

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHEME OF INSTRUCTION AND SYLLABI of B. Tech. Program

RGUKT, Basar



II YEAR I SEMESTER

Subject Code	Course Name	L-T-P	Credits
MA2101	Discrete Structures	4-0-0	4
CS2101	Digital Logic Design	4-0-0	4
CS2102	Design and Analysis of Algorithms	4-0-0	4
CS2103	Scripting Languages	4-0-0	4
CS2104	Database Management System	4-0-0	4
HS2101	Soft Skills-I	2-0-0	1
CS2701	Digital Logic Design Lab	0-0-3	2
CS2704	Database Management System Lab	0-0-3	2
CS2901	Seminar-I	0-0-3	1
Total		22-0-9	26

L-Lectures, T-Tutorials, P-Practicals, C-Credits

MA2101 Externals: 60 Marks Internals: 40 Marks

DISCRETE STRUCTURES

L-T-P-C 4-0-0-4

Objectives:

- Cultivate clear thinking and creative problem solving.
- Teach the basic results in logic, sets and relations, number theory, combinatorics, graph theory and algebraic structures.
- Thoroughly prepare for the mathematical aspects of other Computer Science courses.

UNIT-I

Fundamentals of Logic: Propositional Logic, Propositional Equivalences, Predicate and Quantifiers, nested Quantifiers, Rules of Inference, Proof Methods and Strategy.

Set Theory: Sets, Set Operations.

Mathematical Induction: Introduction to Induction, strong Induction, Recursion.

UNIT-II

Number Theory: The division algorithm, Remainders, greatest common divisors, The fundamental theorem of arithmetic, infinity of primes.

Relations: Relations and their properties, n-ary Relations and their applications, Representing relations, Closures of relations, Equivalence relations, and Partial Orderings.

UNIT-III

Graphs: Graphs, Graph models, special types of graphs, Representing graphs, Graph Isomorphism, connectivity, Euler and Hamilton paths, Planar graphs, Graph Coloring, Matching problem.

Trees: Introduction to Trees, Applications of Trees, Binary Trees, n-ary Trees, Tree Traversal, Spanning Trees.

UNIT-IV:

Combinatorics: Basic principles of counting, The Pigeonhole principle, Permutations and Combinations, Binomial Coefficients, Generalized Permutations and Combinations

Advanced Counting Techniques: Recurrence relations, Solving linear recurrence relations, Generating functions, Catalan Numbers, Principle of Inclusion and Exclusion, Applications of Inclusion and Exclusion.

UNIT-V

Algebraic Structures: Groups, Subgroups, Generators and Evaluation of Powers, Coset and Lagrange's theorem, Isomorphisms and Automorphisms, Homomorphismsm and Normal subgroups, Rings, Integral Domains and Fields.

- 1. Kenneth H. Rosen, "Discrete Mathematics & Its Applications (with Combinatorics and Graph Theory)", (6th Edition), McGraw-Hill, 2007.
- 2. C.L.Liu, D.P.Mohapatra, "Elements of Discrete Mathematics"(A Computer Oriented Aproach) (3rd Edition), McGraw-Hill, 2008.
- 3. J.P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw-Hill, 1997.
- 4. Ronald L. Graham, Donald E. Knuth, Oren Patashnik, "Concrete Mathematics (A Foundation for Computer Science)" 2nd Edition, Pearson Education,2007.
- 5. Dougla B. West, "Introduction to Graph Theory" 2nd Edition, PHI Learning, 2009.
- 6. Richard A. Brualdi, "Introductory Combinatorics" 4th Edition, Pearson, 2004,

CS2101

DIGITAL LOGIC DESIGN

Externals: 60 Marks Internals: 40 Marks

L-T-P-C 4-0-0-4

Objectives:

- To understand basic number systems codes and logical gates.
- To understand the Boolean algebra and minimization logic.
- To understand the design of combinational sequential circuits.
- To understand the basic s of various memory.

UNIT-I

Digital Systems: Binary Numbers, Octal, Hexa-Decimal and other base numbers, Number base conversions, complements, signed binary numbers, Floating point number representation, binary codes, error detecting and correcting codes, digital logic gates(AND, NAND,OR,NOR, Ex-OR, Ex-NOR), Boolean algebra , basic theorems and properties, Boolean functions, canonical and standard forms.

UNIT-II

Gate –Level Minimization and Combination Circuits: The K-Maps Methods, Three Variable, Four Variable, Five Variable , sum of products , product of sums Simplification, Don't care conditions , NAND and NOR implementation and other two level implantation.

UNIT-III

Combinational Circuits (CC): Design Procedure, Combinational circuit for different code converters and other problems, Binary Adder, subtractor, Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers.

UNIT-IV

Synchronous Sequential Circuits: Latches, Flip-flops, analysis of clocked sequential circuits, design of counters, Up-down counters, Ripple counters, Registers, Shift registers, Synchronous Counters.

Asynchronous Sequential Circuits: Reduction of state and follow tables, Role free Conditions.

UNIT-V

Memory: Random Access memory, types of ROM, Memory decoding, address and data bus, Sequential Memory, Cache Memory, Programmable Logic Arrays, memory Hierarchy in terms of capacity and access time.

- 1. Digital Design- M. Morris Mano.
- 2. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
- 3. Switching and Logic Design, C.V.S. Rao, Pearson Education.
- 4. Digital Principles and Design Donald D.Givone, Tata McGraw Hill, Edition.
- 5. Fundamentals of Digital Logic & Micro Computer Design , 5TH Edition, M. Rafiquzzaman John Wiley.

CS2102 DESIGN AND ANALYSIS OF ALGORITHMS

Externals: 60 Marks Internals: 40 Marks

L-T-P-C 4-0-0-4

Objectives:

- Introduces the notations for analysis of the performance of algorithms.
- Describes major algorithmic techniques and mention problems for which each technique is appropriate;
- Describes how to evaluate and compare different algorithms using worst-, average-, and best-case analysis.
- Explains the difference between tractable and intractable problems, and introduces the problems that are P, NP and NP complete.

UNIT-I

Fundamentals of the Analysis of Algorithm Efficiency: Computational Tractability, Pseudo code for expressing algorithms, Time and Space Complexity, Rate of Growth, Asymptotic Notations, Common Running Times, Analysis for Recursive and Non-recursive Algorithms , Analysis of Sorting Algorithms

Divide and Conquer Algorithms: Merge Sort, Recurrence Relations, Methods of Solving Recurrences, Quick Sort, Median, Matrix Multiplication

UNIT-II

Graphs: Basic Definitions and Applications, Depth-first and Breadth-first Search, Topological Sort, Strongly Connected Components, Dijkstra's algorithm and Priority Queue Implementation

Greedy Algorithms: Minimum Spanning Trees, Implementing Kruskal's Algorithm - Union-Find Data Structure, Fractional Knapsack Problem, Huffman Codes and Data Compression

UNIT-III

Dynamic Programming: 0/1 Knapsack Problem, Longest increasing subsequences, Edit distance, Chain Matrix Multiplication, All-pairs Shortest Paths in Graph

UNIT-IV

Linear Programming and Reductions: Flows in Networks, Bipartite Matching, Duality, The Simplex Algorithm, Example Application – Circuit Evaluation

UNIT-V

NP-Complete Problems: Search Problems, Polynomial Time Verification, NP-completeness and reducibility, NP-completeness proof.

Coping with the Limitations of Algorithm: Back Tracking, Branch and Bound, Approximation Algorithms

- 1. Dasgupta, Sanjoy, Christos H Papadimitriou, and Umesh Virkumar Vazirani. *Algorithms*. Boston: McGraw-Hill Higher Education.
- 2. Kleinberg, Jon and Éva Tardos. Algorithm Design. Boston: Pearson/Addison-Wesley.
- 3. Cormen, Thomas H. Introduction To Algorithms. Cambridge, Mass.: MIT Press. Print.
- 4. Horowitz, Ellis and Sartaj Sahni. *Fundamentals Of Computer Algorithms*. Potomac, Md.: Computer Science Press.
- 5. Anany V. Levitin, *Introduction to the Design and Analysis of Algorithms*. Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA.

CS2103 SCRIPTING LANGUAGES

Externals: 60 Marks Internals: 40 Marks

L-T-P-C 4-0-0-4

Objectives:

- The goal of the course is the study of scripting languages such as PERL and Python
- Creation of programs in the Linux environment
- The study of the principles of scripting languages

UNIT-I:

Perl Scripting I: Introduction to Perl Scripting, Basic I/O, Variable, and Scalar data, Arrays, Lists, and Hashes, References,

UNIT-II:

Perl Scripting II: Control structures, Functions, File I/O, , Regular expressions, Special Variables and Debugging.

UNIT-II

Python Scripting I:Introduction-Variables, Strings, numbers, comments, Lists- introducing list, lists and looping, common list operations, removing items from list, numerical lists, list comprehensions, strings as lists, tuples.

More advanced data types(dictionary, string), file I/O, functions, Functions and return values, if and if-else statements, while loop

UNIT-IV

Python Scripting II: Dictionaries, common operations with dictionaries, looping through dictionaries, nesting, classes, inheritance, modules and classes, exceptions and testing. Exceptions, sorting, intro to standard libraries (os, sys).

UNIT-V

Python Scripting III: Network programming with python, multi-processing and multi-threading, debugging with pdb, python unit testing, DB programming, Web development, Python native call, Performance optimizations

- 1. Larry Wall, Tom Christiansen, and John Orwant, *Programming Perl*, 3rd edition, O'Reilly, 2000.
- 2. Budd, Exploring Python. McGraw Hill, 2008.
- 3. Zelle, Python Programming: An Introduction to Computer Science. Franklin, Beedle & Assoc., 2010.

CS2104 DATABASE MANAGEMENT SYSTEM

Externals: 60 Marks Internals: 40 Marks

L-T-P-C 4-0-0-4

Objectives:

Upon successful completion of this Lab the student will be able to:

- Creating database objects
- Modifying database objects
- Manipulating the data
- Retrieving the data from the database server
- Performing database operations in a procedural manner using pl/sql
- Performing database operations (create, update, modify, retrieve, etc.,) using front end tools l
- Design and Develop applications like banking, reservation system, etc.,

UNIT-I

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Data base Systems. Introduction to Data base design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views destroying/ altering Tables and Views.

UNIT-II

Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus - Expressive Power of Algebra and calculus. Form of Basic SQL Query - Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

UNIT-III

Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions -Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

UNIT-IV

Transaction Management - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability -Implementation of Isolation - Testing for serializability. Concurrency Control - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity. Recovery System-Failure Classification-Storage Structure-Recovery and Atomicity - Log -Based Recovery - Recovery with Concurrent Transactions - Buffer Management - Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems. **UNIT-V**

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing -Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations. Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete. Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

- 1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2003.
- 2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006

HS2101

SOFT SKILLS-I

Externals: Internals:

L-T-P-C* 2-0-0-1

Objectives:

- > To implement practically the skills needed for employment.
- > To deal with the society in an acceptable way.
- > To make them competent to attempt and qualify in various tests.
- > To make them proficient in using vocabulary in various situations.

UNIT-I

Vocabulary Building – Teaching Root words – Word association - How to talk about Personality Type - How to talk about Doctors - How to talk about Various Practitioners - How to talk about Science and Scientists - How to talk about various Speech Habits - How to insult your enemies - How to flatter your friends - How to talk about a variety of personal characteristics -How to talk about actions

UNIT-II

Common Errors in English

UNIT-III

Twenty -four seven - L for gist - NDTV debates - L for specific information - Ted Talks - L for detail - Devils' Advocate - **Picture perception** – Describing people, paintings, cartoons etc.

UNIT-IV

Read between the lines – R for Pleasure - Reading Newspaper - Movie Reviews - R for **Specific information** – Essays - Textbooks

UNIT-V

Now you are talking - Giving Opinions - Stating Facts - Agree and disagree - Decisions and Intentions - Raising Questions - Giving and receiving effective feedback

UNIT –VI Writing Dailogue

- 1. Word Power Made Easy
- 2. Ted Talks
- 3. NDTV Talks
- 4. Newspapers (The Hindu, Times of India)

CS2701

DIGITAL LOGIC DESIGN LAB

Externals: 60Marks Internals: 40Marks

L-T-P-C 0-0-3-2

Objectives:

• To provide an introduction to Logic Systems Design thereby giving hands on experience on working with digital ICS, which enable the study Computer System Architecture.

Experiments:

- 1. Familiarization of Logic Gates and Realization of Logic Circuits using basic Gates.
- 2. Design and implementation of Arithmetic Circuits:- Half Adder, Full Adder, n bit Ripple Carry
- 3. Adder, Carry Look ahead Adder, BCD Adder
- 4. Study of Flip Flops:- implementation of RS, JK, D, T and MS Flip Flops
- 5. Design and implementation of Synchronous and Asynchronous Counters, UP/DOWN Counters
- 6. Design and Implementation of Shift Registers, Counters using Shift Registers Ring Counter and Johnson Counter
- 7. Study of Multiplexers, Demultiplexers, Encoder and Decoder
- 8. Design of Comparators and Parity Generators.

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS2101 can be substituted.

CS2702 DATABASE MANAGEMENT SYSTEM LAB

Externals: 60Marks Internals: 40Marks

L-T-P-C 0-0-3-2

Objectives:

- To acquaint the students with the implementation and fundamental algorithms of database systems.
- To provide experience on design, querying, and processing of data in a relational database.

Experiments:

Experiments to implement the following

- 1. Relational algebra operations select, project and join.
- 2. Determination of Attribute Closure, Candidate Key, Functional Dependency.
- 3. Checking Serializability of a Schedule.
- 4. Dynamic Hashing.

Experiments in any relational database for the following

- 1. Creation, Insertion, Updation, Deletion of Tables, Indexes, Views.
- 2. Simple Queries, Nested Queries, Use of Arithmetic and String Functions.
- 3. Simple PL/SQL Programs, Use of Exceptions, Cursor, Procedure, Function, Trigger, Sequence.

CS2901 Externals: 100 Marks

Seminar-I

L-T-P-C 0-0-3-1

Objectives:

- To improve the presentation skills
- To prepare PPT more effectively

Student has to choose a general topic to give a power point presentation