GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Advanced Computer Graphics

Sr.No	Course content
1.	Review of two-dimensional graphics: Transformations, Windowing and Clipping
2.	Three Dimensions: 3D geometry, primitives and transformations. Rotation about an arbitraty axis. Parallel and perspective projcection. Viewing parameters. 3D clipping and viewing transformation
3.	Curves and Fractals: Polygon Meshes. Parametric Cubic curves: B- spline, Bezier, Hermite. Parametrice Bicubic Surfaces. Quadric surfaces. Fractals: fractal lines and surfaces. Applications.
4.	Solid Modelling: Representing solids. Regularized Boolean Set Opreations. Primitive Instancing. Sweep and Boundary Representations. Spatial-partitioning Representations. Constructive Solid Geometry. User Interface for Solid Modelling
5.	Achromatice and Coloured Light: Achromatice light, Gamma correction, Halftone approximation, Chromatice Colour. CIE chromaticity diagram, Colour models for Raster Graphices. Using Color in Computer Graphics
6.	Hidden Lines and Surfaces: Algorithms for Visible-Line and Surface determination: z-buffer, List priority, Scan line, Area Subdivsion, Ray Tracing
7.	Illumination and Shading: Surface detail, shadows and Transparency. Inter object Reflections. Illumination Models. Extended Light Sources. Recursive Ray Tracing
8.	Image based Rendering : Introduction, comparison with geometry based rendering, applications
9.	Animation : Introduction , morphing , character animation and facial animation
10.	Graphics Hardware: special-purpose computer graphics processors and accelerators.

Reference Books:

1. Computer Graphics: principles and practice Foley, vanDam, Feiner Hughes Addision Wesley
2. Mathematical Elements of Graphics Roges Tata McGrow Hill
3. Computer Graphics Donald Hearn and M.Pauline Baker Prentice Hall India
4. Procedural Elements-Computer Graphics, David Rogers, TMH
5. Principles of computer graphics, Shalini Govil-pal, springer

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Computer Algorithm

Sr.No	Course content
1	Introduction: Algorithms; analysis and design of algorithms, Type of recurrences.
2	Sorting, Order Statistics and Data Structures: Heap sort; sorting in linear time; medians and other statistics; red-black trees; augmenting data structures.
3	Advanced Data Structures: B-trees; binomial heaps; Fibonacci heaps; Data structures for disjoint sets.
4	Advanced Design and Analysis Techniques: Dynamic programming; greedy algorithms; amortized analysis; probabilistic algorithms; binary search and traversal techniques.
5	Graph Algorithms: Elementary graph algorithms; Minimum spanning trees; Single source shortest paths; All- pairs shortest paths; Maximum flow; Backtracking; Topological sorting.
6	Algorithms for Common Applications: Sorting networks; Algorithms for parallel computers; Approximation algorithms; Heuristic algorithms String matching.
7	Algebraic Simplifications and Transformations: NP-Hard and NP-Complete problems.

Reference Books:

1. Computer Algorithms by Coreman MIT Press
2. Design and Analysis of Computer Algorithms by Aho,Hopcroft and Ullman ,Pearson
3. The Algorithm Design Manual By Steve s. Skiena

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Information Theory and Coding

Sr.No	Course content
1.	Probability Theory: Random Variable and Processes: Review of probability concept. Concept of random variable: Function of random variable. Distribution and density function Moments, characteristic function and conditional statistics, sequence of random variables. Rayleigh, Rice, Lognormal, Poisson distributions. Central limit theorem.
2.	Stochastic Processes: Spectral representation and Random processes: classification and application of stochastic process. Autocorrelation and Cross-correlation function, spectral representation and estimation.
3.	Information theory: Discrete messages, the concept of information, uniquely decodable code and instantaneously decodable code. Kraft's in-equality and Sardina's Patterson theorem. Average information- Entropy, Information rate. Coding to increase the average information per bit. Probability based Source coding techniques and application – Huffman coding, Shanon-fano code. Arithmetic coding. Marcov chain. Shannon's theorem and channel capacity. Bandwidth and S/N trade off.
4.	Channel coding: Coding for error detection and correction. Hamming distance. Rectangular coding, Block coding and decoding, Cyclic codes – coding and decoding. Convolution codes. Burst error correction codes.
5.	Application of coding: Multimedia System, Storage and Transmission of text, audio and video. Cryptography and information security.

Reference Books:

1. Probability, Random Variable and Stochastic Processes, A. Papoulis, McGraw Hill.
2. Introduction to data compression, Khalid Sayood,Morgan Kaufmann Publisher.
3. Modern Digital and Analog communication system, B.P.Lathi, Oxford university press.
4. Foundation of coding, Jiri Adamek, John Wiley and Sons.
5. Error Control Coding, Shu Lin and D Costello, PHI
6. Cryptography and Network Security, William Stallings,Pearson education Asia.
7. Digital Communication, John G. Proakis, TMH
8. Data Compression the complete reference, 2nd edition, David Salomon.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Computer Graphics

Sr.No	Course content
1.	Display Technologies: Basics of CRT, color CRT, graphics mode, display adapter cards, raster scan and vector scan.
2.	2-D Graphics Primitives: Lines, circle and ellipse scan conversion algorithms, polygons and polylines, polygon filling algorithms, thick primitives, filling with different patterns, character generation, generation of bar-chart and pie-chart, aliasing and anti-aliasing.
3.	Windowing and Clipping: Cohen-Sutherland and Cyrus-back line clipping algorithms, Sutherland-Hodgeman and Weiler-Atherton polygon clipping algorithms.
4.	Geometrical Transformations: Basic Transformations: scaling, rotation, translation. Other transformations: shearing and reflection. Window to view-port transformation.
5.	3-D Viewing and Transformation: Representation of 3-D object in form of polygon mesh, curve and surfaces, 3-D geometrical transformation, parallel and perspective projection.
6.	Rendering: Basics, Rendering techniques: Visible surface determination, Illumination and Shading.

Reference Books:

1. Computer Graphics: principles and practice Foley, vanDam, Feiner Hughes Addision Wesley
2. Computer Graphics Donald Hearn and M.Pauline Baker Prentice Hall India
3. Procedural Elements-Computer Graphics, David Rogers, TMH
4. Computer graphics – Schaum's Outline Series, Computer graphics – Schaum's Outline Series, Tata McGraw Hill

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Internet Technology

Sr.No	Course content
1.	Introduction: Introduction to Internet, History of Internet, Internet Standards, Practical uses of Internet.
2.	Component of the Internet: Connection requirements and options, Internet addressing, Internet standards, Web browser basics
3.	Building Blocks: Understanding protocols, Transmission Control Protocol/Internet Protocol, Name resolution protocols, Client-side protocols, Internet client infrastructure
4.	Components of web page: HTML, DHTML, CSS, JavaScript, XML; Website Design, Overview of Web Servers
5.	Core Components: Hardware platforms, Internet server components, Web servers, E-mail servers, FTP servers, Proxy servers, News servers, Directory servers, Mirrored servers
6.	Networking Hardware and Software Components: Network Interface Cards, Network Cables, Network Connecting Devices etc.

Reference Books:

1. Computer Networks and Internets With Internet Applications By Douglas E Comer ,Pearson
2. Computer Network with Internet Protocols By William Stallings ,Pearson
3. Data Communication And Networking By B.Forouzan TMH Publication
4. Internet & World wide Web :How to Program By Deitel And Deitel ,Person
5. Dynamic HTML: The Definitive Reference (2nd Edition) – Danny Goodman; O'reilly (paperback)
6. HTML 4 Bible - Bryan Pfaffenberger, Bill Karrow; Paperback
7. HTML 4.01 Programmer's Reference – Chris Ullman, Sean Plamer, Simon Oliver…., Paperback

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Wireless Computer Networks

Sr.No	Course content
1.	Overview of Wireless Networks and Medium Characteristics : Introduction, Different generations. Introduction to 1G, 2G, 3G and 4G networks Radio propagation mechanism, Path loss modeling, Effects of Multipath and Doppler.
2.	Physical Layer and Medium Access Alternatives: Short distance base band transmission, Ultra Wide-Band pulse transmission, Carrier modulated transmission, Digital cellular transmition, Broadband and Spread Spectrum transmission, Diversity and Smart receiving techniques. Fixed assignment access for voice oriented networks, Random access for data oriented networks.
3.	Wireless Network Planning and Operation: Wireless network topologies, Cell fundamentals and topologies, Signal to Interference ratio calculation, Capacity expansion techniques. Network planning for CDMA systems. Mobility management, Mobile internet protocols, Radio resources and power management, Security in wireless networks.
4.	GSM, TDMA, CDMA technology and Mobile Data networks: Mechanism to support mobile environment, Communication infrastructure. Reference architecture for North American Systems, IS-95, IMT -2000. GPRS and higher data rates, Short messaging services in GSM, Mobile application protocols.
5.	Wireless Broad band and Ad-hoc networks: IEEE 802.11 WLANs, Ad-Hoc networking, Bluetooth, WPANs, WiMax technology. Wireless Geolocation Systems.

Reference Books:

1. Wireless Communications and Networks, 3G and beyond, ITI Saha Misra, TMH.
2. Mobile Computing Technology, Application and Service Creation By Asoke K Talukder and Roopa R Yavagal, Tata McGraw Hill
3. Mobile and Personal Communication Systems and Services By Raj Pandya ISBN: 81-203-1710-6, PHI
4. Principle of wireless Networks by Kaveh Pahlavan and Prashant Krishnamurthy, Pearson 2002.
5. Wireless Communication Principles and Practice by Theodore S. Rappaport, PE India.
6. Wireless and Mobile Network Architectures: Yi-Bing Lin and Imrich Chlamtac, WILEY
7. Mobile Computing by Raj Kamal ,Oxford

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Parallel Computing

Sr.No	Course content
1.	Introduction: Introduction to parallel processing, pipelining, data parallelism, control parallelism, scalability, topologies in processor organization, UMA and NUMA multiprocessors, flynn's taxonomy, Amdhle's law, basic issues in parallel programming.
2.	Abstract model of serial and parallel computation, basic PRAM algorithm: parallel reduction, prefix sums, list ranking, preorder traversal, merging, graph coloring: introduction of some parallel programming language.
3.	Mapping data to processors on processor arrays and Multi-computer dynamic load balancing on Multi-computers, Deterministic and Non-Deterministic model of scheduling on UMA and NUMA multiprocessors.
4.	Elementary parallel algorithms (on SIMD & MIMD models): Reduction algorithms, Broadcast algorithms and prefix sum algorithms.
5.	Parallel algorithms for basic arithmetic problems: Parallel addition, parallel multiplication, parallel division, FPT using modulo arithmetic and complex arithmetic.
6.	Parallel algorithms for general arithmetic expression evaluation: Nested parenthesis and polynomial evaluation.
7.	Parallel algorithms for matrix problems: Matrix addition, multiplication, solving linear equations and non-linear equations, solving linear recurrence.
8.	Parallel searching and sorting algorithms: Odd-Even Transposition, Bitonic merge sort, Quick sort on SIMD and MIMD models. Searching algorithms for SIMD and MIMD model.
9.	Parallel graph algorithms: Parallel graph traversal algorithm, All pair shortest path and minimum spanning tree algorithm.
10.	Combinatorial algorithms: Algorithms for generating permutations and combinations in parallel, parallel branch and bound algorithm and alpha-beta search algorithm.

Reference Books:

1. Michael J Quinn, Parallel Computing: Theory and Practice, MGH.
2. Selim G. AKL, The Design and Analysis of Parallel Algorithm, PHI.
3. Lakhsmivardhan and Dhall, Analysis and Design of Parallel Algorithms : Arithmetic and Matrix problems.
4. Ananth Gramma et. Al., Introduction of Parallel Computing, PEARSON, Edu.
5. Barry Wilkinson; M. Allen, Parallel Computing, PEARSON, Edu. W.P,.Petersen and P.Arbenz ,Introduction to Paralled Computing , Oxford

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Advanced Data Structures

Sr.No	Course content
1.	Fundamental Data Structuring problem, Red-Black Tree, Top-Down Splay Trees, Skip List, Deterministic Skip List, Random Skip List, Analysis of random and deterministic skip list.AA-Trees, Teaps, Random Treaps, Analyzing treaps.
2.	Multidimensional Indexes: Applications needing Multiple Dimensions, GIS, Data Cubes, , k-d Trees, Operations on k-d Trees, Adapting K-d Trees for Secondary Storage, Region quad Trees and Z-Ordering, Hash-Like Structures for Multidimensional Data, Grid Files, Operations on Grid Files, Partitioned hash functions, Comparison of Grid Files and Partitioned Hashing, Tree-Like Structures for Multidimensional Data, Multiple key Indexes, Performance of Multiple key indexes, Quad Trees, R-Trees, Operations on R-Trees, concept of R* Tree, SS Tree, SR Tree, Clustered index.
3.	Sorting : Internal sorting algorithms for large Structures, External sorting, Model for external sorting, The simple algorithm, Bitonic merge, Multiway Merge, Polyphase Merge, Replacement Selection.
4.	Priority Queue(Heaps) : Simple implementation, Binary Heap, Applications of Priority Queues, D-Heaps, Leftist Heaps, Skew Heaps, Binomial Queues, Pairing Heaps, Heap with unclustered tree/hash index.
5.	Hashing: Hash Tables, Universal Hash families, Applications of dynamic dictionaries, Constructing universal hash family, Strongly universal hash family, Hashing O(1) search time, Nearly perfect hash family, Achieving bounded query time.
6.	The Disjoint Set ADT: Equivalence Relations, The Dynamic Equivalence Problem, Union Algorithm, Path Compression.
7.	Game Tree Evaluation, The Minmax Principle, Randomness and non-uniformity.
8.	Introduction to text searching algorithms, Search techniques for search Engines.

Reference Books:

1. Data Structures and Algorithms in C by Mark Allen Weiss - Pearson
2. Database System Implementation by J. D. Ullman, Jennifer Widom- Pearson
3. The Design and analysis of computer Algorithms by A. V. Aho, R.Sethi and J. D. Ullman, Pearson.
4. Randomized Algorithms by Rajeev Motwani, Prabhakar Raghavan-Cambridge Univ.
5. Database Management Systems by Ramkrishnan and Gehrke –TMH

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Distributed Operating Systems

Sr.No	Course content
1.	Introduction to distributed Systems: Definition and goals, Hardware and Software concepts, Design issues
2.	Communication in Distributed System: Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC
3.	Synchronization in distributed systems: Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems.
4.	Processes and processors in distributed systems: Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues
5.	Distributed File Systems: Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study
6.	Distributed Shared Memory: Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing
7.	Case Study: Amoeba, Mach, Chorus, DCE

Reference Books:

1. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
2. 2. Distributed Operating Systems by Andrew S Tannebaum, PHI

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Design of Language Processors

Sr.No	Course content
1.	Language Processors: Language Processing Activities, Fundamentals of Language Processing, and Fundamentals of Language Specification, Language Processor Development Tools
2.	Data Structures for Language Processing: Search Data Structures, Allocation Data Structures Scanning and parsing fundamentals.
3.	Assemblers: Elements of Assembly Language Programming, A simple Assembly Scheme, Pass Structure of Assembler, design of one and two pass assembler.
4.	Macros and Macro Processors: Macro Definitions and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities
5.	Compilers and interpreters: A simple one pass compiler, Lexical Analysis, Specification of tokens, Recognition of tokens, Finite automata, NFA, Syntax analysis, top down parsing, Bottom up parsing, LR parsers, Syntax directed Translation, L- attributed and S-attributed definitions with their implementation, Type checking, Run-Time Environment: issues and design, Intermediate code generation for declarations, Assignment statements, Boolean expressions, Case statements and Looping structures, Code Optimization, Optimization of basic blocks, loops in flow graphs, global data flow analysis, Code generation
6.	Linkers: Relocation and Linking Concepts, Design of a Linker, Self Relocating Programs, A suitable case study for linker, Loaders
7.	Complier Design Issues

Reference Books:

1. System Programming and Operating Systems by D M Dhamdhere, TMH.
2. Compilers, Principles, Techniques and Tools by A.V. Aho, R. Sethi and J.D.Ullman, Pearson.
3. Advanced compiler Design by Muchnick
4. Systems Programming by John J. Donovan

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Object Oriented Programming

Sr.No	Course content
1.	Introduction : Approaches to Software Design, Evolution of the Object Model, Benefits of Object Programming; Object Model: Objects, Classes, Subclassing and Inheritance, Polymorphism
2.	Object Programming in Windowed Environments: Benefits of OOP in Windowed Application Environments, Application Frameworks and Class Libraries
3.	Overview of Java : Data types : Operators and Control statements.
4.	Classes and Inheritance: Methods; contractors; Garbage collection; Access control; Multilevel hierarchy
5.	Packages and Interfaces : Access protections : Importing packages; Implementation and applications of Interfaces.
6.	Exception handling : Fundamentals : Exception types; try, catch, throw, throws and finally; Nested try statements and propagation of thrown exception
7.	Multithreaded programming : Thread model; Thread priorities; Synchronization and interthread communication
8.	I/O and Applets : Streams; File I/O; Applets; Parameter passing to applets
9.	Event Handling : Event model; Event Classes; Event listeners interfaces.
10.	Abstract Window Toolkit : AWT Classes; Component; Container; Panel; Window; FrameCanvas; Graphics; AWT controls; Layout Managers; Buttons; Check Boxes; Choices; Lists; Scroll Bars; Text fields; Text Areas; Menus; Dialog Boxes; GUI bases programs

11.	Java Library : String handling; Exploring java language; java io; java.util
12.	From Plan to Product: Developing a Plan, Identifying Software Requirements, Designing a General Class Structure, Building a General Application Framework, Implementing Features, Final Polishing
13.	Tools and Methodologies: Analysis and Design Methodologies, Notations
14.	Object Programming for the Web: How Web Applications Work, Web Objects, Building a Simple Object-Oriented Program

Reference Books:

1. The Complete Reference Java 2, Seventh Edition - Patrik Naughton & Herbert Schidt , Tata McGraw Hill Publication
2. Just Java, Second Edition – Peter Vander Linden, Sun Soft Press
3. Special Edition Using Java 2 Platform – Weber, Practice Hall of India
4. Java How to Program, Third Edition – Detiel and Detiel, Peason Education Asia

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name NUMERICAL METHODS

Sr.No	Course content
1.	Modeling, computers and error analysis : Mathematical modeling and engineering problem-solving. Role of computers and software. Approximations and errors. Significant figures; accuracy and precision. Errors; round-off and truncation errors; error propagation
2.	Roots of equations : Mathematical background. Bisection, False-position and Newton- Raphson methods. Case studies
3.	Systems of linear algebraic equations : Mathematical background. Gauss elimination; pitfalls and techniques for improvement. Matrix inversion and Gauss-Seidel methods. Case studies.
4.	Curve fitting : Mathematical background. Least squares linear and polynomial regression. Lagrange interpolating polynomials. Spline interpolation. Case studies
5.	Numerical integration : Mathematical background. Newton-Cotes integration formulas; trapezoidal rule and Simpson's rules; integration with unequal segments. Case studies.
6.	Ordinary differential equations : Mathematical background. Euler's method; modifications and improvements in Euler's method. Runge-Kutta methods. General methods for boundary value problems. Case studies

Reference Books:

1. S C Chapra and R P Canale
   Numerical Methods for Engineers
   McGraw Hill International Edition
2. M K Jain, S R K Iyengar and R K Jain
   Numerical Methods for Scientific and Engineering Computation
   Wiley Eastern
3. S S Shastry
   Introductory Methods of Numerical Analysis
   Prentice Hall of India

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Software Engineering Methodologies

Sr.No	Course content
1.	Introduction: Motivation – Software Attributes – Complexity - Software Quality Issues
2.	Software Process Software Life cycle Process: A Sequential Methodology - A Cyclical Methodology - The Water Sluice – Established Methodologies - The Boehm-Waterfall Methodology - The Boehm-Spiral Methodology Versions - The Booch Methodology - Object Modeling Technique (OMT) Rational Objectory Methodology
3.	Formal Software Engineering: Formal specifications – Techniques – Verification and Validation – Theorem Provers - Model checking – modeling concurrent systems – Temporal logics – CTL & LTL and model checking – SAT Solvers – Testing Techniques – Test Case Generation
4.	Software Architecture: Software Engineering Tools and Environments - Software Metrics - COTS Integration - Distributed, Internet-scale and Web-based Software Engineering
5.	Empirical Study of Software Tools and Methods: Software Reengineering - Software Reuse - Software Safety - Enterprise Architectures, Zachman's Framework; Architectural Styles
6.	Software Design Patterns: Architecture description languages - Product-line architectures; Component based development

Reference Books:

1. Ghezzi, Jazayeri, Mandrioli, " Fundamentals of Software Engineering", 2/E,Pearson ducation,2002
2. Sommerville, " Software Engineering", 6/E,Pearson Education, 2006
3. Roger S Pressman, " Software Engineering – A Practitioner's Approach" , 6/E,MGH, 2005
4. Schmidt, Stal, Rohnert, and Buschmann, " Pattern-Oriented Software Architecture Volume 2: Patterns for Concurrent and Network ed Objects", Wiley, 2000
5. Len Bass, Paul Clements, Rick Katzman, Ken Bass, "Software Architecture in Practice", 2/E, Addiwon –Wesley Professional, 2003.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Digital Image Processing

Sr.No	Course content
1.	Introduction : Fundamentals, Applications; Image processing system components, Image sensing and acquisition, Sampling and quantization, Neighbors of pixel adjacency connectivity, regions and boundaries; Distance measures.
2.	Image Enhancement: Frequency and Spatial Domain, Contrast Stretching, Histogram Equalization, Low pass and High pass filtering.
3.	Image Restoration: Noise models, mean, order—statistics, adaptive filters. Band reject, Band pass and notch filters.
4.	Colour Image Processing: Colour models; Pseudo colour, Image processing; colour transformation, segmentation.
5.	Wavelets and Multi-resolution Processing: Image pyramids, subband coding, Harr transform; multi resolution expression, Wavelet transforms.
6.	Image Compression: Fundamentals; models; error free and lossy compression; standards.
7.	Morphological Image Processing: Boundary extraction; region filtering; connected component extraction; convex hull; Thinning; Thickening; skeletons; pruning; image segmentation.

Reference Books:

1. Digital Image Processing, Second Edition by Rafel C. Gonzalez and Richard E. Woods, Pearson Education
2. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI
3. Fundamentals of Digital Image Processing by Anil K Jain, PHI
4. Digital Image Processing Using Matlab, Rafel C. Gonzalez and Richard E. Woods, Pearson Education

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Artificial Intelligence

Sr.No	Course content
1.	Introduction: What is artificial Intelligence? Major areas of Artificial Intelligence, Introduction to AI Problems and applications, Defining problems as a state space search, Production systems.
2.	Search techniques: Breadth first search, Depth first search, Hill climbing, Best first search, A* algorithm, AO* Algorithm, Iterative Deepening Search, IDA*, Recursive Best First Search, Constraint Satisfaction and Heuristic Repair, Applications.
3.	Game Playing: Introduction to Game playing, The Minimax Search Procedure, Alpha-Beta Procedure, The Search Efficiency of Alpha-Beta Procedure, Recent applications.
4.	Knowledge Representation: Production rules, Predicate Calculus- Rules of Inference; Semantics and Deduction; Unification; Soundness and completeness of rules; Resolution; Resolution refutation, Semantic Nets, Frames, symbolic reasoning, statistical reasoning.
5.	Learning: Definition, Rote learning, learning by taking advice, learning in problem solving, learning from examples, induction.
6.	Uncertain Reasoning: Joint probability, Marginal probability, Probabilistic reasoning and Bayes Nets, forward reasoning versus backward reasoning, Certainty Factors, Fuzzy set theory, Fuzzy relation, fuzzification, Fuzzy value assignment methods, Inference and Composition methods- Min-Max composition, max product composition, Defuzzification methods, Applications and recent developments.
7.	Expert Systems (ES): Advantages and characteristics of Expert System, Knowledge engineering, Steps in Developing an Expert System, Mycin, ES Applications and recent developments.
8.	Evolutionary Computing: Theoretical Background of Genetic Algorithms and Applications.
9.	Connectionist Models: Introduction to Neural Network, Activation functions, Supervised and Unsupervised Learning, Neuro Processing and Neural Network Learning, Learning, Learning rules, Single layer Perceptrons and Classification, Introduction to Multilayer Neural Networks, Neural Network Applications and recent developments.

Reference Books:

1. E. Rich, K. Knight, Artificial Intelligence, TMH.
2. N. J. Nilsson, Artificial Intelligence: A New Synthesis, Harcourt Publishers.
3. Tomthy Ross, Fuzzy Logic and Engineering Application, McGraw Hill International.
4. Giarratano, Expert System Principles and Programming.
5. Kishan Mehrotra, Elements of Artificial Neural Network.
6. E. Goldberg, Genetic Algorithms: Search and Optimization.
7. J. M. Jurada, Neural Networks.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Soft Computing

Sr.No	Course content
1.	Introduction: What is Soft computing? Necessity of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing
2.	Evolutionary Computing: Basic Concepts of Genetic Algorithms (GA), Working Principle, Encoding methods, Fitness function, GA Operators- Reproduction; Crossover; Mutation, Convergence of GA, Multi-level Optimization, Real Life Problems.
3.	Fuzzy Systems: Fuzzy Set theory, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification, Fuzzy Logic, Fuzzy Rule based systems, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.
4.	Neural Networks: Basic Concept of Neural Network, Overview of Learning rules and activation functions, Single layer Perceptrons and Learning, Back Propagation networks- Architecture of Backpropagation(BP) Networks; Backpropagation Learning; Variation of Standard Backpropagation Neural Network, Introduction to Associative Memory, Adaptive Resonance Theory and Self Organizing Map, Recent Applications.
5.	Hybrid Systems: Sequential Hybrid Systems, Auxiliarty Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.
6.	Evolutionary Design of Neural Networks: Genetic Algorithm (GA) based Back propagation Networks, GA based weight determination, Fitness function, Reproduction, Convergence, and Recent Applications.
7.	Fuzzy Evolutionary Algorithms: Introduction, Fuzzy control of Evolution, Evolutionary Algorithms with Fuzzy components, GA in Fuzzy Logic Controller, Recent Applications.
8.	Neural Network Based Fuzzy Systems: Neural Realization of Basic Fuzzy Logic Operators, Neural Network Based Fuzzy Logic Inference, Neural Network Driven Fuzzy Reasoning, Rule based Neural Fuzzy Modeling, Neural Fuzzy Relational Systems, Neuro-Fuzzy Controllers, Recent Applications.

9.	Fuzzy Logic Based Neural Network Models: Fuzzy Neurons, Fuzzy Perceptrons, Fuzzy Neural Networks, Fuzzy Backpropagation (BP) Networks, Fuzzy BP architecture, Learning in Fuzzy BP, Inference by Fuzzy BP, Fuzzy ARTMAP, Fuzzy Associative Memories, Recent Applications.

Reference Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms:Synthesis & Applications, S. Rajasekaran, G. A. Vijayalakshami, PHI.
2. Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI
3. Fuzzy Logic and Engineering Application, Tomthy Ross, TMH
4. Elements of Artificial Neural Network, Kishan Mehrotra,
5. Genetic Algorithms: Search and Optimization, E. Goldberg.
6. Recent Articles and Research papers

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Data Mining and Data Warehousing

Sr.No	Course content
1.	Introduction to Data Mining, Importance of Data Mining, Data Mining functionalities, Classification of Data mining systems, Data mining architecture, Major Issues in Data Mining, Applications of Data Mining, Social impacts of data mining.
2.	Introduction to Data Warehouse and OLAP Technology for Data Mining, Multidimensional data Model, Data warehouse Data Model, Data warehouse Architecture, Data warehouse Implementation, Development of Data Cube Technology, From Data warehousing to Data Mining.
3.	Data Preprocessing, Data cleaning, Data Integration and Transformation, Data reduction, Discretization and Concept Hierarchy Generation.
4.	Data Mining primitives, Languages and System Architectures, Concept description: Characterization and Comparison, Analytical Characterization, Mining Class Comparison.
5.	Association Rule Mining, Mining of Single dimensional Boolean association rules, Multilevel association rules and Multidimensional association rules, Correlation Analysis, Constraint based association Mining.
6.	Classification and Predication: Basic issues regarding classification and predication, Classification by Decision Tree, Bayesian classification, classification by back propagation, Associative classification, Prediction, Classifier accuracy.
7.	Cluster Analysis, basic issues, clustering using partitioning methods, Hierarchical methods, Density based methods, Grid based methods and model based methods, Algorithms for outlier analysis.
8.	Mining complex Types of data: Multidimensional analysis and descriptive mining of complex data objects, Introduction to spatial mining, multimedia mining, temporal mining, text mining and web mining with related algorithms.

Reference Books:

1. Data Mining concepts and Techniques by Jiawei Han, Micheline Kamber – Elsevier.
2. Data Mining by Arun K. Pujari – University Press.
3. Mordern Data Warehousing, Data Mining and Visualization by George M. Marakas –Pearson.
4. Data Mining by Vikram Puri And P.RadhaKrishana –Oxfrod Press.
5. Data Warehousing by Reema Theraja –Oxford Press

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Engineering

Subject Name Cryptography & Network Security

Sr.No	Course content
1.	Introduction: Threats, Vulnerabilities, Attacks, Integrity, Confidentiality, Anonymity, Authentication, Authorization, Non-repudiation, Data Security and Database Security
2.	Secret Key Cryptography: DES, Triple DES, AES, Key Distribution, Attacks
3.	Public Key Cryptography: RSA, ECC, Key Exchange, Attacks.
4.	Integrity, Authentication an Non-Repudiation: Hash Functions, Message Authentication Code, Digital Signature
5.	Public Key Infrastructure: Digital Certificates, Certification Authorities.
6.	Protocols: Basic Authentication Protocols, Attacks, Needham Schroeder Protocol, Kerberos, Network Security with IP Security, Web Security using SSL, E-cash and Secure Electronic Transaction
7.	System Security using Firewalls and VPNs
8.	Worms and Viruses
9.	Miscellaneous: Smart Cards and security, Zero knowledge protocols, Enterprise Application Security, Biometric Authentication, Database Access Control, Security and Privacy Issues in RFIDs

Reference Books:

1. Cryptography and Network Security by William Stallings
2. Security in Computing by Pfleeger and Pfleeger, 3rd Edition, PHI,
3. Computer Security: Art and Science by Bishop, Pearson Edition
4. Computer Security by Gollmall, Willey Publication
5. Network Security by Kaufman, Pearson Edition