**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*

<table>
<thead>
<tr>
<th>Type/ Code</th>
<th>Name of the Course</th>
<th>Credits</th>
<th>Lectures/ Week</th>
<th>Tutorials/ Week</th>
<th>Practical/ Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS422</td>
<td>Advanced Database Management Systems</td>
<td>05</td>
<td>03</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>CS423</td>
<td>TCP/IP Networking</td>
<td>05</td>
<td>04</td>
<td>--</td>
<td>02</td>
</tr>
<tr>
<td>CS424</td>
<td>Cryptography and Network Security</td>
<td>05</td>
<td>03</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>CS431</td>
<td>Distributed Computing</td>
<td>05</td>
<td>03</td>
<td>01</td>
<td>02</td>
</tr>
<tr>
<td>CS440X</td>
<td>Elective – III</td>
<td>05</td>
<td>04</td>
<td>--</td>
<td>02</td>
</tr>
<tr>
<td>CS441X</td>
<td>Elective – IV</td>
<td>05</td>
<td>04</td>
<td>--</td>
<td>02</td>
</tr>
<tr>
<td>CS442</td>
<td>Industrial Training / Internship / Reputed Certificate Course</td>
<td>01 * Additional Credit (Over and Above)</td>
<td>---</td>
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<td>02</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Total</th>
<th></th>
<th>30/31</th>
<th>21</th>
<th>03</th>
<th>14</th>
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</table>

**Semester – II**

<table>
<thead>
<tr>
<th>Name of the Course</th>
<th>Credits</th>
<th>Lectures/ Week</th>
<th>Tutorials/ Week</th>
<th>Practical/ Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>16</td>
<td>---</td>
<td>---</td>
<td>32</td>
</tr>
</tbody>
</table>

| Total                                                  | 16      | ---            | ---             | 32              |

**The list of Electives offered:**

<table>
<thead>
<tr>
<th>Elective – III</th>
<th>Elective – IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS440A Artificial Neural Network</td>
<td>CS441A Machine Learning</td>
</tr>
<tr>
<td>CS440B Artificial Intelligence</td>
<td>CS441B Multimedia Systems</td>
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<tr>
<td>CS440C Computer Graphics</td>
<td>CS441C Mobile Computing</td>
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<tr>
<td>CS440D Human Computer Interaction</td>
<td>CS441D Big Data Analytics</td>
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<tr>
<td>CS440E Data Mining</td>
<td>CS441E Computer Vision</td>
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<tr>
<td>CS440F Cloud Computing</td>
<td>CS441F Real-time Systems</td>
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<tr>
<td>CS440G Information Security</td>
<td>CS441G High Performance Computing</td>
</tr>
<tr>
<td>CS440H Digital Image Processing</td>
<td>CS441H Embedded Systems</td>
</tr>
</tbody>
</table>
Curriculum for B.Tech. CSE from AY 2017-18

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 Warehousing, And Information Retrieval Systems, and Applications.

**Advanced Data Types and New Applications:** Motivation, Time In Databases, Spatial And Geographic 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
5. Database management, Objectives, system functions and administration, Gordon Everest

Curriculum for B.Tech. CSE from AY 2017-18
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.


**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:**
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).


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

References:
2. Distributed System Concepts and Design(5th Ed.), George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair,
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 Hopfield 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**:


CS440B : Artificial Intelligence


**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.


**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

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


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


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

References:
1. David f. Rogers, “Procedural elements of computer graphics”, TMH.
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.


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


References:

CS440E : Data Mining


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 :**
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

**CS440F : Cloud Computing**


**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:**
CS440G : Information Security


**Security Investigation:** Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk


**References:**

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 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:**

Curriculum for B.Tech. CSE from AY 2017-18
**CS441X : Elective – IV(CR-5, L-4,T-0,P-2)**

**CS441A : Machine Learning**


**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.


**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:**

**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

Curriculum for B.Tech. CSE from AY 2017-18
**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 Servers, 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:**
5. Chapman,” Digital Multimedia” Wiley India.

**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 Application Protocol, Singhal, Bridgman,
5. Mauney, Alvinen, Bevis, Chan and Hild

CS441D : Big Data Analytics


References:

CS441E : Computer Vision

Introduction: Image Formation-Image Model, Imaging Devices


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


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:
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:**

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:**
**CS441H : 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.
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.