedia Systems: Components, Distributed Client-Server Operation, Multimedia Object Severs, Multi-Server Network Topologies, Distributed Multimedia Databases and Managing Distributed Objects

Multimedia Database Systems: Multimedia Database Management System, Characteristics Of an MDBMS, Data Analysis, Data Structure, Operations on Data, Integration In a Database Model, Relational Database Model, Object-Oriented Database Model.

References:

1. Prabhat K. Andleigh and Kiran Thakrarar, "Multimedia systems design", PHI, 2002
2. John F. Koegel Buford, "Multimedia systems", Pearson Education, 2002
3. Steinmetz and Nahrstedt, "Multimedia: Computing, Communications and Applications".
4. Tay Vaughan, "Multimedia Making it work", Fifth Edition, TMH
5. Chapman," Digital Multimedia" Wiley India.
6. Ranajan Parekh, "Principles of Multimedia", Tata McGraw Hill
7. Buford – "Multimedia Systems", Pearson.

CS441C : Mobile Computing

Wireless Transmission: Signals, propagation, signal encoding, multiplexing, modulation and spread spectrum

Wireless LANS: IEEE 802.11, Bluetooth and Hiperlan

Mobile Network Layer: IP packet delivery, agent discovery, registration, tunneling and encapsulation, optimization, reverse tunneling, mobile ad-hoc networks

Mobile Transport Layer: Indirect TCP, snooping TCP, mobile TCP, Transaction Oriented TCP, TCP over 3G wireless networks

Wireless WANS: Cellular network, GSM, GPRS, UMTS, CDPD and CDMA

Other Topics: Operating Systems for mobile devices, wireless application protocol, WML and WML Scripts

References:

1. Mobile Communications, Jochen Schiller
2. Wireless Communications and Networks, William Stallings
3. Mobile Computing, Talukder and Yavagal
4. The Wireless Appilcation Protocol, Singhal, Bridgman,
5. Mauney, Alvinen, Bevis, Chan and Hild

CS441D : Big Data Analytics

Overview of Big Data, Stages of analytical evolution, State of the Practice in Analytics, The Data Scientist, Big Data Analytics in Industry Verticals, Data Analytics Lifecycle, Operationalizing Basic Data Analytic Methods, Using R, Advanced Analytics - Analytics for Unstructured Data - Map Reduce and Hadoop, The Hadoop, Ecosystem, In-database Analytics, Data Visualization Techniques, Stream Computing Challenges, Systems architecture, Main memory data management techniques, energy-efficient data processing, Benchmarking, Security and Privacy, Failover and reliability.

References:

1. Bill Franks, Taming The Big Data Tidal Wave, 1st Edition, Wiley, 2012.
2. Frank J. Ohlhorst, Big Data Analytics,1st Edition, Wiley, 2012.

CS441E : Computer Vision

Introduction: Image Formation-Image Model, Imaging Devices

Early Processing: Recovering Intrinsic Structure, Filtering Image, Finding Local Edges, Range Information From Geometry, Surface Orientation, Optical Flow, Resolu-Tion Pyramids.

Boundary Detection: Searching Near And Approximate Location, Hough Method For Curve Detection, Edge Following As Graph Searching, Edge Following As Dynamic Programming, Contour Following

Region Growing: Regions, Local Technique, Blob Coloring, Global Techniques, Split-Ting And Merging

Texture: Structural Models, Texture As A Pattern Recognition Problem, Texture Gra-Dients

Motion: Motion Understanding, Optical Flow, Image Sequences

Representation Of 2-D Geometrical Structure: Boundary Representation, Region Representation, Simple Shape Properties, Representation Of 3-D Structures, Solids And Their Representation, Surface Representation, Generalized Cylinder Representation, Volumetric Representation, Understanding Line Drawings.

Knowledge Representation And Use: Knowledge Base Models And Processes, Se-Mantic Nets, Control Issues in Vision Systems

Matching: Aspects, Graph Theoretic Algorithms, Implementation, Matching In Practice

Inference: First Order Predicate Calculus, Computer Reasoning, Production Systems, Scene Labeling, Active Knowledge

References:

1. Ballard And Brown, “Computer Vision”, Prentice Hall Publication
2. Jain, Kasturi And Schunck, “Machine Vision”, Mcgraw-Hill International Editions

CS441F : Real Time Systems

Introduction: Example of real-time applications, Hard and Soft timing constraints, Task and computational model, Performance metrics

Scheduling Real-Time Tasks: Types Of Schedulers, Table-Driven Scheduling, Cyclic Schedulers, Edf, Rma. Handling Resource Sharing Among Real-Time Tasks, Scheduling Real Time Tasks In Multiprocessor And Distributed Systems

Commercial Real-time operating systems: General concepts, Unix and Windows as RTOS , Survey of Commercial RTOS

Real-time Databases (time permitting): Transaction Priority and Concurrency Control Issues, Disk Scheduling

Real-Time Communication: Real-Time Networks , Communication Protocols.

References:

1. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson, 2008
2. Jane W. Liu, "Real-Time Systems", Pearson Education, 2001
3. Krishna and Shin, "Real-Time Systems", Tata McGraw Hill, 1999

CS441G : High Performance Computing

Introduction to parallel computing: Motivating Parallelism, Scope of Parallel Computing, Parallel Programming Platforms.

Principles of parallel algorithm design: Preliminaries, Decomposition Techniques, Mapping Techniques and Load Balancing, Parallel Algorithms Models.

Parallel programming: message passing: Introduction To MPI, Using Clusters of Computers, Evaluating Parallel Programs, Debugging.

Parallel programming: shared-memory: Thread basics, programming with Pthreads, Java Threads, OpenMp.

Load balancing and termination detection: Dynamic Load Balancing, Distributed Termination Detection Algorithms.

References:

1. An Introduction to Parallel Computing: Design and Analysis of Algorithms, Second Edition - A.Grama, A. Gupta, G. Karypis and V. Kumar, Pearson.
2. Parallel Programming: Techniques and Applications using Networked Work-stations and Parallel Computers" (2nd ed.) by B. Wilkinson and M. Allen, Prentice Hall.
3. Parallel Programming: for Multicore and Cluster Systems, Thomas Rauber, Gudula Rünger, Springer.

CS441H : Embedded Systems

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

References:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

CS442 : Industrial Training/Internship/Reputed Certificate Course (CR-1, L-0,T-0,P-2)

This credit shall be considered over and above for those students who had gone for the industrial training or reputed certificate course or any summer internship at the end of the semester II of third year. All such student must submit their report/certificate to the department. The department will evaluate their report and all such students will get an additional credit as mentioned in the scheme.

Semester – II

CS443 : Project (CR-16, L-0,T-0,P-32)

Student may complete the said project work in the industry or within the department/institute or any reputed academic/research organization. Performance of the student will be evaluated in the midterm and at the end of the semester. Students are required to prepare a complete project report duly signed by the appropriate authorities at the time of examination, where the work done by the student will be evaluated by the examiners.