DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY
BODOLAND UNIVERSITY

Syllabus based on CBCS for M. Sc in Information Technology
No. of Semester: 4
Duration: 2 years

Semester-1

Paper Code	Name of the paper	Credits (L+T+P)	Marks
CSIT-1.1	Advanced Concepts in OOP	4+0+0=4	100
CSIT-1.2	Advanced Computer Organization and Architecture	3+0+1=4	100
CSIT-1.3	Operating Systems	3+0+0=3	100
CSIT-1.4	Advanced Database Management Systems	3+0+1=4	100
CSIT-1.5	LAB-1	5	100
CSIT-1.6	OPEN ELECTIVE-1	2+0+0=2	50
Total	5	20	550

LAB-1:1. Advanced Concepts in OOP
2. Advanced Database Management Systems

OPEN ELECTIVE-1
1. CSIT-G 1.6-1 : Introduction to Computer Programming in C

Semester-2

Paper Code	Name of the paper	Credits (L+T+P)	Marks
CSIT-2.1	Data Communication and Computer Networks	3+1+0=4	100
CSIT-2.2	Data Structures & Complexity Theory	4+0+0=4	100
CSIT-2.3	Microprocessor 8085 & 8086	4+0+0=4	100
CSIT-2.4	Mathematical Foundations of Computer Science	3+1+0=4	100
CSIT-2.5	LAB-2	5	100
CSIT-2.6	OPEN ELECTIVE-2	2+0+0=2	50
Total	6	23	550

LAB-2:1. Advanced Data Structures
2. Microprocessor 8085 & 8086

OPEN ELECTIVE-2
1. **CSIT-G 2.6-1 : Management Information System (MIS)**

Semester-3

Paper Code	Name of the paper	Credits (L+T+P)	Marks
IT-3.1	Web Programming Technology	4+0+0=4	100
CSIT-3.2	Software Engineering	3+1+0=4	100
CSIT-3.3	Data Mining & Warehousing	3+1+0=4	100
CSIT-3.4	Computer Graphics	4+0+0=4	100
CSIT-3.5	LAB-3	5	100
CSIT-3.6	Discipline Centric Elective 1	3+0+0=3	100
Total	6	24	600

LAB 3: Java Programming, HTML, JSP, PHP, XML

Semester-4

Paper Code	Name of the paper	Credits (L+T+P)	Marks
CSIT-4.1	Distributed System	3+1+0=4	100
CSIT-4.2	Compiler Design	4+0+0=4	100
CSIT-4.3	Seminar	4	200
CSIT-4.4	Discipline Centric Elective 2	4+0+0=4	100
CSIT-4.5	Project Work	6	100
Total	4	22	500

	Total No. of Papers	Total Credits	Total Marks
Grand Total	23	92	2200

Discipline Centric Electives:

DAC will decide to float at least two papers against each Elective, from the list below, based on the availability of Faculty Members and their expertise:

1. **CSIT-EL 1 Embedded System**
2. **CSIT-EL 2 Speech Processing**
3. **CSIT-EL 3 Artificial Intelligence**
4. **CSIT-EL 4 Network Security and Cryptography**
5. **CSIT-EL 5 System Administration**
6. **CSIT-EL 6 Image Processing**
7. **CSIT-EL 7 Big Data**
8. **CSIT-EL 8 Software Testing and Quality Assurance**
9. **CSIT-EL 9 Programming Languages**
10. **CSIT-EL 10 Fuzzy Logic**
11. **CSIT-EL 11 Wireless Networks**
12. **CSIT-EL 12 Mobile Computing**

1st SEMESTER

CSIT-1.1 : ADVANCED CONCEPTS IN OBJECT ORIENTED PROGRAMMING

Total marks : 100 **LTPC (4-0-0-4)**

Object Oriented Programming

Structured Programming and Object Oriented Programming paradigms. Data abstraction: Object, class, member and friend functions, memory allocation for objects, constructors and destructors, templates.

Inheritance: Extending a class, casting up the hierarchy, single and multiple inheritances, virtual base class.

Polymorphism: Compile time polymorphism, operator overloading, function overloading, static binding, run-time polymorphism, virtual functions, pure virtual functions, abstract class, dynamic binding.

Exception handling.Object Oriented Design

Object Oriented Design Approaches, Object Modeling Techniques (OMT) tools : Object Model, Dynamic Model, and Functional Model. (Object Diagram, State Diagram, and DFD). Phases of Object-Oriented Development: Object Analysis, System Design, Object Design.

Recommended Readings:

- B. Stroustrup, The C++ Programming Language, Addison Wesley Publishing Company, 1995.
- Herbert Schild : The Complete Reference to C++, Osborne McGrawHill.
- Rambaugh et al. : Object Oriented Modeling and Design, PHI(EEE).

CSIT-1.2 : ADVANCED COMPUTER ORGANIZATION AND ARCHITECTURE

Total Marks- 100 **LTPC (3-0-1-4)**

Instruction Set Architecture: -

Instruction set design, addressing modes, representation of data (character, integral, floating point)

Computer Arithmetic: - Serial adder, parallel adder, ripple carry adder, carry look-ahead adder, multiplication of signed and unsigned numbers, Booth's algorithm, division of integer, floating point arithmetic.

Processor Design: -

Register transfer language, one, two and three bus data path, ALU Design, control unit, hardwired control unit, micro programmed control unit.

Memory: - Classification and types. Cache memory, direct mapped, associative mapped and set associative mapped cache. cache replacement policies, write policy, unified, split and

multilevel cache, virtual memory, paging, segmentation.

Input Output System:
I/O buses, device controller, Interrupt and DMA. Interrupt driven I/O, Program controlled I/O and DMA transfer.

Parallel Architectures:
Classification, SISD, SIMD, MISD, MIMD, Scalar, vector, superscalar and pipelined processor, Pipelining, Instruction pipeline, pipeline bubbles, Hazards: -resource conflicts, data dependency, branch difficulty. Vector computing, arithmetic pipeline, vector and scalar register, chaining, scatter gather operations, vector-register processor, memory- memory vector processor. Array processor.

Advanced concepts:
Branch prediction, super pipelining, Branch delay slot, Register file, superscalar architecture, superscalar pipelines, superscalar branch prediction, out of order execution, register renaming, Pipeline scheduling, dynamic scheduling and static scheduling algorithms, reorder buffer and register renaming, Thronton technique and scoreboard. Tomasulo algorithm and reservation stations. VLIW architecture: - EPIC architecture, Multiprocessor systems: - Interconnection types. Cache coherence problem

Recommended Readings*:*

- Computer Architecture and Organization by B. Govindarajalu.; TMH publication.
- Advanced Computer Architecture A systems Design Approach by Richard Y. Kain; PHI Publication
- Computer Organization and Architecture Designing for Performance by William Stallings; Pearson Education
- Computer System Architecture by M. Morris Mano, PHI Publication

CSIT-1.3: OPERATING SYSTEMS
Total Marks: 100 **LTPC (3-1-0-4)**

Review of computer organization: Major subsystems, instruction sets, I/O organization.

Memory architecture: Address protection, segmentation, virtual memory, paging, page replacement algorithms, cache memory, hierarchy of memory types, associative memory.

Support for concurrent process: Mutual exclusion, shared data, critical sections, busy form of waiting, lock and unlock primitives, synchronization block and wakeup.

Scheduling: Process states, virtual processors, interrupt mechanism, scheduling algorithms, implementation of concurrency primitive.

System deadlock: Prevention, detection and avoidance.

Multiprogramming system: Queue management, I/O supervisors, memory management. File system, disk and drum scheduling.

Case Study: Some real operating system– semaphores, messages, shared memory.

Advanced Topics: Secondary storage management, Security, Distributed operating system.

Recommended Readings:

- A. S. Tanenbaum and A. S. Woodhull, 'Operating Systems Design and Implementation ', PHI
- Stallings, Unix Network programming, PHI.
- Kerninghan and Pike, The Unix programming Environment, PHI.
- M. Bach, 'The Design of the Unix Operating System', PHI
- A. S. Tanenbaum, 'Design of Operating System', Addison Wesley
- J. L. Peterson and A. Silberschatz, 'Operating System concepts ', Addison – Wesley
- Milenkovic, 'Operating System concept and design', McGraw Hill
- W. Stallings, 'Operating Systems', PHI
- A. Silberschatz and P. Galvin, 'Operating System Concepts', Addison-Wesley

CSIT-1.4: ADVANCED DATABASE MANAGEMENT SYSTEMS
Total Marks: 100 **LTPC (4-0-0-4)**

Relational model, relational algebra, and relational calculus (review): Relational model concepts, relational databases and schemas; Relational algebra operations, queries in relational algebra; overview of relational calculus; Commercial query language SQL- data definition, constraints, SQL queries, insertion, deletion, updation.

Semantic modeling (review): introduction, The E-R model, E-R diagrams, design of database with E-R model, Transformation of ER model to relational schema

Normalization and functional dependencies (review): design guidelines, functional dependencies – equivalence of sets of functional dependencies, cover, minimal cover; normal forms- 1NF, 2NF, 3NF, BCNF , 4 NF , dependency-preserving property , lossless join property , algorithms to ensure dependency -preserving property and lossless join property

System implementation techniques: Query processing and optimization- translation between SQL queries and relational algebra ; Transaction processing- transaction and system concepts, desirable properties, schedules and recoverability; Concurrency control- locking techniques, concurrency control based on timestamp ordering, multiversion concurrency control techniques; Database recovery- concepts and techniques, recovery in multidatabase systems; Security and authentication- issues, access control techniques, introduction to multilevel security.

Object oriented database systems: Concepts of object-oriented databases; Standards, languages and design; Object relational database systems.

Distributed databases: Concepts; Data fragmentation, replication, and allocation techniques; Types of distributed database systems; Query processing in distributed databases; Overview of concurrency control and recovery in distributed databases.

Image, multimedia, and spatial databases: Concepts of Image, multimedia, and spatial databases; Content-based indexing and retrieval, Indexing techniques- R trees, R+ trees, KD trees.

Recommended Readings:

- R. Elmasri and S. B. Navathe, 'Fundamentals of Database Systems', Pearson Education.
- C. J. Date, 'An Introduction To Database Systems', Pearson Education.
- D. Stamper and W. Price, 'Database Design And Management- An Applied Approach', Mcgraw Hill.
- C. S. R. Prabhu, 'Object-Oriented Database Systems- Approaches And Architectures', PHI.
- J. D. Ullman, 'Principles of Database Systems', Galgotia

CSIT 1.5: LAB-1 LTPC (--- 5)

1. **Advanced Concepts in OOP**
2. Advanced Database Management Systems

OPEN ELECTIVE-1

CSIT-G 1.6-1: INTRODUCTION TO COMPUTER PROGRAMMING IN C.

TOTAL MARKS: 50 **LTPC(2-0-0-2)**

Computer Fundamentals: Evolution of computers, Generation of Computers, Classification of Computers (Analog, Digital and Hybrid computers,) Classification of Computers according to size, super Computers, Mainframe computers, personal computers (Different Types), Characteristics of computers, Block diagram of a digital computer.

Input/output devices: Concepts of memory-RAM, Primary Memory, ROM, EPROM and EEPROM etc.

INTRODUCTION TO PROGRAMMING CONCEPTS:

Types of Programming Languages, Software, Classification of software, Application Software and System Software, Structured Programming, Algorithms and Flowcharts with examples.

INTRODUCTION TO NUMBER SYSTEM AND CODES:

Different number systems and their conversions (Decimal, Binary, Octal and Hexadecimal),1's complement and 2's complement, Floating point numbers, coding-BCD, Gray ,ASCII etc.

BOOLEAN ALGEBRA AND GATE NETWORKS:

Fundamental concepts of Boolean algebra, Inverter gates, AND, OR, NAND, NOR,X-OR,X_NOR gate. The Universal property of NAND and NOR gate. Basic laws of Boolean algebra, De-Morgan's Theorems, Simplification of Boolean Expression, Karnaugh map (SOP).

COMPUTERS AND COMMUNICATION:

Introduction to Computer Networks, Internet and World Wide Web, FTP, Electronic Mail. Web Development Tools : FrontPage, HTML.

Recommended Books:

2. M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003 – (Unit I, II, V)
3. John .M Yarbrough, Digital Logic Applications and Design, Thomson- Vikas publishing house, New Delhi, 2002. (Unit III, IV)
4. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 2nd ed., Vikas Publishing House Pvt. Ltd, New Delhi, 2004

2ND SEMESTER

CSIT-2.1: DATA COMMUNICATION AND COMPUTER NETWORKS

Total Marks: 100 **LTPC (3-1-0-4)**

UNIT I: Data Communication concepts and terminologies: Data representation, Data transmission, Transmission channels, Signal encoding, Transmission impairments, Transmission media: Guided transmission media (*Twisted pair, Coaxial and Optical fiber);* Wireless transmission (*Terrestrial microwave, satellite microwave, Broadcast Radio and Infrared)*

UNIT II: Asynchronous and Synchronous transmission, Baseband and Broadband transmission, Modulation methods, Modems, Multiplexing.

UNIT III: Evolution of computer networks: Circuit switching, Development of packet switching: 1961-1972, Proprietary networks and internetworking: 1972-1980, Proliferation of networks: 1980-1990. The internet explosion: 1990s.

UNIT IV: Network standards and protocols: The IEEE standards, OSI 7 layer model, TCP/IP protocol suit. Data Link Layer: Frame design, Flow control, Error handling, HDLC, PPP, Sliding window protocol.

UNIT V: Network Layer: IP, X.25, Frame Relay, ATM, Routing, Queuing theory. Transport Layer: TCP, UDP, Congestion control, Flow control, Socket interface. Application Layer: SNMP, Authentication, Encryption, Web and HTTP, FTP, Email, DNS, Network File System (NFS) and File sharing, Remote Procedure Calling (RPC).

UNIT VI: Local Area Network (LAN): Needs, Architecture and Technology, Ethernet: CSMA/CD operation, parameters and specifications, Cabling: 10Base5, 10Base2, 10BaseT, 10BaseF, Hubs, patch panels and wiring closets. Bridges, Switches, 100BaseT, 100BaseVGANY,Gigabit Ethernet. FDDI, Token Ring, Wireless, ISDN, B-ISDN

UNIT VII: VSAT technology, Wireless LAN: Technologies, IEEE standards and protocols. Basics of Network management and Security, Infrastructure for network management and security.

Recommended Readings:

- Stallings, W.; Data and Computer Communications; Prentice Hall of India.
- Tanenbaum A.S.; Computer Networks; Prentice Hall of India.
- Kurose and Ross; Computer Networking; Addison Wesley
- Prakash C. Gupta; Data Communication; Prentice Hall of India

CSIT-2.2: DATA STRUCTURES & COMPLEXITY THEORY

Total Marks: 100 **LTPC (4-0-0-4)**

Data Structure: Definition, Concepts, Overview, Implementation of Data Structures.

Algorithms: Overview and Analysis of Algorithms.

Arrays: Definition, One-Dimensional Array (Memory Allocation, Operations on Arrays, Application of Arrays), Multi-Dimensional (Two- Dimensional arrays, Sparse matrices).

Linked Lists: Definition, Single linked Lists (Representation of a Linked List in Memory, Operations on Linked List), Circular Linked List, Double Linked Lists (Operations on a Doubled Linked Lists), Circular Doubled Linked List (Operations on a Circular Doubled Linked Lists), Application of Linked Lists.

Stacks: Definition, Representation of a Stack (Array Representation of Stacks, Linked List Representation of Stacks), Operation on Stacks, Application of Stacks.

Queues: Definition, Representation of Queues (Representation of Queue using an array, Representation of Queue using a Linked List), Circular Queue, Deque, Priority Queues, Application of Queues).

Trees: Definition and Concepts, Binary Trees and Operations on them, Representation of Binary Tree (Linear Representation of Binary Tree, Linked Representation of Binary Tree), Various Binary Trees: Binary Search Tree, Heap Trees, Height Balanced Binary Tree, Red Black Tree, B Trees and their data structure operations.

Sorting: Insertion Sort, Selection Sort, Bubble Sort, Shell Sort, Quick Sort, Radix Sort, Bucket Sort.

Searching: Linear Search (with Array, Linked List), Binary Search, Fibonacci Search.

Recommended readings:

- T. H. Cormen, C. E. Leiserson and R. L. Rivest, Introduction to Algorithms, Tata-Mcgraw Hill Publishers.
- Horowitz and Sahani, Fundamentals of Computer Algorithms, Galgotia.
- A. Aho, J. E. Hopcroft and J. D. Ullman, Design and Analysis of Computer Algorithms, Addison-Wesley.
- S. Baase and Allen Van Gelder, Computer Algorithms-Introduction to Design and Analysis, Pearson Education, LPE.

CSIT-2.3 : Microprocessor 8085 & 8086

Total Marks : 100 **LTPC: (4-0-0-4)**

UNIT-I: Introduction to Digital Computer and Microprocessor

Digital Computers: General architecture and brief description of elements, instruction execution, instruction format, and instruction set, addressing modes, programming system, higher lever languages.

Buses and CPU Timings: Bus size and signals, machine cycle timing diagram, instruction timing, processor timing.

Microprocessor and Microprocessor Development Systems: Evolution of Microprocessor, Microprocessor architecture and its operations, memory, inputs-outputs (I/Os), data transfer schemes interfacing devices, architecture advancements of microprocessors, typical microprocessor development system.

UNIT-II: 8-bit Microprocessors

8085 microprocessor: pin configuration, internal architecture.Timing & Signals: control and status, interrupt: ALU, machine cycles,

Instruction Set of 8085

Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing.

Instruction format, op-codes, mnemonics, no. of bytes, RTL, variants, no. of machine cycles and T states, addressing modes.

Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assember directives.

UNIT-III: 16-bit Microprocessors

Architecture: Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation,

Operating Modes

Instruction Set of 8086

Addressing Modes

Instruction format: Discussion on instruction Set, Groups, data transfer, arithmetic , logic string, branch control transfer, processor control.

Interrupts: Hardware and software interrupts, responses and types

UNIT-IV : Fundamental of Programming:

Development of algorithms, flowcharts in terms of structures, (series, parallel, if-then-else etc.)

Assembler Level Programming: memory space allocation (mother board and user program) Assembler level programs (ASMs)

UNIT-V : Peripheral Interfacing:

I/O programming: Programmed I/O, Interrupt Driven I/O, DMA I/O interface: serial and parallel communication, memory I/O mapped I/Os. Peripheral Devices: 8237 DMA controller, 8255- Programmable peripheral interface, 8253/8254 Programmable timer/counter. 8259 programmable Interrupt Controller.

Text Books:

1. Gaonkar, Ramesh S, "Microprocessor Architecture, programming and applications with the 8085" Pen ram International Publishing 5th Ed.

2. Uffenbeck, John, "Microcomputers and Microprocessors" PHI/ 3rd Edition.

3. Ray, A.K. & Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing" Tata Mc. Graw Hill.

4. Krishna Kant, "Microprocessors and Microcontrollers" PHI Learning.

Reference Books:

5. Brey, Barry B. "INTEL Microprocessors" Prentice Hall (India)

6. ADitya P Mathur, "Introduction to Microprocessor" Tata Mc Graw Hill

7. M. Rafiquzzaman, "Microprocessors- Theory and applications" PHI

8. B. Ram, "Advanced Microprocessor & Interfacing" Tata McGraw Hill

9. Renu Singh & B.P. Singh, "Microprocessor and Interfacing and applications" New Age International

10. Hall D.V., "Microprocessors Interfacing" Tata Mc Graw Hill

11. Liu and Gibson G.A., "Microcomputer Systems: The 8086/8088 Family" Prentice Hall (India)

CSIT- 2.4: MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

Total marks: 100 **LTPC (3-1-0-4)**

Discrete mathematical structures: Basic concepts of sets, relations, binary relations, functions; Algebraic structures- groups, free groups, congruence, homomorphism and isomorphism, poset, permutation and combination; Lattices and Boolean algebra; Vector Spaces and properties; Linear transformations and linear operators.

Mathematical logic: Connectives- statement formulae and truth tables, tautologies and tautological implications, two-state devices and statement logic; Theory of inference- rules, consistency of premises and indirect method of proof, automatic theorem proving; Propositional calculus, predicate calculus- predicates, quantifiers, predicate formulas, free and bound variables, inference theory of predicate calculus; validity, soundness, completeness, compactness,(definitions only); resolution principles; Skolemization and Herbrand domain; Introduction to axiomatic theory.

Graph theory: Basic concepts- finite and infinite graphs, incidence and degree, isolated and pendant vertices, null graph; Paths and Circuits- isomorphism, subgraphs, walks, connected and disconnected graphs and components, Euler graphs, Bi-partite graphs, Hamiltonian paths and circuits; Trees- properties of trees, distance and centers, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, spanning trees in weighted graphs; Cut-sets- properties, connectivity and separability, network flows; Matrix representation of graphs- incidence matrix, submatrices, circuit matrix, cut-set matrix, path matrix, adjacency matrix; Coloring, Covering and Partitioning- basic concepts; Directed graphs- definition, types, directed paths and connectedness, Euler digraph, tress with directed edges.

Automata theory: Concept of language and grammar. Review of DFA, NFA, NFA with empty moves and their equivalence. Minimization of FA. Regular sets and regular expressions. Pumping lemma for regular sets, closure properties and decision algorithms for regular sets. Context free language – definition, removal of useless symbols, removal of null productions and unit productions. Normal forms of CFLs- CNF and GNF.

Recommended readings:

- J. P. Tremblay and R. Manohar, “Discrete Mathematical Structures With Applications To Computer Science”, Mcgraw Hill.
- C. L. Liu, “Elements of Discrete Mathematics”, Mcgraw Hill.
- J. H. Gallier, “Logic For Computer Science”, J. Willey & Sons.
- H. R. Lewis and C. H. Papadimitriou, “Elements of The Theory of Computation”, PHI.
- N. Deo, “Graph Theory With Applications To Engineering And Computer Science”, PHI

CSIT- 2.5:LAB -2 **LTPC: (---5)**

- **ADVANCED DATA STRUCTURES**
- **MICROPROCESSOR8085/8086**

OPEN ELECTIVE-2

CSIT-G 2.6-1: MANAGEMENT INFORMATION SYSTEMS

TOTAL MARKS: 50 **LTPC(2-0-0-2)**

MANAGEMENT INFORMATION SYSTEM (MIS): Organization and Information Systems, Changing Environment and its impact on Business - The IT/IS and its influence. The Organization: Structure, Managers and activities - Data, information and its attributes - The level of people and their information needs - Types of Decisions and information - Information System, categorization of information on the basis of nature and characteristics.

KINDS OF INFORMATION SYSTEMS: Transaction Processing System (TPS) - Office Automation System (OAS) - Management Information System (MIS) - Decision Support System (DSS) and Group Decision Support System (GDSS) - Expert System (ES) - Executive Support System (EIS or ESS).

COMPUTER IN TELECOMMUNICATION AND NETWORKS: Communication, Media, Modems & Channels - LAN, MAN & WAN - Network Topologies, Internet, Intranet and Extranet. Wireless technologies like Wi-Fi, Bluetooth and Wi-Max.

MANUFACTURING AND SERVICE SYSTEMS: Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank.

ENTERPRISE SYSTEM: Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM - Customer Relationship Management (CRM): Phases. Knowledge Management and e-governance.

CHOICE OF IT: Nature of IT decision - Strategic decision - Configuration design and evaluation Information technology implementation plan.

SECURITY AND ETHICAL CHALLENGES: Ethical responsibilities of Business Professionals – Business, technology. Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and intellectual property. Privacy Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism.

Recommended Books:

1. "Introduction to Information System", James A. O' Brien, Tata McGraw Hill, 12th Edtion.

2. "Management Information Systems", S.Sadagopan, PHI, 1/e, 2005

3. "Management Information Systems", Effy Oz, Thomson Course Technology, 3/e, 2003

4. Corporate Information Strategy and Management", Lynda M AppleGate, Robert D Austin et al, Tata McGraw Hill, 7th Edition.

3RD SEMESTER

IT-3.1: WEB PROGRAMMING TECHNOLOGIES

Total Marks:100 **LTPC(4-0-0-4)**

Internet basics: History and basic idea of Internet; Internet services: telnet, e-mail, ftp, WWW.

Web page design: Designing web pages with HTML- use of tags, hyperlinks, URLs, tables, text formatting, graphics & multimedia, imagemap, frames and forms in web pages. Use of Cascading Style Sheet in web pages.

Creating interactive and dynamic web pages with JavaScript: JavaScript overview; constants, variables, operators, expressions & statements; user-defined & built-in functions; client-side form validation; using properties and methods of built-in objects.

Markup language basics: Standard Generalized Markup Language (SGML) - structures, elements, Content models, DTD, attributes, entities.

Extensible Markup Language (XML): Introduction- using user-defined tags in web pages; displaying XML contents; XML DTDs; use of XSL.

Web Browsers: functions and working principle of web browsers; plug-ins & helper applications; conceptual architecture of some typical web browsers.

Introduction to Client/Server Computing: client-server computing basics; types of Client/Server systems; middleware; N-tired systems: 2-tier/3-tier/4-tier systems; Fat Clients versus Fat Servers.

Web Servers: Web services and web server functionality; web server composition; registration; HTTP, IP address, DNS & ports; conceptual architecture of some typical web servers.

Server-side scripting: overview of CGI, ASP, and JSP. Server side scripting using PHP; Web database connectivity- introduction to ODBC; PHP with database connectivity.

Exposure to Advanced Web Technologies: Distributed Object based models- DCOM, CORBA, EJB; Web services and Related Technologies- ISAPI, SOAP, UDDI, WSDL; Other Advanced Web Technologies- AJAX, ISAPI, .NET.

Web Security: Firewalls- definition and uses, network layer firewalls and application layer firewalls; Proxy servers.

Recommended Readings:

- Oliver, Dick; SAMS Teach Yourself Html 4 in 24 Hours; Techmedia.
- Ashbacher, Charles; SAMS Teach Yourself XML in 24 Hours; Techmedia.
- SAMS Teach Yourself JavaScript in 24 Hours; Techmedia.
- SAMS Teach Yourself PHP in 24 Hours; Techmedia.

- Lehnert, Wendy. G.; Web 101 making the 'Net for you; Pearson Education.
- Sebesta, Robert; World Wide Web Programming.
- www.w3c.org
- www.w3schools.com
- www.enterprosejavaworld.com

CSIT-3.2: SOFTWARE ENGINEERING

Total Marks: 100 **LTPC (3-1-0-4)**

UNIT I: Problem domain, SE challenges, SE approach. Software process, Characteristics of SW process, SW development process model.

UNIT II: SW requirement, problem analysis, requirement specification, functional specification, validation, matrices.

UNIT III: Role of SW architecture, architecture view, component and connector view, style for C&C view. Process planning, Effort estimation, Software Cost Estimation based on COCOMO II cost model, Scheduling and staffing, SW configuration management plan, quality plan, risk management, project monitoring plan.

UNIT IV: Design principle, module level concept, design notation and specification, structured design methodology, verification. OO Analysis and OO Design. OO Design concept, UML, OO Design methodology.

UNIT V: Detail design and PDL, Verification, Metrices. Programming principles and guidelines, Coding process, refactoring, verification. Testing fundamentals.

Recommended Readings:

- An integrated Approach to Software Engineering: Pankaj Jalote: Narosa Publishing House
- Software Engineering: Ron Patton: Pearson Education.
- Software Engineering: K K Agarwal, Yogesh Singh: New Age International Publisher.
- Software Engineering: Ian Sommerville: Pearson Education (Addison Wesley)

- Software Engineering: A practitioner's Approach: Roger S. Pressman: McGraw Hill.

CSIT-3.3: DATA MINING AND WAREHOUSINGTOTAL

MARKS: 100 **LTPC(3-1-0-4)**

Introduction to data warehousing, its characteristics, data types, application and scopes of data warehouse. Data warehouse types.

Design of data warehouse: Data warehouse models, schema and their comparison with respect to actual applications, Process flows within data warehouse. Load manager, warehouse manager and query managers. Aggregations, Metadata.

Hardware and operational Design: Data warehouse server, parallel processing, SMP, MPP and cluster computing and other factors. Data warehouse tuning and testing: Tuning and testing of data warehouse and their need.

Case Study: A practical data warehouse schema design.

Data mining , KDD and their stages, goals of data mining, research methodology and concept learning, data warehouse and data mining, OLTP and OLAP, DSS, Expert systems.

Data mining Tools: Query tools, visual tools, neural networks, genetic algorithms, SVM and decision support systems.

Data mining algorithms: Association rule algorithms, Clustering algorithms, Pattern recognition algorithms, k–means and nearest neighbour algorithms.

Case study: A practical KDD stages design.

RECOMENDED BOOKS:

1. Dolf Zantinge, P. Zantinge, Data mining, PHI
2. Sam Anahory, Data Warehousing in the real world , Pearson

3. Han. J and Kamber. M, Data mining, Concept and Techniques, Esevier

4. Principles of Data Mining. Hand. David, Mannila .Heikki, Smyth, Padhraic. PHI

CSIT-3.4: COMPUTER GRAPHICS

Total Marks:100 **LTPC (4-0-0-4)**

Introduction: Computer graphics and its applications; Input devices; Output devices-display devices; Display techniques- Raster-scan display and Random-scan display; color display techniques; Direct view storage tubes; emissive & non-emissive flat-panel displays-Plasma panels, Thin-film electrostatic displays, LED, LCD; Three-dimensional viewing devices; display systems architecture.

Graphics software: classifications, graphics functions for various operations, software standards- PHIGS, PHIGS+, GKS.

Output primitives: line-drawing algorithms- DDA algorithm and Bresenham's algorithm; Midpoint algorithms for circle & ellipse generation; area-filling algorithms-scan-line polygon-fill, nonzero-winding number rule; scan-line curve filling, boundary-fill algorithm, flood-fill algorithm; Character generation techniques- generation of bitmap and outlined font.

2-D geometric transformations: Basic transformations- translation, rotation and scaling; matrix representations and Homogeneous co-ordinate representations; Composite transformations among translation, rotation and scaling; General pivot-point rotation; General fixed-point scaling; General scaling directions; Other transformations- reflection and shear; Transformation between co-ordinate systems; Definition of Affine transformations.

2-D viewing: definition; viewing transformation pipeline; window-to-viewport co-ordinate transformation.

2-D Clipping operations: definition; point clipping; line clipping algorithms; polygon clipping algorithms; curve clipping, text clipping.

3-D concepts: display methods- Parallel projection, perspective projection, depth visible line & surface identification, surface rendering, exploded & cutaway views, 3-D & stereoscopic views.

3-D geometric transformations: Translation; Rotation- rotations about co-ordinate axes, general 3-D rotation; Scaling; Reflection; Shear.

3-D viewing: viewing transformation pipeline; world co-ordinate to viewing co-ordinate transformation.

Projections: Parallel projection techniques- orthographic & oblique projections and their transformation equations; Perspective projection and transformation equations.

Visible surface detection: definition; classification of algorithms- object-space methods & Image-space methods; algorithms for visible surface detection; curved-surface detection; wireframe displays;

Illumination and Surface rendering: definition and importance; light sources; Definition of basic illumination models.

Color models and applications: properties of light; standard preliminaries- XYZ model, CIE chromaticity diagram; color models- RGB, YIQ, CMY, HSV, HLS; conversion between color models.

Multimedia Systems: Review of typical interactive multimedia systems; Aspects of multimedia systems; Multimedia design techniques, Multimedia technology; Network-based multimedia systems.

Computer Animation: Traditional animation techniques, 2D animation, 3D animation.

Case Study: Graphics API with GD or OpenGL or DirectX/3D.

Recommended Readings:

- Donald Hearn, M. Pauline Baker; "Computer Graphics C Version"; PHI.
- Foly, Van Dam, Feiner, Hughes; "Computer Graphics principles and practice"; Pearson Education.
- Z. Xiang, R. A. Plastock; "Computer Graphics", second edition, McGraw Hill, 2006.
- N. Sinha, A. D. Udai; "Computer Graphics", 1st edition, McGraw Hill, 2008.

CSIT-3.5: LAB 3

Total Marks:100 **LTPC (5-0-0-5)**

JAVA PROGRAMMING, HTML, JSP, PHP, XML

CSIT-3.6: DISCIPLINE CENTRIC ELECTIVE 1

Total Marks:100 **LTPC (3-0-0-3)**

4TH SEMESTER

CSIT-4.1: DISTRIBUTED SYSTEM

Total Marks:100 **LTPC (3-1-0-4)**

Introduction to Distributed Systems: Definition of a distributed system. Design goals- connecting uses and resources, transparency, openness, scalability. Hardware concepts- multiprocessors, homogeneous & heterogeneous systems. Software concepts- distributed operating systems, network operating systems, middleware. The client-server model- clients & servers, application layering, client-server architectures.

Communication: Remote Procedure Call- basic RPC operation, parameter passing, examples. Remote Object Invocation- distributed objects, integrating clients and objects, static versus dynamic RMI, parameter passing, examples and case study. Message oriented communication- persistence and synchronicity in communication, transient communication, persistent communication.

Processes: Threads- introduction, threads in distributed systems. Clients- user interfaces, software for distribution transparency. Servers- general design issues, object servers. Code migration. Software agents- definition, software agents in distributed systems, Agent Technology.

Naming: Naming entities- names, identifiers & addresses, name resolution, name space implementation, the Domain Name System.

Synchronization: Clock synchronization- physical clocks, synchronization algorithms, uses. Logical clocks. Global state. Election algorithms- the Bully algorithm, Ring algorithm. Mutual exclusion- definition, algorithms. Distributed transactions- the transaction model, classification, implementation, concurrency control.

Consistency and Replication: Introduction, reasons for replication, object replication, consistency models.

Fault Tolerance: Introduction- basic concepts, failure models. Reliable client-server communication- point-to-point communication. Reliable group communication- basic reliable-multicasting schemes, atomic multicast. Distributed commit. Recovery.

Distributed File Systems: Introduction: characteristics of file systems, distributed file system requirements, File service architecture: flat file service, directory service, client module. Detailed case study of Sun Network File System (NFS).

Recommended Readings:

1. Tanenbaum & Steen; Distributed Systems Principles and Paradigms; Pearson Education, 2004.
2. Coulouris, Dollimore & Kindberg; Distributed Systems Concepts and Design, 3/e; Pearson Education.2006.

CSIT-4.2: COMPILER DESIGN

Total Marks: 100 **LTPC (4-0-0-4)**

Introduction: What is a compiler? Phases of compiler. Overview of working of a compiler

Lexical Analysis: NFA, DFA, conversion from NFA to DFA. Regular expression. Regular expression to NFA conversion. Minimisation of DFA. Writing a lexical analyser for C using Lex.

Syntax analysis: Grammar representation. Derivation and parse tree. Ambiguity and possible elimination. Top down parsing. Recursive descent and predictive top down parsing. Elimination of Left recursion. Bottom up parsing. Operator precedence parsing, LR parsing (including SLR and LALR). Error detection and recovery. Parser table construction. Writting a parser for a subset of C using yacc.

Code generation: Symbol table contents, implementation. Type checking. Syntax directed translation. Forms of intermediate codes. Abstract Syntax Trees, Directed Acyclic Graph, Three address code. Intermediate code generation for different language constructs like arrays, boolean expressions, if, if-else, while, case or switch, function calls. Writing a intermediate code generator and an interpreter for the intermediate code for the parser developed in 3 above. Target code generation issues. Runtime storage management.

Code Optimisation: DAG, basic blocks, Common sub-expression elimination, variable propogation, code motion, strength reduction, elimination of dead code, loop optimisation. Data flow analysis.

Recommended Readings

- Aho, Sethi, Ullman; Compilers, Principles, Techniques, Tools, Pearson Education
- Introduction to Compiler Construction, A.V.Aho. Ravi Sethi, J.D.Ullman; Pearson Education.
- Compiler Design in C, Holub., P.H.I.
- Compiler Design, Santanu Chattopadhyay, P.H.I.

- The Essence of Compilers, Hunter, Pearson Education.

CSIT-4.3: SEMINAR

TOTAL MARKS: 100 **LTPC(4-0-0-4)**

CSIT-4.4: DISCIPLINE CENTRIC ELECTIVE-2

TOTAL MARKS: 100 **LTPC(4-0-0-4)**

CSIT-4.5: PROJECT WORK

TOTAL MARKS: 100 **LTPC(6-0-0-6)**

	TOTAL NO. OF PAPERS	TOTAL CREDITS	TOTAL MARKS
GRAND TOTAL	**23**	**92**	**2200**

DEISCIPLINE CENTRIC ELECTIVES:

DAC will decide to float at least two papers against each Elective, from the list below, based on the availability of Faculty Members and their expertise:

1. **CSIT-EL 1 Embedded System**
2. **CSIT-EL 2 Speech Processing**
3. **CSIT-EL 3 Artificial Intelligence**
4. **CSIT-EL 4 Network Security and Cryptography**
5. **CSIT-EL 5 System Administration**
6. **CSIT-EL 6 Image Processing**
7. **CSIT-EL 7 Big Data**
8. **CSIT-EL 8 Software Testing and Quality Assurance**

9. **CSIT-EL 9 Programming Languages**
10. **CSIT-EL 10 Fuzzy Logic**
11. **CSIT-EL 11 Wireless Networks**
12. **CSIT-EL 12 Mobile Computing**

Syllabus for Discipline Centric Electives-1:

CSIT-EL 1: EMBEDED SYSTEM

TOTAL MARKS:100 **LTPC(3-0-0-3)**

Introduction: - What is an embedded system? Why is it special? What types of processor are used? What are the other peculiarities?

Processors for embedded systems: - 8 bit processors 8085, 8051 and PIC 18FXX: - Architecture and instruction set. (already covered in microprocessor) 16 bit: - 8086 32 bit : - 80386 architecture and instruction set, ARM based processor architecture and instruction set.

Operating systems for embedded systems: -

Real time operating systems Issues: -

I/O programming: Synchronization, transfer rate and latency. Polled I/O issues. Interrupt driven I/O. ISR. Response time interrupt controller. Software interrupts and exceptions. Buffering of data and queuing of interrupt requests.

Concurrency control: Foreground/Background systems, Thread state and serialization, latency, prevention of interrupt overruns. Concurrent execution of threads, context switch, non-preemptive multitasking, preemptive multitasking. Critical sections:- disableing interrupts, disabling ask switch, spin lock, mutex and semaphore.

Scheduling in Embedded Systems: Conventional scheduling, deadline driven scheduling, rate monotonic scheduling, deadlock, watchdog timer.

Memory Management: Static allocation, dynamic allocation. Recursion and dynamic allocation. shared memory, reentrant functions.

Boot up and System initialization.

80x86 microprocessor with a C compiler (suited for RTOS) and uC/OS RTOS may be used for practicals.

Some real embedded application shall be taken up for practical.

Recommended Readings

- Fundamentals of Embedded Software by Daniel W Lewis, Pearson Education
- An Embedded Software Priomer by David E. Simon, Pearson Education

CSIT-EL 6: IMAGE PROCESSING

TOTAL MARKS:100 **LTPC(3-0-0-3)**

Image digital representation. Elements of visual perception. Sampling and quantisation. Image processing system elements. Fourier transforms. Extension to 2· D, ocr, Walsh, Hadamard transforms. Enhancement and segmentation: Histogram modification. Smoothing, sharpening. Thresholding. Edge detection. Segmentation. Point and region dependent techniques. Image encoding: Fidelity criteria. Transform compression. KL, Fourier, DCT. Spatial compression, Run length coding. Huffman and contour coding. Restoration: Models. Inverse filtering. Least squares filtering. Recursive filtering.

RECOMMENDED BOOKS :

2. Gonslaez, et.a1, "Digital Image Processing", Addison Wesley, Reading, M.A., 1990.

CSIT-EL 9: PROGRAMMING LANGUAGES

Total Marks:100 **LTPC (3-0-0-3)**

Programming Language concepts

Factors influencing the evolution of programming languages - influence of architecture and operating system, implementation methods. Development in programming methodology, desirable features and design issues. Language processors. Syntax, semantics and Virtual Computers, Binding and Binding time.

Paradigms and Languages

Imperative Programming Languages

Statements, data types, subprograms, sequence control, data control, dynamic allocation using pointers, operating and programming environment, Subprogram activation- parameter passing methods, scope rules for names. Nested procedures. Syntax and translation.

Object Oriented Languages

Data abstraction: object oriented thinking, class, grouping of data and operations, constructors and destructors, templates.

Inheritance: Extending a class, casting up the hierarchy, single and multiple inheritances, virtual base class.

Polymorphism: Compile time polymorphism, operator and function overloading, static binding, run-time polymorphism, virtual functions, pure virtual functions, abstract class, dynamic binding.

Exception handling.

[As OOP has been covered in semester 1 in depth, a quick review of the above concepts will be made.]

Functional Programming Languages

Principles of functional programming. Types-values, bindings and functions, environment and scope, recursive functions, polymorphic functions, type variables.
Lists and programming with lists (LISP).

Functional programming in C++.

Logic Programming Languages

Review of Predicate Logic. Logic as a language for problem solving. Facts, rules, queries and deductions, sentence structure. General structure and computational behavior of logic programs. Unification algorithm. Procedural interpretation of Logic. Algorithmic view of logic program execution. A brief introduction to PROLOG.

Recommended Readings:

- T.W. Pratt and M. V. Zelkowitz: Programming Languages: Design and Implementation; PHI.
- Ravi Sathi, Programming Languages, Concepts and Constructs, Pearson Education, Asia, LPE
- B. Stroustrup, The C++ Programming Language, Addison Wesley Publishing Company, 1995.
- W. Lloyd, Foundations of Logic Programming, Springer 1984.
- Carlo Ghezzi, Mehdi Jazayeri, Programming Language Concepts, J. Wiley & sons.
- E. Horowitz : Fundamentals of Programming Languages; Galgotia Publications Pvt Ltd.
- K. C. Louden; Programming Languages-Principles and Practice; Thompson (2 nd Indian Edition);

Syllabus for Discipline Centric Electives-2:

CSIT-EL 3: ARTIFICIAL INTELLIGENCE

TOTAL MARKS:100 **LTPC(4-0-0-4)**

Historical foundation of AI. AI application areas. AI problem, Underlying assumptions, AI techniques, Level of models, success criteria. Problem as a state space search, Production Systems, Problem characteristics, PS characteristics, Design issues of search programs.

Heuristic Search Techniques : Generate and test, Hill Climbing, Best-First Search, Problem reduction.

Knowledge representation and Mapping, Approaches, Issues. Predicate logic. Representing simple facts in logic, Instance and isa relationship, Computable function and predicity, Resolution, Natural Deduction.

Knowledge representation using rules, Procedural vs declarative, logic programmes, Forward vs backward recovery, matching. Nonmonotonic reasoning and logic. Implementation: Depth first abd breath first search.

Introduction to statistical reasoning. Probability and bays theorem, Fuzzy logic concept. Concept of weak slot and filter, and strong slot and filter structure. Fundamental of Natural Language Processing : Syntactic processing, semantic analysis. Concept of Expert Systems : Representation using domain knowledge, Expert System shell, knowledge acquisition.

RECOMENDED VOOKS:

- Artificial Intelligence : E. Rich & K. Knight : Tata McGraw Hill.
- Artificial Intelligence: Structures and Strategies for Complex Problem solving: George Luger, Pearson Education.
- Principles of Artificial Intelligence: Nils J Nisson: Narosa

CSIT-EL 2: SPEECH PROCESSING

TOTAL MARKS: 100 **LTPC (4-0-0-4)**

UNIT-I: Digital Signal Processing

Introduction: signals, systems and signal Processing, Frequency in Continuous Time & Discrete Time Signals. Analog to Digital & Digital to Analog Conversion. Discrete Time Signals & Systems: Discrete Time Signals, Discrete Time Systems, Discrete Time Systems described by Difference equations, Correlation of Discrete Time Signals.

UNIT II : FUNDAMENTALS OF SPEECH SIGNAL

History of speech recognition research, The Speech Signal : Speech production mechanism, Classification of speech, sounds, nature of speech signal, models of speech production. Speech signal processing: purpose of speech processing, digital models for speech signal, Digital processing of speech signals, Significance, short time analysis.

UNIT III : TIME DOMAIN METHODS FOR SPEECH PROCESSING

Time domain parameters of speech, methods for extracting the parameters, Zero crossings, Auto correlation function, pitch estimation.

UNIT IV: FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING

Short time Fourier analysis, filter bank analysis, spectrographic analysis, Formant extraction, pitch extraction, Analysis - synthesis systems. Homomorphic Signal Processing

UNIT V: LINEAR PREDICTIVE CODING OF SPEECH

Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains.

UNIT VI: SPEECH ANALYSIS

Cepstral analysis of speech, formant and pitch estimation, Mel frequency cepstrum computation, Applications of speech processing - Speech recognition, Speech synthesis and speaker verification.

UNIT VII: AUTOMATIC SPEECH RECOGNITION

Basic pattern recognition approaches, Parametric representation of speech, Evaluating the similarity of speech patterns, Isolated digit Recognition System, Continuous digit Recognition System. Vector quantization, speech coding

UNIT VIII : HIDDEN MARKOV MODEL FOR SPEECH RECOGNITION

Introduction to Hidden Markov Model (HMM), Types of HMM, Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMs, Adapting to variability in speech (DTW), Language models. Example of speech recognition project.

Recommended Books:

1. L. Rabiner and B.-H. Juang, Fundamentals of Speech Recognition, Prentice Hall, 1995, ISBN 0-13-015157-2
2. L. R. Rabiner and R. W. Schafer, Digital Processing of Speech Signals, Prentice-Hall, 1978, ISBN 0-13-213603-1.