DISTRIBUTED SYSTEM
(CS701)

Objective: To introduce the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission.	
Unit	**Topic**
I	**Characterization of Distributed Systems.** Examples of distributed systems, Resource sharing on the web, challenges. **System Models:** Introduction, Architectural model fundamental model. **Networking and Internetworking:** Types of network, Network Principles, Internet Protocols**.** Ethernet, WiFi, Bluetooth and ATM.
II	**Interprocess Communication:** API for the internet protocols, External data representation and marshalling, client-server communication, Group communication, Interprocess communication in Unix. **Distributed Objects and Remote Invocation:** Communication between distributed objects, Remote Procedure calls, Events and notifications, Java RMI, Sun network File system.
III	**Operating System Support:** Operating system Layer, Protection, Processes and threads, Communication and Invocation, Operating system Architecture. **Security:** Overview of security techniques, Cryptographic algorithms, Digital signatures, Cryptography pragmatics.
IV	**Time and Global states:** Clocks, events and process states, synchronizing physical clocks, logical time and logical clocks. **Coordination and agreement:** Distributed mutual exclusion, elections, multicast communication, consensus and related problems.
V	**Transactions and concurrency control:** Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. **Distributed Transactions:** Flat and Nested transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

References:

1. Distributed Systems, S. Ghosh, Chapman & Hall/CRC, Taylor & Francis Group,2010.
2. Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Pearson Education, 2012

DIGITAL IMAGE PROCESSING
(CS702)

Objective: The purpose of this course is to impart knowledge on various Digital Image Processing Techniques and their Applications.	
Unit	**Topic**
I	**Introduction and Fundamentals:** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Spatial Domain: Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.
II	**Image Enhancement in Frequency Domain:** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Low-pass Filters; Sharpening Frequency Domain Filters – Gaussian High-pass Filters; Homomorphic Filtering.
III	**Image Restoration:** A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering– Band-pass Filters; Minimum Mean-square Error Restoration.
IV	**Color Image Processing:** Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.
V	**Image Compression:** Fundamentals, image compression models, Compression methods: Huffman coding, Golomb Coding, Arithmetic Coding, LZW coding, Run-Length coding, Symbol based coding.error-free compression, lossy predictive coding, image compression standards. **Image Segmentation:**Fundamentals, Point, Line and edge detection. Thresholding: foundation, Basic Global Thresholding, Otsu's Method, Image smoothing to improve global thresholding.

References:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Tata McGraw Hill Pvt. Ltd, 2016.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning, 2010.

CRYPTOGRAPHY & NETWORK SECURITY
(CS703)

Objective: The objective of this course is to Discover software bugs that pose cyber security threats, explain and recreate exploits of such bugs in realizing a cyber attack on such software, and explain how to fix the bugs to mitigate such threats.	
Unit	**Topic**
I	**Introduction:** Security Goals, Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services and Mechanisms, A model for Internetwork Security, Euclidian Algorithm, Modular operator, Congruence, Additive invers, Multiplicative Inverse, Cryptanalysis, Cipher and Types of Cipher, Substitution Cipher, Caeser Cipher, Affine Cipher, Mono-alphabetic and Polyalphabetic cipher.
II	**Symmetric key and Encryption:** Groups and Applications, Modern Block Ciphers, Component of Modern Bloch Ciphers, D Boxes, Straight D Boxes, Modern Stream ciphers, Encryption, Conventional Encryption Principles & Algorithms, Data Encryption Standard (DES), Des Structure, DES Function, DES Algorithm and key generation, Security of DES, Advanced Encryption Standard(AES), Criteria, Round Data Unit, Algorithm, Analysis of AES,RC4.
III	**Cryptography:** Public key and Private key in Cryptography, Role of public key in cryptography, Cipher, Types of Cipher, Mode of Operation, Cryptography Algorithms (RSA, RABIN, ELGAMAL, Diffie-Hellman, ECC), Key Distribution, Approaches of Message Authentication, Hash Functions in cryptography.
IV	**Email and Web Security:** Pretty Good Privacy (PGP) and S/MIME.IP Security Overview, IP Security Architecture, Authentication Header, Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).
V	**Network Security**: Intruders, Viruses and related threats, Virus Countermeasures, Firewall Design principles, Trusted Systems, Intrusion Detection Systems.

References:

1.William Stallings, Network Security Essentials (Applications and **Books** Standards), Pearson Education, 4th Edition, 2010

2. Eric Maiwald, Fundamentals of Network Security, McGraw-Hill Osborne Media; 2010.

3. Whitman, Thomson, Principles of Information Security, Course Technology, 4th Edition, 2011.

4. Stallings, Cryptography and Network Security, Third edition, Pearson Publications, 2013

DISTRBBUTED SYSTEM LAB
(CS751)

LIST OF EXPERIMENTS

1. Write a program which simulates client server communication.
2. Implementing various Interprocess communication tools in Unix.
3. Implement RPC.
4. Implement RMI.
5. Implement Cristian's method for synchronizing clocks.
6. Implement Berkeley algorithm Clock for synchronizing clocks.
7. Simulate Lamport logical clocks for ordering events.
8. Simulate Mattern and Fidge vector clocks for ordering events.
9. Detect whether there is a Dead lock in a given wait for graph.
10. Simulate forward or backward validation technique in concurrency control.

DIGITAL IMAGE PROCESSING LAB
(CS752)

LIST OF EXPERIMENTS

1. Acquisition and Display of color and Grayscale Images, Conversion of Color to Grayscale using Averaging, Grayscale to Bitmap Image using Thresholding
2. Implement the spatial image enhancement functions on a bitmap image –
   (a) Mirroring (Inversion) (b) Rotation (Clockwise) (c) Enlargement (Double Size)
3. Implementation of Histogram Equalization in Grayscale Image.
4. Image Enhancement in Spatial Domain- Smoothing and Sharpening.
5. Image Enhancement in Frequency Domain- Fourier Transform, Gaussian Highpass Filters, Homomorphic Filtering.
6. Image Restoration: Spatial Filtering and Statistic Filters.
7. Color Image Processing: RGB to HSI conversion, Segmentation.
8. Morphological Image Processing- Dilation and Erosion, Opening and Closing, Thinning, Thickening.
9. Image Compression: error-free compression, lossy predictive coding
10. Segmentation- Edge Detection, Line Detection. Multi-level Thresholding, Local Thresholding.