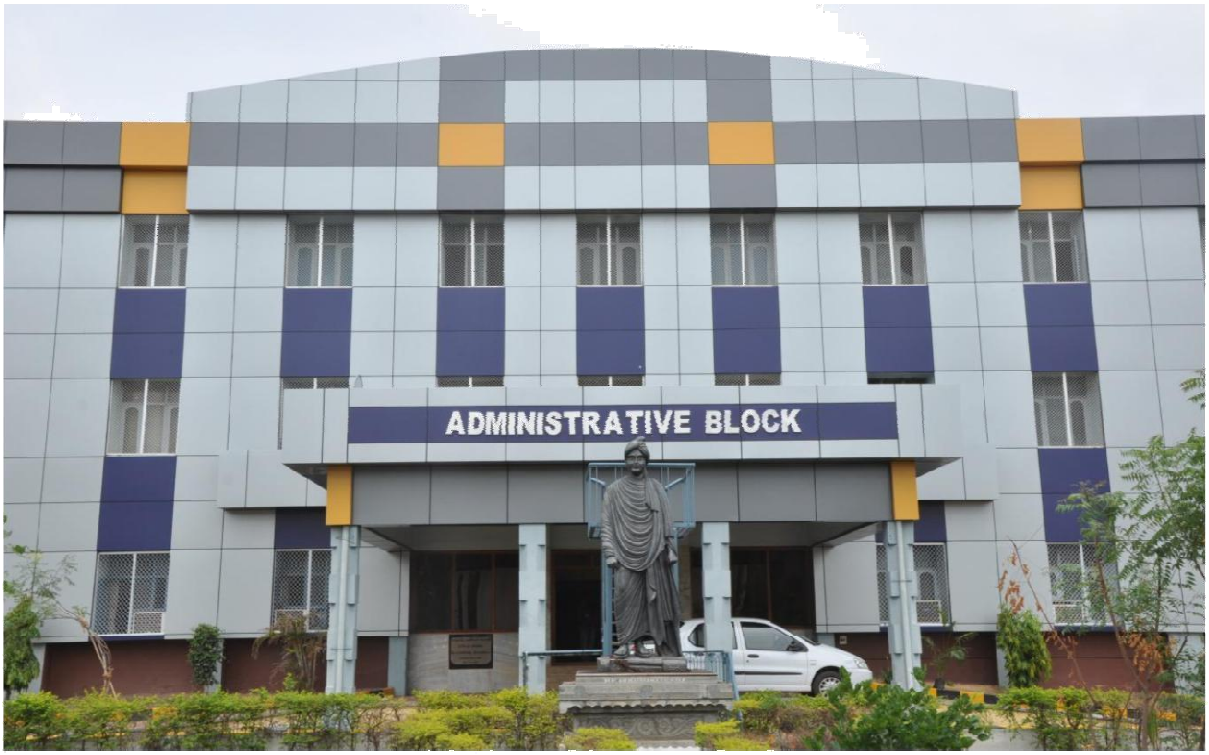

Scheme – 2023

Department of Computer Science & Engineering

G. Pulla Reddy Engineering College (Autonomous): Kurnool

Accredited by NBA of AICTE and NAAC of UGC

Affiliated to JNTUA, Anantapuramu

Scheme and Syllabus for

Minor in COMPUTER SCIENCE

(for Non-IT Branches)

(With Effect from the Batch Admitted in 2023-24)

G. PULLA REDDY ENGINEERING COLLEGE (Autonomous) : KURNOOL

SCHEME -23

Minor in CSE

Applicable from the Academic Year 2023-24 onwards

Minor in Computer Science

S.No	Title	L	T	P	Credits	CIA	End Exam	Total Marks
1	Data structures and Algorithms	3	0	0	3	30	70	100
2	Introduction to Operating System	3	0	0	3	30	70	100
3	Data Structures and Algorithms Lab	0	0	3	1.5	30	70	100
4	Object Oriented Programming	3	0	0	3	30	70	100
5	Introduction to Database Systems	3	0	0	3	30	70	100
6	OOPs & Database Lab	0	0	3	1.5	30	70	100
7	Introduction to Software Engineering	3	0	0	3	30	70	100
				Total	**18**			

DATA STRUCTURES AND ALGORITHMS (DSA)								
Minor in CS						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
MCS01	**M**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1:	Understand basics of data structures and algorithms.
CO2:	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.
CO3:	Understand and develop algorithms for well-known problems using greedy methods.
CO4:	Apply dynamic-programming approach to solve the problems.
CO5:	Apply the backtracking algorithmic paradigm to solve combinatorial problems

UNIT – I

Algorithms- Problem Solving, Introduction to Algorithms, Characteristics of algorithms, Phases in development of algorithm, Analysis of Algorithms, Complexity of algorithms- Space complexity, Time complexity, Asymptotic notation- Big-O, Theta and Omega.

Basic Data structures - Arrays, Stack, Queue and Linked List

UNIT – II

Divide and Conquer: General method, Binary search, Finding Maximum and Minimum, Merge sort, Quick sort, Strassen's Matrix Multiplication.

UNIT – III

Greedy method: The General Method, Knapsack Problem, Tree Vertex splitting, Minimum-Cost Spanning Trees, Single Source Shortest Paths.

UNIT – IV

Dynamic Programming: The General Method, Multistage Graphs, All Pairs Shortest Paths, Optimal Binary Search Trees, The Travelling Salesperson Problem

UNIT – V

Backtracking: The General Method, The n-Queens Problem, Graph Coloring Problem, and Hamiltonian cycles.

Text Books:

Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni and S. Rajasekharan, Universities Press.

Reference Books:

1. Algorithm Design: Foundations, Analysis and Internet examples, M. T. Goodrich and R. Tomassia, John Wiley and sons.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford Univ. Press

Online Learning Resources:

1. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
2. https://www.javatpoint.com/daa-tutorial

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question

No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

INTRODUCTION TO OPERATING SYSTEMS (IOS)								
Minor in CS						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
MCS02	**M**	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1:	Understand the basics of the Operating System and their different structures.
CO2:	Comprehend the process management policies, CPU Scheduling and Process synchronization
CO3:	Able to design and incorporate Deadlock handling mechanisms
CO4:	Able to implement memory management schemes and allocation policies
CO5:	Able to demonstrate file management system and its implementation

UNIT – I

Introduction:

Operating System - Operations, Services, User Operating System Interface, System Calls, Types of System Calls, Operating system structure

UNIT – II

Process Management:

Process Concept, Process Scheduling, CPU Scheduling Criteria,CPU Scheduling Algorithms, Operations on Processes, Process Synchronization, Critical Section Problem, Semaphores, Monitors.

UNIT – III

Deadlocks:

System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT – IV

Memory Management:

Main Memory-Introduction ,Contiguous Memory Allocation, Paging, swapping

Virtual Memory-: Introduction, Demand paging, Page Replacement, Allocation of Frames.

UNIT – V

File System:

File System Interface- File Concepts, Access Methods, File system Structure, File system Implementation, Directory Implementation, Allocation Methods, Free-Space Management

Text Books:

Operating System Concepts , Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.

Reference Books:

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018..
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson, 2016.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

DATA STRUCTURES AND ALGORITHMS LAB DSA(P)								
Minor in CS						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
MCS03	M	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		0	**0**	**3**	**1.5**	**30**	**70**	**100**

End Exam Duration: 3 Hrs

Course Outcomes : On successful completion of the course, the students will be able to

CO1:	Implement the operations of Basic Data structures.
CO2:	Implement Divide and Conquer Techniques.
CO3:	Implement Greedy methods.
CO4:	Implement Dynamic programming.
CO5:	Implement Backtracking techniques.

LIST OF EXPERIMENTS

1. Implement Stack operations using Array.
2. Implement Queue operations using Arrays.
3. Implement Single Linked List and its operations.
4. Implement Binary Search algorithm using Divide and Conquer Technique.
5. Implement Merge Sort algorithm using Divide and Conquer Technique
6. Implement Maximum and Minimum element in an array using Divide and Conquer
7. Implement Fractional Knapsack problem using Greedy Technique.
8. Implement Prims algorithm for finding minimum cost spanning tree using Greedy
9. Implement All Pairs Shortest paths problem sing Dynamic Programming.
10. Implement N Queens problem using Backtracking technique

Text Books:

1. Algorithm Design: Foundations, Analysis and Internet examples, M. T. Goodrich and R. Tomassia, John Wiley and sons.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford Univ. Press

Online Learning Resources:

1. https://walkccc.me/LeetCode/problems/51/
2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3. https://pencilprogrammer.com/algorithms/graph-coloring-problem
4. https://www.javatpoint.com/daa-tutorial

OBJECT ORIENTED PROGRAMMING (OOP)								
Minor in CS								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
MCS04	**M**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs					**End Exam Duration: 3 Hrs**			
Course Outcomes : At the end of the course the student will be able to								
CO1:	Understand Object Oriented Programming concepts and Java programming constructs.							
CO2:	Comprehend the concepts of Class, Object and methods.							
CO3:	Demonstrate the concepts of Inheritance, Packages and Interfaces.							
CO4:	Understand String handling methods and Exception handling mechanism.							
CO5:	Understand Collection interfaces and Collection classes.							

UNIT – I

Object Oriented concepts:

Overview of Java, Java buzzwords, Object Oriented Principles.

Programming Constructs:

Data types, Operators, Control Statements- if statements, Ternary Operator(?:), Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each Loop, Break Statement, Continue Statement.

Arrays: Introduction, Declaration and Initialization of Arrays, Accessing elements of Arrays, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Two-dimensional Arrays**.**

UNIT – II

Classes, Objects and Methods:

Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Accessing class members, Constructors, this Keyword, Defining Methods, Overloaded Methods, Overloaded Constructors, Class Objects as Parameters in Methods, Reading Console input, Writing Console output.

Inheritance:

Inheritance basics, Types of Inheritance- Simple, Multi-level, Hierarchical Inheritance, super key word, Method overriding.

UNIT – III

Abstract Classes and Interfaces:

Abstract classes and final key word, Defining an interface and Implementing interface.

Packages:

Defining a package, Access protection, Importing packages.

UNIT – IV

String Handling:

String constructors, String Methods-Character extraction, String comparison, Searching strings and Modifying strings.

Exception Handling:

Introduction, Types of Exceptions, try, catch, throw, throws and finally. Java built-in exceptions, Creating customized exceptions.

UNIT – V

Multithreading:

Java thread model, Creating a thread- Extending Thread class and Implementing Runnable

interface, Thread class methods, Thread priorities.

Collections:

Collection Interfaces- List, Set. Collection Classes-Array List, Linked List, Hash Set, Linked Hash Set. Accessing a Collection using an Iterator.

Text Books:

1. Java The Complete Reference, Herbert Schildt, TATA McGraw-Hill, Eleventh Edition, 2019.
2. Programming with Java, E Balaguruswamy, A Primer, TATA McGraw-Hill, Sixth Edition, 2019.

Reference Books:

1. Thinking in Java, Bruce Eckel, Pearson Education, Fourth Edition, 2008.
2. Java How to Program, Early Objects,H.Deitel and P.Deitel, Global Edition, 2017

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

INTRODUCTION TO DATABASE SYSTEMS (IDS)								
Minor in CS						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
MCS05	M	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Sessional Exam Duration: 2 Hrs						**End Exam Duration: 3 Hrs**		

Course Outcomes : At the end of the course the student will be able to

CO1:	Understand the fundamentals of databases and its working environment.
CO2:	Design database systems using Entity Relationship Diagrams from the requirements.
CO3:	Use SQL for database creation, manipulation and maintenance.
CO4:	Apply SQL queries for Data aggregation, calculations, views, sub-queries.
CO5:	Apply normalization techniques to normalize a database.

UNIT – I

Introduction: Introduction to DBMS, Purpose of Database Systems, Database System Applications, View of Data, Data Models, Database Users, Database Architecture

UNIT – II

Entity-Relationship Model: Basic Concepts, Cardinality of Relationship, ER Diagram Notations, Entity Relationship Diagrams, Modelling using ER Diagrams, Reduction of an ER Schema to Tables.

UNIT – III

Structured Query Language (SQL): Introduction to SQL, Data types, Data Definition language commands, Data Manipulation language Commands and Data control Language Commands, Candidate Key, Primary key, Foreign key, Select Clause, Where Clause, Arithmetic & Logical operations, Constraints.

UNIT – IV

Advanced SQL: Pattern Matching, Order by, Group by, Set Operations, Aggregate Functions, Join operations, views, Sub Queries, Nested Queries

UNIT – V

Relational Database Design: Features of Good Relational Database Designs, Decomposition, Purpose of Normalization, Functional Dependency, Types of Normal Forms - First Normal Form, Second Normal Form, Third Normal Form, Boyce Codd Normal Form, Fourth Normal Form, Fifth Normal Form.

Text Books:

1. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH
2. Database Management Systems, 3rd edition, Raghurama Krishnan, Johannes Gehrke, TMH

Reference Books:

1. Introduction to Database Systems, 8thedition, C J Date, Pearson
2. Database Management System, 6th edition, RamezElmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, 10th edition, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning, 2022.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/105/106105175/

Question Paper Pattern:

Sessional Exam: The question paper for Sessional Examination shall be for 40 marks. The question paper shall consist of Four questions and all questions are compulsory. Question No.1 shall contain Five compulsory short answer questions for a total of Ten marks. Question No.2 to 4 shall be EITHER/OR Type for Ten marks each. Student shall Answer any one of them. Each of these questions may contain sub-questions.

End Examination: The question paper for End Examination shall be for 70 marks. The Question paper shall contain Six Questions and all questions are compulsory. Question No.1 shall contain Ten compulsory short answer questions for a total of Twenty marks (with Two short answer questions from each unit). Question No.2 to 6 shall be EITHER/OR Type for Ten marks each and shall cover one Unit of the Syllabus for each question. Student shall Answer any one of them. Each of these questions may contain sub-questions.

OOPs & DATABASE LAB(OOPD(P))								
Minor in CS						**Scheme: 2023**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
MCS06	**M**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**TOTAL**
		0	**0**	**3**	**1.5**	**30**	**70**	**100**
End Exam Duration: 3 Hrs								
Course Outcomes : On successful completion of the course, the students will be able to								
CO1:	Implement Method overloading, Constructor overloading and Inheritance.							
CO2:	Implement String handling and Exception handling.							
CO3:	Implement DDL, DML and DCL Commands to create and manipulate databases.							
CO4:	Implement SQL queries to retrieve data from databases.							
LIST OF EXPERIMENTS								
1. Programs on Method overloading and Constructor overloading.								
2. Program to implement Multilevel and Hierarchical Inheritance.								
3. Program to implement Multiple inheritance using interfaces.								
4. Programs on String Handling methods.								
5. Programs to implement built-in exceptions and customized exceptions.								
6. Perform DDL, DML and DCL commands.								
7. Create various tables like Branch, Account, Depositor, Customer, Loan and Borrower for a Banking system with constraints using a Schema diagram.								
8. Perform various SQL queries on select clause, where clause, pattern matching, Order by, and Group by.								
9. Implement SQL Queries on Set operations, Aggregate functions and Join Operations.								
10. Implement Nested Queries and Correlated nested Queries.								
Text Books:								
1. P. J. Deitel, H. M. Deitel, “Java for Programmers”, Pearson Education, PHI, 4th Edition, 2007.								
2. Henry F. Korth& Abraham Silberschatz [2005], Data Base System Concepts, MC Graw Hill.								
Online Learning Resources:								
1. https://java-iitd.vlabs.ac.in/								
2. https://www.w3schools.com/sql								

INTRODUCTION TO SOFTWARE ENGINEERING (ISE)

Minor in CS — **Scheme: 2023**

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	Continuous Internal Assessment	End Exam	TOTAL
MCS07	M	3	0	0	3	30	70	100

Sessional Exam Duration: 2 Hrs — **End Exam Duration: 3 Hrs**

Course Outcomes : At the end of the course the student will be able to

CO1:	Identify the key activities in managing a software project and Process Models.
CO2:	Understand the components of Software Requirements Specification document.
CO3:	Apply systematic procedure for software design and deployment.
CO4:	Understand the testing strategies to build the test cases.
CO5:	Estimate project risks and project metrics.

UNIT – I

Software Process and Agile Development: Introduction to Software Engineering, Evolving Role of Software, Software Process, **Process Models:** Waterfall Model, Incremental Process Model, Spiral Model, Introduction to Agility-Agile process-Extreme programming-XP Process.

UNIT – II

Requirements Analysis & Specification: Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document.

UNIT – III

Software Design: Design process, Design Concepts, Design Model, Architectural Design, Architectural styles, User Interface Design: Interface analysis, Interface Design,

UNIT – IV

Testing & Maintenance: Software testing fundamentals-Internal and external views of Testing, white box testing, black box testing- Regression Testing, Unit Testing, Integration Testing, Validation Testing, Refactoring, Maintenance.

UNIT – V

Risk Management & Software Metrics: Risk Management, Identification, Projection, Risk Management, Risk Identification-RMMM Plan. Software Measurement, Metrics for software quality, Types of Metrics, Function Point, and Size Oriented Metrics.

Text Books:

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Seventh Edition, Mc Graw-Hill International Edition, 2010.
2. Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia, 2011.

Reference Books:

1. K.K.Agarwal&Yogesh Singh [2008], Software Engineering, New Age International Publishers.
2. James F.Peters, Witoldpedecz, JohnWiely [2008], Software Engineering-and. Engineering approach.
3. Pankaj Jalote’s , Software Engineering -A Precise Approach, Wiley.

Online Learning Resources:

https://archive.nptel.ac.in/courses/106/105/106105182/

Question Paper Pattern:

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