GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

ADVANCE ENGINEERING MATHEMATICS

SUBJECT CODE: 2130002

B.E. 3rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	2	0	5	70	20	10	30	0	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Introduction to Some Special Functions:** Gamma function, Beta function, Bessel function, Error function and complementary Error function, Heaviside's function, pulse unit height and duration function, Sinusoidal Pulse function, Rectangle function, Gate function, Dirac's Delta function, Signum function, Saw tooth wave function, Triangular wave function, Halfwave rectified sinusoidal function, Full rectified sine wave, Square wave function.	02	4
2	**Fourier Series and Fourier integral:** Periodic function, Trigonometric series, Fourier series, Functions of any period, Even and odd functions, Half-range Expansion, Forced oscillations, Fourier integral	05	10
3	**Ordinary Differential Equations and Applications:** First order differential equations: basic concepts, Geometric meaning of y' = f(x,y) Direction fields, Exact differential equations, Integrating factor, Linear differential equations, Bernoulli equations, Modeling , Orthogonal trajectories of curves.Linear differential equations of second and higher order: Homogeneous linear differential equations of second order, Modeling: Free Oscillations, Euler- Cauchy Equations, Wronskian, Non homogeneous equations, Solution by undetermined coefficients, Solution by variation of parameters, Modeling: free Oscillations resonance and Electric circuits, Higher order linear differential equations, Higher order homogeneous with constant coefficient, Higher order non homogeneous equations. Solution by [1/f(D)] r(x) method for finding particular integral.	11	20

4	**Series Solution of Differential Equations:** Power series method, Theory of power series methods, Frobenius method.	03	6
5	**Laplace Transforms and Applications:** Definition of the Laplace transform, Inverse Laplace transform, Linearity, Shifting theorem, Transforms of derivatives and integrals Differential equations, Unit step function Second shifting theorem,	09	15
	Dirac's delta function, Differentiation and integration of transforms, Convolution and integral equations, Partial fraction differential equations, Systems of differential equations		
6	**Partial Differential Equations and Applications:** Formation PDEs, Solution of Partial Differential equations f(x,y,z,p,q) = 0, Nonlinear PDEs first order, Some standard forms of nonlinear PDE, Linear PDEs with constant coefficients,Equations reducible to Homogeneous linear form, Classification of second order linear PDEs.Separation of variables use of Fourier series, D'Alembert's solution of the wave equation,Heat equation: Solution by Fourier series and Fourier integral	12	15

Reference Books:

1. Advanced Engineering Mathematics (8th Edition), by E. Kreyszig, Wiley-India (2007).
2. Engineering Mathematics Vol 2, by Baburam, Pearson
3. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley (2005)
4. R. V. Churchill and J. W. Brown, Fourier series and boundary value problems (7th Edition), McGraw-Hill (2006).
5. T.M.Apostol, Calculus , Volume-2 (2nd Edition), Wiley Eastern , 1980

Course Outcomes:

1. Students will be able to**apply**the concept of Fourier series and use it to find Fourier expansion for periodic or non-periodic functions.
2. Students will **EVALUATE** Laplace transform for various functions and apply them to find Laplace transform or inverse Laplace transform of functions of t and also find solution of initial value problems.
3. Students will **learn**various methods for finding the general solution of ordinary differential equations and use it to engineering problems.
4. Students will be able to **differentiate**the singularities and apply it to find series solution of second order ordinary differential equations.
5. **Understand** partial differential equations and know various methods to solve partial differential equations.Students will **examine** the concepts the method of separation variables and use it to find solutions of Heat equation, Laplace equation and Wave equation.

	PO1	PO2	PO3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO-1	2		3										1			
CO-2	1		1										2			
CO-3			2										1			
CO-4	3		1		2								2			
CO-5	3	2	2										2	2		

Co- Po Justification

Mapping	Level	Justification
		Students will be able to
CO1-PO1 Co2 – PO1	2 1	Use knowledge of Fourier series and Fourier integral Laplace transform in various engineering problem and find its optimum solution.
CO1-PO3 CO2-PO3 CO3-PO3 CO4-PO3 CO5-PO3	3 1 2 1 2	Use the knowledge of mathematical concept, students can design and develop solutions for engineering problems.
CO5-PO3	2	Understand mathematical problem's analysis
CO4-PO1 CO5-PO1	3 3	Know various data analysis approach involves solving IT engineering problems
CO4-PO1 CO5-PO2	3 2	Know fundamental concepts of o.d.e which will help in solving IT engineering problem

Co- Pso Justification

Mapping	Level	Justification
		Students will be able to
CO1-PSO1 CO2-PSO1 CO3-PSO1 CO4-PSO1 CO5-PSO1	1 2 1 2 2	Apply knowledge of mathematics inreal life problems using engineering principles and find its solution.
CO5-PSO2	2	Analyze and understand the mathematical problem and make it easy and find it solution.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

ENGINEERING ECONOMICS AND MANAGEMENT

SUBJECT CODE: 2130004

B.E. 3rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	0	3	70	20	10	0	0	0	100

Course Objectives:

At the end of the course, students should be able to:

1. Students will be able to **describe** the fundamental theories and principles used in Engineering Economics and Management and to some extent are able to **compare** and **evaluate** them.
2. Students will be able to **learn**, **compare** and **apply** various cost concepts and analysis techniques.
3. They will be able to **understand a** business plan for an entrepreneurship project using economics and Management fundamentals.
4. Students will be able to **apply** the knowledge and techniques, skills and methods to become successful project leaders.
5. Students will be able to apply professional ethical principles and corporate social responsibility concepts in personal, financial and economic decisions for sustainable growth and development.
6. Students will be able to analyze and think through basic economic problems of our country.

Syllabus:

1	Introduction to Economics; Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics Theory of Demand & Supply; meaning, determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity; elasticity of demand, price elasticity, income elasticity, cross elasticity
2	Theory of production; Theory of production; production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur), Law of variable proportions & law of returns to scale Cost; meaning, short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost. Break even analysis; meaning, explanation, numerical

3	Markets Markets; meaning, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly) National Income; meaning, stock and flow concept, NI at current price, NI at constant price, GNP, GDP, NNP,NDP, Personal income, disposal income.
4	Basic economic problems Basic economic problems; Poverty-meaning, absolute & relative poverty, causes, measures to reduce Unemployment: meaning, types, causes, remedies Inflation; meaning, types, causes, measures to control
5	Money Money; meaning, functions, types, Monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools Banking; meaning, types, functions, Central Bank- RBI; its functions, concepts; CRR, bank rate, repo rate, reverse repo rate, SLR.
6	Introduction to Management Introduction to Management; Definitions, Nature, scope Management & administration, skill, types and roles of managers Management Principles; Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory
7	Functions of Management Functions of Management; Planning, Organizing, Staffing, Directing, Controlling (meaning, nature and importance) Organizational Structures; meaning, principles of organization, types-formal and informal, line, line & staff, matrix, hybrid (explanation with merits and demerits), span of control, departmentalization.
8	Introduction to Marketing management Introduction to Marketing management; Marketing Mix, concepts of marketing, demand forecasting and methods, market segmentation Introduction to Finance Management; meaning, scope, sources, functions
9	Introduction to Production Management Introduction to Production Management; definitions, objectives, functions, plant layout-types & factors affecting it, plant location- factors affecting it. Introduction to Human Resource Management; definitions, objectives of manpower planning, process, sources of recruitment, process of selection
10	Corporate Social Responsibility Corporate Social Responsibility; meaning, importance Business Ethics; meaning, importance.

CO-PO mapping

	PROGRAM OUTCOMES												PSOs				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
CO 1	3	1	1										1				
CO 2			2								1						
CO 3			2					2	1		2						
CO 4	2							2		2						1	
CO 5								1									
CO 6						2											

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Basic knowledge of theories and principles used in Engineering Economics and Management will be gained by students.
CO1 -PO3	1	Concepts learned in this subject will be useful to analyze situations related organization of various management and finance related activities in industry.
CO2-PO11	2	Various cost concepts and analysis techniques will be useful for effective finance management of the projects.
CO3-PO11	2	Students they can analyze the requirements for an entrepreneurship project using economics and Management fundamentals.
CO2-PO3	2	Basic concepts of cost, money, banking, national income will enable students to analyze various industry problem and they will be able to apply learned concepts to solve those problems.
CO3-PO3	3	Students use the knowledge of the subject to **design a** business plan for an entrepreneurship project using economics and Management fundamentals.
CO6-PO6	2	Knowledge about nation's economy and various economic problems and understand the consequent responsibilities relevant to the professional engineering practice.
CO4-PO8,10	2	Students will be able to **apply** the knowledge and techniques, skills and methods to become successful project leaders.
CO5-PO8	1	Students will be able to apply professional ethical principles and Corporate social responsibility concepts in personal, financial and economic decisions for sustainable growth and development.
CO6-PO6	2	The students should analyze basic economic problems of our country and follow informed and responsible engineering practices
CO1-PSO1	1	Students grasp and apply chemical engineering fundamentals considering the impact of, economy.
CO6-PSO4	1	The students should know about economic and management concepts to develop soft-skills and leadership attitude to work on industrial and professional arena.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

DATA STRUCTURES

SUBJECT CODE: 2130702

B.E. 3rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	4	8	70	20	10	20	10	20	150

Course Objectives:

1. To impart the basic concepts of data structures and algorithms and analyse performance
2. To understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures
3. To understand concepts about searching and sorting techniques
4. To understand basic concepts about stacks,queues,lists,trees and graphs

Syllabus:

1	INTRODUCTION TO DATA STRUCTURE: Data Management concepts, Data types – primitive and non-primitive, Performance Analysis and Measurement (Time and space analysis of algorithms-Average, best and worst case analysis), Types of Data Structures- Linear & Non Linear Data Structures.
2	LINEAR DATA STRUCTURE Array: Representation of arrays, Applications of arrays, sparse matrix and its representation Stack: Stack-Definitions & Concepts, Operations On Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression And Their Compilation, Recursion, Tower of Hanoi Queue: Representation Of Queue, Operations On Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue
3	Linked List: Singly Linked List, Doubly Linked list Circular linked list ,Linked implementation of Stack, Linked implementation of Queue, Applications of linked list.
4	NONLINEAR DATA STRUCTURE : Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Threaded binary tree, Binary search trees, Conversion of General Trees To Binary Trees, Applications Of Trees, Some balanced tree mechanism, eg. AVL trees, 2-3 trees, Height Balanced, Weight Balance, Graph-Matrix Representation Of Graphs, Elementary Graph operations,(Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree)
5	HASHING AND FILE STRUCTURES : Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques, File Structure: Concepts of fields, records and files, Sequential, Indexed and

	Relative/Random File Organization, Indexing structure for index files, hashing for direct files, Multi-Key file organization and access methods.

Course outcomes:

1. Students will be able to **describe** the fundamental algorithms used in computer programming and **analyse** the asymptotic performance of algorithms.
2. Students will be able to **describe, compare and apply** various linear and non-linear data structures with operations.
3. Students will be able to **describe, compare and apply** various sorting, searching and hashing operations.
4. Students will be able to **design** and **solve** open design problem to meet the requirements of dynamic engineering situations

PROGRAMME SPECIFIC OUTCOMES

PSO1: Foundations of Software Development: Apply design and development principles to develop software applications/products of varying complexity in emerging areas.
PSO2: Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm
PSO3: Competent in Emerging Trends: Ability to use current tools and techniques necessary for computing practices.
PSO4: Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and provides innovative solution

CO-PO mapping

CO-PO Mapping
(3/2/1/) indicating correlation strength – Strong (3), Medium (2), Weak (1)

COs	PROGRAMME OUTCOMES (POs)												PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2										3	3		
CO2	3	3	3										3			
CO3	3	3	3										3			
CO4	3	3	3	2	1								3		3	3

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Fundamental details related to computer programs and data structures

CO1-PO2	2	Concepts learned in this subject will be useful to analyse various algorithm.
CO1-PO3	2	Concepts learned in this subject will be useful to design efficient algorithms
CO2-PO1	3	This course will deliver fundamental knowledge linear and non-linear data structures
CO2-PO2	3	Students will be able to learn and compare various linear and non-linear data structures with performance analysis
CO2-PO3	3	Basic concepts of linear and non-linear data structures will enable students to analysereal world problems and they will be able to apply learned techniques to solve those problems.
CO3-PO1	3	This course will deliver fundamental knowledge sorting and searching techniques
CO3-PO2	3	Students will be able to learn and compare various sorting and searching techniques with performance analysis
CO3-PO3	3	Basic concepts of sorting and searching operations will enable students to analyse real world problems and they will be able to apply learned techniques to solve those problems.
CO4-PO1	3	Students will be able to apply learned algorithms in the design of digital systems.
CO4-PO2	3	Analysis of real world problems with different perspective
CO4-PO3	3	Apply knowledge about data structures and algorithmsto solve various societal problems.
CO4-PO4	2	Conceptual knowledge about data structure can further be expanded to understand and solve complex problems related to industries.
CO4-PO5	1	Solution to complex problems will enable students to utilize or create modern IT tools/ procedures
CO1-PS01	3	Development principles to develop software applications using algorithm asymptotic analysis
CO1-PSO2	3	Basic knowledge of mathematics applied to analyse and solve the problem algorithmically and efficiently.
CO2-PSO1	3	Development of software using linear and non-linear data structures
CO3-PS01	3	Development of software using various sorting and searching techniques
CO4-PSO1	3	Targeting real world software development using learned techniques of data structure to meet the dynamic requirements
CO4-PSO3	3	Exploring opportunities in tools usage and development for software development
CO4-PSO4	3	Research and development in terms of technique implementation at software and hardware level for optimizing the solution

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

DATA BASE MANAGEMENT SYSTEMS

SUBJECT CODE: 2130703

B.E. 3rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	4	8	70	20	10	20	10	20	150

Course Objectives:

- This course introduces fundamental concepts of Data Base Design, Data Models, Different Data Base Languages.
- This course provides formaulating simple & advanced database quries/objects with PL/SQL using Relational Algebra and DB connectivity.
- This course introduces Database Transactions including concurrency control, journaling,backup and recovery, and data object locking and protocols.

Syllabus:

1	Introductory concepts of DBMS : Introduction and applications of DBMS, Purpose of database,Data, Independence, Database System architecture- levels, Mappings, Database, users and DBA
2	Relational Model : Structure of relational databases, Domains, Relations,Relational algebra – fundamental operators and syntax,relational algebra queries, tuple relational calculus
3	Entity-Relationship model : Basic concepts, Design process, constraints, Keys,Design issues, E-R diagrams, weak entity sets,extended E-R features – generalization, specialization,aggregation, reduction to E-R database schema
4	Relational Database design: Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1Nf, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF, Multi-valued dependency, 4NF, Join dependency and 5NF
5	Query Processing & Query Optimization : Overview, measures of query cost, selection operation, sorting, join, evaluation of expressions, transformation of relational expressions, estimating statistics of expression results, evaluation plans, materialized views
6	Transaction Management : Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, two-phase locking protocol, Isolation, Intent locking

7	Security: Introduction, Discretionary access control, Mandatory Access Control, Data Encryption
8	SQL Concepts : Basics of SQL, DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. transaction control commands – Commit, Rollback, Savepoint
9	PL/SQL Concepts : Cursors, Stored Procedures, Stored Function, Database Triggers

Reference Books:

1. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems (5/e), Pearson Education, 2008
2. An introduction to Database Systems, C J Date, Addition-Wesley.
3. Database System Concepts, Abraham Silberschatz, Henry F. Korth & S. Sudarshan, McGraw Hill.
4. Understanding SQL by Martin Gruber, BPB
5. SQL- PL/SQL by Ivan bayross
6. Oracle – The complete reference – TMH /oracle press

Course outcomes:

1. Students will be able to **know** the need of Program Data Independence and DBMS technology as a backend database development in Application Softwares.
2. Students will be able to **apply** E-R Modelling to prepare E-R diagrams for database design. Formulate relational tables from E-R diagram and Relational modelling, populate relational database and formulate SQL queries on data.
3. Students will be able to **identify** the Functional Dependancy in data and eliminate it with **Normalization** to improve database design**.**
4. Students will be able to **learn** Concurrency Control mechanism, Database Recovery methods with Transaction Theory.
5. Students will be able to **apply** the knowledge, techniques, models and modern tools to become successful database professionals in software industries.

CO-PO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2												2			
CO 2	2	3	3		2				2				3	2		
CO 3	1	2											3	2		
CO 4	2												2	2		
CO 5						3									3	2

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	2	Basic knowledge of Database Technology & Traditional File system will be gained by students.
CO2-PO1	2	This course covers Modelling of Data using Entity-Relationship Model
CO2-PO2	3	Students will be able to analyze requirements of data for a particular problem domain.
CO2-PO3	3	Students will follow Design to Implemantation by conversion from E-R Diagram to relational tables.
CO2-PO5	2	Students use various latest open source tools and frameworks for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO2-PO9	2	A Database project will impart team work skills.
CO3-PO1	1	Various techniques for finding Functional Dependancy is delivered.
CO3-PO2	2	Students will be able to apply Normaliazation to improve database design.
CO4-PO1	2	Students will learn all issues in concurrent execution of Transaction & various methods to recover database.
CO5-PO6	3	Apply knowledge of DBMS to solve various societal problems like Aadhar Database maintainance, MIS etc.
CO1-PSO1	2	Students will identify the need of DBMS as backend for storing data independantly in Software Development.
CO2-PSO1	3	Learning to write SQL queries will develop student's data management skills in Software Development.
CO2-PSO2	2	Mathamatical Foundation will be developed in students by learing RELATION ELGEBRA & E-R Modelling.
CO3-PSO1	3	Techniues of Normalization will improve the skill of designing effcient database during Software Development.
CO3-PSO2	2	Study of Finding & eliminating Functional Dependancy in data using appropriate data structure and suitable algorithm will improve Mathamatical Foundation.
CO4-PSO1	2	Understanding of Concurrency & Recovery techniques will develop skills of building Reliable & Parallel system.
CO4-PSO2	2	Study of Serializability of Transactions will build logical & analytical skills in student.
CO5-PSO3	3	Learning of Modern tools & techniques of DBMS with its inner working will help students to be Database Professonal.
CO5-PSO4	2	Foundation of Database Security, Encrption & Query Optimization, Data Science will open a Reserch scope for the students.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

DIGITAL ELECTRONICS

SUBJECT CODE: 2131004

B.E. 3rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

- learn basic concepts of digital circuits and system which leads to design of complex digital system such as microprocessors.
- This course gives idea about various concepts combinational and sequential circuits using digital logic fundamentals.
- This is the first course by which students get exposure to digital electronics world.

Syllabus:

Sr. No.	Content	Total Hrs	% Weightage
1	Binary Systems and Logic Circuits: The Advantage of Binary, Number Systems, The Use of Binary in Digital Systems, Logic Gates, Logic Family Terminology.	**3**	**5**
2	Boolean Algebra and Mapping Methods: Boolean Algebra, Karnaugh Maps, Variable Entered Maps, Realizing Logic Function with Gates, Combinational Design Examples.	**7**	**15**
3	Logic Function Realization with MSI Circuits: Combinational Logic with Multiplexers and Decoders, Standard Logic Functions with MSI Circuits, Design Problem Using MSI Circuits.	**7**	**15**
4	Flip Flops, Counters and Registers: Flip Flops and its Applications	**8**	**15**
5	Introduction to State Machines: The Need for State Machines, The State Machine, Basic Concepts in State Machine Analysis.	**3**	**5**
6	Synchronous State Machine Design: Sequential Counters, State Changes Referenced to Clock, Number of State Flip-Flops, Input Forming Logic, Output Forming Logic, Generation of a State Diagram from a Timing Chart, Redundant States, General State Machine Architecture	**8**	**15**
7	Asynchronous State Machines: The Fundamental-Mode Model, Problems of Asynchronous Circuits Basic Design Principles, An Asynchronous Design Example.	**7**	**15**
8	Logic Families: Transistor-Transistor Logic(TTL), Emitter-Coupled Logic(ECL),	**4**	**5**

	MOSFET Logic, TTL Gates.		
9	Programmable Logic Devices: Introduction to Programmable Logic Devices,	**5**	**10**

COURSE OUTCOMES (CO)

After successful completion of this course, the students should be able to

CO1	Have a thorough understanding of the fundamental concepts and techniques used in digital electronics
CO2	To understand and examine the structure of various number systems and its application in digital design
CO3	The ability to understand, analyze and design various combinational and sequential circuits.
CO4	Create the appropriate truth table from a description of a combinational logic function

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2														1		
CO2	2	2														1	
CO3	2	2															
CO4														1			

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	1	Basic knowledge about fundamentals of electronics will be gained by students.
CO2-PO1	2	Students will understand the basic the structure of various number systems.
CO2-PO2	2	Students will be able to design an application using the concepts
CO3-PO1	2	Students understand, analyze and design various combinational and sequential circuits
CO1-PSO2	1	Student will draw design circuit to solve given and develop circuit.
CO2-PSO3	1	Students will be able to comprehend basic concepts of digital electronics and demonstrates these concepts.

CO4-PSO1	2	Students create truth table from a description of a combinational logic function

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

OPERATING SYSTEM
SUBJECT CODE: 2140702
B.E. 4rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

- This course introduces fundamental concepts and principles of operating systems.
- This course covers how the various elements that underlie operating system interact and provides services for execution of application software with sytem call interface.
- This course provide comprehensive introduction aboutthe data structures and algorithms used to implement various sub-system of OS.

Syllabus:

1	Introduction: Basics of Operating Systems: Definition – Generations of Operating systems – Types of Operating Systems, OS Service, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine
2	Process Management Processes: Definition , Process Relationship , Process states , Process State transitions , Process Control Block ,Context switching – Threads – Concept of multithreads , Benefits of threads – Types of threads Process Scheduling: Definition , Scheduling objectives ,Types of Schedulers ,Scheduling criteria : CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time (Definition only), Scheduling algorithms : Pre emptive and Non , pre emptive , FCFS –SJF – RR , Multiprocessor scheduling : Types , Performance evaluation of the scheduling.
3	Interprocess Communication: Race Conditions, Critical Section, Mutual Exclusion, Hardware Solution, Strict Alternation , Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc., Scheduling , Scheduling Algorithms.
4	Deadlocks: Definition,Deadlock characteristics , Deadlock Prevention , Deadlock Avoidance :banker's algorithm, Deadlock detection and Recovery.
5	Memory Management Basic Memory Management: Definition ,Logical and Physical address map , Memory allocation : Contiguous Memory allocation –Fixed and variable partition – Internal and

	External fragmentation and Compaction , Paging : Principle of operation – Page allocation –Hardware support for paging –,Protection and sharing – Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging (Concepts only) – Page Replacement policies : Optimal (OPT) , First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU)
6	I/O Management Principles of I/O Hardware: I/O devices, Device controllers , Direct memory access Principles of I/O Software: Goals of Interrupt handlers , Device drivers , Device independent I/O software , Secondary-Storage Structure: Disk structure ,Disk scheduling algorithm
7	File Management File concept, Aaccess methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous,linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table),efficiency & performance.
8	Security & Protection Security Environment, Design Principles Of Security, User Authentication, Protection Mechanism : Protection Domain, Access Control List
9	Unix/Linux Operating System Development Of Unix/Linux, Role & Function Of Kernel, System Calls, Elementary Linux command & Shell Programming, Directory Structure, System Administration Case study: Linux, Windows Operating System

Reference Books:

1. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, Wiley-Indian Edition (2010).
2. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008).
3. Principles of Operating Systems by Naresh chauhan, Oxford Press (2014).
4. Operating Systems by D.M. Dhamdhere, Tata McGraw Hill 2nd edition.
5. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000
6. UNIX Concepts and Applications(4 th Edition)– by Sumitabha Das, Tata McGraw Hill.
7. Unix Shell Programming – by Yashwant Kanetkar, BPB publications.

Course outcomes:

1. Students will be able to identify the underlying components and architecutre of OS.
2. Students will be able to conceptulize the executing program – with process & thread management.
3. Students will be able to learn and simulate existing algorithms for Memory Management & identify scope of improvement in it from Research perspective.
4. Students will be able to compare type of file system & security available in various existing OS and future OS.

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2		1									
CO 2	2		3	2	2							
CO 3	2			2								
CO 4	2	3										

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	2	Basic knowledge of the underlying components and architecutre of OS will be gained by students.
CO1-PO3	1	Students will be able to design Operating System.
CO2-PO1	2	Students will be able to apply knowledge of data structure & Programming laguages for understanding Process Management
CO2-PO3	3	Achieving parallelism at process and thread level to improve performance of program.
CO2-PO4	2	Compare varius process scheduling algorithms and devise more efficient algorithm.
CO2-PO5	2	Students use various latest open source tools and frameworks for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO3-PO1	2	Students will be able to apply the fundamental knowledge of memory management to map the data and processor.
CO3-PO4	2	Students will be able to investigate scope of improving existing Memeory Management alogorithms.
CO4-PO1	2	Students will gain knowledge about security aspect of OS.
CO4-PO2	3	Comparative analysis of File Sytem in various operating system.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

OBJECT ORIENTED PROGRAMMING WITH C++

SUBJECT CODE: 2140705

B.E. 4rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	4	8	70	20	10	20	10	20	150

Course Objectives:

- The object oriented approach for software development has become the de-facto standard for the industry to develop the product based or customized software based on customer demand.
- The software libraries developed for various fields also follows the phenomena of object oriented development.
- The subject covers the basic concepts of the object oriented paradigm and popular object oriented programming language C++.
- The subject covers the basics of C++, objects and classes, Inheritance, Polymorphism, I/O and file management, and advance topics including templates, exceptions and STL (Standard Template Library).

Syllabus:

1	Concepts of OOP : Introduction OOP, Procedural Vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP	4Hours
2	C++ Basics : Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures	6 Hours
3	C++ Functions : Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments, friend functions, virtual functions	6 Hours
4	Objects and Classes : Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, type conversion	8 Hours
5	Inheritance : Concept of Inheritance, types of inheritance: single, multiple, multilevel, hierarchical, hybrid, protected members, overriding, virtual base class	8 Hours
6	Polymorphism : Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism	6 Hours
7	I/O and File Management : Concept of streams, cin and cout objects, C++ stream classes, Unformatted and formatted I/O, manipulators, File stream, C++ File stream classes, File management functions, File modes, Binary and random Files	8 Hours

8	Templates, Exceptions and STL: What is template? function templates and class templates, Introduction to exception, try-catchthrow, multiple catch, catch all, re-throwing exception, implementing user defined exceptions, Overview and use of Standard Template Library	8 Hours

Course outcomes:
After successful completion of this course, the students should be able to

1. **Differentiate** procedure and object oriented languages and **model** the real world applications using Object Oriented Programming concepts using C++ language.
2. **Build** various functions, classes and objects using appropriate encapsulation and design principles.
3. **Apply** various object oriented features like constructor, inheritance, polymorphism, I/O streams and files to solve various computing problems.
4. **Use** advance features of C++ like temples and exception handling to make programs supporting reusability and sophistication.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Foundations of Software Development: Apply design and development principles to develop software applications/products of varying complexity in emerging areas.

PSO2: Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm

PSO3: Competent in Emerging Trends: Ability to use current tools and techniques necessary for computing practices.

PSO4: Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and provides innovative solution

CO-PO Mapping
(S/M/W) indicating correlation strength – Strong (S), Medium (M), Weak (W)

COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO 1	3															
CO 2	2	1											2			
CO 3	2				2	1			1				2			
CO 4	2				2								2		2	

Mapping & Justification

Mapping	Level	Justification
CO1–PO1	3	Basic knowledge of object oriented programming concepts will be gained by students.

CO2–PO1	2	This course will deliver fundamental knowledge about data abstraction, data hiding, data encapsulation using classes and objects which will further be utilized in the design and development of solution to real time problems.
CO2–PO2	1	Basic concepts of OOPC will enable students to analyse complex problems and they will be able to apply OOP concepts to solve those problems.
CO3-PO1	2	Core concepts like inheritance and polymorphism will be taught to students which can be considered as basic building blocks for software development.
CO3–PO5	2	Students can applyvarious object oriented features like constructor, inheritance, polymorphism, I/O streams and files using open source tools and technology to solve various computing problems.
CO3–PO6	1	Apply knowledge about OOP to solve various social problems like Client-Server System, Object Oriented Database, Real Time Systems Design, Simulation and Modelling Systemetc.
CO3-PO9	1	Students in a group develop small project to implement concept of Object Oriented Programming.
CO4-PO1	2	Knowledge of exception handling will be used to design reliable software.
CO4–PO5	2	Custom template in C++ will help students to create generic programs which can further be modified and reuse when require.
CO2-PSO1	2	This course will deliver fundamental knowledge about object oriented programming which will further be utilized in the development of programs.
CO3-PSO1	2	Knowledge of inheritance, polymorphism and I/O streams will be used to make reusable programs.
CO4-PSO1	2	Advanced features of OOP will be used to solve real world problems.
CO4-PSO3	2	Knowledge about latest tools of OOP will be delivered to students which can be used to resolve existing problems.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

NUMERICAL AND STATISTICAL METHODS FOR COMPUTER ENGINEERING

SUBJECT CODE: 2140706

B.E. 4rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

To know about various types of Errors, Calculate the error correction and get actualroot of theequation. Understand different methods of solution of the equations and compare them. Student will bemade aware of different numerical and statistical methods which are used in engineering field, withemphasis on how to prepare program for different methods.

Syllabus:

1	Mathematical modeling andengineering problemSolving.Approximations and errors. Significant figures, accuracy andprecision,Errors, round-off and truncation errors, error propagation.	4Hours
2	Roots of Equations: Mathematical background, Bisection, Regula Falsi, NR method, Secant,Successive approximation method, Budan's Theorem, Barristow's method, case studies.	6Hours
3	Systems of linear algebraic equations: Mathematical background, Gauss elimination; pitfalls and techniques for improvement, matrix inversion and Gauss-Seidel methods, ill- conditional Equations, Predictor-Corrector methods, case studies.	8 Hours
4	Curve Fitting: Mathematical background, Least squares linear and polynomial regression, Lagrange interpolating Polynomials. Splineinterpolation, Case studies.	12 Hours
5	Numerical Integration: Newton-Cotes integration formulas; trapezoidalrule and Simpson's rules: Interpolation, case studies.	5 Hours
6	Ordinary differential equations: Euler's method, Runge-Kutta methods. General methods for boundary value problems, Case studies.	5Hours
7	Statistical Methods: Frequency distributions, Data analysis, Expectations and moments, Corelation and regression, Trend analysis, Seasonal effects, Cyclical Fluctuation, Moving average, MSE, Predictions. Non-parametric statistics. Computer-based resampling techniques. Confidence intervals and statistical significance.	8 Hours

Course outcomes:

After successful completion of this course, the students should be able to-

1. Demonstrate understanding of common numerical methods, Mathematical modelling and sources of errors.
2. Apply numerical methods to obtain approximate solutions to mathematical problems.
3. Illustrate concept of curve fitting and numerical integration and their implementation.
4. Understand Statistical Methods for Data Analysis, Trend Analysis and sampling techniques.
5. Ability to compare the computational methods for advantages and drawback, choose the suitable computational method among several existing methods.

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	3											1				
CO 2	3		2	2										3		
CO 3				3										3		
CO 4		1		2												
CO 5	2	3														2

1- LOW, 2-MEDIUM, 3-HIGH

Mapping & Justification

Mapping	Level	Justification
CO 1–PO1	3	Student will be able to apply knowledge of mathematic to define more accuracy and percentage of error in solution
CO 1 – PO12	1	This learning will be applied to any solution given by student lifelong.
CO2-PO1	3	It provides basic as well as advance principals of mathematics and engineering so that they can provide solution to complex engineering problems.
CO2-PO3	2	By applying various methods like, bisection real time problem of searching (binary search) can be solved. Interpolation can be used to find value for given data from data table.
CO2-PO4	2	Student can apply linear algebraic equations to solve complex problem and mathematical series.
CO2-PSO2	3	Student will be able tosolve mathematics equations and formulas to by using programming language.
CO3-PO4	3	Student will be able to understand more accurate values by using curve fitting and numerical integration
CO3-PSO2	3	Student will be able to solve mathematics equations and formulas to by using programming language.
CO4-PO1	1	Student will learn basic about data analysis, correlation and regression.
CO4-PO4	2	Student will be able to analyse data, interpretation of data and can

		generate conclusion.
CO5-PO2	2	By applying various comparisons student can conclude about best methods. Student can identify points by which existing methods may work better.
CO5-PSO2	2	The knowledge of identifying best methods among various methods will help students to identify research gap and encourage them for literature survey and analysis.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

COMPUTER NETWORKS

SUBJECT CODE: 2140709

B.E. 4rd SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

COURSE OBJECTIVES:

1 To familiarize with the TCP/IP protocol suite

2 To understand the different protocols used in each layer of TCP/IP.

3 To study the implementation of TCP/IP protocols

COURSE OUTCOMES

After successful completion of this course, the students should be able to

C2140709 .1	To master the terminology and concepts of the OSI reference model and the TCP-IP reference model
C2140709 .2	Understand the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks and Addressing scheme used in internet
C2140709 .3	Explain and demonstrate the mechanics associated with IP addressing, device interface, association between physical and logical addressing, sub netting and super netting and various routing technology.
C2140709 .4	Have a working knowledge of datagram and internet socket programming

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO.1	2															
CO.2		2	1										1			

CO.3	1		2							1						
CO.4	2		1													

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	2	Apply the knowledge of basic concepts of Internet architecture and communication strategies for solutions of complex networking Problems..
CO1-PO2	2	Identifying and analyzing addressing schemes that can be used in different categories of networks.
CO2-PO3	3	Able to design and develop the solutions for solving problems in Internet addressing.
CO3-PO1	3	Apply the knowledge of routing techniques
CO3-PO3	2	Design better solutions for better and error free transmission in Internet using appropriate routing methods.
CO3-PO10	1	Ability to opt the correct routing strategies and to end in better solutions for community and society using Internet.
CO4-PO1	2	Able to apply the fundamentals of Internet architectures in contributing new solutions for complex problems in Internet
CO4-PO3	1	Designing solutions for multicasting over Internet
CO2-PSO1	1	Students shall learn software engineering principles and practice.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

CYBER SECURITY

SUBJECT CODE: 2150002

B.E. 5th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
0	1	2	3	0	0	0	50	30	20	100

COURSE OBJECTIVES:

After learning the course the students should be able to: student should understand cyber-attack, types of cybercrimes, cyber laws and also how to protect them self and ultimately society from such attacks

Sr.No	Content
1	Systems Vulnerability Scanning Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet
2	Network Defense tools Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System
3	Web Application Tools Scanning for web vulnerabilities tools: Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTC-Hydra
4	Introduction to Cyber Crime and law Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident

	Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000.
5	Introduction to Cyber Crime Investigation Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

ANAIYSIS AND DESIGN OF ALGORITHMS
SUBJECT CODE: 2150703
B.E. 5th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. This course enables to understand and analyse algorithms for various applications for different domains.
2. It targets various problem solving paradigms/approaches and their analysis.
3. This course enables the use of various tools and platforms to implement and analyse algorithms to solve problems of various categories.

Syllabus:

1	**Basics of Algorithms and Mathematics:** What is an algorithm?. Mathematics for Algorithmic Sets, Functions and Relations, Vectors and Matrices, Linear Inequalities and Linear Equations.
2	**Analysis of Algorithm:** The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations, Analyzing control statement, Loop invariant and the correctness of the algorithm, Sorting Algorithms and analysis: Bubble sort, Selection sort, Insertion sort, Shell sort Heap sort, Sorting in linear time : Bucket sort, Radix sort and Counting sort
3	**Divide and Conquer Algorithm:** Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential.
4	**Dynamic Programming:** Introduction, The Principle of Optimality, Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient, Making Change Problem, Assembly Line-Scheduling, Knapsack problem, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.
5	**Greedy Algorithm** General Characteristics of greedy algorithms, Problem solving using Greedy Algorithm - Activity selection problem, Elements of Greedy Strategy, MinimumSpanning trees (Kruskal's algorithm, Prim's algorithm), Graphs: Shortestpaths, The Knapsack Problem, Job Scheduling Problem, Huffman code.
6	**Exploring Graphs:** An introduction using graphs and games, Undirected Graph, DirectedGraph, Traversing Graphs, Depth First Search, Breath First Search,Topological sort, Connected components
7	**Backtracking and Branch and Bound:**

	Introduction, The Eight queens problem , Knapsack problem, Travelling Salesman problem, Minimax principle
8	**String Matching:** Introduction, The naive string matching algorithm, The Rabin-Karpalgorithm, String Matching with finite automata, The Knuth-Morris-Prattalgorithm.
9	**Introduction to NP-Completeness:** The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms

Course outcomes:

Students will be able to

1. Analyse the asymptotic performance of algorithms.
2. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Find optimal solution by applying various methods.
4. Apply pattern matching algorithms to find particular pattern.
5. Differentiate polynomial and non-polynomial problems.
6. Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate.

CO-PO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
2150703.1	2	1	-	-	-	-	-	-	-	1	2	-	-	1	2	-
2150703.2	-	2	1	-	-	-	-	-	-	1	2	-	-	1	2	-
2150703.3	-	3	-	-	-	-	-	-	-	-	2	-	-	-	2	-
2150703.4	-	2	1	-	-	-	-	-	2	-	1	-	2	-	1	2
2150703.5	1	2	-	-	-	-	-	-	-	1	2	-	-	1	2	-
2150703.6	2	2	-	-	-	-	-	-	-	-	2	-	-	-	2	-
2150703	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**2**	**-**	**2**	**3**	**2**	**2**

Mapping & Justification

Mapping	**Level**	**Justification**
CO1-PO1	2	Students shall learn basics of algorithm and related fundamental theories.
CO1-PO2	1	Students shall learn to compare different algorithms based on their asymptotic performance.
CO1-PO10	1	By knowing complexity of problem solution it can be communicated properly in real time example.
CO1-PO11	2	Student will be able to apply learned analytical skills in project execution and management.
CO1-PSO2	1	Learn mathematical concepts related to asymptotic notations.
CO1-PSO3	2	Apply the concepts to analyse the performance of algorithms.

CO2-PO2	2	Derive recurrence relations of the divide and conquer algorithms.
CO2-PO3	1	Solve recurrence relation for a given algorithm.
CO2-PO10	1	Student can Communicate effectively on complex engineering activities with the engineering community and with society at large.
CO2-PO11	2	Learning this approach will help student to effectively manage the real time project with complex problem.
CO2-PSO2	1	Learn mathematical concepts related to recurrent relations.
CO2-PSO3	2	Apply the concepts to describe the performance of divide and conquer algorithms.
CO3-PO2	3	Students shall be able to compare solutions and find the optimal solution for a given criteria.
CO3-PO11	2	Student will be able to solve complex problem with efficient solution, which can help them to execute project effectively.
CO3-PSO3	2	Learn to apply various methods to find optimal solution to a given problem.
CO4-PO2	2	Students shall be able to analyse whether a given algorithms can be applied to a particular pattern matching problem or not.
CO4-PO3	1	Solve a pattern matching problem(s).
CO4-PO9	2	Student can prepare various projects forming teams.
CO4-PO11	1	Pattern matching will help students to find various analysis of project data. Best practice will enhance efficiency of task.
CO4-PSO1	2	Learn how to implement pattern matching algorithms.
CO4-PSO3	1	Learn how to apply pattern matching algorithms to pattern matching problem.
CO5-PO1	1	Gain knowledge about various problems and the category they belong to in order to analyse them further.
CO5-PO2	2	Shall be able to compare polynomial and non-polynomial problems.
CO5-PO10	1	Student will be able to efficiently justify/communicate given task/problem is polynomial or non-polynomial problems.
CO5-PO11	2	By learning this student will be able to identify problem of project properly which will help and leads to good execution of overall project.
CO5-PSO2	1	Learn mathematical concepts related to polynomial and non-polynomial problems.
CO5-PSO3	2	Apply method to differentiate polynomial and non-polynomial problems.
CO6-PO1	2	Shall gain knowledge about graph algorithms.
CO6-PO2	2	Shall be able to analyse graph algorithms and compare them.
CO6-PO11	2	Graph algorithms and its models will be useful in project management to evaluate various execution paths.
CO6-PSO3	2	Learn how to employ graph algorithms to analyse and model engineering problems.

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

OBJECT ORIENTED PROGRAMMING USING JAVA
SUBJECT CODE: 2150704
B.E. 5th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. Main objective of this course is to teach basic concepts and techniques which form the object oriented programming paradigm.
2. This course gives idea about various concepts of object oriented programming paradigmlike abstract data types, encapsulation, inheritance and polymorphism.
3. This course provides insight about How to use Java SDK environment to create, debug and run Java programs.

Syllabus:

1	Basics of Java: Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements – If , else, nested if, if-else ladders, Switch, while, do-while, for, for-each, break, continue.
2	Array and String: Single and Multidimensional Array, String class, StringBuffer class, Operations on string, Command line argument, Use of Wrapper Class.
3	Classes, Objects and Methods: Class, Object, Object reference, Constructor, Constructor Overloading, Method Overloading, Recursion, Passing and Returning object form Method, new operator, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.
4	Inheritance and Interfaces: Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding Handle multilevel constructors – super keyword,Stop Inheritance - Final keywords, Creation and Implementation of an interface, Interface reference, instanceof operator, Interface inheritance, Dynamic method dispatch ,Understanding of Java Object Class,Comparison between Abstract Class and interface, Understanding of System.out.println – statements.
5	Package: Use of Package, CLASSPATH, Import statement, Static import, Access control
6	Exception Handling: Exception and Error, Use of try, catch, throw, throws and finally, Built in Exception, Custom exception, Throwable Class.
7	Multithreaded Programming: Use of Multithread programming, Thread class and Runnable interface , Thread priority, Thread synchronization, Thread communication, Deadlock
8	IO Programming: Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader
9	Collection Classes: List, AbstractList, ArrayList, LinkedList, Enumeration, Vector,

	Properties, Introuduction to Java.util package
10	Networking with java.net: InetAddressclass,Socket class, DatagramSocket class, DatagramPacket class
11	Introduction to Object orientation: Introduction to Object orientation, Modeling as a Design Technique ModelingConcepts,abstraction, The three models, Class Model, State model and Interaction model.
12	Class Modeling: Object and class concepts, link and association, Generalization and Inheritance
13	Advanced class Modeling: Advanced Object and class concepts, Association Ends, N-ary associations, aggregation, abstract classes, multiple inheritance, Metadata, Constraints, Derived data, Packages.
14	State modelling: Events, states, Transition and conditions, state diagram, state diagram behaviour
15	Interaction Modeling: Use case Models, sequence models, activity models

Course outcomes:

1. Students will be able to **comprehend** the concepts of Object Oriented Programming and be able to **create** an application which **demonstrates** the use of interfaces, abstract classes and packages.
2. Students will be able to **use** the concept of exception handling to design user friendly applications and be able to **apply** the concept of wrapper classes and collection classes to ease the work of programmer.
3. Students will be able to **design**and **demonstrate** multi-threaded client server application to speed up the execution time.
4. Students will be able to p**repare** UML diagrams for software system.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Foundations of Software Development: Apply design and developmentprinciples to develop software applications/products of varying complexity in emerging areas.

PSO2: Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm

PSO3: Competent in Emerging Trends: Ability to use current tools and techniques necessary for computing practices.

PSO4: Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and provides innovative solution

CO-PO Mapping

(S/M/W) indicating correlation strength – Strong (S), Medium (M), Weak (W)

COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3												2			
CO2	2		2										2			

CO 3	2		2		3	2			2				2		2	
CO 4	2		3						2	1			2			

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Basic knowledge aboutconcepts of Object Oriented Programmingwill be gained by students.
CO2-PO1	2	Concepts learned in this subject will be useful to design reliable solution.
CO2-PO3	2	This course will deliver knowledge about exception handling and wrapper class which will further be utilized in the development of efficient software.
CO3-PO1	2	Students will be able to differentiate between single threaded and multithreaded application and they can analyzethe need of particular type of application in a specified situation.
CO3-PO3	2	Concepts of client-server will be useful in designing effective web applications.
CO3-PO5	3	Students use various tools and frameworks for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO3-PO6	2	Knowledge about advanced concepts of programming isdelivered which subsequently used in solving real time problems.
CO3-PO9	2	Students will design various applications in group which impart team work skills.
CO4-PO1	2	Conceptual knowledge about UML diagram is delivered which can further be utilized for serving software industries.
CO4-PO3	3	Apply knowledge of UML diagram for designing real world problem.
CO4-PO9	2	Analyzing software requirements and framing solutions required group efforts which impart team work and leadership skills.
CO4-PO10	1	Formulation of the problem and validating the solution requires communication with the stack holders which in turn helps in grooming the communication skills.
CO1-PSO1	2	Concepts of JAVA programming will be useful in developing programs.
CO2-PSO1	2	Fundaments of exception handling and wrapper classes will be taught to students which will be used to design reliable application development.
CO3-PSO1	2	To make execution faster concept of multi threaded application development will be used.
CO4-PSO1	2	To understand and design solution of real world problem UML diagrams will be very useful.
CO3-PSO3	2	This course will impart the knowledge about latest tools and technologies which can be used to implement need based problems.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

SYSTEM PROGRAMMING

SUBJECT CODE: 2150708

B.E. 5th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. To introduce students the concepts and principles of system programming and to enable them to understand the duties and scope of a system programmer.
2. To introduce methods and techniques for designing and implementing system-level programs.
3. To teach assembly language directives, macros, operators, loader and linker
4. To train students in developing skills for writing system software with the aidof sophisticated OS services, programming languages and utility tools.

Syllabus:

No.	Content	Total Hrs	% Weightage
1	Overview of System Software Introduction, Software, Software Hierarchy, Systems Programming,Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Different Views on the Meaning of a Program, System Software Development, Recent Trends in Software Development, Levels of System Software	06	10
2	Overview of Language Processors Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables Data Structures for Language Processing: Search Data structures, Allocation Data Structures.	06	15
3	Assemblers Elements of Assembly Language Programming, Design of theAssembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86 , Algorithm of Single Pass Assembler, Multi-Pass Assemblers, Advanced Assembly Process, Variants of Assemblers Design of two pass assembler,	06	15
4	Macro and Macro Processors Introduction, Macro Definition and Call, Macro Expansion, NestedMacro Calls, Advanced Macro Facilities, Design Of a Macro Preprocessor, Design of a Macro Assembler, Functions of a MacroProcessor, Basic Tasks of a Macro Processor, Design Issues	08	20

	of Macro Processors, Features, Macro Processor Design Options, Two-Pass Macro Processors, One-Pass Macro Processors		
5	Linkers and Loaders Introduction, Relocation of Linking Concept, Design of a Linker, Self Relocating Programs, Linking in MSDOS, Linking of Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders	06	20
6	Scanning and Parsing Programming Language Grammars, Classification of Grammar,Ambiguity in Grammatic Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools, LEX, YACC	06	10
7	Compilers Causes of Large Semantic Gap, Binding and Binding Times, DataStructure used in Compiling, Scope Rules, Memory Allocation,Compilation of Expression, Compilation of Control Structure, Code Optimization	04	5
8	Interpreters & Debuggers Benefits of Interpretation, Overview of Interpretation, The JavaLanguage Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger	04	5

Reference Books:

1. System Programming by D M Dhamdhere McGraw Hill Publication
2. System Programming by Srimanta Pal OXFORD Publication
3. System Programming and Compiler Construction by R.K. Maurya& A. Godbole.
4. System Software – An Introduction to Systems Programming by Leland L. Beck, 3rd Edition, Pearson Education Asia, 2000
5. System Software by SantanuChattopadhyay, Prentice-Hall India,2007

Course outcomes:

CO 2150708.1: To inspect the execution process of HLL programs

CO 2150708.2: To analyze the basic design and working of various system software.

CO 2150708.3: To implement and understand various system software.

CO 2150708.4: To examine the working of scanner and parser.

CO-PO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 2150708.1	1	2	-	3	-	-	-	-	-	-	-	-	2	-	-	-

CO 2150708.2	-	3	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO 2150708.3	3	-	-	-	3	-	-	1	-	-	-	2	3	2	-	1
CO 2150708.4	1	2	-	-	-	-	-	-	-	-	-	-	1	-	3	-

Mapping & Justification:

Mapping	Level	Justification
CO 2150708.1-PO1	1	Engineering basic knowledge will be applied to learn execution of high level language programs.
CO2150708.1-PO2	2	Review the concepts of program execution for the purpose of implementation.
CO2150708.1-PO4	3	Students will completely understand internal execution mechanism of high level language program.
CO2150708.2-PO2	3	Working of various system software will be understood by the students.
CO2150708.3-PO1	3	For the implementation of system software, students have to use the basic principles of engineering.
CO2150708.3-PO5	3	Students use various latest open source tools and software for performing of their laboratory experiments.
CO2150708.3-PO8	1	For the implementation of laboratory practicals, students will be trained and forced to have their own implementation not copied from somewhere else.
CO2150708.3-PO12	2	Students will implements system software which some self learning ability and can create very advance system software.
CO2150708.4-PO1	1	The knowledge of scanner and parser will be acquired by students.
CO2150708.4-PO2	2	Understanding of scanner and parser will be useful in design of system software.
CO 2150708.1-PSO1	2	Understanding of HLL execution will be useful in development of new system software.
CO 2150708.2-PSO1	2	knowledge of basic design and working of system software will help to develop new software
CO 2150708.3-PSO1	3	Using basic knowledge, some part of system software can be implemented.
CO 2150708.3-PSO2	2	To implement part of system software mathematical fundamentals will be applied.
CO 2150708.3-PSO4	1	Research gap can be identified in existing system software and some improvement can be done in newer one.
CO 2150708.4-PSO1	1	Study of scanner and parser will be useful in design of system software.
CO 2150708.4-PSO3	3	New tools will be learnt by students in study of scanner and parser.

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

COMPUTER GRAPHICS
SUBJECT CODE: 2151603
B.E. 5th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. This course provides fundamental knowledge about hardware architecture of various display devices along with display methods.
2. This course gives idea about various algorithms of drawing and filling primitive shapes. It also delivers the inside knowledge about 2D/3D transformations, clipping, viewing.
3. This course introduces some advanced and research topics like visible surface detection, back face detection, colour models etc.

Syllabus:

1	Basic of Computer Graphics: Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards
2	Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers.
3	2D transformation and viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping
4	3D concepts and object representation: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces
5	3D transformation and viewing: 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations
6	Advance topics: visible surface detection concepts, back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), Colour models: properties of light, XYZ, RGB, YIQ and CMY colour models

Course outcomes:

5. Students will be able to **describe** the fundamental algorithms used in computer graphics and to some extent be able to **compare** and **evaluate** them.
6. Students will be able to **learn**, **compare** and **apply** various transformation techniques. They will be able to **design** basic animations using latest graphics package software.
7. Students will be able to **solve** open design problems regarding surface/ edge detection.
8. Students will be able to **apply** the knowledge, techniques, skills and modern tools to become successful professionals in graphics industries.

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	3	1														
CO 2	2	2	2		3								2		1	
CO 3	2	2	3			2			1							
CO 4	3														2	1

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Basic knowledge of computer graphics algorithms will be gained by students.
CO1-PO2	1	Concepts learned in this subject will be useful to analyze various graphics systems.
CO2-PO1	2	This course will deliver fundamental knowledge about transformation techniques which will further be utilized in the design and development of animations.
CO2-PO2	2	Students will be able to differentiate various transformations and they can analyze the need of particular technique in a specified situation.
CO2-PO3	2	Basic concepts of Computer Graphics will enable students to analyze graphics problem and they will be able to apply learned techniques to solve those problems.
CO2-PO5	3	Students use various latest open source tools and frameworks for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO3-PO1	2	Knowledge about surface and edge detection techniques is delivered.
CO3-PO2	2	Students will be able to analyze and compare among surface / edge detections algorithms.
CO3-PO3	3	Students will be able to apply learned algorithms in the design of computer graphics based systems.
CO3-PO6	2	A mini project will impart team work skills.
CO3-PO9	1	Apply knowledge about Computer Graphics to solve various societal problems like computer vision, surveillance etc.
CO4-PO1	3	Conceptual knowledge about computer graphics which can further be utilized for serving graphics related industries.
CO2-PSO1	2	Students will be able to learn, compare and apply various design and

		development principles to develop software applications
CO2-PSO3	1	Students will be able to learn, compare and apply various Ability to use current tools and techniques necessary for computing practices.
CO4-PSO3	2	Students will be able to apply the knowledge, techniques, skills and modern tool in industries. Ability to use current tools and techniques necessary for computing practices.
CO4-PSO4	1	Students will be able to apply the knowledge, techniques, skills and modern tools to use knowledge in various domains to identify research gaps and provides innovative solution

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

SOFTWARE ENGINEERING
SUBJECT CODE: 2160701
B.E. 6th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. This course aims to provide knowledge about the concepts, principles and mechanisms for developing a software project.
2. It aims to cover software development life cycle, development models and agilemethodology.
3. Covers documentation part extensively to ensure quality and timely completion of the project.
4. Aims software development process improvement and reengineering

Syllabus:

1	Introduction to Software and Software Engineering - The Evolving Role of Software, Software: A Crisis on the Horizon and Software Myths, Software Engineering: A Layered Technology, Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Agile Process Model, Component-Based Development, Process, Product and Process.
2	Agile Development - Agility and Agile Process model, Extreme Programming, Other process models of Agile Development and Tools.
3	Managing Software Project - Software Metrics (Process, Product and Project Metrics), Software Project Estimations, Software Project Planning (MS Project Tool), Project Scheduling & Tracking, Risk Analysis &Management (Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation).
4	Requirement Analysis and Specification - Understanding the Requirement, Requirement Modelling, Requirement Specification (SRS), Requirement Analysis and Requirement Elicitation, Requirement Engineering.
5	Software Design - Design Concepts and Design Principal, Architectural Design, Component Level Design (Function Oriented Design, Object Oriented Design) (MS Visio Tool), User Interface Design, Web Application Design.
6	Software Coding & Testing - Coding Standard and coding Guidelines, Code Review, Software Documentation, Testing Strategies, Testing Techniques and Test Case, Test Suites Design, Testing Conventional Applications, Testing Object Oriented Applications, Testing Web and Mobile Applications, Testing Tools (Win runner, Load runner).
7	Quality Assurance and Management - Quality Concepts and Software Quality Assurance, Software Reviews (Formal Technical Reviews), Software Reliability, The Quality Standards: ISO 9000, CMM, Six Sigma for SE, SQA Plan.
8	Software Maintenance and Configuration Management - Types of Software Maintenance, Re-Engineering, Reverse Engineering, Forward Engineering, The SCM Process, Identification of Objects in the Software Configuration, Version Control and Change Control.

9	Software Engineering and Software as a Service - Product Lifetime: Independent Product Vs. Continues, Improvement, Software as a Service, SaaS Architecture.
10	Advanced Topics in Software Engineering - Component-Based Software Engineering, Client/Server Software Engineering, Web Engineering, Reengineering, Computer-Aided Software Engineering, Software Process Improvement and emerging Trends in software Engineering.

Course outcomes:Students will be able to

1. Define principals and working of software process models.
2. Describe agile development methodology and analyse where to apply.
3. Prepare SRS and software process metrics for a given requirement.
4. Prepare Test Suite and Quality Assurance plan for a given project.
5. Understand and analyse software management principles.

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2										
CO 2	2	2										
CO 3		3	2	1	2				2	1		
CO 4		3	3							1		
CO 5	2	2									1	

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Student shall gain basic knowledge about principles and working of various software process models.
CO1-PO2	2	Students shall learn to compare various s/w process models.
CO2-PO1	2	Basic knowledge of agile development methodology.
CO2-PO2	2	Students shall learn to compare and analyse agile development models.
CO3-PO2	3	Learn to analyse project's functional and non-functional requirements and prepare SRS.
CO3-PO3	2	Design modules, sub-modules and interfaces for a given software requirement.
CO3-PO4	1	This covers researching for a complex functionality as well.
CO3-PO5	2	Preparation of SRS includes using tools.
CO3-PO9	2	SRS is a team exercise and requires inputs from all the team members.
CO3-PO10	1	SRS preparation includes a lot of discussion on understanding the project requirements and representing the requirements in the various formats (like UML diagrams)
CO4-PO2	3	This involves analysing all the test cases which are applicable. Ensuring quality includes analysis of all the project aspects and phases.
CO4-PO3	3	Designing a test suit for s/w requirement.
CO4-PO10	1	Requires a lot of effective communication within and outside the team.
CO5-PO1	2	Students shall gain basic knowledge about s/w management

		principles.
CO5-PO2	2	Management principles include analysis and comparison of different scenarios with each other.
CO5-PO11	1	Students get basic knowledge about the management and financial aspects of a project.

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

ADVANCED JAVA
SUBJECT CODE: 2160707
B.E. 6th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. This course is essential for providing knowledge over the issues of managing data on web; developing powerful GUI based friendly user interface, server side programming and developing applications for communication over network using object oriented fundamentals.
2. This course builds a strong understanding of JDBC Technology. It gives in to demonstrate why Servlets are the cornerstone of Java's Web platform. It shows how JSP is built on the Servlet architecture.
3. This course explains how to use JSTL, custom tags and expression language to reduce Java code in Web pages while adding tremendous power and capability to those pages.
4. The course culminates in an exploration of Java MVC frameworks like spring at a high level and also other framework like JSF and Hibernate framework.

Syllabus:

1	Java Networking : Network Basics and Socket overview, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, ServerSocket, InetAddress, URL, URLConnection	6 Hours
2	JDBC Programming : The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQLException Class, The SQLWarning Class, The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management.	8 Hours
3	Servlet API and Overview : Servlet Model: Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor ServletContext and ServletConfig interface, Attributes in Servelt, Request Dispacher interface The Filter API: Filter, FilterChain, Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting	10 Hours
4	Java Server Pages : JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment, JSP Directives, JSP Action, JSP Implicit Objects, JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking, JSP	10 Hours

	Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing	
5	Java Server Faces2.0 : Introduction to JSF, JSF request processing Life cycle, JSF Expression Language, JSF Standard Component, JSF Facelets Tag, JSF Convertor Tag, JSF Validation Tag, JSF Event Handling and Database Access, JSF Libraries: PrimeFaces	04 Hours
6	Hibernate 4.0 : Overview of Hibernate, Hibernate Architecture, Hibernate Mapping Types, Hibernate O/R Mapping, Hibernate Annotation, Hibernate Query Language	08 Hours
7	Java Web Frameworks: Spring MVC : Overview of Spring, Spring Architecture, bean life cycle, XML Configuration on Spring, Aspect – oriented Spring, Managing Database, Managing Transaction	08 Hours

Course outcomes:

After successful completion of this course, the students should be able to

9. **Apply** the networking concepts to **establish** the two-way communication between client and server.
10. **Demonstrate** and **develop** the applications with JDBC.
11. **Enhance** the functionality of the Web server by using Servlet to develop web application and to **configure** filters to change the behaviour of resource dynamically**.**
12. **Separate** the presentation logic from the business logic and help to **embedded**java Code in Static HTML page using JSP 2.1 (Java ServerPage).
13. **Create** and **use** tag extensions or custom tags in a web page using JSTL.
14. **Use** modern tools like spring web MVC Framework, JSF, and Hibernate for designing and developing web applications and web servicesand **integrate** spring with Hibernate**.**

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	3		2													
CO 2			2		2											
CO 3	1		2		3											
CO 4		2	3										3			
CO 5					3											
CO 6					2			1	1				2		3	

2- LOW, 2-MEDIUM, 3-HIGH

Mapping & Justification

Mapping	Level	Justification
CO 1 - PO1	3	Students will be able to understand basic knowledge of network programming in Java.

CO 1 – PO3	2	This course will deliver fundamental knowledge about transformation techniques which will further be utilized in the design and development of animations.
CO 2 – PO3	2	JDBC will help students to design solution to do various operations on data in any RDBMS through java.
CO 2 – PO5	2	Students will be able to apply various concepts of JDBC to develop application using modern tools like Eclipse, Net beans, etc
CO 3 - PO1	1	Basic knowledge of web container and client server web model is delivered.
CO 3 – PO3	2	Servlets will help students to create dynamic web page with the help of java programming language.
CO 3 – PO5	3	Students selectlatest Database connectivity drivers and methods to create enterprise application.
CO 4 – PO2	2	This course discusses the advantages of JSP over servlet and explores the different architectures of JSP pages.
CO 4 – PO3	3	Designing a dynamic web page with the help of various elements of JSP will help students in separating the presentation logic from the business logic. This will allow students to play two different roles as web designers and pure java programmers.
CO 4 – PSO1	3	Students will be able to design and develop solutions to problem in real world.
CO 5-PO5	3	The creation of custom tags reduce the use of various old scripting elements of JSP, and thus students can eliminate the need of using or importing old Java code in JSP.
CO 6 – PO5	2	Students will be able to create simple, reliable, scalable enterprise application using hibernate and spring framework.
CO 6 – PO8	1	Using various validation techniques, students will be able detect and correct common programming errors at run time using debugging tools.
CO 6 – PO9	1	Apply various web framework like hibernate, spring to create e-commerce websites like flipkart, amazon, etc
CO 6 – PSO1	2	Apply frameworks to develop software applications/products of varying complexity in emerging areas
CO 6 – PSO3	3	With the knowledge of tools like JSF, Spring and Hibernate Framework for computing practices.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

WEB TECHNOLOGY

SUBJECT CODE: 2160708

B.E. 6th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

1. This course will make students familiar about basic Internet and WWW.
2. The overall objective of the course is to understand the concepts of web programming irrespective of programming language.
3. Students will learn about style sheets, java script and server-side programming using PHP.
4. This course provides introduction to some advanced web concepts like database programming, session management and XML

Syllabus:

Sr. No.	Content
1	**Introduction** : Concept of WWW, Internet and WWW, HTTP Protocol : Request and Response, Web browser and Web servers, Features of Web 2.0
2	**Web Design**: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation
3	**HTML** : Basics of HTML, formatting and fonts, commenting code, colour, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5
4	**Style sheets** : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colours and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3
5	**JavaScript** : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and Javascript, Events and buttons
6	**XML:** Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT
7	**PHP:** Introduction and basic syntax of PHP, decision and looping with examples,

	PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP
8	**PHP and MySQL:** Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs

Course Outcomes:

1. Students will **learn** about basis functioning of Internet by studying its architecture.
2. Students will be able to **compare** different types of style sheets and their priorities.
3. Students will be able to **differentiate** client side and server side scripting techniques. They will be able to **apply** particular scripting technique as per the requirements.
4. Knowledge of PHP will help them to **build** dynamic web based solution based on user requirements.
5. **Adopt** design pattern based approaches and frameworks which will make students ready for industry.

CO-PO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2
CO 1	3												3	3
CO 2	3	2											2	2
CO 3		3	3										3	0
CO 4		2	3	2	2	1			2				0	3
CO 5	3				2								1	0

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	This course uncovers basic working mechanism and architecture of Internet. Students learn about various types of web pages and request response mechanism.
CO2-PO1	3	Basic knowledge of Style sheets is required to create rich and interactive user interfaces.
CO2-PO2	2	Knowledge about various types and classes of CSS will help

		students to analyze problem and apply appropriate CSS.
CO3-PO2	3	Study of client side and server side scripting will enable students to analyze problem and apply particular type of scripting as per the needs.
CO3-PO3	3	Students will be able to design various tiers of application and will make use of web programming techniques to build it.
CO4-PO2	2	Students will analyze application requirements and with the use knowledge about database, they will create database design of the application.
CO4-PO3	3	Web programming skills using PHP will enable them to write coding.
CO4-PO4	2	HTML based form data collection will require interaction with end user.
CO4-PO5	2	Experiments about web programming, using various IDEs and web/database servers.
CO4-PO6	1	Understanding of need and advantages of web based applications will enable students to serve society more better way.
CO4-PO9	2	A mini project will impart team work skills.
CO5-PO1	3	Knowledge of MVC and design patterns will further be useful in real time project development.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

.NET TECHNOLOGY

SUBJECT CODE: 2160711

B.E. 6th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. Main objective of this course is to teach fundamentals of C# programming.
2. This course gives idea about various concepts of standalone application development and web application development.
3. This course provides insight about How to use Visual Studio environment to create, debug and run various .Net applications.

Syllabus:

1	Introduction to .NET Framework:NET framework, MSIL, CLR, CLS, CTS, Namespaces, Assemblies The Common Language Implementation, Assemblies, Garbage Collection, The End to DLL Hell - Managed Execution
2	C# - The Basics and Console Applications in C#:Name Spaces - Constructor and Destructors, Function Overloading & Inheritance, Operator Overloading, Modifiers - Property and Indexers , Attributes & Reflection API, When to use Console Applications - Generating Console Output, Processing Console Input
3	C#.NET:Language Features and Creating .NET Projects, Namespaces Classes and Inheritance -, Namespaces Classes and Inheritance -, C, Exploring the Base Class Library -, Debugging and Error Handling -, Data Types -, Exploring Assemblies and Namespaces, String Manipulation ,Files and I/O ,Collections
4	ADO.NET:Benefits of ADO.NET, ADO.NET compared to classic ADO -, Datasets, Managed Providers -, Data Binding: Introducing Data Source Controls -, Reading and Write Data Using the SqlDataSource Control
5	Windows Forms and Controls in details:The Windows Forms Model, Creating Windows Forms Windows Forms Properties and Events, Windows Form Controls, Menus - Dialogs – ToolTips
6	Visual Inheritance in C#.NET:Apply Inheritance techniques to Forms, Creating Base Forms, Programming Derived Forms
7	Mastering Windows Forms:Printing - Handling Multiple Events, GDI+, Creating Windows Forms Controls
8	ASP.NET:Introduction to ASP.NET, Working with Web and HTML Controls, Using Rich Server Controls, Login controls, Overview of ASP.NETValidation Controls, Using the Simple Validations, Using the Complex Validators Accessing Data using

	ADO.NET, Using the Complex Validators Accessing Data using ADO.NET, Configuration Overview
9	Themes and Master Pages:Creating a Consistent Web Site, ASP.NET 2.0 Themes - Master Pages, Displaying Data with the GridView Control Introducing the GridView Control, Filter Data in the GridView Control, Allow Users to Select from a DropDownList in the Grid, Add a Hyperlink to the Grid, Deleting a Row and Handling Errors
10	Managing State:Preserving State in Web Applications and Page-Level State, Using Cookies to Preserve State, ASP.NET Session State ,Storing Objects in Session State, Configuring Session State, Setting Up an Outof-Process State Server, Storing Session State in SQL Server, Using Cookieless Session IDs, Application State Using the DataList and Repeater Controls, Overview of List-Bound Controls, Creating a Repeater Control and DataList Control
11	Creating and Consuming Web Services:The Motivation for XML Web Services, Creating an XML Web Service with Visual Studio, Designing XML Web Services, Creating Web Service Consumers, Discovering Web Services Using UDDI
12	Advanced in .NET:Introduction to Windows Presentation Foundation (WPF), Window Communication Foundation and its Application

Course outcomes:

1. Students will be able to **apply** the concepts of Object oriented programming and C# to make console and windows applications.
2. Students will be able to **prepare** good UI with the help of various C# controls, themes and master page.
3. Students will be able to **design** fully functional web application using the concepts of ADO.Net, various server controls and state management.
4. Students will be able to **use** advanced concepts related to Web Services, WCF, and WPF in project development.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Foundations of Software Development: Apply design and development principles to develop software applications/products of varying complexity in emerging areas.

PSO2: Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm

PSO3: Competent in Emerging Trends: Ability to use current tools and techniques necessary for computing practices.

PSO4: Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and provides innovative solution

CO-PO Mapping

(S/M/W) indicating correlation strength – Strong (S), Medium (M), Weak (W)

COs	**PROGRAMME OUTCOMES (POs)**												**PSOs**			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4

CO 1	3											2			
CO 2	2											2			
CO 3	2	1	2		3	2			2	2			2		2	
CO 4	2		3		3	2			2				2		2	

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Basic knowledge aboutconcepts of Object Oriented Programmingand C# will be gained by students.
CO2-PO1	2	Concepts learned in this subject will be useful to design good look and feel of the software.
CO3-PO1	2	Students will gain knowledge about web application development using ASP.Net and C#.
CO3-PO2	1	To develop an efficient solution, student will analyse problem completely.
CO3-PO3	2	Concepts of state management and ASP.Net will be useful in designing reliable web applications.
CO3-PO5	3	Students use Visual Studioplatform for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO3-PO6	2	Knowledge about advanced concepts of programming isdelivered which subsequently used in solving real time problems.
CO3-PO9	2	Students will design various applications in group which impart team work skills.
CO3-PO10	2	Students in a group communicate with various stack holders for formulating exact problem and validating prepared solution which develops communication skills.
CO4-PO1	2	Conceptual knowledge about Web services, WPF and WCF is delivered which can further be utilized for serving software industries.
CO4-PO3	3	Apply knowledge of Web service and WCF for designing real world problem.
CO4-PO5	3	Knowledge of modern technologies like WPF and WCF is delivered to enrich the software.
CO4-PO6	2	After understanding latest concepts of .Net, students can effectively solve real world problems.
CO4-PO9	2	Analyzing software requirements and framing solutions required group efforts which impart team work and leadership skills.
CO1-PSO1	2	Basics of C# programming will help student to design console applications.
CO2-PSO1	2	To enrich UI of web applications concepts of Theme and Master page is being taught to students.
CO3-	2	To solve problem of user, this course taught all the fundaments of

PSO1		Web application development.
CO4-PSO1	2	To develop high end applications, concepts of WPF and WCF is discussed with students.
CO3-PSO3	2	To develop full proof web application with all the required feature, student needs to use latest technologies for web development.
CO4-PSO3	2	Good UI and reliable communication can be achieved through implementing latest tools and technologies of Visual Studio.

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

DATA COMPRESSION AND DATA RETRIEVAL
SUBJECT CODE: 2161603
B.E. 6th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

1. To impart knowledge about requirements of data compression in real world applications.
2. To impart basic concepts related to data compression terminology.
3. To understand concepts about lossy and lossless compression algorithms and its application on various types of data.
4. To understand basic concepts related to scalar and vector quantizers
5. To understand basic concepts related to boolean retrieval and XML retrieval.

Syllabus:

1	Compression Techniques : Lossless Compression , Lossy Compression ,Measures of Performance
2	Mathematical Preliminaries for Lossless Compression Models : Physical Models, Probability Models, Markov Models, Composite Source Model, Coding, Uniquely Decodable Codes, Prefix Codes, Algorithmic Information Theory, Minimum Description Length Principle
3	Huffman Coding: The Huffman Coding Algorithm, Minimum Variance Huffman Codes, Adaptive Huffman Coding, Update Procedure, Encoding Procedure, Decoding Procedure, Golomb Codes, Rice Codes, Tunstall Codes Applications of Huffman Coding, Lossless Image Compression Text Compression, Audio Compression
4	Arithmetic Coding : Introduction, Coding a Sequence, Generating a Tag, Deciphering the Tag, Generating a Binary Code, Uniqueness and Efficiency of the Arithmetic Code, Algorithm Implementation Integer Implementation, Comparison of Huffman and Arithmetic Coding, Adaptive Arithmetic Coding
5	Dictionary Techniques: Static Dictionary, Digram Coding, Adaptive Dictionary, The LZ77 Approach, The LZ78 Approach, Applications, File Compression —UNIX compress, Image Compression—The Graphics Interchange Format (GIF), Image Compression—Portable Network Graphics (PNG), Compression over Modems —V.42 bis
6	Predictive Coding: Prediction with Partial match (ppm):The basic algorithm,The ESCAPE SYMBOL,Length of context,The Exclusion Principle,The Burrows -Wheeler Transform:Move -to -front coding, Lossless Image Compression CALIC, JPEG-LS, Multi-resolution Approaches,

	Facsimile Encoding, Dynamic Markoy Compression
7	Mathematical Preliminaries for Lossy Coding: Distortion criteria, Models,The Quantization Problem, Uniform Quantizer, Adaptive Quantization Forward Adaptive Quantization, Backward Adaptive Quantization, Nonuniform Quantization, pdf-Optimized Quantization, Companded Quantization
8	Vector Quantization: Advantages of Vector Quantization over Scalar Quantization, The Linde -Buzo -Gray Algorithm, Initializing the LBG Algorithm, The Empty Cell Problem, Use of LBG for Image Compression, Tree-Structured Vector Quantizers, Design of Tree-Structured Vector Quantizers, Pruned Tree-Structured Vector Quantizers, Structured Vector Quantizers, Pyramid Vector Quantization, Polar and Spherical Vector Quantizers, Lattice Vector Quantizers
9	Boolean retrieval: An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries, The extended Boolean model versus ranked retrieval, The term vocabulary and postings lists, Document delineation and character sequence decoding, Obtaining the character sequence in a document, Choosing a document unit, Determining the vocabulary of terms, Tokenization, Dropping common terms: stop words, Normalization (equivalence classing of terms), Stemming and lemmatization, Faster postings list intersection via skip pointers, Positional postings and phrase queries, Biword indexes, Positional indexes
10	XML retrieval : Basic XML concepts, Challenges in XML retrieval,A vector space model for XML retrieval, Evaluation of XML retrieval, Text-centric vs. data-centric XML retrieval

Course outcomes:

1. Students will be able to **describe** the fundamental algorithms used in data compression and **analyse** the performance of compression algorithms.
2. Students will be able to **compare and apply** various Lossy and lossless compression techniques.
3. Students will be able to **describe, compare**and **apply**scalar and vector quantizers.
4. Students will be able to **apply** information retrieval and **solve** problems.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Foundations of Software Development: Apply design and development principles to develop software applications/products of varying complexity in emerging areas.

PSO2: Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm

PSO3: Competent in Emerging Trends: Ability to use current tools and techniques necessary for computing practices.

PSO4: Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and provides innovative solution

CO-PO Mapping (3/2/1) indicating correlation strength – Strong (3), Medium (2), Weak (1)		
CO	**PROGRAMME OUTCOMES (POs)**	**PSOs**

s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	PS O4
CO 1	3	2	2											3		
CO 2	3	3	3										3	3		
CO 3	3	3												3		
CO 4	3	3												3		

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Fundamental details related to data compression terminologies
CO1-PO2	2	Concepts learned in this subject will be useful to analyse various data compression algorithm.
CO1-PO3	2	Concepts learned in this subject will be useful to design efficient data compression algorithms
CO2-PO1	3	This course will deliver fundamental knowledge of lossy and lossless compression techniques
CO2-PO2	3	Students will be able to learn and compare various lossy and lossless compression coding mechanisms with performance analysis
CO2-PO3	3	Basic concepts of lossy and lossless compression will enable students to analysereal world problems and they will be able to apply learned techniques to solve those problems.
CO3-PO1	3	Students will be able to understand the need of and concepts related to quantization techniques
CO3-PO2	3	Students will be able to learn and compare scalar and vector quantization techniques
CO4-PO1	3	Students will be able to understand the need of and concepts related to data retrieval techniques
CO4-PO2	3	Students will be able to learn and compare various Boolean retrieval and XML retrieval techniques
CO1-PSO2	3	Application of mathematical foundation to analyse performance of various compression algorithm
CO2-PSO1	3	Software development using lossyand lossless compression techniques
CO2-PSO2	3	Application of mathematical foundation to analyse performance of lossyand lossless compression algorithm
CO3-PSO2	3	Understand the utilization of scalar and vector quantizers in compression procedure
CO4-PSO2	3	Understand the utilization of XML and Boolean retrieval techniques in compression procedure

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

IMAGE PROCESSING
SUBJECT CODE: 2161604
B.E. 6th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. To learn the fundamental concepts of Digital Image Processing and Video Processing
2. To understand basic image enhancement and segmentation techniques.
3. To illustrate Image Transform calculations mathematically and develop image processing algorithm
4. To learn Image Compression and Decompression Techniques

Syllabus:

1	Digital image fundamentals: Light and Electromagnetic spectrum, Components of Image processing system, Image formation and digitization concepts, Neighbours of pixel adjacency connectivity, regions and boundaries, Distance measures, Applications
2	Image Enhancements: In spatial domain: Basic gray level transformations, Histogram processing, Using arithmetic/Logic operations, smoothing spatial filters, Sharpening spatial filters. In Frequency domain: Introduction to the Fourier transform and frequency domain concepts, smoothing frequency-domain filters, Sharpening frequency domain filters
3	Image Restoration: Various noise models, image restoration using spatial domain filtering, image restoration using frequency domain filtering, Estimating the degradation function, Inverse filtering
4	Colour Image processing: Colour fundamentals, Colour models, Colour transformation, Smoothing and Sharpening, Colour segmentation
5	Wavelet and Multi-resolution processing: Image pyramids, Multi-resolution expansion, wavelet transform
6	Image compression: Introduction, Image compression model, Error-free compression, Lossy compression
7	Image segmentation: Detection of discontinuities, Edge linking and boundary detection, thresholding

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Foundations of Software Development: Apply design and development principles to develop software applications/products of varying complexity in emerging areas.
2. Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm
3. Competent in Emerging Trends: Ability to use current tools and techniques necessary for computing practices.
4. Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and provides innovative solution

Course outcomes:

1. **Describe** image enhancement and Segmentation technique.
2. **Develop** fast image transform.
3. **Solve** Image compression and decompression techniques
4. S**olve** open design problems regarding image and video processing.

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

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	3		1											2		
CO 2	3	2	2		3										2	
CO 3		2										2		2		
CO 4		2											1			2

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Basic knowledge of image processing and video processing algorithms will be gained by students.
CO1-PO3	1	Concepts learned in this subject will be useful to design and develop image processing system.
CO2-PO1	3	This course will deliver fundamental knowledge about image transformation and enhancement techniques.

CO2-PO2	2	Students will be able analyse different problem related to segmentation and enhancement of image/video.
CO2-PO3	2	Basic concepts of Image processingwill enable students to develop solutions for different image processing problems
CO2-PO5	3	Students use various latest open source tools and frameworks for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO3-PO2	2	Knowledge about algorithms with time complexity isdelivered.
CO3-PO12	2	Students will be able to apply these knowledge in life long problem in the domain of image and video processing.
CO4-PO2	2	Students will be able analyse different problem related to compress of image/video.
CO1-PSO2	2	Students will be able to apply mathematical concepts in image enhancement and segmentation.
CO2-PSO3	2	The current tools used for processing images with less amount of processing time.
CO3-PSO2	2	Students will be able to apply mathematical concepts in image/video compression and decompression.
CO4-PSO1	1	Students will be able to design and develop real-world image processing / video processing applications.
CO4-PSO4	2	Student will be able to find out limitation of traditional approaches and investigate the research gap by analysing the strength and weakness of different open ended problem.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

INFORMATION AND NETWORK SECURITY

SUBJECT CODE: 2170709

B.E. 7TH SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

- This course aims to provide knowledge about the concepts, principles and mechanisms for providing security to the information/data.
- The subject covers various important topics concern to information security like symmetric and asymmetric cryptography, hashing, message and user authentication, digital signatures, key distribution and overview of the malware technologies.
- The subject also covers the applications of all of these in real life applications.

Syllabus:

1	Symmetric Cipher Model, Cryptography, Cryptanalysis and Attacks; Substitution and Transposition techniques
2	Stream ciphers and block ciphers, Block Cipher structure, Data Encryption standard (DES) with example, strength of DES, Design principles of block cipher, AES with structure, its transformation functions, key expansion, example and implementation
3	Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode
4	Public Key Cryptosystems with Applications, Requirements and Cryptanalysis, RSA algorithm, its computational aspects and security, Diffie-Hillman Key Exchange algorithm, Man-in-Middle attack
5	Cryptographic Hash Functions, their applications, Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA)
6	Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers
7	Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm
8	Key management and distribution, symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure
9	Remote user authentication with symmetric and asymmetric encryption, Kerberos
10	Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH

Course Outcomes:

1. Students will be able to define the concepts of information security and their use.
2. Students will be able to describe the principles of symmetric and asymmetric cryptography.

3. Students will be able to understand and apply the various symmetric and asymmetric key algorithms.
4. Students will be able to understand and apply the concepts of hashing, message authentication, digital signature and digital certificates the various symmetric and asymmetric key algorithms.
5. Students will be able to understand and apply various key management and remote authentication mechanisms.

CO-PO-PSO mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	…	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3										2	1		
CO 2	2	1									2			
CO 3	2	2	3								2		1	
CO 4	2	2	3								2		1	
CO 5	2	2									2		1	

Mapping & Justification

Mapping	**Level**	**Justification**
CO1-PO1	3	Students shall gain basic knowledge about security aspects of information and computer and other networks.
CO1-PSO1	2	Students shall learn fundamentals of security system architecture.
CO1-PSO2	1	It includes mathematical foundations of security systems.
CO2-PO1	2	Knowledge about cryptographic principles will be gained by the students.
CO2-PO2	1	Students shall be able to analyse which cryptographic principles to apply for a given situation.
CO2-PSO1	2	Students shall learn symmetric and asymmetric systems.
CO3-PO1	2	Basic knowledge about cryptographic algorithms as a whole shall be understood by the students.
CO3-PO2	2	Students shall be able to identify which en-decryption/key-generation algorithm to apply.
CO3-PO3	3	Design a cryptographic algorithm for a given problem.
CO3-PSO1	2	Students shall learn about key generation algorithms and systems.
CO3-PSO3	1	Students shall learn the applications of key generation algorithms.
CO4-PO1	2	Basic knowledge about hashing algorithms shall be gained by the students.
CO4-PO2	2	Students shall be able to analyse which hashing/message authentication/digital signature algorithms to apply for a given problem statement.
CO4-PO3	3	Designing a mechanism for message authentication/digital signature shall be explained to the students.
CO4-PSO1	2	Students shall learn about authentication mechanisms.
CO4-PSO3	1	Students shall learn the applications of authentication mechanisms.
CO5-PO1	2	Basic knowledge about key management scenarios shall be gained by the students.
CO5-PO2	2	Students shall be able to analyse and compare various key management scenarios.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

MOBILE COMPUTING AND WIRELESS COMMUNICATION

SUBJECT CODE: 2170710

B.E. 7TH SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

COURSE OBJECTIVES:

After learning the course the students should be able to:

1. Understand mobile and wireless network systems such as 2G/3G/4G mobile telephony/data networks,
2. Understand GSM and GPRS
3. Understand the working of wireless local area network, Bluetooth.

1	**Introduction, Transmission Fundamentals**-Signals for Conveying Information, Analog and Digital Data Transmission, Channel Capacity, TransmissionMedia, Multiplexing **Communication Networks-** LANs,MANs,andWANs,SwitchingTechniques,CircuitSwitching,Packet Switching, **Protocols and the TCP*/IP*Suite-** The Need for a Protocol Architecture,The*TCP/IP* Protocol Architecture,The OSI Model,Internetworking
2	**Cellular Wireless Networks**-Principles of Cellular Networks,First-Generation Analog Second-Generation TDMA Second-Generation CDMA,Third-Generation Systems **Antennas and Propagation**-Antennas, Propagation Modes, Line-of-Sight Transmission, Fading in the Mobile Environment **Modulation Techniques**-Signal Encoding Criteria, Digital Data- Analog Signals, Analog Data-Analog Signals, Analog Data-Digital Signals

	Spread Spectrum-The Concept of Spread Spectrum,Frequency Hopping Spread Spectrum,Direct Sequence Spread Spectrum,Code Division Multiple Access, **Coding and Error Control-**Error Detection, Block Error Correction Codes , Convolutional Codes, Automatic Repeat Request
3	**Multiple access in Wireless System – Multiple access scheme, frequency division multiple access, Time division multiple access, code division multiple access, space division multiple access, packet radio access, multiple access with collision avoidance.** **Global system for mobile communication** - Global system for mobile communication, GSM architecture, GSM entities, call routing in GSM,PLMN interface, GSM addresses and identifiers, network aspects in GSM,GSM frequency allocation, authentication and security **General packet radio service(GPRS) -** GPRS and packet data network, GPRS network architecture, GPRS network operation, data services in GPRS, Applications of GPRS, Billing and charging in GPRS **Wireless System Operations and standards -** Cordless Systems,Wireless Local Loop, WiMAX and IEEE 802.16 Broadband Wireless Access Standards Mobile **IP and** Wireless Application. Protocol
4	Wi-Fi and the IEEE 802.11 Wireless LAN Standard – IEEE 802 architecture, IEEE 802.11 architecture and services, IEEE 802.11 Medium access control, IEEE 802.11 physical layer, Wi-Fi protected access.
5	**Bluetooth, -** Radio specification, baseband specification, link manager specification, logical link control and adaption protocol
6	Android APIs, Android Architecture, Application Framework, The Application components, The manifest file, downloading and installing Android, Exploring the Development Environment, Developing and Executing the first Android

	application, Working with Activities, The LinearLayout Layout, The RelativeLayout Layout, The ScrollView Layout, The TableLayout Layout, The FrameLayout Layout, Using the TextView, EditText View, Button View, RadioButton, CheckBox, ImageButton, RatingBar, The options Menu, The Context Menu.

Course Outcomes :

CO1	Students will gain knowledge of GSM architecture
CO2	Students will be able to understand mobility management
CO3	Students will be able to use and apply the concept of working of wireless architectures and their applications.
CO4	Students will be able to write a basic code for android application

CO PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	0	3	1	3	1	2	1	3
CO2	2	1	3	0	3	1	3	0	3	1	3	0
CO3	1	2	1	2	1	0	1	0	1	2	1	2
CO4	0	1	1	0	2	1	2	1	3	0	3	1

Justification

CO1	PO1	1. Engineering knowledge	3	GSM architecture should be understand
	PO2	2. Problem analysis:	2	Analyse the GSM architecture
	PO3	3. Design/development of solutions	1	design gsm architecture
	PO4	4. Conduct investigations of complex problems	2	Investigate GSM Architecture
	PO6	6. The engineer and society	3	Application for the society
	PO7	7. Environment and sustainability	1	Low enviremental effect

	PO8	8. Ethics	3	GSM architecture should be understand
	PO9	9. Individual and team work	1	GSM architecture understanding
	PO10	10. Communication	2	apply for communication
	PO11	11. Project management and finance	1	Manage how the GSM architure working
	PO12	12. Life-long learning	3	GSM is base of mobile operation
CO2	PO1	1. Engineering knowledge	2	mobility management should be understand
	PO2	2. Problem analysis:	1	Analyse the mobility management
	PO3	3. Design/development of solutions	3	design mobility management
	PO5	5. Modern tool usage	3	Application for the society
	PO6	6. The engineer and society	1	Low enviremental effect
	PO7	7. Environment and sustainability	3	mobility management should be understand
	PO9	9. Individual and team work	3	apply for communication
	PO10	10. Communication	1	Manage how the Mobility management working
	PO11	11. Project management and finance	3	Mobile operation
CO3	PO1	1. Engineering knowledge	1	Wireless Architecture should be understand
	PO2	2. Problem analysis:	2	Analyse the Wireless Architecture
	PO3	3. Design/development of solutions	1	design Wireless Architecture
	PO4	4. Conduct investigations of complex problems	2	Investigate Wireless Architecture
	PO5	5. Modern tool usage	1	Application for the society

	PO7	7. Environment and sustainability	1	Low enviremental effect
	PO9	9. Individual and team work	1	Wireless Architecture should be understand
	PO10	10. Communication	2	GSM architecture understanding
	PO11	11. Project management and finance	1	apply for communication
	PO12	12. Life-long learning	2	Manage how the Wireless communication working
CO4	PO2	2. Problem analysis:	1	Analyse the Android application
	PO3	3. Design/development of solutions	1	design Application
	PO5	5. Modern tool usage	2	Application for the society
	PO6	6. The engineer and society	1	Impact on society
	PO7	7. Environment and sustainability	2	Low enviremental effect
	PO8	8. Ethics	1	Framework for the application should be understand
	PO9	9. Individual and team work	3	Manage project with the help of team
	PO11	11. Project management and finance	3	Manage how the application working and its costing
	PO12	12. Life-long learning	1	Learn what the actual way to deveop application

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

DISTRIBUTED DBMS

SUBJECT CODE: 2170714

B.E. 7TH SEMESTE

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

1. To introduce principles and foundations of distributed databases, including architecture, design issues, integrity control, query processing and optimization, transactions, and concurrency control
2. To enable students to understand the difference between different database system and integrate the.

Syllabus:

1	Introduction: Distributed Data Processing, Distributed Database Systems, Promises of DDBSs, Complicating factors, Problem areas
2	Overview of RDBMS: Concepts, Integrity, Normalization
3	Distributed DBMS Architecture : Models- Autonomy, Distribution, Heterogeneity DDBMS Architecture – Client/Server, Peer to peer, MDBS
4	Data Distribution Alternatives: Design Alternatives – localized data, distributed data Fragmentation – Vertical, Horizontal (primary & derived), hybrid, general guidelines, correctness rules Distribution transparency – location, fragmentation, replication Impact of distribution on user queries – No Global Data Dictionary(GDD), GDD containing location information,

	Example on fragmentation
5	Semantic Data Control : View Management, Authentication – database authentication, OS authentication, Access Rights, Semantic Integrity Control – Centralized & Distributed , Cost of enforcing semantic integrity
6	Query Processing : Query Processing Problem, Layers of Query Processing Query Processing in Centralized Systems – Parsing & Translation, Optimization, Code generation, Example Query Processing in Distributed Systems – Mapping global query to local, Optimization
7	Optimization of Distributed Queries: Query Optimization, Centralized Query Optimization, Join Ordering Distributed Query Optimization Algorithms
8	Distributed Transaction Management & Concurrency Control: Transaction concept, ACID property, Objectives of transaction management, Types of transactions, Objectives of Distributed Concurrency Control, Concurrency Control anomalies, Methods of concurrency control, Serializability and recoverability, Distributed Serializability, Enhanced lock based and timestamp based protocols,

	Multiple granularity, Multi version schemes, Optimistic Concurrency Control techniques
9	Distributed Deadlock & Recovery Deadlock concept, Deadlock in Centralized systems, Deadlock in Distributed Systems – Detection, Prevention, Avoidance, Wait-Die Algorithm, Wound-Wait algorithm Recovery in DBMS - Types of Failure, Methods to control failure, Different techniques of recoverability, Write- Ahead logging Protocol, Advanced recovery techniques- Shadow Paging, Fuzzy checkpoint, ARIES, RAID levels, Two Phase and Three Phase commit protocols

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Foundations of Software Development: Apply design and development principles to develop software applications/products of varying complexity in emerging areas.
2. Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm
3. Competent in Emerging Trends: Ability to use current tools and techniques necessary for computing practices.
4. Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and provides innovative solution

Course outcomes:

1. Design and implement distributed database for enterprise application.
2. Provides solutions for heterogeneous database
3. Apply various Query Optimization Algorithms in distributed database

Reference Books:

1. Principles of Distributed Database Systems, Ozsu, Pearson Publication
2. Distributed Database Mangement Systems, Rahimi & Haug, Wiley
3. Distributed Database Systems, Chanda Ray, Pearson Publication
4. Distributed Databases, Sachin Deshpande, Dreamtech

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology
DATA MINING AND BUSINESS INTELIGENCE
SUBJECT CODE: 2170715
B.E. 7TH SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

- To understand basic concepts and techniques of Data Mining and Business Intelligence.
- To introduce basic principles, concepts and applications of data warehousing and data preprocessing.
- To illustrate various algorithms for clustering, prediction, and classification.
- To understand various tools of Data Mining and their techniques to solve the real time problems.

Syllabus:

No.	Content	Total Hrs	% Weightage
1	**Overview and concepts Data Warehousing and Business Intelligence** Why reporting and Analysing data, Raw data to valuable information- Lifecycle of Data - What is Business Intelligence - BI and DW in today's perspective - What is data warehousing - The building Blocks: Defining Features – Data warehouses and data 1marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing - Basic elements of data warehousing - trends in data warehousing.	5	12
2	**The Architecture of BI and DW** BI and DW architectures and its types - Relation between BI and DW - OLAP (Online analytical processing) definitions - Difference between OLAP and OLTP - Dimensional analysis - What are cubes? Drill-down and roll-up - slice and dice or rotation - OLAP models - ROLAP versus MOLAP – defining schemas: Stars, snowflakes and fact constellations	7	16

3	**Introduction to data mining (DM)** Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process	4	8
4	**Data Pre-processing** Why to pre-process data? - Data cleaning: Missing Values, Noisy Data - Data Integration and transformation - Data Reduction: Data cube aggregation, Dimensionality reduction - Data Compression - Numerosity Reduction - Data Mining Primitives - Languages and System Architectures: Task relevant data - Kind of Knowledge to be mined - Discretization and Concept Hierarchy.	7	16
5	**Concept Description and Association Rule Mining** What is concept description? - Data Generalization and summarization-based characterization - Attribute relevance - class comparisons Association Rule Mining: Market basket analysis - basic concepts - Finding frequent item sets: Apriori algorithm - generating rules – Improved Apriori algorithm – Incremental ARM – Associative Classification – Rule Mining	7	16
6	**Classification and Prediction** What is classification and prediction? – Issues regarding Classification and prediction: Classification methods: Decision tree, Bayesian Classification, Rule based, CART, Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression Introduction of tools such as DB Miner /WEKA/DTREG DM Tools	7	16
7	**Data Mining for Business Intelligence Applications** Data mining for business Applications like Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance and CRM etc., Data Analytics Life Cycle: Introduction to Big data Business Analytics – State of the practice in analytics role of data scientists Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.	4	8
8	**Advance topics** Introduction and basic concepts of following topics.	4	8

	Clustering, Spatial mining, web mining, text mining, Big Data: Introduction to big data: distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce. Introduction to Hadoop architecture: Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering – Monitoring & Maintenance.		

Reference Books:

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
2. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
3. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.
4. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
5. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", Wiley India.

Course outcomes:

CO 2170715.1: Inspect how data can be pre-processed before applying data mining technique

CO 2170715.2: Examine the different classification & clustering techniques in data mining.

CO 2170715.3: Apply data mining techniques to solve various problems.

CO 2170715.4: Analyze and provide solutions for some problems using mining association techniques.

CO 2170715.5: Acquire the basic knowledge of business intelligence and data warehouse and its architecture.

CO 2170715.6: Examine the advanced data mining techniques and the popular data mining tools.

CO-PO mapping:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 2170715.1	2	2	3	1	-	-	-	-	-	-	-	-	-	2	-	-
CO 2170715.2	3	2	-	-	3	-	-	-	1	-	-	-	-	3	-	-
CO 2170715.3	1	-	3	-	-	-	-	1	-	-	-	2	-	-	2	2
CO 2170715.4	2	-	2	-	-	-	-	1	-	-	-	2	-	1	-	-
CO 2170715.5	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CO 2170715.6	1	1	3	-	3	1	-	-	-	-	-	-	-	-	2	2

Mapping & Justification:

Mapping	Level	Justification
CO 2170715.1-PO1	2	Students have to apply mathematical knowledge and engineering fundamentals to understand the concept of data pre-processing.
CO 2170715.1-PO2	2	Principles of mathematics and engineering sciences are used in analysis and understanding of various data pre-processing techniques.
CO 2170715.1-PO3	3	Understanding of data pre-processing techniques to improve the efficiency of the mining process can be used to design and develop solutions for complex engineering problems.
CO 2170715.1-PO4	1	Investigation on data pre-processing techniques will help the students to draw the conclusion on quality of data.
CO 2170715.2-PO1	3	Using mathematical knowledge, students will learn clustering and classification techniques.
CO 2170715.2-PO2	2	The study of clustering and classification algorithms involves principles of mathematics and engineering.
CO 2170715.2-PO5	3	Students will use latest tool to learn clustering and classification algorithms.
CO 2170715.2-PO9	1	Students will implement various practicals on clustering and classification as an individual or team work.
CO 2170715.3-PO1	1	To solve data mining related problems, students will apply mathematical knowledge and engineering fundamentals.
CO 2170715.3-PO3	3	Using data mining concepts, students will solve complex problems.
CO 2170715.3-PO8	1	To solve data mining problems, students should have ethics to implement practicals by their own.
CO 2170715.3-PO12	2	The students will become aware of the need for lifelong learning and the continued upgrading of technical knowledge in application of classification and clustering.
CO 2170715.4-PO1	2	Solution of association mining problems involves the solving complex engineering problem.
CO 2170715.4-PO3	2	Students will design the solution of complex problem to solve association mining problems.
CO 2170715.4-PO8	1	To solve association mining problems, students should have ethics to implement practicals by their own.
CO 2170715.4-PO12	2	The students will be aware of the need for lifelong learning and continue to upgrading of technical knowledge in application of association mining.
CO 2170715.5-PO1	2	Understanding of business intelligence and data warehouse

		architecture involves the mathematical knowledge and engineering fundamentals.
CO 2170715.5-PO2	1	Principles of mathematics and engineering sciences are used in understanding and analysis of business intelligence and data warehouse architecture.
CO 2170715.6- PO1	1	Study of advanced data mining techniques involves the applicability of mathematical and engineering fundamentals.
CO 2170715.6- PO2	1	Students will learn to analyze various problems and apply suitable data mining technique and tools accordingly.
CO 2170715.6- PO3	3	Students prepare the solution of various problems based on advanced data mining techniques.
CO 2170715.6-PO5	3	Students will learn latest data mining tools to understand advanced data mining algorithms.
CO 2170715.6-PO6	1	Students can apply advanced data mining techniques to solve real life problems.
CO 2170715.1-PSO2	2	Data pre-processing will develop foundation of mathematical concepts.
CO 2170715.2-PSO2	3	Learning of classification & clustering techniques will be useful to build mathematical foundation.
CO 2170715.3-PSO3	2	While learning Data mining techniques, students will use various tools for computing practice.
CO 2170715.3-PSO4	2	Using data mining techniques, innovative solutions can be proposed for some problems.
CO 2170715.4-PSO2	1	Solutions for some problems using mining association techniques involve mathematical concepts.
CO 2170715.6-PSO3	2	With the understanding of advanced Data mining techniques, students will have ability to use advanced tools for computing practice.
CO 2170715.6-PSO4	2	With the knowledge of advanced data mining techniques, students will be able to identify research gap and can provide solution.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

BIG DATA ANALYTICS

SUBJECT CODE: 2171607

B.E. 7TH SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

The objectives of this subject are tointroduce students the concept and challenge of big data (3 V's: volume, velocity, and variety) and apply skills and tools to manage and analyse the big data.

Syllabus:

1	**INTRODUCTION TO BIG DATA** Introduction– distributed file system–Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce	6 Hours
2	**INTRODUCTION TO HADOOP AND HADOOP ARCHITECTURE** Big Data – Apache Hadoop & Hadoop EcoSystem, Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce -, Data Serialization.	12Hours
3	**HDFS, HIVE AND HIVEQL, HBASE** HDFS-Overview, Installation and Shell, Java API; Hive Architecture and Installation, Comparison with Traditional Database, HiveQL Querying Data, Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries, HBase concepts, Advanced Usage, Schema Design, Advance Indexing, PIG, Zookeeper , how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.	8 Hours
4	**SPARK** Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine learning with MLib.	12 Hours
5	**NoSQL** What is it?, Where It is Used Types of NoSQL databases, Why NoSQL?, Advantages of NoSQL, Use of NoSQL in Industry, SQL vs NoSQL, NewSQL	05 Hours
6	**Data Base for the Modern Web** Introduction to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document-Oriented, principles of schema design, Constructing queries on Databases, collections and Documents , MongoDB Query Language	08 Hours

Course outcomes:

After successful completion of this course, the students should be able to

1. To Define and explain the big data problems and differentiate between big data and conventional data.
2. **Build** and maintain reliable, scalable, distributed systems with Apache Hadoop and **Create** Map-Reduce based Applications with ingress and egress concepts
3. Understand hadoop concepts like HiveQL, Hbase, Cassandra, PIG, Zookeeper.
4. Design and build SPARK framework with MLib tool.
5. **Differentiate** between conventional SQL query language and NoSQL basic concepts
6. **Design** and build MongoDB based Big data Applications and learn MongoDB query language

CO-PO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	2		2													
CO 2			2										1			
CO 3					3										3	
CO 4					2										3	
CO 5				1											2	
Co6		2											2			

3- LOW, 2-MEDIUM, 3-HIGH

Mapping & Justification

Mapping	Level	Justification
CO 1–PO1	2	Students will be classify digital data into structured, semi-structured and unstructured data and will learn to deal with issues of big data.
CO 1 – PO3	2	This course will deliver fundamental knowledge about Hadoop distributed file system to deal with big data which will further be utilized in the design and development of enterprise complex problems.
CO2-PO3	3	Map reduce programming Model will help students to develop applications which can process huge amounts of data typically running into terabytes in size
CO2-PO3	2	Hadoop will help students to find solution to complex problems with distributed systems.
CO2-PSO1	1	Students will be able to design and develop application with Map reduce programming model.
CO3-PO5	3	Students will be able to select and apply various tools and technology like HiveQL, Hbase, Cassandra, PIG, and Zookeeper to solve problems of distributed systems with big data.
CO3-PSO3	3	Using various tools students will be able to create solution to complex real time applications.
CO4-PO2	2	Apache Spark Mlib will help students to learn machine learning tool to process big data issues.
CO4-PSO3	3	Students will be able to use Mlib – Machine learning tool to process

		real time data fast.
CO5-PO4	1	Students will be able to compare traditional relational databases with various Non-relational databases NoSQL.
CO5-PSO3	2	With the knowledge of NoSQL databases, students will learn creating various solution to complex enterprise problems.
CO6-PO2	2	Students will be able to create big data application using MongoDB.
CO6-PSO1	2	Students will be able to apply design and development applications to develop software applications/products of varying complexity in emerging areas using MongoDB.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

ARTIFICIAL INTELLIGENCE

SUBJECT CODE: 2180703

B.E. 8TH SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Course Objectives:

1. Analyse and Compare various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
2. Implement a small AI system in a team environment.
3. Apply knowledge representation, reasoning, and machine learning techniques to real-world problems.

Syllabus:

1	What is AI? : The AI Problems, The Underlying Assumption, WhatIs An AI Techniques, The Level Of The Model, Criteria For Success,Some General References, One Final Word.
2	Problems, State Space Search & Heuristic Search Techniques :Defining The Problems As A State Space Search, Production Systems,Production Characteristics, Production System Characteristics, AndIssues In The Design Of Search Programs, Additional Problems.Generate-And-Test, Hill Climbing, Best-First Search, ProblemReduction, Constraint Satisfaction, Means-Ends Analysis.
3	Knowledge Representation Issues : Representations And Mappings,Approaches To Knowledge Representation.
4	Using Predicate Logic : Representation Simple Facts In Logic,Representing Instance And Isa Relationships, Computable FunctionsAnd Predicates, Resolution.
5	Representing Knowledge Using Rules : Procedural VersusDeclarative Knowledge, Logic Programming, Forward VersusBackward Reasoning.
6	Symbolic Reasoning Under Uncertainty : Introduction To NonmonotonicReasoning, Logics For Non-monotonic Reasoning
7	Statistical Reasoning : Probability And Bays' Theorem, CertaintyFactors And Rule-Base Systems, Bayesian Networks, DempsterShaferTheory, Fuzzy Logic
8	Weak Slot-and-Filler Structures : Semantic Nets, Frames.
9	Strong Slot-and-Filler Structures : Conceptual Dependency,Scripts, CYC
10	Game Playing: Overview, And Example Domain : Overview,MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening,The Blocks World, Components Of A Planning System, Goal StackPlanning, Nonlinear Planning Using Constraint Posting, HierarchicalPlanning, Reactive Systems, Other Planning Techniques

11	Understanding: What is understanding? , What makes it hard?, Asconstraint satisfaction
12	Natural Language Processing : Introduction, Syntactic Processing,Semantic Analysis, Semantic Analysis, DiscourseAnd Pragmatic Processing, Spell Checking
13	Connectionist Models : Introduction: Hopfield Network, LearningIn Neural Network, Application Of Neural Networks, RecurrentNetworks, Distributed Representations, Connectionist AI AndSymbolic AI
14	Introduction to Prolog : Introduction To Prolog: Syntax andNumeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and LocalVariables, Iteration and Recursion, Property Lists and Arrays,Miscellaneous Topics, LISP and Other AI Programming Languages

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Foundations of Software Development: Apply design and development principles to develop software applications/products of varying complexity in emerging areas.
2. Foundation of Mathematical Concepts: Ability to apply mathematical methodologies to solve computation task, model real world problem using appropriate data structure and suitable algorithm
3. Competent in Emerging Trends: Ability to use current tools and techniques necessary for computing practices.
4. Applications of Computing and Research Ability: Ability to use knowledge in various domains to identify research gaps and provides innovative solution

Course outcomes:

1. Ability to develop a basic understanding of AI building blocks presented in intelligentagents.
2. Ability to choose an appropriate problem solving method and knowledge representationtechnique.
3. Ability to analyze the strength and weaknesses of AI approaches to knowledge– intensive problem solving.
4. Ability to design and develop the AI applications in real world scenario.

Reference Books:

1 “Artificial Intelligence” -By Elaine Rich And Kevin Knight (2nd Edition) Tata Mcgraw-Hill
2. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI
3 Introduction to Prolog Programming By Carl Townsend.
4. “PROLOG Programming For Artificial Intelligence” -By Ivan Bratko(Addison-Wesley)
5. “Programming with PROLOG” –By Klocksin and Mellish.

CO-PO-PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO 1	2	1										2		2		
CO 2		2	2		3									1		2
CO 3		2														2

CO 4									2			2	1			

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	2	Basic knowledge of AI techniques will be gained by students.
CO1-PO2	1	Concepts learned in this subject will be useful to design and develop AI based system.
CO1-PO12	2	The AI techniques used in real-life problem in day to day life, life long problem arise.
CO2-PO2	2	This course will deliver fundamental knowledge about AI methods.
CO2-PO3	2	Students will be able analyse different problem related to AI methods.
CO2-PO5	3	Students use various latest open source tools and frameworks for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO3-PO2	2	Knowledge about AI algorithms, strength and weekness of AI methods.
CO4-PO9	2	A mini project provided to students to develop AI based system.
CO4-PO12	2	Students will be able to apply these knowledge in life long problem in the domain of image and video processing.
CO1-PSO2	2	Students will be able to apply mathematical concepts in AI based intelligent system.
CO2-PSO2	1	Student will use mathematical methods and model to choose appropriate method selection and knowledge representation.
CO2-PSO4	1	The ability of knowledge representation use to define research problem and find out research gap in various domain.
CO3-PSO4	2	Student will be able to find out limitation of traditional approaches and investigate the research gap by analysing the strength and weakness of different AI approaches.
CO4-PSO1	1	Students will be able to design and develop real-world intelligent applications.

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

IOT AND APPLICATIONS
SUBJECT CODE: 2180709
B.E. 8TH SEMESTER

Teaching and Examination Scheme

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content

Sr. No.	Syllabus Content	No. of Hours
1	**IoT & Web Technology** The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	8
2	**M2M to IoT – A Basic Perspective**– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. **M2M to IoT-An Architectural Overview**– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	10
3	**IoT Architecture -State of the Art** – Introduction, State of the art, **Architecture Reference Model**- Introduction, Reference Model and architecture, IoT reference Model, **IoT Reference Architecture**- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	10
4	**IoT Applications for Value Creations** Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.	8

1. Understand the vision of IoT from a global context and the application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.
2. Determine the Market perspective of IoT.
3. Building state of the art architecture in IoT and Use of Devices, Gateways and Data Management in IoT.
4. Study Existing architecture of IoT

Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	0	1	1	0	0	1	0	1	2	1	3	1	3	-	1
CO2	2	0	0	0	1	2	1	3	3	1	3	0	-	3	-	2
CO3	1	3	3	3	3	0	1	0	1	2	1	2	-	-	-	1
CO4	2	0	3	2	1	0	0	0	1	1	1	1	1 -	-	-	1

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

PYTHON PROGRAMMING

SUBJECT CODE: 2180711

B.E. 8TH SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

- This course introduces syntax, semantics and concepts of Python Programming.
- This course covers various data structures available in Python and applies them in solving scientific/computational problems.
- This course covers object oriented paradigm of Python for writing efficient code modules that are extensible, maintainable, and reusable.
- This course provides comprehensive study of GUI and Network & Multithread application development in Python.

Syllabus:

1	Introduction to Python: The basic elements of python, Branching Programs, Control Structures, Strings and Input Iteration
2	Functions, Scoping and Abstraction: Functions and scoping, Specifications, Recursion, Global variables, Modules, Files, System Functions and Parameters
3	Structured Types, Mutability and Higher-Order Functions: Strings, Tuples, Lists and Dictionaries, Lists and Mutability, Functions as Objects
4	Testing, Debugging, Exceptions and Assertions: Types of testing – Black-box and Glass-box, Debugging, Handling Exceptions, Assertions
5	Classes and Object-Oriented Programming: Abstract Data Types and Classes, Inheritance, Encapsulation and Information Hiding
6	Simple Algorithms and Data structures: Search Algorithms, Sorting Algorithms, Hash Tables
7	Advanced Topics I: Regular Expressions – REs and Python, Plotting using PyLab, Networking and Multithreaded Programming – Sockets, Threads and Processes, Chat Application
8	Advance Topics II: Security – Encryption and Decryption , Classical Cyphers, Graphics and GUI Programming – Drawing using Turtle, Tkinter and Python, Other GUIs

Reference Books:

1. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice

Hall of India
2. R. Nageswara Rao, “Core Python Programming”, dreamtech
3. Wesley J. Chun. “Core Python Programming - Second Edition”, Prentice Hall
4. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structures and Algorithms in Python”, Wiley
5. Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication
6. Luke Sneeringer, “Professional Python”, Wrox
7. “Hacking Secret Ciphers with Python”, Al Sweigart,
URL- https://inventwithpython.com/hacking/chapters

Course outcomes:

1. Learn professional Python style, best practices, and develop programming skills.
2. Students will be able to make use of data sturucture types and inbuilt modules available in Python to meet the need of computational problems.
3. Gain a deep understanding of Python's objects and memory model as well as its OOP features, including those found in Python's new-style classes
4. Build more effective GUI, network and other client/server applications and enhance I/O-bound applications with the use of multithreading.

CO-PO mapping

	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	2										3			
CO 2	2				2									2	2	2
CO 3	3	2	3			2							3			
CO 4	3	2	2			2							3		2	

Mapping & Justification

Mapping	Level	Justification
CO1-PO1	3	Students will strongly gain knowledge of Programming skill.
CO1-PO2	2	Students will learn analyzing data and computational problems.
CO1-PO3	2	Students will be able implement program for solving computational problems.
CO2-PO1	2	Students will be able to apply knowledge of data structure & Programming languages.
CO2-PO5	2	Students use various latest open source tools and frameworks for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO3-PO1	3	Knowledge about object oriented modeling and how it helps in representing real world systems.
CO3-PO2	2	Students will be able to analyze the problem using Object oriented paradigm
CO3-PO3	3	Knowledge in object oriented modeling will result in better modular design of softwares.

CO3-PO6	2	A mini project will impart team work skills.
CO4-PO1	3	Powerful insights for developing complex applications using Python.
CO4-PO2	2	Analysis and study of requirements of Complex applications.
CO4-PO3	2	Students will be able to develop GUI applications for various domains.
CO4-PO6	2	A mini project will impart team work skills.
CO1-PSO1	3	Learning to write Python Programs develops strong Programming skills in student for Software Development.
CO2-PSO2	2	Solving Computational Problems with Python will build mathematical foundation for the students
CO2-PSO3	3	Learning to make use of latest IDEs, tools & modules/libraries of python will prepare students upto Professonal level.
CO2-PSO4	2	Study of Python Advanced Libraries/ Modules will promote students to do Research/Innovative work for solving complex problems.
CO3-PSO1	3	By learing Python Object , Memory & OOP features with new class style enables students for Object oriented paradigm of Software development.
CO3-PSO1	3	Study of developing GUI, Client-server, Multithreading applications make student more focused in User Interaction, Parallelism part of Software development.
CO3-PSO3	2	By making use of latest tools, modules &IDEs of Python, students will be familiar with emerging technologies.

GUJARAT TECHNOLOGICAL UNIVERSITY

Information Technology

CLOUD INFRASTRUCTURE AND SERVICES

SUBJECT CODE: 2180712

B.E. 8TH SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. Understand the importance of virtualization in distributed computing and how this hasenabled the development of Cloud Computing. Understand concept of Load balancing and Hypervisors.
3. Cloud Service provider AWS (amazon web services) in detail.

Syllabus:

1	Introduction to Cloud Technologies: Introduction to the Cloud Computing, History of cloud computing, Cloud service options, Cloud Deployment models, Business concerns in the cloud.
2	Virtualization and Cloud Platforms: Exploring virtualization, Load balancing, Hypervisors, Machine imaging, Cloud marketplace overview, Comparison of Cloud providers.
3	Introduction to AWS: AWS history, AWS Infrastructure, AWS services, AWS ecosystem.
4	Programming, management console and storage on AWS: Basic Understanding APIs - AWS programming interfaces, Web services, AWS URL naming, Matching interfaces and services, Elastic block store - Simple storage service, Glacier - Content delivery platforms.
5	AWS identity services, security and compliance: Users, groups, and roles - Understanding credentials, Security policies, IAM abilities and limitations, AWS physical security - AWS compliance initiatives, Understanding public/private keys, Other AWS security capabilities.
6	AWS computing and marketplace: Elastic cloud compute - Introduction to servers, Imaging computers,Auto scaling, Elastic load balancing, Cataloging the marketplace, AMIs, Selling on the marketplace.
7	AWS networking and databases: Virtual private clouds, Cloud models, Private DNS servers (Route 53), Relational database service – DynamoDB, ElastiCache, Redshift.
8	Other AWS services and management services: Analytics services, Application services, Cloud security, CloudWatch, CloudFormation, CloudTrail, OpsWorks.
9	AWS billing and Dealing with disaster: Managing costs, Utilization and tracking, Bottom line impact, Geographic and other concerns, Failure plans, Examining logs.

Course outcomes:

CO 2180712.1: Concept of Why and What about Cloud Computing. Articulate the main concepts, key technologies, various implementation models (SaaS, PaaS, IaaS, Public, Private, Hybrid etc) strengths, and limitations of cloud computing.

CO 2180712.2: Understand the principle of cloud virtualization, cloud storage, data management, data visualization, Hypervisors and load balancing.

CO 2180712.3: Amazon Web Services (AWS) introduction and Architecture, implementing AWS services to make your infrastructure scalable, reliable, and highly available. AWS Security and its capabilities.

CO 2180712.4: Understanding concepts of Big Data Management and become familiar with cloud based analytics services in AWS.

CO 2180712.5: To analyse the billing of resources and management

CO 2180712.6: Understanding how to deal with disasters.

CO-PO mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 2180712.1	3	1	2	-	-	-	-	-	-	-	-	1	2	-	-	4
CO 2180712.2	2	2	3	-	2	-	-	-	-	-	-	-	-	-	3	-
CO 2180712.3	-	-	-	-	3	-	-	-	2	-	-	-	-	-	1	-
CO 2180712.4	-	-	-	2	3	-	-	-	-	-	-	-	-	-	2	-
CO 2180712.5	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO 2180712.6	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-

Mapping & Justification

Mapping	Level	Justification
CO 2180712.1-PO1	3	Basic knowledge of Cloud computing, its architecture, pros and cons and available technologies will help student to understand it better.
CO 2180712.1-PO2	1	Basic problems and limitation can be identified. Doing literature survey student can fill the technological gap.
CO 2180712.1-PO3	2	Various models and structure (architecture of Cloud) implementation.
CO 2180712.1-PO12	1	As cloud computing is emerging and well advanced technology, well understanding of concepts can be taken for long time of use without considering technological change.
CO 2180712.2-PO1	2	Principle of cloud virtualization, cloud storage, data management and data visualization, and load balancing to understand robustness of cloud environment.
CO 2180712.2-PO2	2	Research and analysis of virtualization, load balancing will help student to identify loopholes in current technology.
CO 2180712.2-PO3	2	Basic concepts like, Cloud virtualization, load balancing etc. will enable students to analyse problems and they will be able to apply various learned techniques to solve those problems.
CO 2180712.2-PO5	2	Students use various latest open source tools, softwares and frameworks for performing their laboratory experiments. So, they will be acquainted with latest tools and techniques.
CO 2180712.3-PO5	3	Understanding and learning basics of AWS (Amazon Web Services) tool, technology, API.

CO 2180712.3-PO9	2	Students either individual or in a group can learn use of various services available in AWS as project and in laboratory experiments as well.
CO 2180712.4-PO4	2	By understanding Big Data and various analytical services, student can learn to solve complex problems.
CO 2180712.4-PO5	3	Various data analytics techniques can be used to generate meaning full information. Exploring various tools for data science.
CO 2180712.5-PO11	1	Student will learn management of AWS services and its billing.
CO 2180712.6-PO8	3	Student will able to understand how AWS will be available in worse situation. Any natural disaster, human created attacks, AWS services will be available to user.
CO 2180712.1-PSO1	2	Basic knowledge of Cloud Computing and Infrastructure will help student to develop and understand various services and structure.
CO 2180712.1-PSO1	4	Student will get fundamental knowledge, can be used to identify research gap in existing available structure.
CO 2180712.2-PSO3	3	By using these various techniques, student can learn emerging technologies and tools available in cloud computing.
CO 2180712.3-PSO3	1	AWS is an emerging cloud service. Learning this tools and technology help student to make compatible with current trends in computing practice.
CO 2180712.4-PSO3	2	This will help student to understand various data analytics services available in AWS.

GUJARAT TECHNOLOGICAL UNIVERSITY
Information Technology

ANDROID PROGRAMMING
SUBJECT CODE: 2180715
B.E. 8TH SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Course Objectives:

This course teaches final-year Computer Science students how to develop Android apps. To be able to understand the process of developing software for the mobile. To be able to create mobile applications on the Android Platform. To be able to create mobile applications involving data storage in SQLite database

Course:

Sr No	Content
1	**The Basics:** ● Hello Worl**d:** Intro to Android, Why develop apps for Android?, Flavors of Android operating systems, Challenges of developing for Android (multiple OS, need backwards compatibility, need to consider performance and offline capability) ● **Concept: Create Your First Android App:** Overview of the development process - Java, Android Studio , Project layout in Android Studio, Target and minimum SDKs, Android Virtual Device (AVD) Monitor, Viewing logs in logcat and AVD, Android manifest file , App Architecture: An app consists of one or more activities. For an activity, write Java code and layout xml, and hook them together, and register the activity in the manifest file. ● **Concept: Layouts, Views and Resources:** Layout elements can be viewed and edited in Layout Editor and XML, Introduction to the range of UI elements, Resources (layouts, strings, styles, themes), Identifying resources with IDs, Programmatically referencing resources using resource IDs, on Click attribute, Getting user input from a view, Programmatically changing UI elements, Layout Managers, Defining layouts for activities, inflating the layout. ● **Concept: Scrolling Views:** How to make activities scrollable: compare ScrollView, ListView, RecyclerView , Getting the resource ID for a UI element

	by inflating a layout (needed for RecyclerView) , How to implement RecyclerView (requires layout managers and ViewHolders) , Performance impications of different kinds of scrolling UI elements ● **Concept: Resources to Help You Learn:** Resources to help you learn: Samples that ship with the SDK, Templates for projects, developer.android.com, Android developer blog , Android developer YouTube channel, Source code and samples in github, Stack overflow, Google search! ● **Activities and Intents :**About activities, Defining Activities , Activity Lifecycle , Activity navigation , About intents ,Explicit vs Implicit intents ,Passing info to new activity ,Returning data from activity ● **The Activity Lifecycle and Managing State:** Activity lifecycle , Activity lifecycle callback methods , Activity instance state ● **Starting Activities with Implicit Intents:** Starting activities by sending implicit intents, Intent filters and enabling your activities to receive intents, ShareCompat ● **Testing and Debugging, and Backwards Compatibility:** Debugging your apps, Testing your app, Support libraries
2	**User Interface:** ● **User Input Controls:** Getting user input , Changing keyboards , Buttons , Dialogs and pickers , Spinners, checkboxes, and radio buttons , Gestures , Speech recognition (not done), Sensors (not done) ● **Menus:** Options menu, contextual menus (floating and action bar), and popup menu, Adding menu items. Handling on Clicks from menus. ● **Screen Navigation:** Terminology, Different ways a user can navigate through an app, Action bar, Settings menu, Navigation drawer, Directed workflow (funnels), Best practices for navigation ● **Themes and Styles:** Best practices for themes and styles, Performance benefits for themes, When and how to use drawables, best practices for drawable, When and how to use nine-patches, best practices for nine-patches, Tools for creating drawables ● **Material Design:** What is material design? Material design best practices. Material Design guidelines, Implementing Material Design look and feel, with compatibility with previous versions, Support library for Material Design design, Transitions and Animations ● **Adapt layouts for multiple devices and orientations:** Why we need to consider different screen sizes and orientations , Screen density (dip or dp), How

	to create adaptive layouts using resources folders , Different ways to create images that scale nicely, Images and image formats and how they affect performance (download speeds). ● **Accessibility:** Why accessibility matters, Accessibility considerations: Color blindness, poor vision, poor hearing, physical limitations, Accessibility guidelines , Testing for accessibility , Screen readers, Making your app more accessible: Color and Contrast, button size --> Material Design guidelines, considerate layouts and navigation ● **Localization:** How to prep your app for localization, LTR and RTL (eg Arabic) text. ● **Testing the User Interface:** Automated testing of UIs, User testing your UI with real users, Using the Espresso and UI Automator frameworks for testing UIs
3	**Background Tasks:** ● **Connect to the Internet: Background Tasks,** Synchronous versus async tasks, What is the UI thread and when should you use it? , Example of a background task -- retrieving data over the internet, Creating background tasks. (schedule, send data, etc.) , Implementing AsyncTask (doInBackground(), callbacks) , Limitations of AsyncTask , Passing info to background tasks, Initiating background tasks, Scheduling background tasks (intro only, more later). ● **Connecting to the Internet:** Permissions, Building URIs, Opening and closing Internet connections, Parsing JSON in Android. (Because it's common.) , Sending requests and parsing response. ● **AsyncTaskLoade:** Intro to AsyncTaskLoader , loadInBackground() , AsyncTaskLoader callbacks , Benefits of loaders ● **Broadcast Receivers:** What is a Broadcast Receiver and a Broadcast Intent? , Broadcast Receiver Security and Lifecycle ● **Services:** What is a service? Long running task without a UI, Difference between Activity and Service , Start and stop services, Lifecycle methods, Foreground services, IntentService class, App priority (critical, high, low), How to create a new Service. ● **Notifications:** What is a Notification? , Notification Design Guidelines. ● **Triggering, Scheduling, and Optimizing Background Tasks:**

	AlarmManager ● **Transferring Data Efficiently:** Less data, less often! Cell radio life cycle, Job Scheduler. Why to use Job Scheduler instead of SyncManager/SyncAdapter, Difference between alarms and job schedulers.
4	● **Data -- Saving, Retrieving, Loading** ● **Storing Data in your app:** Internal versus external storage, Privacy, sharing, security, encryption of your data , Shared Preferences: Store private primitive data in key-value pairs , SQLite Databases: Store structured data in a private database , Store data on the web with your own network server, Firebase for storing and sharing data in the cloud, Concept: Preferences , What are Settings and Preferences? , Settings best practices (harder to take away settings than to add, for usability reasons, Storing and retrieving preferences as key/value pairs using SharedPreference, Different Settings types, Settings menu, Using Activity and PreferenceFragments to allow users to set preferences ● **Store data using SQLite database:** Overview of SQLite, OpenHelper Android class , Querying (dev) Searching (user) databases , Best practices for using databases in Android , Best practices for testing your database ● **Using Content Resolvers to access data:** Content Providers and Content Resolvers work together, what is a content provider? , What is a content resolver? , How do they work together? , How to implement and use Content Resolvers ● **Content Providers:** When to implement content providers , How to implement content providers (overview), Content URIs , UriMatcher, Content Provider authorities , Required methods on ContentProvider (query, insert, delete, update) , MIME types , Contracts , Making content provider data accessible to other apps by modifying manifest, and protecting data with permissions. ● **Using Loaders to Load and Display Data:** Using loaders to asynchronously load data into an activity or fragment, Benefits of Loaders -- why use them? , Loader states (started, stopped, reset) , LoaderManager , Methods & callbacks to implement in Loaders: loadInBackground(), deliverResult() onStart/StopLoading(), onReset/Cancelled()),Registering listeners , Using CursorLoader with ContentProviders
5	**Polish and Publish** ● **Permissions:** The permissions model ● **Libraries:** Using libraries

	● **Widgets:** What are widgets? When to use them and how to implement them. ● **Publishing your App:** Different ways to monetize your app (overview only) ● **Making and publishing APKs:** Guidelines for publishing in Google Play , Make and sign the APK, Beta test your app , Publish your app to Google Play

Course outcomes (COs)

1. CO 1: Students will able to understand and analyse the Mobility landscape.
2. CO 2: Students will able to design and develop mobile apps, using Android as development platform.
3. CO 3: Students will able to create user experience design,synthesis and apply with native data handling and background tasks and notifications.
4. CO 4: Students will able to understand and implement of subtle Differences such as native hardware play, location Awareness, graphics, and multimedia.

Mapping of Course outcomes (COs) to Program outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											
CO2		H	H	M		M						
CO3				S		H						
CO4				H								

Justification:

CO1-PO1	H	Mobility Lands capping is the concern of Engineering Knowledge enhancement.
CO2-PO2	H	To design mobile app one needs to make problem analysis
CO2-PO3	H	Solution development
CO2-PO4	M	In this course not much complex problems involved
CO2-PO6	M	Modern tools are not used other than android studio.
CO3-PO4	S	No data handling involve as a part of complex problem solution.
CO3-PO6	H	Impact on society is heigher.