FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE
SEMESTER: SEVENTH (C.B.S.)
BRANCH: COMPUTER TECHNOLOGY

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**Elective I:** Computational Intelligence, Advance Database Systems, Software Architecture, Digital Signal Processing

**Elective II:** Natural Language Processing, Advance Operating System, Architecture of Web Application, Wireless sensor Networks
FOUR YEAR BACHELOR OF ENGINEERING (B.E.) DEGREE COURSE  
SEMESTER: EIGHTH (C.B.S.)  
BRANCH: COMPUTER TECHNOLOGY

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**Elective III:** Pattern Recognition, Parallel Computing, Bio Informatics, Web Data Management, Human Computer Interface

**Elective IV:** Computational Geometry, Cloud Computing, Digital Forensic, Cognitive Science, Digital Image Processing
BECT401T: Compilers

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UNIT I
Introduction to Compilers: Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyzer, LEX. Top down Parsing; LL(1) Parser, recursive descent parser.

UNIT II
Syntax Analysis: Specification of syntax of programming languages using CFG, Top-down parser, design of LL (1) parser, bottom up parsing technique, LR parsing, Design of SLR, CLR, LALR parsers, YACC.

UNIT III
Syntax directed translation: Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations- postfix, syntax tree, TAC, translation of expressions, controls structures, declarations, procedure calls, Array reference.

UNIT IV
Code optimization: Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, induction variable removal, Elimination of Common sub expression.

UNIT V

UNIT VI
Storage allocation & Error Handling: Run time storage administration stack allocation, symbol table management, Error detection and recovery-lexical, syntactic and semantic.
TEXTBOOKS

BECT401P: Compilers lab: Practical based on above syllabus

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BECT402T: Artificial Intelligence

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UNIT I
Introduction to AI: Definition of AI, Early work in AI, Importance of AI and related fields, Task domains of AI systems, Intelligent agents, Generic architecture of intelligent agent.
Basics of problem solving: Defining the problem on a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs.

UNIT II
Heuristic search techniques: Generate and test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Means-ends analysis.
Knowledge Representation: Representation and mapping, Approaches and Issues. Introduction to proposition logic, Knowledge representation using predicate logic, Unification and resolution. Representing knowledge using rules, procedural Vs declarative knowledge, logic programming, forward Vs backward reasoning, matching.

UNIT III
Statistical reasoning: Symbolic Vs Statistical reasoning, Nonmonontonic and monotonic reasoning, Probability and Bayes’ theorem, Certainty factors and rule based systems, Baysian networks, introduction to fuzzy logic.

UNIT IV
Learning: General learning model, Types of learning - rote learning, learning by taking advice, learning by analogy, induction learning, learning by discovery.
Expert systems: Characteristic features of expert system, Architecture of expert system, Expert system shell, knowledge acquisition and validation, knowledge system building tools.
UNIT V
Natural Language Processing: Overview of linguistics, Grammar and languages, basic parsing techniques, semantic analysis and representation structures.
Game playing: Minimax search procedure, adding alpha-beta cutoffs.

UNIT VI
Genetic Algorithm: Motivation, GA cycle, genetic operators, GA based Machine Learning, illustrative example.

TEXT BOOK:

BECT402P: Artificial Intelligence lab: Practical based on above syllabus

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BECT403T: Elective-I Computational Intelligence

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UNIT I
Introduction to Computational Intelligence, Intelligence machines, Computational intelligence paradigms, Short history.

UNIT II

UNIT III

UNIT IV
Evolutionary computation, Chromosomes, fitness functions, and selection mechanisms, Genetic algorithms: crossover and mutation, Genetic programming, Evolution strategies.

UNIT V
Swarm intelligent systems: Introduction, ant colony systems, development of ant colony systems, working of ant colony systems.

UNIT VI

Text Books:
BECT403T: Elective-I Advanced Database Management Systems

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UNIT I
Introduction to Distributed Databases, DDBMS architectures, Comparison of Homogeneous and Heterogeneous Databases, Concurrency control in distributed databases, Distributed query processing, Distributed data storage, Distributed transactions, Commit protocols, and Directory systems-LDAP.

UNIT II
Introduction to Parallel databases, Parallel database architecture, speedup, scale-up I/O parallelism, Comparison of Inter-query and Intra-query parallelism, parallel query evaluation, implementation issues of Parallel query evaluation.

UNIT III
Object-based databases: Complex data types, structured types and inheritance in SQL, table inheritance, array and multi-set types in SQL, object identity and reference types in SQL, Persistent programming languages, Object-oriented vs. Object-Relational.

UNIT IV

UNIT V
Introduction to Data warehouse, Data warehouse architecture, Creating and maintaining a warehouse, Multidimensional data model, OLAP and data cubes, Operations on cubes, pre-processing, Analysis of Data pre-processing.

UNIT VI
Textbooks:
BECT403T: Elective-I Software Architecture

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UNIT I
Introduction to Software Architecture, Architecture Business Cycle, What is software architecture, software architecture requirements, Architecture structures and views, Documenting software architectures, Opportunities and Advances in software architectures.

UNIT II
Introduction to Quality Attributes, Need of quality attributes, Understanding quality attributes, architecture and quality attributes, achieving quality attributes. Case study of quality attributes in software architecture templates. Deriving Quality Attributes for software architectures

UNIT III
Design Patterns: history, principles and expectations. Study of a number of representative patterns like Singleton, Factory, Adaptor, Facade, Proxy, Iterator, Observer, Mediator, composite, Ways of using patterns. Case studies of patterns in software architecture

UNIT-IV
Introduction to Middleware, Middleware as infrastructure, Types of Middleware, RPC, Object brokers; CORBA: System Architecture, CORBA: Dynamic Service Selection and Invocation, Message oriented middleware. Specifications and Characteristics of Middleware Technologies. Recent advances in Middleware Technologies

UNIT-V
Introduction to three tier and n-Tier Web Architectures, XML, Client side technologies HTML, DHTML, Java Applets, Active X controls, DOM, AJAX. Need of Client side technology in multi-tier architectures Examples of three tier and n-tier architectures, client side technologies.
UNIT-VI
Need of server side technology in multi-tier architectures, Java Web Services, Server side technologies: JSP, SOA.

Text Book:

Reference Book:

BECT403T: Elective-I Digital Signal Processing

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Unit I
Introduction: Basic elements of DSP and its requirement, Advantages of Digital over analog signal processing, sampling theorem, sampling process and reconstruction of sampling data. Discrete time signals & systems, classification of discrete time signals and systems, LTI systems, linear convolution, Cross Correlation, Autocorrelation.

Unit II
Z- Transforms: The Z-transform: Definition, properties of the region of convergence for the Z-transform, Ztransform properties, Inverse Z-transform, Parseval’s theorem, unilateral Z-transform.

Unit III
Discrete and Fast Fourier Transforms: Definition and properties of DFT, IDFT, Relation between DFT and Z-Transform, Radix-2 FFT algorithms, Linear filtering methods based on DFT, circular convolution, Frequency analysis of discrete time signals using DFT, Gortzel algorithm.

Unit IV

Unit V
FIR Filter Design & Realization: Symmetric and antisymmetric FIR filters, Linear phase FIR filter, design of FIR filters using windows (Rectangular, Bartlett, Hanning, Hamming & Blakman), frequency sampling method, FIR differentiators, FIR filter structures.

Unit VI

Text Books:

Reference books:
BECT404T: Elective II Natural Language Processing

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**Unit I**
Introduction: NLP tasks in syntax, semantics, and pragmatics, Key issues & Applications such as information extraction, question answering, and machine translation, the problem of ambiguity, the role of machine learning, brief history of the field.

**Unit II**

**Unit III**
Syntactic parsing: Grammar formalisms and tree banks, Efficient parsing for context-free grammars (CFGs), Statistical parsing and probabilistic CFGs (PCFGs), Lexicalized PCFGs.

**Unit IV**
Semantic Analysis: Lexical semantics and word-sense disambiguation, Compositional semantics, Semantic Role labeling and Semantic Parsing.

**Unit V**
Information Extraction (IE): Named entity recognition and relation extraction, IE using sequence labeling, automatic summarization Subjectivity and sentiment analysis.

**Unit VI**
Machine Translation (MT): Basic issues in MT, Statistical translation, word alignment, phrase-based translation, and synchronous grammars.
Text Books:

Reference Books:
BECT404T: Elective-II Advance Operating System

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Unit I
Fundamentals: Introduction, Models and Features, Concept of Distributed Operating system, Issues in Design of a Distributed Operating System.

Unit II
Distributed Mutual Exclusion: Requirement of Mutual Exclusion Algorithm, Non Token Based Algorithm, Token Based Algorithms, Comparative Performance Analysis.

Unit III
Agreement protocols: Introduction, System Model, Classification of Agreement Problems, Solutions to the Byzantine Agreement Problem.

Unit IV
Distributed File system: Introduction to Distributed File System, Architecture, and Mechanism for Building Distributed File System.
Distributed Shared Memory: General Architecture of DSM systems, Algorithm for Implementing DSM, Memory coherence and Coherence Protocols.

Unit V
Unit VI

Text Books:


Reference Books:

BECT404T: Elective-II Architecture of Web Application

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UNIT I

UNIT II

UNIT III
XML & Introduction to Web server: Core XML, XHTML, XSL, Basic operation of web servers, mechanism for dynamic content recovery, Server configuration, Server security

UNIT IV
Overview of browser functionality: Architecture Considerations, Processing flow in Browser, Processing HTTP Request, Processing HTTP Responses, Cookie coordination, Privacy & P3P.

UNIT V
Active Browser Pages: Java Script, Cascading Style Sheets, DHTML, AJAX, CGI scripts and clickable maps

UNIT VI
Internet Telephoning, Virtual reality over the web, Intranet and Extranet, Firewall Design Issues.

Text Books:
Reference book

BECT404T: Elective-II Wireless Sensor Network

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UNIT I
Introduction, Sensor network application, Factors influencing sensor network design: Fault tolerance, Scalability, Production cost, Operating environment, sensor network topology, hardware constraints, transmission media and power consumption. Sensor network communication architecture, Characteristics, Technical Challenges, and Design Directions

UNIT II

UNIT III

UNIT IV

UNIT V

UNIT VI

REFERENCE BOOKS:

BECT406T: Data Warehousing & Mining

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UNIT I
Introduction: Evolution of data warehousing, Characteristics, Operational database systems and data warehouse (OLTP & OLAP), Multidimensional data models, Data warehouse architecture, OLAP Operations., Design and construction of data warehouses.
UNIT II
Fundamentals of data mining, Data mining functionalities, Classification of data mining systems, Data mining task primitives, Integration of data mining systems with data warehouse, Major issues and challenges in data mining, Data preprocessing- need for processing, data cleaning, integration, transformation, data reduction. Discretisation and concept hierarchy generation, data mining application areas.

UNIT III
Classification: Introduction, Decision tree, Building decision tree- tree induction algorithm, Split algorithm based on information theory, Split algorithm based on gini index, Decision tree rules, naive based methods.

UNIT IV
Mining frequent patterns and Association Rules: Market basket analysis, Frequent item sets and association rules, Apriori algorithm, FP growth algorithm, Improving efficiency of Apriori and FP growth algorithms.

UNIT V

UNIT VI

TEXT BOOK:

BECT406P: Data Warehousing & Mining: Practical based on above syllabus

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BECT407T: Cyber and Information Security

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UNIT I
Need of Information Security: Legal, Ethical and Professional Issues Attributes of security- authentication, access control, confidentiality, authorization, integrity, non-reproduction.

UNIT II
Introduction to Secret key and Cryptography: Block Cipher Principle: Stream ciphers and block cipher, Block cipher design principles, modes of operation, Encrypt given messages using DES, Triple DES, IDEA, AES Problems on cryptography algorithms.
Confidentiality Using Conventional Encryption: Key Distribution.

UNIT III
Introduction to Public key and Cryptography: Principles of Public-Key Cryptosystem, RSA algorithm, Ket Management, Diffie Hellman Key Exchange, Encrypt given messages using ECC.
Introduction to Number Theory: Prime and Relative Prime numbers, Modular Arithmetic, Fermat’s and Euler’s Theoram, Euclids Algorithm, the Chinese Remainder Theorem.
UNIT IV

UNIT V
Firewall: Firewall Functionality, Policies and Access Control Policies, Firewall Types.

UNIT VI
Software Vulnerability: Phishing, Buffer Overflow, Cross-site Scripting (XSS), SQL Injection.
Electronic Payment: Payment Types, Enabling Technologies-Smart Cards and Smart Phones, Cardholder Present E-Transaction-Attacks, Chip Card Transactions, Payment over Internet-Issues and Concerns, Secure Electronic Transaction, Online Rail Ticket Booking.
Electronic Mail Security: Pretty Good Privacy, S/MIME

Text Book:

Reference Books:

### BECT407P: Cyber and Information Security: Practical based on above syllabus

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BECT408T: Elective-III Pattern Recognition

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UNIT I
Introduction: Statistical Decision Theory, Image Processing and Analysis, Probability- Probabilities of events, random variables, joint distribution & densities.

UNIT II
Moments of random variables, estimation of parameters from samples, minimum risk estimators.

UNIT III
Non Parametric decision making- Histograms, Kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate functions, minimum squared error, estimation functions, choosing a decision making technique.

UNIT V
Component Analysis and dimension reduction: Principal Component Analysis, Fisher Linear Discriminant, Locally Linear Embedding.

UNIT V

UNIT VI
Clustering- Introduction, hierarchical clustering, partition clustering.

TEXTBOOKS:

REFERENCE BOOKS:
BECT408T: Elective-III Parallel Computing

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UNIT I
Parallel Processing Architectures: Parallelism in sequential machines, Abstract model of parallel computer, Multiprocessor architecture, Pipelining, Array processors.
Programmability Issues: An overview, Operating system support, Types of operating systems, Parallel programming models, Software tools

UNIT II
Data Dependency Analysis: Types of dependencies loop and array dependences, Loop dependence analysis, Solving diophantine equations, Program transformations
Shared Memory Programming: General model of shared memory programming, Process model under UNIX

UNIT III
Algorithms for Parallel Machines: Speedup, Complexity and cost, Histogram computation, Parallel reduction, Quadrature problem, Matrix multiplication, Parallel sorting algorithms, Solving linear systems, Probabilistic algorithms

UNIT IV

UNIT V
Debugging Parallel Programs: Debugging techniques, Debugging message passing parallel programs, Debugging shared memory parallel programs
Memory and I/O Subsystems: Hierarchical memory structure, Virtual memory system, Memory allocation and management, Cache allocation and management, Cache memories and management, Input output subsystems

UNIT VI
Other Parallelism Paradigms: Data flow computing, Systolic architectures, Functional and logic paradigms, Distributed shared memory
Performance of Parallel Processors: Speedup and efficiency, Amdahl’s law, Gustafson-Barsis’s law, Karf-Flatt metric, Isoefficiency metric

Text Books:

References:

BECT408T: Elective-III Bioinformatics

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UNIT I
Introduction To Bioinformatics: Scope of bioinformatics, elementary commands and protocols, FTP, Telnet, HTTP, primer on information theory.

UNIT II

UNIT III
Special Topics In Bioinformatics: DNA mapping and sequencing, Map alignment, large scale sequencing methods, Shotgun and Sanger method.

UNIT IV
Sequence Alignment And Dynamic Programming: Heuristic alignment algorithms, Global sequence alignments- Needleman-Wunsch algorithm, Smith-Waterman algorithm - local sequence alignments, Amino acid substitution matrices- PAM and BLOSUM.

UNIT V
Primary Database And Their Use: Introduction to biological databases, organization and management of databases, Searching and retrieval of information from the World Wide Web, Structure databases - PDB (Protein Data Bank), Molecular Modeling Databases (MMDB), primary databases- NCBI, EMBL, DDBJ.
Secondary Databases: Introduction to secondary databases- organization and management of databases Swissprot, PIR, KEGG.

UNIT VI
Biochemical Data Bases: Introduction to biochemical databases, organization and management of databases,KEGG, EXGESCY, BRENDA, WIT.

TEXT BOOKS:

REFERENCE BOOKS:
UNIT I

UNIT II
XPath and XQuery: Regular Path Expressions, XPath Basics, XPath steps and expressions, Path evaluations, axes, node tests, predicates, XQuery Syntax, FLWOR expression, advanced features, XUpdate.

UNIT III
Automata on ranked trees, unranked trees, XML Schema, other schema languages, Graph semistructured data, graph bisimulation, data guides, XML query evaluation, XML identifiers, XML evaluation techniques

UNIT IV
Ontologies, Querying and Data Integration: RDF, RDF Schema, OWL, Description Logic, Querying data through ontologies, Querying RDF data, querying through RDFS

UNIT V
Building Web scale applications: Web search, web crawlers, web information retrieval, Web graph mining and hot topics in web search, Distributed systems, failure management, Required properties of a distributed system, P2P networks,

UNIT VI
Text Book:

Reference Books:
3. W3C web site.
BECT408T: Elective-III Human Computer Interface

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**Unit I**
Introduction: Importance of user Interface: definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface - popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user - Interface popularity, characteristics- Principles of user interface.

**Unit II**
Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions.

**Unit III**
Screen Designing: Design goals: Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition - amount of information - focus and emphasis - presentation information simply and meaningfully - information retrieval on web -statistical graphics - Technological consideration in interface design.

**Unit IV**

**Unit V**

**Unit VI**
Interaction Devices: Keyboard and function keys, pointing devices, speech recognition digitization and generation - image and video displays drivers.
Text Books:

Reference Books:
BECT409T: Elective IV: Computational Geometry

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UNIT I

UNIT II
Polygon Triangulation Guarding an Art Gallery: Guarding and Triangulations, Partitioning a Polygon into Monotone Pieces, Triangulating a Monotone Polygon, Linear Programming Manufacturing with Molds: The Geometry of Casting, Half-Plane Intersection, Incremental Linear Programming, Randomized Linear Programming.

UNIT III

UNIT IV

UNIT V
UNIT VI

Text Book

Reference Books
BECT409T: Elective IV: Cloud Computing

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Unit I

Unit II
Cloud Computing Architecture: Cloud computing stack, Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services, Service Models (XaaS), Infrastructure as a Service (IaaS), Platform as a Service(PaaS), Software as a Service(SaaS), Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud.

Unit III
Big Data Analysis, Hadoop and Map Reduce: Introduction, Clustering Big Data, Classification of Big Data, Hadoop MapReduce Job Execution, Hadoop scheduling, Hadoop cluster setup, configuration of Hadoop, starting and stopping Hadoop cluster.

Unit IV

Unit V
Application Development using C#: Understand object oriented concepts in C#.NET, Creation of UI and event handling, web page creation using ASP.NET, ADO.NET architecture, implementation of data seta, using ADO.NET in console application, using ADO.NET in web application.

Unit VI
Creating Cloud Application using Azure: Creating simple cloud application, configuring an application, creating virtual machine, deployment of application to Windows Azure Cloud, using Azure Storage Services, using Azure Table Service, deployment of application to the production environment.

Text Books:

Reference Books:
UNIT I
Introduction & evidential potential of digital devices - Key developments, Digital devices in society, Technology and culture, Comment, Closed vs. open systems, evaluating digital evidence potential.

UNIT II
Device Handling & Examination Principles: Seizure issues, Device identification, Networked devices, Contamination, Previewing, Imaging, Continuity and hashing, Evidence locations.

UNIT III
A seven element security model, A developmental model of digital systems, Knowing, Unknowing, Audit and logs, Data content, Data context. Internet & Mobile Devices The ISO / OSI model, The internet protocol suite, DNS, Internet applications, Mobile phone PDAs, GPS, Other personal technology.

UNIT IV

UNIT V
Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised, Internet Tracing Methods 65.

UNIT VI
Techniques, Computer Forensics Investigative Services, Process Improvement Forensic Course Content, Case Histories.

**TEXT BOOKS:**

**REFERENCES:**
BECT409T: Cognitive Science

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UNIT I

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UNIT IV

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UNIT VI

Text Book

Reference Books
BECT409T: Elective-IV Digital Image Processing

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UNIT I

UNIT II

UNIT III
Image Enhancement in the frequency Domain: Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering, Implementation

UNIT IV
Image Compression and Morphological processing, Introduction to image compression and its need, Compression models, Elements information theory, Error free compression, Lossy compression, Introduction to morphological processing, Dilation and Erosion, Opening and closing, Some basic morphological algorithm (Boundary extraction, Region filling, Convex hull, Skeleton)

UNIT V
UNIT VI
Image Representation: Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region. Description: Boundary Descriptors, Shape Numbers, Fourier Descriptors, Regional Descriptors, Simple Descriptors, Topological Descriptors, introduction to image file formats: TIFF, JPEG, BMP, etc.

Text Books

Reference Books