Second Year - Third Semester

Branch: Computer Science and Engineering

Course Code	CS 301
Course Title	**DATA STRUCTURES**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Programming Fundamentals (CS 101/201), Object Oriented Programming (CS 202)
Course Objectives (CO)	1. To develop proficiency in the specification, representation, and implementation of data types and data structures. 2. To understand the basic concepts of the fundamentals of different types of data structures. 3. To demonstrate the ways of implementation of different types of data structures. 4. To learn the techniques to solve problems like sorting, searching, insertion and deletion of data etc. related to data structures.
Course Outcome	1. Understand common data structures (such as arrays, linked lists, stacks, queues, priority queues, trees, heaps, hash tables, associative containers). 2. Understand the algorithms that build and manipulate different types of data structures including sorting, searching, and hashing algorithms. 3. Decide, apply and implement the appropriate data type and data structure for a given problem. 4. Make appropriate data structure and algorithm design decisions with respect to program size, execution speed, and storage efficiency.

SYLLABUS

Note for Examiner- *Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each or 5 questions of 2 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.*

SECTION-A

Complexity Analysis: Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structures and

algorithms.

(4 hours)

Linear Lists: Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, doubly linked lists, circular linked lists, applications of lists in bin sort, radix sort, sparse tables.

(8 hours)

Stacks and Queues: Abstract data types, sequential and linked implementations, representative applications such as parenthesis matching, towers of Hanoi.

(4 hours)

Sorting: Bubble sort, selection sort, insertion sort, Shell sort,Quick sort, Heap sort, Merge sort; Radix sort, Analysis of the sorting methods, Selecting the top k elements.

(7 hours)

SECTION-B

Trees: Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, Heap data structure and its applications as priority queues, heap implementation, insertion and deletion operations, Heapsort.

(7 hours)

Search & Multi-way Trees: Binary search trees, search efficiency, insertion and deletion operations, importance of balancing, AVL trees, B-trees, B+ trees

(7 hours)

Graphs: Definition, terminology, directed and undirected graphs, properties, connectivity in graphs, applications, implementation – adjacency matrix and linked adjacency chains, graph traversal – breadth first and depth first, spanning trees.

(5 hours)

Hashing: hashing as a search structure, hash table, collision avoidance, linear open addressing, chaining.

(3 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Data Structures using C and C++	Y. Langsam, M. J. Augenstein, A. M. Tanenbaum	2nd Edition, Pearson Education
2.	Data Structures & Program Design in C	R. Kruse, C. L. Tondo, B. Leung, S. Mogalla	2nd Edition, Pearson Education
RECOMMENDED BOOKS			
1	Fundamentals of Data Structures in C++	E. Horowitz, S. Sahni , D. Mehta	2ndEdition, Universities Press
2	Art of Computer Programming, Volume 1: Fundamental algorithms,	Donald E. Knuth	3rd Edition, Addison-Wesley
3	Art of Computer Programming, Volume 3: Sorting and Searching,	Donald E. Knuth	2nd Edition, Addison-Wesley

Branch: Computer Science and Engineering

Course Code	CS 351
Course Title	**DATA STRUCTURES (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Implementation of array operations: Traversal, Insertion & Deletion at and from a given location
2. Stacks: Implementation of Push, Pop; Conversion of Infix expression to Postfix, Evaluation of Postfix expressions.
3. Queues: Circular Queue: Adding & deleting elements.
4. Linked list: inserting, deleting, implementation of stacks & queues using linked lists; Polynomial addition.
5. Trees: Implementation of Binary & Binary Search Trees, Recursive and Non-recursive traversal of Trees.
6. Implementation of Graphs
7. Implementation of sorting and searching algorithms
8. Hash tables implementation: searching, inserting and deleting

Branch: Computer Science and Engineering

Course Code	CS 302
Course Title	**DATABASE SYSTEMS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering(CS102), Programming Fundamentals(CS101/201)
Course Objectives (CO)	The main objective of this course is to provide students with the background to design, implement, and use database management systems. This course offers a good understanding of database systems concepts and prepares the student to be in a position to use and design databases for different applications. Behind the development and design of this course is to know. 1. How to design, manipulate and manage databases. 2. The course participants are exposed to the various forms, types and models of database systems to enable them make viable choices. 3. Supportive and complementary concepts of managing data and documents are thoroughly examined to give a wholesome view of data/information management. 4. The ultimate aim is to encourage the usage of database management systems for effective data management.
Course Outcome	1. Design ER and Relational models for real world problems with normalized data. 2. Construct simple and moderately advanced database queries using Structured Query Language (SQL) and Procedural SQL (PL/SQL). 3. Understand the concept of transactions along with achieving concurrency control through serializability and locking protocols. 4. Design and implement various Security and integrity controls.

SYLLABUS

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SECTION-A

Introduction to Database Systems:
File Systems Versus a DBMS, Advantages of a DBMS, Components of DBMS, Describing and Storing Data in a DBMS, Database System Architecture, Data abstraction, Data independence, Schemas.

(6 hours)

Physical Data Organization:
Fixed length and Variable Length Records, File Organizations and Indexing, Index Data Structures, Hashing, B-trees, Clustered Index, Sparse Index, Dense Index.

(3 hours)

Data Models:
Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.

(4 hours)

The Relational Model:
Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data.

(4 hours)

Relational Query Languages:
SQL: Basic SQL Query, Creating Table and Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Cursors, Dynamic SQL, Integrity Constraints in SQL, Triggers and Active Database, Relational Completeness, Basic Query Optimization Strategies, Algebraic Manipulation and Equivalences.

(6 hours)

SECTION-B

Database Design:
Functional Dependencies, Reasoning about Functional Dependencies, Normal Forms, Schema Refinement, First, Second and Third Normal Forms, BCNF, Multi-valued Dependency, Join Dependency, Fourth and Fifth Normal Forms, Domain Key Normal Forms, Decompositions

(6 hours)

Transaction Management:
ACID Properties, Serializability, Concurrency Control, Concurrency problems: Dirty read, Lost update, Incorrect summary, Lock Management, Locking Protocols: Two phase, Time stamp, Validation based, Multiversion and Granularity based, Deadlocks Handling.

(6 hours)

Backup and Recovery:
Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer Management.

(6 hours)

Database Protection:
Threats, Access Control Mechanisms, Discretionary Access Control, Grant and Revoke, Mandatory Access Control, Bell LaPadula Model, Role Based Security, Firewalls, Encryption and Digital Signatures. (4 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Fundamentals of Database Systems	RamezElmasri, ShamkantNavathe	Pearson Education Fifth Edition
RECOMMENDED BOOKS			
1	An Introduction to Database Systems	C.J. Date	Pearson Education Eighth Edition
2	Database Management Systems	Alexis Leon, Mathews Leon	
3	Database Systems Concepts, Design and Applications	S. K. Singh	Pearson Education
4	Database Management Systems	Raghu Ramakrishnan, Johannes Gehrke	Tata McGraw-Hill
5	System Concepts	Abraham Silberschatz, Henry F. Korth, S. Sudarshan	Tata McGraw-Hill

Branch: Computer Science and Engineering

Course Code	CS 352
Course Title	**DATABASE SYSTEM (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Introduction to SQL and installation of SQL Server / Oracle.
2. Data Types, Creating Tables, Retrieval of Rows using Select Statement, Conditional Retrieval of Rows, Alter and Drop Statements.
3. Working with Null Values, Matching a Pattern from a Table, Ordering the Result of a Query, Aggregate Functions, Grouping the Result of a Query, Update and Delete Statements.
4. Set Operators, Nested Queries, Joins, Sequences.
5. Views, Indexes, Database Security and Privileges: Grant and Revoke Commands, Commit and Rollback Commands.
6. PL/SQL Architecture, Assignments and Expressions, Writing PL/SQL Code, Referencing Non-SQL parameters.
7. Stored Procedures and Exception Handling.
8. Triggers and Cursor Management in PL/SQL

Branch: Computer Science and Engineering

Course Code	CS 303
Course Title	**DISCRETE STRUCTURES**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To get familiar and understand the fundamental notions in discrete mathematics. 2. To introduce the knowledge of core mathematical foundation of computer science. 3. Be exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups. 4. Be aware of the counting principles. 5. To introduce the basic properties of graphs and trees and model simple applications.
Course Outcome	1. Get familiar and understand the fundamental notions in discrete mathematics. 2. Acquire the knowledge of core mathematical foundation of computer science. 3. Aware of the counting principles, basic properties of graph, trees and model simple applications. 4. Exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups.

SYLLABUS

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SECTION-A

Set theory:
Definition of sets and proof by induction; Peano postulates; Relations; representation of relations by graphs; properties of relations; equivalence relations and partitions; Partial orderings; Posets; Linear and well-ordered sets.

(9 hours)

Functions:
Mappings; injection and surjections; composition of functions; inverse functions; special functions; pigeonhole principle.

(5 hours)

Mathematical reasoning:
Propositions; negation disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs used in program proving .

(9 hours)

SECTION-B

Combinatorics:
Elementary combinatorics; counting techniques; recurrence relation; generating functions.

(6 hours)

Graph Theory:
Introduction, Graphs Multigraph, Isomorphic Graph, Homeomorphic Graphs, Paths and Circuits, Shortest Paths In weighted Graphs, Eulerian and Hamiltonian Paths and Circuits, Konigsberg Bridge, Complete , Regular, Bipartite Graphs, Planar Graphs, Graph Coloring, Graph Traversal Techniques. Trees, Binary Search Trees, Complete & Extended Binary Trees.

(10 hours)

Groups:
Definition and elementary properties of groups, semigroups, monoids, rings, fields and lattices.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Elements of Discrete Mathematics	C.L.Liu, D P Mohapatra	Tata McGraw Hill Third Edition
2	Discrete Mathematics and applications	K.H.Rosen,	Tata McGraw Hill Seventh Edition
3	Discrete Mathematics, McGraw Hill,	Lipschutz	McGraw Hill, Latest Edition
4	Discrete Mathematical Structures ,	B. Kolman, R. C. Busby and S. C. Ross	PHI, Latest Edition

Branch: Computer Science and Engineering

Course Code	CS 304
Course Title	**MICROPROCESSORS**
Type of Course	Core
L T P	3 1 0
Credits	4
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	Introduction to Computer Science and Engineering(CS102), Programming Fundamentals(CS101/201)
Course Objectives (CO)	Provide students with the opportunity to gain experience in microprocessor-based system design, assembly language programming, and I/O interfacing to microprocessors. This course is intended as a first level course for microcomputer and embedded system design. Designer of an embedded system must have a thorough understanding of hardware, software and system integration. In view of this, various aspects of hardware design, such as interfacing of memory and different types of I/O devices, will be covered in details. As it is customary to write software in machine or assembly language for embedded system applications, laboratory assignments will be on assembly language programming of 8085. 1. This course contains fundamental principles of 8085 microprocessor, its hardware interfacing and programming. 2. After completion of this course the student must be able to use 8085 microprocessor and its peripherals in small applications.
Course Outcome	1. Identify the basic element and functions of microprocessor, describing the architecture of microprocessor and its peripheral devices, memory interfacing. 2. Demonstrate the fundamental understanding on the operation between the microprocessor and its interfacing devices, testing and troubleshooting, circuit diagrams along with description. 3. Apply the programming techniques in developing the assembly language program for microprocessor application, types of instructions and its uses, 8-bit as

	well as 16-bit programming, looping, counter delay executions, issues related to debugging. 4. Understand the concepts of stack and subroutines, its need in microprocessors, various types of interrupts, interrupt handling, instructions related to interrupts and related programming, interfacing data convertors and brief introduction to various general purpose programmable peripheral devices and its interfacing with 8085 microprocessor.

SYLLABUS

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SECTION-A

Microprocessor Architecture and Microcomputer Systems:
Microprocessor Architecture Memory, Input and Output Devices, the 8085 MPU, Example of an 808S-Based Microcomputer, Memory Interfacing, The SDK-85 Memory System.

(4 hours)

Interfacing I/O Devices:
Basic Interfacing Concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting, I/O Interfacing Circuits.

(4 hours)

Programming the 8085:
Introduction to 8085 Assembly Language Programming, The 8085 Programming Model, Instruction Classification, Instruction format.
Data Transfer (Copy) Operations, Arithmetic Operations, Logic Operations Branch Operations, Writing Assembly Language Programs.

(7 hours)

Programming Techniques with Additional Instructions:
Programming Techniques Looping, Counting and Indexing, Additional Data Transfer -'arid 16-Bit Arithmetic Instructions, Arithmetic Operations Related to Memory, Logic Operations.

(8 hours)

SECTION-B

Counters and Time Delays:
Counters and Time Delays, Hexadecimal Counter, Modulo: Ten Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.

(4 hours)

Stack and Subroutines:
Stack, Subroutine, Conditional Call and Return Instructions.

(4 hours)

Interrupts:
The 8085 Interrupt 8085 Vectored interrupts.

(4 hours)

Interfacing Data Converters:
Digital- to- Analog *(01* A) Converters, Analog- to- Digital (A/D) Converters.

(4 hours)

General -Purpose Programmable Peripheral Devices:

The 82S5A Programmable Peripheral Interface, Illustration: Interfacing Keyboard and Seven- Segment Display, Illustration: Bi- directional-Data Transfer between Two Microcomputers, The 8254 Programmable Interval Timer, The 8259 A Programmable Interrupt Controllers, and Direct Memory. Access (DMA) and the 8257 DMA Controller, serial communication, Programmable communications interface 8251.

(6 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Microprocessor Programming and Architecture, Applications with the 8085	Ramesh S. Gaonkar	Pearson third edition
RECOMMENDED BOOKS			
1	Microprocessor Principles and Applications,	Charles M.Gilmore	Tata McGraw Hill.
2	Microprocessors and Interfacing programming and Hardware	Douglas V. Hall	Tata McGraw Hill second edition.

Branch: Computer Science and Engineering

Course Code	CS 354
Course Title	**MICROPROCESSORS (Practical)**
Type of Course	Core
L T P	0 0 3
Credits	1
Course Assessment Methods End Semester Assessment Continuous Assessment	 50

SYLLABUS

Practical should be covered based on the following directions:

1. Familiarization of 8085 kit.
2. Applications of data movement instructions to develop relevant programs.
3. Verification of arithmetic and logic operations using above kits.(At least 5 programs)
4. Application of assembly language using 8085 instructions set to develop various programs.
5. Development of interfacing circuits of various control applications based on 8085.

Branch: Computer Science and Engineering

Course Code	AS 201
Course Title	**ECONOMICS**
Type of Course	Core
L T P	3 0 0
Credits	3
Course Assessment Methods End Semester Assessment (University Exam.) Continuous Assessment (Sessional, Assignments, Quiz)	 50 50
Course Prerequisites	None
Course Objectives (CO)	1. To make students understand how society manages its scarce resources for achieving maximum satisfaction. 2. To make students learn about economic aspects related to a consumer, firm, market and economy.
Course Outcome	1. Apply engineering knowledge to maximize profit, satisfaction and welfare. 2. Identify the forces that affect the economy. 3. Apply concepts of economy to software development.

SYLLABUS

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SECTION-A

Introduction to Economics

Nature of Economics, Economic Thoughts, Economic Activities, Relationship of Economics with other Social Sciences and Engineering

(5 hours)

Theory of Consumer Behaviour

Demand: Types, Law of Demand, Determinants of Demand and Change in Demand

Elasticity of Demand: Nature, Degrees, Types, Measurement and Factors Affecting Elasticity of Demand and its Application

Laws of Consumption: Concept and Applicability of Law of Diminishing Marginal Utility and Law of Equi-Marginal Utility

(10 hours)

Theory of Production and Cost

Cost: Types of Costs, Production: Law of Variable Proportion, Returns to Factor and Returns to Scale, Economies and Diseconomies of Scale

(9 hours)

SECTION-B

Theory of Market
Nature and Relevance of Perfect Competition, Monopoly and Monopolistic Competition

(8 hours)

Basic Concepts of Macroeconomics
National Income: Concept and Measurement, Determination of Equilibrium of Income
Inflation: Concept, Causes and Effect of Inflation, Measures to Control Inflation

(8 hours)

Economics of Software:-Why should software be valued? Principles of valuation. Cost versus value. Market value of software companies. Examples of estimation of the value of software.
Sales expectations and discounting. Alternate business models. Risks when outsourcing and offshoring development.

(5 hours)

TEXT BOOKS			
S. No.	**NAME**	**AUTHOR(S)**	**PUBLISHER**
1.	Modern Economics	Ahuja H. L	S. Chand & Co. Ltd
2	Economics For Engineers	Gupta M. L. & Gupta S. P	ESS PEE Publications
3.	Valuing Intellectual Capital, Multinationals and Taxhavens;	GioWiederhold	Springer Verlag, August 2013
4.	Business Economics	Ahuja H. L	S. Chand & Co. Ltd
5.	Macroeconomic Theory	Jhingan M.L	Konark Publisher Pvt. Ltd.
6.	Principles of Microeconomics	Stiglitz J. & Walsh Carl E	W.W. Norton & Company
7.	Principles of Macroeconomics	Stiglitz J. & Walsh Carl E	W.W. Norton & Company
8.	Principles of Economics	Mankiw N Gregory	Cengage Learning
9.	Course in Microeconomics Theory	Kreps A	Prentice Hall
10.	Economics	Samuelson Paul A. & Nordhaus William D	Tata McGraw Hill
11.	Microeconomics	Gravelle H. & Reiss R	Pearson Education
12.	Macro Economics: Theory and Practice	Ahuja H. L.,	S. Chand & Co. Ltd.