GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Science & Engineering

Subject Name Service Oriented Architecture

Sr.No	Course content
1.	Introduction :Brief history of information technology , Concepts of Distributed Computing, XML
2.	Enterprise architectures -Integration versus interoperation , J2EE ,.NET, Model Driven Architecture
3.	Basic concepts -Directory services ,SOAP ,WSDL ,UDDI ,Web Services: Definition, Architectures and Standards
4.	Principles of Service-Oriented Architecture- Service-orientation and object-orientation, SOA Standards Stack, SOA with Web Services, Key Principles of SOA,WS-* Specifications: Message Exchange Pattern,Coordination,Atomic Transactions,Business Activities,Orchestration,Choreography,WS-Addressing,WS-ReliableMessaging,WS-Policy (including WS-PolicyAttachments and WS-PolicyAssertions),WS-MetadataExchange,WS-Security (including XML-Encryption, XML-Signature, and SAML),WS-Notification Framework (including WS-BaseNotification, WS-Topics, and WS-BrokeredNotification),WS-Eventing
5.	Principles of Service-Oriented Computing- RPC versus Document Orientation,Service Life Cycle,Service Creation ,Service Design and Build,Service Deployment,Publish Web service using UDDI,Service Discovery ,Service Selection ,Service Composition ,Service Execution and Monitoring,Service Termination ,Service Composition and Modeling Business Processes with Business Process Execution Language (BPEL)

Reference Books:

1. SOA Using Java™ Web Services by Mark D. Hansen
2. SOA Design Pattern By Thomas Erl PHI
3. Web service contract Design & Versioning for SOA by Thomas Erl PHI
4. SOA with .NET by Rajbalasubhramaniam Prentice Hall

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Science & Engineering

Subject Name **Quantum Theory & Algorithm Design.**

Sr.No	Course content
1.	Qubit & Quantum States: The Qubit, Vector Spaces. Linear Combination Of Vectors, Uniqueness of a spanning set, basis & dimensions, inner Products, orthonormality, gram-schmidt ortho gonalization, bra-ket formalism, the Cauchy-schwarez and triangle Inequalities.
2.	Matrices & Operators: Observables, The Pauli Operators, Outer Products, The Closure Relation, Representation of operators using matrices, outer products & matrix representation, matrix representation of operators in two dimensional spaces, Pauli Matrix, Hermitian unitary and normal operator, Eigen values & Eigen Vectors, Spectral Decompostion, Trace of an operator, important properties of Trace, Expectation Value of Operator, Projection Operator, Positive Operators, Commutator Algebra, Heisenberg uncertainty principle, polar decomposition & singular values, Postulates of Quantum Mechanics.
3.	Tensor Products: Representing Composite States in Quantum Mechanics, Computing inner products, Tensor products of column vectors, operators and tensor products of Matrices.
4.	Density Operator: Density Operator of Pure & Mix state, Key Properties, Characterizing Mixed State, Practical Trace & Reduce Density Operator, Density Operator & Bloch Vector.
5.	Quantum Measurement Theory : Distinguishing Quantum states & Measures, Projective Measurements, Measurement on Composite systems, Generalized Measurements, Positive Operator- Valued Measures.
6.	Introduction Mathematics for Algorithmic: Sets, Functions and Relations. Amortized Analysis: Properties of Matrices, Solving systems of linear Equations, Linear programming, general linear programs, an overview of linear programming The Greedy Methods: Optimization problems, the greedy method, 0/1 knapsack problem, topological sorting, Single source shortest path, minimum cost spanning tree. Divide & Conquer: The method. Application: merge sort. Dynamic programming: The method, Application: 0/1 knapsack problem Skip lists and hashing. Priority Queues: Huffman Codes. Binary Search Trees: Binary search trees, indexed binary search trees,bineary search tree operations and implementation. Graphs. Basic Data Structures: Tree, The tree Abstract Data type, Tree Traversal, Binary tree.

Reference Books :

1. Quantum Computing without Magic by Zdzis_law Meglicki
2. Quantum Computing Explained By DAVID McMAHON
3. Quantum Computer Science By Marco Lanzagorta, Jeffrey Uhlmann
4. An Introduction to Quantum Computing Phillip Kaye, Raymond Laflamme, Michele Mosca
5. Introduction to Algorithms by Thomas H. Cormen, Leiserson, Rivest & Stein.
6. Data Structures, Algorithms & Applications in C++ by Sartaj Sahni.
7. Algorithm Design by Michael T. Goodrich.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Science & 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. Distributed Operating Systems by Andrew S Tannebaum, PHI

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Science & Engineering

Subject Name: Major Elective I-Information Security

Sr.No	Course content
1.	Cryptography and Data Security Information assurance issues -Threats to authentication, privacy and integrity, Generating MD5 hash collisions -Approaches to cryptography -Symmetric vs. asymmetric ciphers, Issues for secret key encryption, Public key fixes to secret key problems, Hashing and digital signatures, Generating and exchanging keys -Authentication via key ownership, Non-repudiation using digital signatures, Digital signatures in the real world, Key distribution and management, E-voting.
2.	Intrusion Detection Overview, Host based intrusion detection systems, Network based intrusion detection systems, IDS as part of the overall Security System, IDS Signatures and Analysis Schemes for Intrusion Detection Systems, Anomaly detection, Expert Systems, Tools for packet analysis and intrusion detection, Some intrusion detection tools(Snort,Windump,Ethereal etc.), Case Reports of various attack strategies, Implementation Issues ,Future directions.

Reference Books:

1. Intrusion Detection & Prevention by Carl Endorf, Eugene Schultz, Jim Mellander, Jack Kozio. Mcgraw Hill publication
2. Network Intrusion Detection (3Edition) by Stephen Northcutt and Judy Novak ISBN 0735712654
3. Snort 2.1 Intrusion Detection (Book with CD-ROM) by Jay Beale, Caswell syngress.
4. William Stallings; Cryptography and Network Security, Pearson publication, 4 edition, 2004
5 . William Stallings; Network Secuirty Essentials, Pearson publication, 2005.
6. A. Menezes, P. van Oorschot, and S. Vanstone; Handbook of Applied Cryptography,
CRC Press, 1996 -www.cacr.math.uwaterloo.ca/hac

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Science & Engineering

Subject Name: Major Elective I-Information Theory & 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 Science & Engineering

Subject Name: Major Elective I-Real Time Computing

Sr.No	Course content
1	**Basic real time concepts**: Terminology, Real-time system design issues, Example Real-time system, Common misconceptions,
2	**Hardware consideration:** Basic architecture, Hardware interfacing, Central processing unit, Memory, Input output, Enhancing performance, Other special devices, Non-von-neumann architectures
3	**Real-time operating system:** Real-time kernels, Theoretical foundation of Real-time operating system, Intertask communication and synchronization, Memory management
4	**Software Requirement Engineering:** Requirement Engineering process, Types of Requirement, Requirement specification of Real-time system, Formal method in Software specification, Structured analysis and design, Object oriented analysis and the unified modeling language, Organizing the Requirement documents, Organizing and writing Requirements, Requirement validation and review,
5	**Software system design:** Properties of Software, Basic Software engineering principles, The design activity, Procedural-oriented design, Object-oriented design
6	**Programming language and software production process:** Introduction, Assembly language, Procedural language, Object-oriented language, Brief survey of languages, Coding standards
7	**Performance analysis and optimization:** Theoretical preliminaries, Performance analysis, Application of queuing theory, I/O Performance, Performance optimization, Result from compiler optimization, Analysis of Memory Requirements, Reducing Memory utilization
8	**Engineering considerations:** Metrics, Faults, Failures and Bugs, Fault-Tolerance, Systems integration, Refactoring Real-time code, Cost estimation using COCOMO

Reference Books:

1. Real Time System Design and Analysis by Phillip
2. Real-Time Systems ($60 at amazon.com), by Jane Liu.
3. Linux Device Drivers ($24 at amazon.com), by Alessandro Rubini.
4. The Ada Reference Manual.
5. The material covered in the first part of the course follows very closely the textbook *Real-Time Systems* by Jane W.S. Liu at Illinois

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Science & Engineering

Subject Name: Inter Disciplinary -1 – 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 By Foley, VanDam, Feiner, Hughes Addision-Wesley
2 Computer Graphics By Donald Hearn & M Pauline Baker PHI
3 Procedural Elements of Computer Graphics By David F Roger TMH
4 Computer graphics – Schaum's Outline Series Zhigang Xiang, Roy Plastock TMH

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Science & Engineering

Subject Name: Inter Disciplinary -1 – 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 Olive, Paperback

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Science & Engineering

Subject Name: Wireless networking and mobile computing

Sr.No	Course content
1.	Wireless transmission – Frequencies for radio transmission , signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum , Cellular system
2.	Telecommunication systems – GSM, Digital enhanced cordless telecommunications(DECT)
3.	Wireless Medium Access control and CDMA- based communication – Medium access control, Introduction to CDMA-based systems, Spread spectrum in CDMA systems, coding methods in CDMA
4.	Wireless LAN – Infra red vs radio transmission, infrastructure and ad hoc networks, IEEE 802.11, Bluetooth
5.	Mobile network layer – Mobile IP, Dynamic host configuration protocol, Mobile ad-hoc networks, Wireless sensor networks
6.	Mobile transport layer – Traditional TCP, Classical TCP improvements, snooping TCP, Mobile TCP, TCP over 2.5/3G wireless networks
7.	Mobile internet connectivity – WAP 1.1, Layers of WAP, Wireless Application Environment, WML and WMLScript , wireless telephony application, WAP 2.0 architecture , XHTML-MP(Extensible Hypertext Markup Language Mobile profile)
8.	Mobile Operating System ,Mobile file system, Security in mobile computing
9.	Wireless network simulator such as ns2

Reference Books:

1. Mobile Communication By Jochen Schiller (Pearson Education)
2. Mobile Computing By Raj Kamal (Oxford)
3. Handbook of Wireless Networks and Mobile Computing (WILEY-INDIA edition)
4. Mobile Computing By Asoke Talukder

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Science & Engineering

Subject Name: Distributed Computing & Application

Sr.No	Course content
1	Introduction to distributed computing
2	Network programming with sockets and streams
3	Inter-process communication: Remote Procedure Calls, Concurrency and multithreading
4	Parallel computing: domain and functional partitioning, parallel virtual machines – PVM, message passing interface - MPI, and performance measurements
5	Distributed Objects and Middleware Remote Method Invocation Remote Method Invocation – Internet-Inter ORB Protocol Object Persistence and Object Serialization, Object Brokers, Message-Oriented Middleware
6	Development of Enterprise applications: Use of standards J2EE / .NET to develop distributed enterprise applications
7	Introduction to XML, APIs for XML Processing
8	Enterprise Application Integration, Web Technologies, Web services: Concepts, Protocols: SOAP, WSDL, UDDI, Development of Web services
9	Introduction to cluster computing, and grid computing
10	Research issues

Reference Books:

1. Distributed Computing – Concepts and Applications" by M. L. Liu, published by Addison-Wesley, Inc.
2. Java in Distributed System, Marko Boger, John Wiley and Sons Ltd.
3. Java Network Programming and Distributed Computing, David Reilly and Michael Reilly, Addison-Wesley
4. Web Services, Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju, Springer Verlag
5. "Developing EJB Components", Pravin Tulachand, published by Sun Microsystems

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Science & Engineering

Subject Name: Major Elective II- Advance Compiler Design

Sr.No	Course content
1	The Structure of a Compiler ,Lexical Analyzer, LEX, Design of Lex ,Top down Parsing, LL(1) Parsers ,Bottom up Parsing, YACC, LR parsers ,Syntax Directed Translation ,Types and Type Checking ,Run-Time Storage Administration and Symbol Table Management ,Intermediate Code and Code Generation ,Data-Flow Analysis ,Code Optimizations,Architecture and recent development on compilers,Introduction, Other Translators, Lexical Analysis Using lex, Parsing Using CUP , Semantic Actions, Parse Trees , Parse Trees, cont., Symbol Tables, Type Checking, Activation Records, Review/Activation Records, Test Postmortem/Finish Pretest Topics, Intermediate Code Generation, Int. Code/Declarations, Basic Blocks, Instruction Selection, Liveness Analysis, Register Allocation, Coloring Algorithm for RA, Optimizations and Data Flow Analysis.

Reference Books:

1. Aho, Alfred V.; Sethi, Ravi; and Ullman, Jeffrey D. *Compilers--Principles, Techniques, and Tools*, Addison-Wesley, Reading, Mass., 1986 (Available at Cal Poly Bronco Bookstore or Campus Books).
2. A Retargetable C Compiler: Design and Implementation Fraser and Hansen, Benjamin-Cummings, 1995.
3. Advanced Compiler Design and Implementation, Muchnick, Morgan and Kaufmann, 1998.
4. Crafting a Compiler, Fischer and LeBlanc, Benjamin-Cummings, 1988.
5. Introduction to Compiler Construction with UNIX, Schreiner and Friedman, Prentice-Hall, 1985. (on reserve)
6. Compiler Design in C, Holub, Prentice-Hall, 1990.
7. Rich, Craig A. *Advanced Compiler Design--CS 441 Lecture Notes*, Spring 2001 (Available at Bronco Copy 'n Mail in the University Union).

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Science & Engineering

Subject Name: Major Elective II- 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 Science & Engineering

Subject Name: Major Elective II- Object Oriented Methodology & Design

Sr.No	Course content
1.	Introduction - What is Object –Oriented? Characteristics of Object, what is Object-Oriented Development? Key concepts of Object Oriented Design Object Oriented Themes, Evidence for Usefulness of Object Oriented Development, Modular Design and Encapsulation, cohesion and coupling, Modifiability and Testability.
2.	Basics of Object Oriented Programming – Implementing classes, Programming with multiple classes, Interfaces, Abstract classes, Comparing objects for equality, Notation for describing Object Oriented Systems.
3.	Modeling as a Design Technique - Modeling, The Object Modeling Technique.
4.	Object Modeling – Object and Classes, links and Associations, Relationships between classes, Advanced Link and Association Concepts, Generalization and Inheritance, Grouping Constructs, A Sample Object Model.
5.	Advanced Object Modeling - Aggregation, Abstract Classes, Generalization as Extension and Restriction, Multiple Inheritance, Meta data , Candidate Keys, Constraints
6.	Dynamic Modeling - Events and States , Operations, Nested state Diagrams ,Concurrency, Advanced Dynamic Modeling Concepts , A Sample Dynamic Model , Relation of Object and Dynamic Models.
7.	Functional Modeling - function Models , Data Flow Diagrams, specifying operations, Constraints , A sample Functional Model , Relation of functional to Object and Dynamic Models
8.	Language Features for Object Oriented Implementation – Organizing the classes, Collection classes, Exceptions , Run Time Type Identification, Graphical User Interfaces programming support, Long term storage of objects
9.	Elementary Design Patterns - Iterator, Singleton,adapter
10.	Analyzing a System – Analysis phase, Gathering the requirements, Functional requirements specification, Defining Conceptual classes and relationships, Using the knowledge of the domain
11.	Design and Implementation – Design, Implementing design
12.	How “Object –oriented “ is Our Design? - Introduction , A first Example of Refactoring , A second look at Remove Books , Using Generics to Refactor Duplicated Code
13.	Exploring Inheritance - introduction, Applications of Inheritance , Inheritance:Some Limitations and Caveats , Type Inheritance ,Making Enhancements to the Library class , Improving the Design , consequences of introducing Inheritance ,Multiple Inheritance
14.	Modeling with Finite State Machines - Introduction simple Example , Finite State Modeling , A First Solution to the Microwave Problem , Using the State Pattern, Improving Communication between Objects , Redesign using the Observer pattern

	,Eliminating the conditionals ,Designing GUI Programs using the State Pattern
15.	Interactive systems and the MVC architecture - Introduction , The MVC Architecture Pattern , Creating a Simple Drawing Program , The Design of the Subsystems , Getting into the Implementation, Implementing the Undo operation, Drawing Incomplete items , Adding a new feature , pattern based solutions
16.	Designing with Distributed Objects - Client/ Server Systems, Java Remote Method Invocation , Implementing a An Object –oriented system on the web

- Sr No 1,2,3,4 is prerequisite for the subject, it is self study.

Reference Books:

1. Object oriented Modeling and Design By Rumbaugh, Blaha , Premerlani, Eddy, Lorensen
2. Object Oriented Analysis Design and Implementation By Brahma Dathan, Sarnath Ramnath

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Science & Engineering

Subject Name **Major Elective III- Data Mining & 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 Science & Engineering

Subject Name **Major Elective III- Embedded Systems**

Sr.No	Course content
1.	Introduction -Embedded Systems Overview, Design Challenge — Optimizing Design Metrics, Processor Technology, IC Technology, Design Technology, Trade-offs
2.	Custom Single-Purpose Processors: Hardware- Introduction, Combinational Logic, Sequential Logic, Custom Single-Purpose Processor Design, RT-Level Custom Single-Purpose Processor Design, Optimizing Custom Single-Purpose Processors
3.	General-Purpose Processors: Software- Introduction, Basic Architecture, Operation, Programmer's View, Development Environment, Application-Specific Instruction-Set Processors (ASIPs), Selecting a Microprocessor, General-Purpose Processor Design,
4.	Standard Single-Purpose Processors: Peripherals- Introduction, Timers, Counters, and Watchdog Timers, UART, Pulse Width Modulators, LCD Controllers, Keypad Controllers, Stepper Motor Controllers, Analog-to-Digital Converters, Real-Time Clocks
5.	Memory – Introduction, Memory Write Ability and Storage Permanence, Common Memory Types, Composing Memory, Memory Hierarchy and Cache, Advanced RAM
6.	Interfacing – Introduction, Communication Basics, Microprocessor Interfacing: I/O Addressing- Interrupts and Direct Memory Access, Arbitration, Multilevel Bus Architectures, Advanced Communication Principles, Serial Protocols, Parallel Protocols
7.	Digital Camera Example- Introduction, Introduction to a Simple Digital Camera, Requirements Specification, Design
8.	The 8051 Microcontrollers- Microcontrollers & Embedded Processors, Overview of 8051 family, Real World Interfacing
9.	8051 Assembly Language Programming- Inside the 8051, Introduction to 8051 Assembly Programming, Assembling and running 8051 Program, The Program Counter and ROM space in the 8051, Data Types and Directives, 8051 flag bits and the PSW register, 8051 register banks and stack

Reference Books:

1. Embedded System Design: A Unified Hardware / Software Introduction By Frank Vahid and Tony Givargis, (WILEY-INDIA III Edition)
2. The 8051 Microcontroller and Embedded Systems : Using Assembly and C By M.A. Mazidi, J.G. Mazidi & R.D. McKinlay (Pearson Education II Edition)
3. Embedded Systems: Architecture, Programming And Design By Raj Kamal (TMH Publication II Edition)
4. Hardware Software Co -design: Principles and Practice By Jorgan Syaunstrup and W.Wolf (Springer, 1997)
5. Programming Embedded Systems in C and C++ By Michael Barr, (O'Reilly Media, 1999)

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Science & Engineering

Subject Name Major Elective III- Grid Computing

Sr.No	Course content
1.	Environment: Grid computing environments. Topics: Overview of GCE; Programming models; Middleware for building grid computing environments; Language support (MPI- G, MPI-G2, etc) for grid computing; Meta models for grid programming; Security.
2.	Applications. Deals with case studies, how the global computing infrastructure has become a reality for collaborative complex data intensive computing aid for federated database services, web services, bioinformatics
3.	It will also include among others some selection of topics from Seti project, Sun grid engine, Skyserver and some national grid projects
4.	Monitoring and evaluation: It will include following: Monitoring; Scheduling; Performance tuning; Debugging and performance diagnostic issues;

Reference Books:

1. Grid Computing by Joshy Joseph, Craig Fellenstein, Provided by Prentice Hall, IBM Press
2. Grid Computing by Springer LNCS 2970

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Computer Science & Engineering

Subject Name Inter Disciplinary II- 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 Science & Engineering

Subject Name Inter Disciplinary II- 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 statement
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