

**Scheme of Instruction & Syllabi**  
**Of**  
**Bachelor of Technology**  
**(Computer Science and Engineering)**  
**(4<sup>th</sup> Year)**  
(Effective Session 2016-17)

**(Dr. Gaurav Agarwal)**  
**HOD CSE**

**(Dr. R.K. Shukla)**  
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**Invertis Institute of Engineering & Technology**  
**INVERTIS UNIVERSITY**  
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**STUDY AND EVALUATION SCHEME**  
**B.Tech in Computer Science and Engineering**  
**(Effective from session 2016-2017)**  
**YEAR IV, SEMESTER VII**

S. No.	Course Code	SUBJECTS	HOURS			EVALUATION SCHEME					SUBJECT TOTAL	Credit
						SESSIONAL EXAM.				END SEM.		
			L	T	P	CT	TA	AT	TOTAL			
<b>THEORY</b>												
1	BCS-701	Advanced Computer Architecture	3	1	0	20	10		30	70	100	4
2	BCS-702	Artificial Intelligence and Expert Systems	3	1	0	20	10		30	70	100	4
3	BCS-703	Data Warehouse and Mining	3	1	0	20	10		30	70	100	4
4	BCS-704	Distributed Systems	3	1	0	20	10		30	70	100	4
5		CS Elective-IV	3	1	0	20	10		30	70	100	4
<b>PRACTICALS AND PROJECTS</b>												
7	BCS-751	Industrial Training Viva-Voce	0	0	2	-	-		25		25	1
8	BCS-752	Artificial Intelligence Lab	0	0	2	-	-		10	15	25	1
9	BCS-753	Project	0	0	4	-	-		25	25	50	2
10	BCS-754	Seminar	0	0	2	-	-		25	-	25	1
11	GP-701	General Proficiency	-	-	-	-	-		25	-	25	1
		<b>TOTAL</b>	17	6	6				260	390	650	26

**L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks**

**CS ELECTIVE-IV**

BCS-071 Embedded and Real Time Systems

BCS-072 Data Compression

BCS-073 Neural Networks

BCS-074 OS for Smart Devices (Android )

BCS-075 Client Server Computing

**STUDY AND EVALUATION SCHEME**  
**B.Tech in Computer Science and Engineering**  
**(Effective from session 2016-2017)**  
**YEAR IV, SEMESTER VIII**

S. No.	Course Code	SUBJECTS	HOURS			EVALUATION SCHEME					SUBJECT TOTAL	Credit
						SESSIONAL EXAM.				END SEM.		
			L	T	P	CT	TA	AT	TOTAL			
<b>THEORY</b>												
1	BCS-801	Cryptography and Network Security	3	1	0	20	10		30	70	100	4
2	BCS-802	.NET Framework	2	1	0	10	5		15	35	50	2
3	BCS-803	Mobile Computing	3	1	0	20	10		30	70	100	4
4		CS Elective-V	3	1	0	20	10		30	70	100	4
5		CS Elective-VI	3	1	0	20	10		30	70	100	4
<b>PRACTICALS AND PROJECTS</b>												
7	BCS-851	Cryptography and Network Security Lab	0	0	2	-	-		10	15	25	1
8	BCS-852	.NET Lab	0	0	2	-	-		10	15	25	1
9	BCS-853	Mobile Computing Lab	0	0	2	-	-		10	15	25	1
10	BCS-854	Project	0	0	6	-	-		50	50	100	4
11	GP-801	General Proficiency	-	-	-	-	-		25	-	25	1
		<b>TOTAL</b>	14	5	6				240	410	650	26

**L-Lecture, T- Tutorial , P- Practical , CT – Cumulative Test ,TA –Teacher Assessment , AT – Attendance , E-Sem – End Semester Marks**

**CS ELECTIVE-V**

BCS-081 Distributed Database  
BCS-082 Software Quality Management

**CS ELECTIVE-VI**

BCS-086 Computational Geometry  
BCS-087 Computational Complexity

BCS-083 Simulation and Modeling  
BCS-084 Bioinformatics  
BCS-085 Digital Image Processing

BCS-088 IT in Forensic Science  
BCS-089 Advanced Computer Network  
BCS-090 Big Data Analysis

**BCS-701 ADVANCED COMPUTER ARCHITECTURE**

L T P C  
3 1 0 4

**MODULE-I**

**Introduction and performance** :Evolution of computer Architecture, Architectural classification schemes and parallel computing models, conditions of parallelism, program flow mechanisms, performance evaluation and speedup performance laws, RISC and CISC processors, VLIW architecture

**MODULE-II**

**Pipelining** : Instruction level parallelism, principles of linear and nonlinear pipelining Techniques, Hazards, Instruction and arithmetic pipeline design, super scalar and super pipeline design.

**Memory hierarchy technology**: Cache memory organizations and performance issues; multilevel caches, Virtual memory technology and memory management.

**MODULE-III**

**SIMD processor**: SIMD array processor, Interconnection networks , SIMD matrix multiplication algorithm, vector processor architecture and instruction types.

**MIMD multiprocessor**: shared and distributed memory architectures, cache coherence and Synchronization.

**Text Books:**

1. Kai Hwang, "Advanced Computer Architecture," McGraw-Hill.

2. Hwang and Briggs, "Computer Architecture and Parallel Processing," McGraw Hill.

**Reference Books:**

1. Pipelined and Parallel processor design by Michael J. Flynn – 1995, Narosa.

2. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier)

**BCS-702 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM**

L T P C  
3 1 0 4

**MODULE-I**

**Introduction:** Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Processing.

**Introduction to Search :** Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

**MODULE-II**

**Knowledge Representation & Reasoning:** Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

**MODULE-III**

**Machine Learning:** Supervised and unsupervised learning, Decision trees, Statistical learning models, learning with complete data - Naive Bayes models, Learning with hidden data –EM algorithm, Reinforcement learning,

Expert systems architecture. Generalities about expert systems. Conceptual infrastructure of expert systems.

**Text Books:**

1. *Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education.*
2. *Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill*

**Reference Books:**

1. *E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education.*
2. *Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India.*

**BCS-703 DATA WAREHOUSE AND DATA MINING**

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**MODULE-I**

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, 3 Tier Architecture, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Testing Data Warehouse

**MODULE-II**

Data Mining: Overview, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression. Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, Mining Single-Dimensional Boolean Association rules from Transactional Databases, Apriori-Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

**MODULE-III**

.Classification and Predictions: What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Grid Based Methods-STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis



**Text Books:**

1. *Alex Berson, Stephen Smith, "Data Warehousing, Data Mining & OLAP" TMH Publication.*
2. *Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier*

**Reference Books:**

1. *Sam Anahory, Dennis Murray, "Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems, Pearson Education*
2. *Mallach, "Data Warehousing System", McGraw –Hill*
3. *M.H. Dunham, " Data Mining: Introductory and Advanced Topics" Pearson Education*

**BCS-704 DISTRIBUTED SYSTEM**

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**MODULE-I**

**Characterization of Distributed Systems:** Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

**Theoretical Foundation for Distributed System:** Limitation of Distributed system, absence of global clock, shared memory, Lamport's Logical clock, Vectors clocks.

**Concepts in Message Passing Systems:** causal order, total order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

**Distributed Mutual Exclusion:** Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

**MODULE-II**

**Distributed Deadlock Detection:** system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

**Agreement Protocols:** Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

**Distributed Resource Management:** Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

**MODULE-III**

**Failure Recovery in Distributed Systems:** Concepts in Backward and Forward recovery, Recovery in Concurrent systems, obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

**Fault Tolerance:** Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

**Transactions and Concurrency Control:** Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering.

**Distributed Transactions:** Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

**Text Books:**

1. Singhal&Shivaratri, "*Advanced Concept in Operating Systems*", McGraw Hill
2. Coulouris, Dollimore, Kindberg, "*Distributed System: Concepts and Design*", Pearson Education

**Reference Books:**

1. Tenanuanbaum, Steen, "*Distributed Systems*", PHI
2. Gerald Tel, "*Distributed Algorithms*", Cambridge University Press.

1. To implement Breadth first search (BFS).
2. To implement Depth first search (DFS).
3. To find the solution of Water Jug problem.
4. To find the solution of 8-puzzle.
5. Write a program to show the advantage and disadvantage of green and red cuts.
6. Implement Forward Chaining
7. Implement Backward Chaining
8. Implement STEEPEST ASCENT HILL CLIMBING.
9. Implement COUNT PROPAGATION NETWORK.
10. To implement Best first search.

**BCS 071 EMBEDDED AND REAL TIME SYSTEMS**

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3 1 0 4

**MODULE-I**

Introduction : Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems. Core of Embedded Systems : Microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

**MODULE-II**

**Introduction:** Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

**MODULE-III**

**Real Time Scheduling:** Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

**Resources Sharing:** Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol.

**Text Books:**

1. *Real Time Systems by Jane W. S. Liu, Pearson Education Publication.*
2. *Embedded Systems, Rajkamal, TataMcGraw-Hill*

**Reference Books:**

1. *Mall Rajib, "Real Time Systems", Pearson Education*
2. *Albert M. K. Cheng , "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley*

### MODULE-I

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical *Preliminaries* for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Huffman coding: Loss less image compression, Text compression, Audio Compression.

### MODULE-II

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress.

Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42bits. Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markov Compression.

### MODULE-III

Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured Vector Quantizers.

#### **Text Book:**

1. Khalid Sayood, *Introduction to Data Compression*, Morgan Kaufmann Publishers

### MODULE-I

Neuro computing and Neuroscience: Historical notes, human Brain, neuron Mode 1, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

Data processing: Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, covariance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

### MODULE-II

Multilayered network architecture, back propagation algorithm, heuristics for making BP algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, PROP algorithm), approximation properties of RBF networks and comparison with multilayerperceptran.

### MODULE-III

Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Softcomputing. Neuro-Fuzzy-genetic algorithm Integration.

#### **Text Books:**

1. *J.A. Anderson, AnIntroduction to Neural Networks, MIT*
2. *Hagen Demuth Beale, Neural Network Design, Cengage Learning*

**Reference Books:**

1. *R.L. Harvey, Neural Network Principles, PHI*
2. *Kosko, Neural Network and Fuzzy Sets, PHI*



**BCS-074 ANDROID OPERATING SYSTEM**

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**MODULE 1**

About Android , Smart phones future, **Preparing the environment-** Installing the SDK , Creating Android Emulator , Installing Eclipse , Installing Android Development Tools , Choosing which Android version to use **Android Architecture-** Android Stack, Android applications structure

**MODULE 2**

**UI Architecture-**Application context , Intents ,Activity life cycle , Supporting multiple screen sizes **User Interface Widgets-** Text controls , Button controls ,Toggle buttons , Images **Notifications and Toasts-** Parameters on Intents ,Pending intents ,Status bar notifications ,Toast notifications **Menus-** Localization, Options menu , Context menu **Dialogues-** Alert dialog , Custom dialog , Dialog as Activity

**MODULE 3**

**Lists-**Using string arrays, Creating lists, Custom lists **Location and Maps-** Google maps , Using GPS to find current location **Working of Data Storages-**Shared preferences ,Preferences activity ,Files access , SQLite database **Network Communication-**Web Services , HTTP Client , XML and JSON **Services-**Service lifecycle, Foreground service **Publishing the App-**Preparing for publishing ,Signing and preparing the graphics ,Publishing to the Android Market.

**Text Books:**

1. *Bill Philips & Brian Hardy, Android Programming: The Big Nerd Ranch Guide*
2. *Greg Nudelman, [Android Design Patterns: Interaction Design Solutions for Developers](#)*
3. *Ian G. Clifton, [Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps](#)*
4. *Ed Burnette, [Hello, Android: Introducing Google's Mobile Development Platform \(Pragmatic Programmers\)](#)*

**BCS-075 CLIENT SERVER COMPUTING**

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**MODULE-I**

**Client/Server Computing:** DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, client server file system, , client server development tools, advantages of client server computing.

**Components of Client/Server application:** The client: services, request for services, RPC, windows services, fax, print services, remote boot services, Utility Services & Other Services, Example of authentication server, type of servers and their services, Network operating system, email servers.

**MODULE-II**

**Client/Server Network:** connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, Secure Socket layer, Introduction to cloud architecture.

**MODULE-III**

**Client server computing and Internet:** Client server and internet, Web client server, 3 tier client server web style, CGI , the server side of web, CGI and State, SQL database servers, Middleware and federated databases, data warehouses, EIS/DSS to data mining, GroupWare Server , what is GroupWare, components of GroupWare.

**Client Server Systems Development:** Naming, Addressing, and Location Services, Client/server security, Distributed file systems, Distributed DBMS, Data Replication, Distributed Programming, Managing a Client/Server Environment, The future of client server Computing Enabling Technologies.(Expert system, EDI, Multimedia, SET)

**Text Books:**

1. *Patrick Smith & Steve Guengerich, “Client / Server Computing”, PHI*
2. *Dawna Travis Dewire, “Client/Server Computing”, TMH*
3. *Majumdar & Bhattacharya, “Database management System”, TMH*
4. *Korth, Silberchatz, Sudarshan, “Database Concepts”, McGraw Hill*
5. *Elmasri, Navathe, S.B, “Fundamentals of Data Base System”, Addison Wesley*

**BCS-801 CRYPTOGRAPHY AND NETWORK SECURITY**

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**MODULE-I**

**Introduction to security attacks:** services and mechanism, Classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, feistel structure, Data encryption standard (DES), Strength of DES, block cipher modes of operations, Triple DES, Advanced Encryption Standard (AES) encryption and decryption.

**MODULE-II**

**Introduction to group, field, finite field of the form  $GF(p)$ :** modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem.

Principals of public key crypto systems, RSA algorithm, security of RSA

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA).

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS).

**MODULE-III**

**Key Management and distribution:** Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos Electronic mail security: pretty good privacy (PGP), S/MIME.

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic transaction (SET).

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls.

**Text Books:**

1. William Stallings, “Cryptography and Network Security: Principals and Practice”, Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill

**Reference Books:**

1. Bruce Schiener, “Applied Cryptography”. John Wiley & Sons
2. Bernard Menezes,” Network Security and Cryptography”, Cengage Learning.
3. AtulKahate, “Cryptography and Network Security”, Tata McGraw Hill

**BCS-802 .NET FRAMEWORK USING C#**

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3104

**MODULE-I**

**The .Net framework:** Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS) and its Architecture, Microsoft Intermediate Language (MSIL), Just-In-Time Compilation, Framework Base Classes. **Programming Language C#:** Declaring implicit and explicit variables, Unicode characters and strings, creating Object and Classes, The Main method specification.

**MODULE-II**

**Object oriented programming with C#:** Inheritance, Method Overloading and method overriding, Polymorphism, Operator Overloading, Abstract Class, Inner Class, and Interface. Delegates, Partial Classes, Exception Handling, Creating Name-Space, Input-Output and File Handling, Multithreading,

**Windows Application:** Introduction of windows form, Linking Window Form, Creating Properties, window form controls, MDI form.

**MODULE-III**

**Containers and its Event Handling:** Flow Layout Panel, Group Box, Panel, Split Container, Tab Control, Table Layout Panel. **Navigation Control and Its Event Handling:** Context Menu Strip, Tool Strip, Status Strip, Tool Strip Container. **Dialog Boxes and its Event Handling:** Message Dialog Boxes, Color Dialog, Folder Browser Dialog, Font Dialog, Open File Dialog, Save File Dialog, Data Grid View, Dataset, Creating Setup of Web Application.

**Introduction to ASP.NET with C#:** Introduction of web application, web site, A Review of Classic ASP , ASP.NET Web Applications, Rendering HTML with Server Controls.

**Working with Web Forms Controls and C#:** Introduction to Web Forms Controls, Simple InputControls, Hyperlinks, Button Controls and List Controls. Dropdown List Control, Overview of ASP.NET Validation Controls, Client-Side Validation, Server-Side Validation, File Upload controls, Wizard controls. Master Page, Ad Rotator Control, Login Controls, Session Management using Cookies, Session.

**Text Books:**

1. *Beginning Visual C# 2008, Wiley, Wrox Publication, 2nd Edition 2008*
2. *Programming with C#, E. Balagurusamy, TMH, 2nd Edition 1999*
3. *Microsoft .Net for Programmers, Fergal Grimes, SPI Edition,*

4. *C# Programming Language, Anders Hejlsberg, Mads Torgersen, Scott Wiltamuth, and Peter Golde, Pearson Education Inc, 4th Edition.*

**BCS-803 MOBILE COMPUTING**

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3 1 0 4

**MODULE-I**

**Introduction:** Issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, handoffs, channel allocation in cellular systems, CDMA, GPRS. Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, Mobile IP, WAP: Architecture, protocol stack, application environment,

**MODULE-II**

**Data management issues:** data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations. Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

**MODULE-III**

**Adhoc networks and localization:** Adhoc Networks issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

**Text Books:**

1. J. Schiller, *Mobile Communications*, Addison Wesley.
2. Charles Perkins, *Mobile IP*, Addison Wesley.

**Reference Books:**

1. Charles Perkins, *Ad hoc Networks*, Addison Wesley.
2. Upadhyaya, "Mobile Computing", Springer

**BCS-851 CRYPTOGRAPHY AND NETWORK SECURITY LAB**

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0021

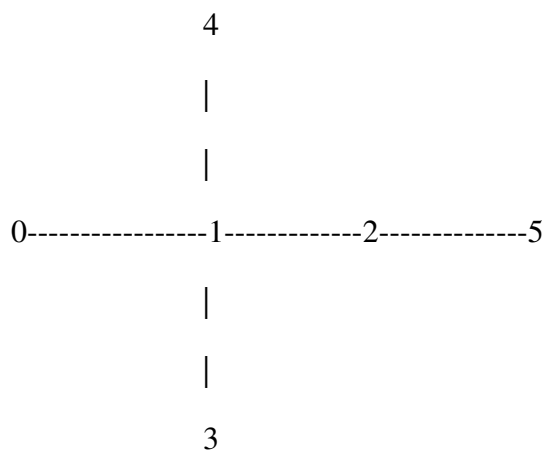
1. Implement caesar cipher
2. Implement Euclid's Algorithm for GCD
3. Implement Rabin Miller Algorithm for prime test.
4. Implement DES algorithm.
5. Implement Diffie-Hellman Algorithm
6. Implement RSA algorithm
7. Implement Kerberos.
8. Implement Digital Signature algorithm.
9. Configure SSH (Secure Shell) and send/receive a file on this connection to verify the correctness of this system using the configured parameters.
10. Configure a firewall to block the following for 5 minutes and verify the correctness of this system using the configured parameters:
  - (a) Two neighborhood IP addresses on your LAN.
  - (b) All ICMP requests
  - (c) All TCP SYN Packets



**BCS-852 MOBILE COMPUTING LAB**

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0021

1. Install NS2.
2. Write a Tcl script to create a network as shown:



3. Create TCP connection on simple topology, use nam to show animation.
4. Create both TCP and UDP traffic, use nam to show animation and TCP variable tracing, use nam graph to show TCP sequence plot.
5. Simulate ADODV and compute its performance factors.
6. Simulate DSDV and compute its performance factors.
7. Simulate DSR and compute its performance factors.
8. CASE STUDY: Comparison of ADODV, DSDV, and DSR Routing Protocols.

**BCS-081 DISTRIBUTED DATABASE**

L T P C  
3 1 0 4

**MODULE-I**

**Transaction and schedules:** Concurrent Execution of transaction, Conflict and ViewSerializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

Lock based protocols, time stamp based protocols, Multiple Granularity and MultiversionTechniques, Enforcing serializability by Locks, Locking system with multiple lock modes,architecture for Locking scheduler.

**MODULE-II**

**Distributed Transactions Management:** Data Distribution, Fragmentation and ReplicationTechniques, Distributed Commit, Distributed Locking schemes, Long duration transactions,Moss Concurrency protocol.

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Logbased recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems,Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

**MODULE-III**

**Distributed Query Processing:**Multiway Joins, Semi joins, Cost based query optimization fordistributed database, Updating replicated data, protocols for Distributed Deadlock Detection,Eager and Lazy Replication Techniques.

**Text Books:**

1. *Silberschatz, orth and Sudershan, Database System Concept', McGraw Hill*
2. *Ramakrishna and Gehrke, ' Database Management System, McGraw Hill*

**Reference Books:**

1. *Garcia-Molina, Ullman,Widom, ' Database System Implementation' Pearson Education*
2. *Ceei and Pelagatti, 'Distributed Database', TMH*
3. *Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill*

**BCS-082 SOFTWARE QUALITY MANAGEMENT**

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3104

**MODULE - I**

**INTRODUCTION TO SOFTWARE QUALITY:**

Software Quality – Hierarchical models of Boehm and McCall – Quality measurement – Metrics measurement and analysis – Gilb’s approach – GQM Model  
**SOFTWARE QUALITY ASSURANCE:**

Quality tasks – SQA plan – Teams – Characteristics – Implementation – Documentation – Reviews and Audits

**MODULE - II**

**QUALITY CONTROL AND RELIABILITY:**

Tools for Quality – Ishikawa’s basic tools – CASE tools – Defect prevention and removal – Reliability models – Rayleigh model – Reliability growth models for quality assessment

**MODULE - III**

**QUALITY MANAGEMENT SYSTEM:**

Elements of QMS – Rayleigh model framework – Reliability Growth models for QMS – Complexity metrics and models – Customer satisfaction analysis.  
**QUALITY STANDARDS:**  
Need for standards – ISO 9000 Series – ISO 9000-3 for software development – CMM and CMMI – Six Sigma concepts.

**Text Books:**

1. Allan C. Gillies, “Software Quality: Theory and Management”, Thomson Learning, 2003.
2. Stephen H. Kan, “Metrics and Models in Software Quality Engineering”, Pearson Education (Singapore) Pte Ltd., 2002.

**Reference Books:**

1. Norman E. Fenton and Shari Lawrence Pfleeger, “Software Metrics” Thomson, 2003
2. Mordechai Ben – Menachem and Garry S. Marliss, “Software Quality”, Thomson Asia Pte Ltd, 2003.
3. Mary Beth Chrissis, Mike Konrad and Sandy Shrum, “CMMI”, Pearson Education (Singapore) Pte Ltd, 2003.
4. ISO 9000-3 “Notes for the application of the ISO 9001 Standard to software development”.

**BCS-083 SIMULATION AND MODELING**

L T P C  
3 1 0 4

**MODULE-I**

System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

**MODULE-II**

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

**MODULE-III**

Simulation of PERT Networks, critical path computation, uncertainties in activity duration ,resource allocation and consideration. Simulation languages and software, continuous and discrete simulation languages, expression based languages, object oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

**Text Books:**

1. Geoffrey Gordon, “ System Simulation”, PHI
2. Jerry Banks, John S. C Barry L. Nelson David M. Nicol, “Discrete Event System Simulation”, Pearson Education

**Reference Books:**

1. *V P Singh, “System Modeling and simulation”, New Age International.*
2. *Averill M. Law, W. David Kelton, “System Modeling and simulation and Analysis”, TMH.*

**BCS-084 BIOINFORMATICS**

**MODULE I**

Introduction to bioinformatics and data generation What is bioinformatics and its relation with molecular biology. Examples of related tools(FASTA, BLAST, BLAT, RASMOL), databases(GENBANK, Pubmed, PDB ) and software(RASMOL,Ligand Explorer). Data generation; Generation of large scale molecular biology data. Applications of Bioinformatics.

**MODULE II**

Unit II Biological Database and its Types Introduction to data types and Source. Population and sample, Classification and Presentation of Data. Quality of data, private and public data sources. General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases . Specialized Genome databases: Structure databases, Data storage and retrieval and Interoperability Flat files, relational, object oriented databases and controlled vocabularies. File Format.

**MODULE III**

Introduction to Metadata and search; Indices, Boolean, Fuzzy, Neighboring search. The challenges of data exchange and integration. Ontologies, interchange languages and standardization efforts. General Introduction to XML, UMLS, CORBA, PYTHON and OMG/LIFESCIENCE. Sequence Alignments and Visualization Introduction to Sequences, alignments and Dynamic Programming; Local alignment and Global alignment, Pairwise alignment and multiple sequence alignment.

**Text Books:**

1. Attwood, T.K. and Parry-Smith, D. J. *Introduction to Bioinformatics*, Longmans
2. S. Sundara Rajan, R. Balaji, *Introduction to Bioinformatics*, Himalaya Pub

**BCS-085 DIGITAL IMAGE PROCESSING**

L T P C  
3 1 0 4

**MODULE 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 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 Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

**MODULE II**

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.

**MODULE 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 – Bandpass Filters; Minimum Mean-square Error Restoration.

**Text Books:**

1. *Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.*
2. *Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.*
3. *Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ. E*

**BCS-086 COMPUTATIONAL GEOMETRY**

L T P C  
3 1 0 4

**MODULE-I**

**Introduction**, Application domains of computational geometry, Limitations of computational geometry, Convex hulls, Jarvis March method, Graham's scan method, Planar Graphs, Regions, Dual of a graph, Geometric Dual, Triangulations: polygon triangulations, guarding, Art Gallery problem.

**MODULE-II**

**Voronoi diagrams**: construction and applications, Delauney triangulations, Divide and conquer approach, Flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties. **Geometric searching**: point-location, Trapezoidal maps, Fractional cascading, Finger trees, Segment trees, Interval trees, Visibility: weak and strong.

**MODULE-III**

**Arrangements of lines**: zone theorem, **Combinatorial geometry**: Ham-sandwich cuts. **Sweep techniques**: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, Topological sweep for line arrangements.

**Text Books:**

1. Franco P. Preparata and Michael Ian Shamos, "Computational Geometry: An Introduction", Springer.
2. Mark de Berg, Marc van Kreveld, Mark Overmars, and Otfried Cheong, "Computational Geometry: Algorithms and Applications", Springer.

**Reference Books:**

1. Ketan Mulmuley, "Computational Geometry: An Introduction Through Randomized Algorithms", Prentice-Hall.
2. Joseph O'Rourke, "Computational Geometry in C", Cambridge University Press.



**BCS-087 COMPUTATIONAL COMPLEXITY**

L T P C  
3 1 0 4

**MODULE-I**

Models of Computation, resources (time and space), algorithms, computability, complexity. Complexity classes, P/NP/PSPACE, reductions, hardness, completeness, hierarchy, relationships between complexity classes.

**MODULE-II**

Randomized computation and complexity; Logical characterizations, incompleteness; Approximability. Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.

**MODULE-III**

Probabilistically checkable proofs; Communication complexity; Quantum computation.

**Text Books:**

1. *Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity ,Prentice-Hall*

**Reference Books:**

1. *Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press*
2. *Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer*

**MODULE-I**

**Overview of Biometrics:** Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security. **Authentication and Biometrics:** Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans. **Common biometrics:** Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification.

**Introduction to Information Hiding:** Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography.

**MODULE-II**

**Principles of Steganography:** Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

**A Survey of Steganographic Techniques:** Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques.

**Steganalysis:** Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

**MODULE-III**

**Watermarking and Copyright Protection:** Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system. Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare, cyber crime, types of cyber crimes, Digital evidence, nature of digital evidence, precautions while dealing with digital evidence.

**Text Book:**

1. *Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.*

### MODULE-I

Introduction: Uses of computer Networks, Reference Models, Channel allocation problem, Multiple access Protocols, Ethernet, Wireless LANs, Broadband Networks, Structure Overlay Networks, P2P Computing

### MODULE-II

Network Layer Design Issues, Addressing: Internet Address, Classful Addressing, Subnetting, Supernetting, Classless Addressing, dynamic Address Configuration, Network Layer Protocol: ARP, ICMP, IPV4 and IPV6.

### MODULE-III

Transport Service, Elements of transport protocol, Process to Process Delivery, Internet Transport Protocols UDP, Internet Transport Protocols TCP, Performance Issues. The Application Layer: Client Server Model, Socket Interface: sockets, Connectionless interactive server, Connection-Oriented concurrent server,

#### **Text Books:**

1. *Computer Networks and Internets* - Douglas E. Comer; PE.
2. *Communication Networks* - Leon-Garcia-Widjaja; TMH.
3. *Internetworking with TCP / IP* - Douglas E. Comer; PE.
4. *TCP/IP protocol suite* - ForouzanBehrouz A; TMH.
5. *Computer Networks* – Andrew S. Tannenbaum; PHI.
6. *Data and Computer Communication* - William Stallings; PHI

## MODULE 1

**Introduction** – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce **INTRODUCTION HADOOP** Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop.

## MODULE 2

**HADOOP ARCHITECTURE** Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance

## MODULE 3

**HADOOP ECOSYSTEM AND YARN** Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN, Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating

### **Text Books:**

1. *The Big Data-Driven Business: How to Use Big Data to Win Customers, Beat Competitors, and Boost Profits* [Russell Glass](#), [Sean Callahan](#).
2. *Data Fluency: Empowering Your Organization with Effective Data Communication*, [Zach Gemignani](#), [Chris Gemignani](#), [Richard Galentino](#).
3. *Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data*, Gebundene Ausgabe, von [EMC Education Services](#) (Herausgeber)
4. [Hadoop: The Definitive Guide](#) Author: Tom White Publisher: Hadoop: The Definitive Guide
5. [Hadoop in Action](#) Author: Chuck Lam Publisher: Manning