SunRise University

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Recognized by UGC Act, 1956 u/s 2 (f)

Syllabus of

UNDERGRADUATE DEGREE COURSE

Computer Science and Engineering (AI)

SunRise University, Alwar

SunRise University, Alwar

Department of Computer Science Engineering (Artificial Intellegence)

Teaching & Examination Scheme
B.Tech. : III Semester

Code	Subject	Cr.	Hrs. /Week			Exam Hrs.	Maximum Marks				
			L	T	P		MS1	MS2	IA	Th.	Total
THEORY											
3BTCSE-AI01	Advance Engineering Mathematics-I	3	3	0	0	3	10	10	20	60	100
3BTCSE-AI02	Technical Communication/ Managerial Economics and Financial Accounting	3	3	1	0	3	10	10	20	60	100
3BTCSE-AI03	Digital Electronics	3	3	0	0	3	10	10	20	60	100
3BTCSE-AI04	Data Structures and Algorithms	3	3	1	0	3	10	10	20	60	100
3BTCSE-AI05	Object Oriented Programming	3	3	1	0	3	10	10	20	60	100
3BTCSE-AI06	Software Engineering	3	3	1	0	3	10	10	20	60	100
PRACTICALS & SESSIONALS											
Code	Subject	Cr.	Hrs. /Week			Exam Hrs.	IA (60%)		EA(40%)		Total
			L	T	P		MP1 (30%)	MP2 (30%)			
3BTCSE-AI07	Data Structures and Algorithms Lab	2	0	0	2	3	30	30	40		100
3BTCSE-AI08	Object Oriented Programming Lab	2	0	0	2	3	30	30	40		100
3BTCSE-AI09	Software Engineering Lab	2	0	0	2	3	30	30	40		100
3BTCSE-AI10	Digital Electronics Lab	2	0	0	2	3	30	30	40		100
	GRAND TOTAL	26	18	06	08						1000

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Teaching & Examination Scheme
B.Tech. :IV Semester

Code	Subject	Cr.	Hrs. /Week			Exam Hrs.	Maximum Marks				
			L	T	P		MS1	MS2	IA	Th.	Total
THEORY											
4BTCSE-AI01	Discrete Mathematics Structure	3	3	0	0	3	10	10	20	60	100
4BTCSE-AI02	Managerial Economics and Financial Accounting/ Technical Communications	3	3	1	0	3	10	10	20	60	100
4BTCSE-AI03	Microprocessor & Interfaces	3	3	0	0	3	10	10	20	60	100
4BTCSE-AI04	Database Management System	3	3	1	0	3	10	10	20	60	100
4BTCSE-AI05	Theory Of Computation	3	3	1	0	3	10	10	20	60	100
4BTCSE-AI06	Data Communication and Computer Networks	3	3	1	0	3	10	10	20	60	100
PRACTICALS & SESSIONALS											
Code	Subject	Cr.	Hrs. /Week			Exam Hrs.	IA (60%)		EA(40%)		Total
			L	T	P		MP1 (30%)	MP2 (30%)			
4BTCSE-AI07	Microprocessor & Interfaces Lab	2	0	0	2	3	30	30	40		100
4BTCSE-AI08	Database Management System Lab	2	0	0	2	3	30	30	40		100
4BTCSE-AI09	Network Programming Lab	2	0	0	2	3	30	30	40		100
4BTCSE-AI10	Linux Shell Programming Lab	2	0	0	2	3	30	30	40		100
	GRAND TOTAL	26	18	06	08						1000

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Teaching & Examination Scheme
B.Tech. :V Semester

Code	Subject	Hrs. /Week			Exam Hrs.	Maximum Marks				
		L	T	P		MS1	MS2	IA	Th.	Total
5BTCSE-AI01	Data Mining-Concepts and Techniques	3	0	0	3	10	10	20	60	100
5BTCSE-AI02	Compiler Design	3	1	0	3	10	10	20	60	100
5BTCSE-AI03	Operating System	3	0	0	3	10	10	20	60	100
5BTCSE-AI04	Computer Graphics & Multimedia	3	1	0	3	10	10	20	60	100
5BTCSE-AI05	Analysis of Algorithms	3	1	0	3	10	10	20	60	100
5BTCSE-AI06	Fundamentals of Blockchain	3	1	0	3	10	10	20	60	100

Code	Subject	Hrs. /Week			Exam Hrs.	IA (60%)		EA(40%)	Total
		L	T	P		MP1 (30%)	MP2 (30%)		
5BTCSE-AI07	Computer Graphics & Multimedia Lab	0	0	2	3	30	30	40	100
5BTCSE-AI08	Compiler Design Lab	0	0	2	3	30	30	40	100
5BTCSE-AI09	Analysis of Algorithms Lab	0	0	2	3	30	30	40	100
5BTCSE-AI10	Advance Java Lab	0	0	2	3	30	30	40	100
	GRAND TOTAL	18	06	08					1000

Teaching & Examination Scheme
B.Tech. :VI Semester

Code	Subject	Hrs. /Week			Exam Hrs.	Maximum Marks				
		L	T	P		MS1	MS2	IA	Th.	Total
6BTCSE-AI01	Digital Image Processing	3	0	0	3	10	10	20	60	100
6BTCSE-AI02	Machine Learning	3	1	0	3	10	10	20	60	100
6BTCSE-AI03	Information Security System	3	0	0	3	10	10	20	60	100
6BTCSE-AI04	Computer Architecture and Organization	3	1	0	3	10	10	20	60	100
6BTCSE-AI05	Principles of Artificial Intelligence	3	1	0	3	10	10	20	60	100
6BTCSE-AI06	Cloud Computing	3	1	0	3	10	10	20	60	100
Code	Subject	Hrs. /Week			Exam Hrs.	IA (60%)		EA(40%)		Total
		L	T	P		MP1 (30%)	MP2 (30%)			
6BTCSE-AI07	Digital Image Processing Lab	0	0	2	3	30	30	40		100
6BTCSE-AI08	Machine Learning Lab	0	0	2	3	30	30	40		100
6BTCSE-AI09	Python Lab	0	0	2	3	30	30	40		100
6BTCSE-AI10	Mobile Application Development Lab	0	0	2	3	30	30	40		100
	GRAND TOTAL	18	06	08						1000

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II Year-III Semester: B.Tech. Computer Science and Engineering (AI)

3BTCSE-AI01: Advanced Engineering Mathematics

Credit-3 **Max. Marks : 100 (IA:40, ETE:60)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	**Random Variables:** Discrete and Continuous random variables, Joint distribution, Probability distribution function, conditional distribution.Mathematical Expectations: Moments, Moment Generating Functions, variance and correlation coefficients, Chebyshev's Inequality, Skewness and Kurtosis.	7
2	**Binomial distribution**, Normal Distribution, Poisson Distribution and their relations, Uniform Distribution, Exponential Distribution. Correlation: Karl Pearson's coefficient, Rank correlation. Curve fitting. Line of Regression.	5
3	**Historical development**, Engineering Applications of Optimization, Formulation of Design Problems as a Mathematical Programming Problems, Classification of Optimization Problems	8
4	**Classical Optimization using Differential Calculus:** Single Variable and Multivariable Optimization with & without Constraints, Langrangian theory, Kuhn Tucker conditions	6
5	**Linear Programming:** Simplex method, Two Phase Method and Duality in Linear Programming. Application of Linear Programming: Transportation and Assignment Problems.	14
	TOTAL	40

3BTCSE-AI02: Technical Communication

Credit-2 **Max. Marks : 100 (IA:40, ETE:60)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction to Technical Communication-** Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	**Comprehension of Technical Materials/Texts and Information Design & development-** Reading of technical texts, Readingand comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	**Technical Writing, Grammar and Editing**- Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	**Advanced Technical Writing**- Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
	TOTAL	**26**

3BTCSE-AI03: Digital Electronics

Credit-3 **Max. Marks : 100 (IA:40, ETE:60)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours

1	**Fundamental concepts:** Number systems and codes, Basic logic Gates and Boolean algebra: Sign & magnitude representation, Fixed point representation, complement notation, various codes & arithmetic in different codes & their inter conversion. Features of logic algebra, postulates of Boolean algebra.Theorems of Boolean algebra.	**8**
2	**Minimization Techniques and Logic Gates**: Principle of Duality - Boolean expression -Minimization of Boolean expressions –– Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions – Quine - McCluskey method of minimization.	**8**
3	**Digital Logic Gate Characteristics:** TTL logic gate characteristics. Theory & operation of TTL NAND gate circuitry. Open collector TTL. Three state output logic. TTL subfamilies.MOS& CMOS logic families. Realization of logic gates in RTL, DTL, ECL, C-MOS & MOSFET.	**8**
4	**Combinational Circuits:** Combinational logic circuit design, adder, subtractor, BCD adder encoder, decoder, BCD to 7-segment decoder, multiplexer demultiplexer.	**8**
5	**Sequential Circuits:** Latches, Flip-flops - SR, JK, D, T, and Master-Slave Characteristic table and equation,counters and their design, Synchronous counters – Synchronous Up/Down counters – Programmable counters – State table and state transition diagram ,sequential circuits design methodology. Registers –shift registers.	**8**
	TOTAL	**40**

3BTCSE-AI04: Data Structures and Algorithms

Credit-3 **Max. Marks: 100 (IA:40, ETE:60)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours

1	Stacks: Basic Stack Operations, Representation of a Stack using Static Array and Dynamic Array, Multiple stack implementation using single array, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions and Towers of Hanoi.	**8**
2	Queues: Basic Queue Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues- Round Robin Algorithm. Circular Queues, DeQueue Priority Queues. Linked Lists:Introduction, single linked list, representation of a linked list in memory, Different Operations on a Single linked list, Reversing a single linked list, Advantages and disadvantages of single linked list, circular linked list, double linked list and Header linked list.	**10**
3	Searching Techniques: Sequential and binary search.Sorting Techniques: Basic concepts, Sorting by: bubble sort, Insertion sort, selection sort, quick sort, heap sort, merge sort, radix sort and counting sorting algorithms.	**7**
4	Trees: Definition of tree, Properties of tree, Binary Tree, Representation of Binary trees using arrays and linked lists, Operations on a Binary Tree, Binary Tree Traversals (recursive), Binary search tree, B-tree , B+ tree, AVL tree, Threaded binary tree.	**7**
5	Graphs: Basic concepts, Different representations of Graphs, Graph Traversals (BFS & DFS), Minimum Spanning Tree(Prims &Kruskal), Dijkstra's shortest path algorithms.Hashing: Hash function, Address calculation techniques, Common hashing functions, Collision resolution: Linear and Quadratic probing, Double hashing.	**8**
	TOTAL	**40**

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3BTCSE-AI05: Object Oriented Programming

Credit-3 **Max. Marks : 100 (IA:40, ETE:60)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	Introduction to different programming paradigm, characteristics of OOP, Class, Object, data member, member function, structures in C++, different access specifiers, defining member function inside and outside class, array of objects.	8
2	Concept of reference, dynamic memory allocation using new and delete operators, inline functions, function overloading, function with default arguments, constructors and destructors, friend function and classes, using this pointer.	8
3	Inheritance, types of inheritance, multiple inheritance, virtual base class, function overriding, abstract class and pure virtual function	9
4	Constant data member and member function, static data member and member function, polymorphism, operator overloading, dynamic binding and virtual function	9
5	Exception handling, Template, Stream class, File handling.	6
	TOTAL	40

3BTCSE-AI06: Software Engineering

Credit-3 **Max. Marks : 100 (IA:40, ETE:60)**
3L+0T+0P **End Term Exam: 3 Hours**

SN	CONTENTS	Hours
1	Introduction, software life-cycle models, software requirements specification, formal requirements specification, verification and validation.	8
2	Software Project Management: Objectives, Resources and their estimation, LOC and FP estimation, effort estimation, COCOMO estimation model, risk analysis, software project scheduling.	8
3	Requirement Analysis: Requirement analysis tasks, Analysis principles. Software prototyping and specification data dictionary, Finite State Machine (FSM) models. Structured Analysis: Data and control flow diagrams, control and process specification behavioral modeling	8
4	Software Design: Design fundamentals, Effective modular design: Data architectural and procedural design, design documentation.	8
5	Object Oriented Analysis: Object oriented Analysis Modeling, Data modeling. Object Oriented Design: OOD concepts, Class and object relationships, object modularization, Introduction to Unified Modeling Language	8
	TOTAL	**40**

3BTCSE-AI07: Data Structures and Algorithms Lab

Credit-1.5 **Max. Marks :100 (IA:60, ETE:40)**
0L+0T+3P

SN	CONTENTS
1	Write a simple C program on a 32 bit compiler to understand the concept of array storage, size of a word. The program shall be written illustrating the concept of row major and column major storage. Find the address of element and verify it with the theoretical value. Program may be written for arrays up to 4-dimensions.
2	Simulate a stack, queue, circular queue and dequeue using a one dimensional array as storage element. The program should implement the basic addition, deletion and traversal operations.
3	Represent a 2-variable polynomial using array. Use this representation to implement addition of polynomials
4	Represent a sparse matrix using array. Implement addition and transposition operations using the representation.
5	Implement singly, doubly and circularly connected linked lists illustrating operations like addition at different locations, deletion from specified locations and traversal.
6	Repeat exercises 2, 3 & 4 with linked structure.
7	Implementation of binary tree with operations like addition, deletion, traversal.
8	Depth first and breadth first traversal of graphs represented using adjacency matrix and list.
9	Implementation of binary search in arrays and on linked Binary Search Tree.
10	Implementation of different sorting algorithm like insertion, quick, heap, bubble and many more sorting algorithms.

3BTCSE-AI08: Object Oriented Programming Lab

Credit-1.5 **Max. Marks : 100 (IA:60, ETE:40)**
0L+0T+3P

SN	CONTENTS

1	Understand the basics of C++ library, variables, data input-output.
2	C++ program using with the concept of structures.
3	Implement class and object concepts and function overloading.
4	Write programs to understand dynamic memory allocation and array of objects.
5	Program to understand different types of constructors and destructor.
6	Implement friend function to access private data of a class and usage of this pointer.
7	Write programs to understand the usage of constant data member and member function, static data member and member function in a class.
8	Implement different types of inheritance, function overriding and virtual function
9	Implement Operator overloading concepts.
10	Write programs to understand function template and class template.
11	Write programs to understand exception handling techniques.
12	Write programs to understand file handling techniques.

3BTCSE-AI09: Software Engineering Lab

Credit-1.5 **Max. Marks : 100 (IA:60, ETE:40)**
0L+0T+3P

SN	CONTENTS
1	Development of requirements specification, function oriented design using SA/SD, object-oriented design using UML, test case design, implementation using Java and testing. Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle.
2	Develop Software Requirements Specification (SRS) for a given problem in IEEE template.
3	Develop DFD model (level-0, level-1 DFD and Data dictionary) of the project.
4	Develop structured design for the DFD model developed.
5	Developed all Structure UML diagram of the given project.
6	Develop Behavior UML diagram of the given project.
7	Manage file, using ProjectLibre project management software tool.

3BTCSE-AI10: Digital Electronics Lab

Credit-1.5 **Max. Marks : 100 (IA:60, ETE:40)**
0L+0T+3P

SN	CONTENTS
1	To verify the truth tables of basic logic gates: AND, OR, NOR, NAND, NOR. Also to verify truth table of Ex-OR, Ex-NOR (For 2, 3, & 4 inputs using gateswith 2, 3, & 4 inputs).
2	To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized usingNAND& NOR gates.
3	To realize an SOP and POS expression.
4	To realize Half adder/ Subtractor& Full Adder/ Subtractor using NAND & NOR gatesand to verify their truth tables.
5	To realize a 4-bit ripple adder/ Subtractor using basic Half adder/ Subtractor& basic Full Adder/ Subtractor.
6	To verify the truth table of 4-to-1 multiplexer and 1-to-4 demultiplexer. Realize the multiplexer using basic gates only. Also to construct and 8-to-1 multiplexer and 1-to-8 demultiplexer using blocks of 4-to-1 multiplexer and 1-to-4 demultiplexer.
7	Design & Realize a combinational circuit that will accept a 2421 BCD code and drive a TIL -312 seven-segment display.
8	Using basic logic gates, realize the R-S, J-K and D-flip flops with and without clock signal and verify their truth table.
9	Construct a divide by 2,4& 8 asynchronous counter. Construct a 4-bit binary counter and ring counter for a particular output pattern using D flip flop.
10	Perform input/output operations on parallel in/Parallel out and Serial in/Serial out registers using clock. Also exercise loading only one of multiple values into the register using multiplexer. Note: As far as possible, the experiments shall be performed on bread board. However, experiment Nos. 1-4 are to be performed on bread board only.

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UNDERGRADUATE DEGREE COURSE

Computer Science and Engineering (AI)

SunRise University, Alwar

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II Year-IV Semester: B.Tech. Computer Science and Engineering (AI)

4BTCSE-AI01: Discrete Mathematics Structure

Credit: 3 **Max. Marks: 100(IA:40, ETE:60)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Set Theory:** Definition of sets, countable and uncountable sets, Set operations, Partition of set, Cardinality (Inclusion-Exclusion & Addition Principles) Venn Diagrams, proofs of some general identities on sets. **Relation:** Definition, types of relation, composition of relations, Pictorial representation of relation, Equivalence relation, Partial ordering relation, Job-Scheduling problem. **Function:** Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions, pigeonhole principle. Theorem proving Techniques: Mathematical induction, Proof by contradiction. Composition of Functions. The Pigeonhole and Generalized Pigeonhole Principles.	7
3	**Propositional Logic:** Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Normal Forms, Universal and existential quantifiers. 2 way predicate logic. Introduction to finite state machine Finite state machines as models of physical system equivalence machines, Finite state machines as language recognizers.	8
4	**Posets, Hasse Diagram and Lattices:** Introduction, ordered set, Hasse diagram of partially, ordered set, isomorphic ordered set, well ordered set, properties of Lattices, bounded and complemented lattices. **Combinatorics:** Introduction, Permutation and combination, Binomial Theorem, Multimodal Coefficients Recurrence Relation and Generating Function: Introduction to Recurrence Relation and Recursive algorithms, linear recurrence relations with constant coefficients, Homogeneous solutions, Particular solutions, Total solutions, Generating functions, Solution by method of generating functions.	8
5	**Algebraic Structures:** Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.	8
6	**Graph Theory:** Introduction and basic terminology of graphs, Planer graphs, Multigraphs and weighted graphs, Isomorphic graphs, Paths, Cycles and connectivity, Shortest path in weighted graph, Introduction to Eulerian paths and circuits, Hamiltonian paths and circuits, Graph coloring, chromatic number, Isomorphism and Homomorphism of graphs, matching, vertex/edge covering.	8

Total	**40**

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4BTCSE-AI02: Managerial Economics and Financial Accounting

Credit-2 **Max. Marks : 100(IA:40, ETE:60)**
2L+0T+0P **End Term Exam: 2 Hours**

SN	CONTENTS	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Basic economic concepts-** Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	3
3	**Demand and Supply analysis-** Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
4	**Production and Cost analysis-** Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
5	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
6	**Financial statement analysis-** Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
	TOTAL	26

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4BTCSE-AI03: Microprocessor & Interfaces

Credit: 3 **Max. Marks: 100(IA:40, ETE:60)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introduction to Microprocessors, microcontroller; 8085 Microprocessor Architecture, pin description, Bus concept and organization; concept of multiplexing and de-multiplexing of buses; concept of static and dynamic RAM, type of ROM, memory map.	7
3	Software architecture registers and signals, Classification of instruction, Instruction set, addressing modes, Assembly Language Programming and Debugging, Programming Technique, instruction Format and timing.	8
4	Advance Assembly Language Programming, Counter and time delay; types of Interrupt and their uses, RST instructions and their uses, 8259 programmable interrupt controller; Macros, subroutine; Stack-implementation and uses with examples; Memory interfacing.	8
5	8085 Microprocessor interfacing:, 8255 Programmable Peripheral Interface, 8254 programmable interval timer, interfacing of Input/output device, 8279 Key board/Display interface.	8
6	Microprocessor Application: Interfacing scanned multiplexed display and liquid crystal display, Interfacing and Matrix Keyboard, MPU Design; USART 8251, RS232C and RS422A, Parallel interface-Centronics and IEEE 488.	8
	Total	40

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4BTCSE-AI04: Database Management System

Credit: 3 **Max. Marks: 100(IA:40, ETE:60)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	**Introduction to database systems:** Overview and History of DBMS. File System v/s DBMS.Advantage of DBMS Describing and Storing Data in a DBMS.Queries in DBMS.Structure of a DBMS. **Entity Relationship model:** Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model- Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Data Base, and Design with ER Model- Entity v/s Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation v/s ternary Relationship Conceptual Design for a Large Enterprise.	7
3	**Relationship Algebra and Calculus:** Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division, Relation Calculus, Expressive Power of Algebra and Calculus. **SQL queries programming and Triggers:** The Forms of a Basic SQL Query, Union, and Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values and Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.	8
4	**Schema refinement and Normal forms:** Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form, Normalization-Decomposition into BCNF Decomposition into 3-NF.	8
5	**Transaction Processing:** Introduction-Transaction State, Transaction properties, Concurrent Executions. Need of Serializability, Conflict vs. View Serializability, Testing for Serializability, Recoverable Schedules, Cascadeless Schedules.	8
6	**Concurrency Control: Implementation of Concurrency:** Lock-based protocols, Timestamp-based protocols, Validation-based protocols, Deadlock handling, **Database Failure and Recovery:** Database Failures, Recovery Schemes: Shadow Paging and Log-based Recovery, Recovery with Concurrent transactions.	8
	Total	40

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4BTCSE-AI05: Theory Of Computation

Credit: 3 **Max. Marks: 100(IA:40, ETE:60)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Finite Automata & Regular Expression: Basic machine, Finite state machine, Transition graph, Transition matrix, Deterministic and non-deterministic finite automation, Equivalence of DFA and NDFA, Decision properties, minimization of finite automata, Mealy & Moore machines. Alphabet, words, Operations, Regular sets, relationship and conversion between Finite automata and regular expression and vice versa, designing regular expressions, closure properties of regular sets, Pumping lemma and regular sets, Myhill- Nerode theorem , Application of pumping lemma, Power of the languages.	7
3	Context Free Grammars (CFG), Derivations and Languages, Relationship between derivation and derivation trees, leftmost and rightmost derivation, sentential forms, parsing and ambiguity, simplification of CFG, normal forms, Greibach and Chomsky Normal form , Problems related to CNF and GNF including membership problem.	8
4	Nondeterministic PDA, Definitions, PDA and CFL, CFG for PDA, Deterministic PDA, and Deterministic PDA and Deterministic CFL , The pumping lemma for CFL's, Closure Properties and Decision properties for CFL, Deciding properties of CFL.	8
5	Turing Machines: Introduction, Definition of Turing Machine, TM as language Acceptors and Transducers, Computable Languages and functions, Universal TM & Other modification, multiple tracks Turing Machine. Hierarchy of Formal languages: Recursive & recursively enumerable languages, Properties of RL and REL, Introduction of Context sensitive grammars and languages, The Chomsky Hierarchy.	8
6	Tractable and Untractable Problems: P, NP, NP complete and NP hard problems, Un-decidability, examples of these problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.	8
	Total	40

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4BTCSE-AI06: Data Communication and Computer Networks

Credit: 3 **Max. Marks: 100(IA:40, ETE:60)**

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	1
2	Introductory Concepts: Network hardware, Network software, topologies, Protocols and standards, OSI model, TCP model, TCP/IP model, Physical Layer: Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System	7
3	Data Link Layer: Error Detection and Correction, Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction, Protocols: Stop and wait, Go-back-N ARQ, Selective Repeat ARQ, Sliding window, Piggy backing, Pure ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA	9
4	Network Layer: Design issues, Routing algorithms: IPV4, IPV6, Address mapping: ARQ, RARQ, Congestion control, Unicast, Multicast, Broadcast routing protocols, Quality of Service, Internetworking	8
5	Transport Layer: Transport service, Elements of transport protocols, User Datagram Protocol, Transmission Control Protocol, Quality of service, Leaky Bucket and Token Bucket algorithm	8
6	Application Layer**:** WWW, DNS, Multimedia, Electronic mail, FTP, HTTP, SMTP, Introduction to network security	7
	Total	40

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4BTCSE-AI07: **Microprocessor & Interfaces Lab**

Credit: 1 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+2P

List of Experiments:

1. Add the contents of memory locations XX00 &XX01 & place the result in memory location XX02.
2. Add the 16 bit numbers stored in memory location & store the result in another memory location.
3. Transfer a block of data from memory location XX00 to another memory location XX00 in forward & reverse order.
4. Write a program to swap two blocks of data stored in memory.
5. Write a program to find the square of a number.
6. Write a main program and a conversion subroutine to convert Binary to its equivalent BCD.
7. Write a program to find largest & smallest number from a given array.
8. Write a program to Sort an array in ascending & descending order.
9. Write a program to multiply two 8 bit numbers whose result is 16 bit.
10. Write a program of division of two 8 bit numbers.
11. Generate square wave from SOD pin of 8085 & observe on CRO.
12. Write a program to perform traffic light control operation.
13. Write a program to control the speed of a motor.

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4BTCSE-AI08**: Database Management System Lab**

Credit: 1.5 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+3P

List of Experiments:

1. Design a Database and create required tables. For e.g. Bank, College Database
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for implementing ALTER,UPDATE and DELETE.
4. Write the queries to implement the joins.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG () and COUNT ().
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion , updation and deletion
10. Using the referential integrity constraints.
11. Write the query for creating the users and their role.

Data Base Designing Project:

For better understanding students (group of 3-4 students) should design data base for any data base project, understand the requirement and design methodology of project by its own.

Some example of data base design project like:

College management system, Inventory management system and Hospital management system.

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4BTCSE-AI09**: Network Programming Lab**

Credit: 1.5 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+3P

List of Experiments:

1. Study of Different Type of LAN& Network Equipments.
2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.
3. LAN installations and Configurations.
4. Write a program to implement various types of error correcting techniques.
5. Write a program to implement various types of framing methods.
6. Write two programs in C: hello_client and hello_server
    a. The server listens for, and accepts, a single TCP connection; it reads all the data it can from that connection, and prints it to the screen; then it closes the connection
    b. The client connects to the server, sends the string “Hello, world!”, then closes the connection
7. Write an Echo_Client and Echo_server using TCP to estimate the round trip time from client to the server. The server should be such that it can accept multiple connections at any given time.
8. Repeat Exercises 6 & 7 for UDP.
9. Repeat Exercise 7 with multiplexed I/O operations.
10. Simulate Bellman-Ford Routing algorithm in NS2.

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4BTCSE-AI10**: Linux Shell Programming Lab**

Credit: 1 **Max. Marks: 100(IA:60, ETE:40)**

0L+0T+2P

List of Experiments:

1. Use of Basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, dfspace, du, ulimit.
2. Commands related to inode, I/O redirection and piping, process control commands, mails.
3. Shell Programming: Shell script based on control structure- **If-then-fi, if-then-else-if, nested if-else, to find:**

Greatest among three numbers.

To find a year is leap year or not.

To input angles of a triangle and find out whether it is valid triangle or not.

To check whether a character is alphabet, digit or special character.

To calculate profit or loss.

4. Shell Programming - Looping- while, until, for loops

Write a shell script to print all even and odd number from 1 to 10.

Write a shell script to print table of a given number

Write a shell script to calculate factorial of a given number.

Write a shell script to print sum of all even numbers from 1 to 10.

Write a shell script to print sum of digit of any number.

5. Shell Programming - case structure, use of break

Write a shell script to make a basic calculator which performs addition, subtraction,

Multiplication, division

Write a shell script to print days of a week.

Write a shell script to print starting 4 months having 31 days.

6. Shell Programming - Functions

Write a shell script to find a number is Armstrong or not.

Write a shell script to find a number is palindrome or not.

Write a shell script to print Fibonacci series.

Write a shell script to find prime number.

Write a shell script to convert binary to decimal and decimal to binary

7. Write a shell script to print different shapes- Diamond, triangle, square, rectangle, hollow square etc.
8. Shell Programming – Arrays

Write a C program to read and print elements of array.

Write a C program to find sum of all array elements.

Write a C program to find reverse of an array.

Write a C program to search an element in an array.

Write a C program to sort array elements in ascending or descending order.

Syllabus of

UNDERGRADUATE DEGREE COURSE

Computer Science and Engineering
(Artificial Intelligence)

SunRise University, Alwar

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5BTCSE-AI01**: Data Mining-Concepts and Techniques**

Credit: 2 **Max. Marks: 100**(IA:40, ETE:60)
2L+0T+0P **End Term Exam: 3 Hours**

Course Objectives:

1. To introduce the fundamental processes data warehousing and major issues in data mining
2. To impart the knowledge on various data mining concepts and techniques that can be applied to text mining, web mining etc.
3. To develop the knowledge for application of data mining and social impacts of data mining.

Course Outcomes: After completion of the course, students would be able to:

1. Interpret the contribution of data warehousing and data mining to the decision-support systems.
2. Prepare the data needed for data mining using pre-processing techniques.
3. Extract useful information from the labelled data using various classifiers.
4. Compile unlabeled data into clusters applying various clustering algorithms.
5. Discover interesting patterns from large amounts of data using Association Rule Mining
6. Demonstrate capacity to perform a self-directed piece of practical work that requires the application of data mining techniques.

Detailed Syllabus: (per session plan)

UNIT	Contents
1	Introduction to Data Mining: Introduction to data mining-Data mining functionalities-Steps in data mining process- Classification of data mining systems, Major issues in data mining. Data Wrangling and Preprocessing: Data Preprocessing: An overview-Data cleaning-Data transformation and Data discretization
2	Predictive Modeling: General approach to classification-Decision tree induction- Bayes classification methods- advanced classification methods: Bayesian belief networks-Classification by Backpropagation- Support Vector Machines-Lazy learners
3	Descriptive Modeling: Types of data in cluster analysis-Partitioning methods- Hierarchical methods-Advanced cluster analysis: Probabilistic model-based clustering- Clustering high-dimensional data-Outlier analysis
4	Discovering Patterns and Rules: Frequent Pattern Mining: Basic Concepts and a Road Map - Efficient and scalable frequent item set mining methods: Apriori algorithm, FP-Growth algorithm- Mining frequent itemsets using vertical data format- Mining closed and max patterns- Advanced Pattern Mining: Pattern Mining in Multilevel, Multidimensional Space
5	Data Mining Trends and Research Frontiers: Other methodologies of data mining: Web mining-Temporal mining-Spatial mining-Statistical data mining- Visual and audio data mining- Data mining applications- Data mining and society: Ubiquitous and invisible data mining- Privacy, Security, and Social Impacts of data mining

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, third edition ,2013

2. Pang-Ning Tan,Michael Steinbach, Anuj Karpatne, Vipin Kumar, Introduction to Data Mining, second edition, Pearson, 2019

REFERENCE BOOKS:

1. Ian.H.Witten, Eibe Frank and Mark.A.Hall, Data Mining:Practical Machine Learning Tools and Techniques,third edition , 2017
2. Alex Berson and Stephen J. Smith, Data Warehousing, Data Mining & OLAP, Tata McGraw Hill Edition, Tenth Reprint, 2008.
3. Hand, D., Mannila, H. and Smyth, P. Principles of Data Mining, MIT Press: Massachusets. third edition, Pearson, 2013

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5BTCSE-AI02**: Compiler Design**

Credit: 3 **Max. Marks: 100**(IA:40, ETE:60)

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Objective, scope and outcome of the course. Compiler, Translator, Interpreter definition, Phase of compiler, Bootstrapping, Review of Finite automata lexical analyzer, Input, Recognition of tokens, Idea about LEX: A lexical analyzer generator, Error handling.	06
3	**Review of CFG Ambiguity of grammars:** Introduction to parsing. Top down parsing, LL grammars & passers error handling of LL parser, Recursive descent parsing predictive parsers, Bottom up parsing, Shift reduce parsing, LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Operator precedence parsing, Introduction of automatic parser generator: YACC error handling in LR parsers.	10
4	**Syntax directed definitions;** Construction of syntax trees, S-Attributed Definition, L-attributed definitions, Top down translation. Intermediate code forms using postfix notation, DAG, Three address code, TAC for various control structures, Representing TAC using triples and quadruples, Boolean expression and control structures.	10
5	**Storage organization;** Storage allocation, Strategies, Activation records, Accessing local and non-local names in a block structured language, Parameters passing, Symbol table organization, Data structures used in symbol tables.	08
6	**Definition of basic block control flow graphs;** DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG.	07
	Total	42

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5BTCSE-AI03**: Operating System**

Credit: 3 **Max. Marks: 100**(IA:40, ETE:60)

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction and History of Operating systems:** Structure and operations; processes and files Processor management: inter process communication, mutual exclusion, semaphores, wait and signal procedures, process scheduling and algorithms, critical sections, threads, multithreading	04
3	**Memory management:** contiguous memory allocation, virtual memory, paging, page table structure, demand paging, page replacement policies, thrashing, segmentation, case study	05
4	**Deadlock:** Shared resources, resource allocation and scheduling, resource graph models, deadlock detection, deadlock avoidance, deadlock prevention algorithms **Device management:** devices and their characteristics, device drivers, device handling, disk scheduling algorithms and policies	15
5	**File management:** file concept, types and structures, directory structure, cases studies, access methods and matrices, file security, user authentication	07
6	**UNIX and Linux operating systems as case studies;** Time OS and case studies of Mobile OS	08
	Total	40

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5BTCSE-AI04**: Computer Graphics & Multimedia**

Credit: 3 **Max. Marks: 100**(IA:40, ETE:60)
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**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	06
3	**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. Aliasing, and introduction to Anti Aliasing (No anti aliasing algorithm).	07
4	**Two Dimensional Graphics:**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	08
5	**Three Dimensional Graphics:**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.3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.	08
6	**Illumination and Colour Models:**Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.	06
7	**Animations &Realism:**Design of Animation sequences – animation function – raster animation – key frame systems – motion specification – morphing – tweening. **ComputerGraphics Realism:** Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons – space filling curves – fractals – Grammar based models – fractals – turtle graphics – ray tracing.	06
	Total	42

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5BTCSE-AI05**: Analysis of Algorithms**

Credit: 3 **Max. Marks: 100**(IA:40, ETE:60)

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Background**: Review of Algorithm, Complexity Order Notations: definitions and calculating complexity. **Divide And Conquer Method**: Binary Search, Merge Sort, Quick sort and Strassen's matrix multiplication algorithms.	06
3	**Greedy Method**: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning Trees. **Dynamic Programming**: Matrix Chain Multiplication. Longest CommonSubsequence and 0/1 Knapsack Problem.	10
4	**Branch And Bound**: Traveling Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem. **Pattern Matching Algorithms**: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms.	08
5	**Assignment Problems:** Formulation of Assignment and Quadratic Assignment Problem. **Randomized Algorithms**- Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2- SAT. Problem definition of Multicommodity flow, Flow shop scheduling and Network capacity assignment problems.	08
6	**Problem Classes Np, Np-Hard And Np-Complete:** Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems.Cook's Theorem. Proving NP-Complete Problems - Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover andSet Cover Problem.	08
	Total	41

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5BTCSE-AI06**: Fundamentals of Blockchain**

Credit: 2 **Max. Marks: 100**(IA:40, ETE:60)
2L+0T+0P **End Term Exam: 3 Hours**

Course Objectives:

1. The students should be able to understand a broad overview of the essential concepts of blockchain technology.
2. To familiarize students with Bitcoin protocol followed by the Ethereum protocol – to lay the foundation necessary for developing applications and programming.
3. Students should be able to learn about different types of blockchain and consensus algorithms.

Course Outcomes: After completion of the course, students would be able to:

1. To explain the basic notion of distributed systems.
2. To use the working of an immutable distributed ledger and trust model that defines blockchain.
3. To illustrate the essential components of a blockchain platform.

Detailed Syllabus: (per session plan)

UNIT	Contents
1	Basics: The Double-Spend Problem, Byzantine Generals' Computing Problems, Public-Key Cryptography, Hashing, Distributed Systems, Distributed Consensus.
2	Technology Stack: Blockchain, Protocol, Currency. Bitcoin Blockchain: Structure, Operations, Features, Consensus Model, Incentive Model
3	Ethereum Blockchain: Smart Contracts, Ethereum Structure, Operations, Consensus Model, Incentive Model.
4	Tiers of Blockchain Technology: Blockchain 1.0, Blockchain 2.0, Blockchain 3.0, Types of Blockchain: Public Blockchain, Private Blockchain, Semi-Private Blockchain, Sidechains.
5	Types of Consensus Algorithms: Proof of Stake, Proof of Work, Delegated Proof of Stake, Proof Elapsed Time, Deposite-Based Consensus, Proof of Importance, Federated Consensus or Federated Byzantine Consensus, Practical Byzantine Fault Tolerance. Blockchain Use Case: Supply Chain Management.

TEXT BOOKS:

1. Kirankalyan Kulkarni, Essentials of Bitcoin and Blockchain, Packt Publishing.
2. Anshul Kaushik, Block Chain & Crypto Currencies, Khanna Publishing House.
3. Tiana Laurence, Blockchain for Dummies, 2nd Edition 2019, John Wiley & Sons.
4. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashir, Packt Publishing (2017).

REFERENCE BOOKS:

1. Blockchain: Blueprint for a New Economy by Melanie Swan, Shroff Publisher O'Reilly Publisher

Media; 1st edition (2015).

2. Mastering Bitcoin: Programming the Open Blockchain by Andreas Antonopoulos.

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5BTCSE-AI07**: Computer Graphics & Multimedia Lab**

Credit: 1 **Max. Marks:100 (IA:60, ETE:40)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Implementation of Line, Circle and ellipse attributes
2	To plot a point (pixel) on the screen
3	To draw a straight line using DDA Algorithm
4	Implementation of mid-point circle generating Algorithm
5	Implementation of ellipse generating Algorithm
6	Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear
7	Composite 2D Transformations
8	Cohen Sutherland 2D line clipping and Windowing
9	Sutherland – Hodgeman Polygon clipping Algorithm
10	Three dimensional transformations - Translation, Rotation, Scaling
11	Composite 3D transformations
12	Drawing three dimensional objects and Scenes
13	Generating Fractal images

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5BTCSE-AI08**: Compiler Design Lab**

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Introduction: Objective, scope and outcome of the course.
2	To identify whether given string is keyword or not.
3	Count total no. of keywords in a file. [Taking file from user]
4	Count total no of operators in a file. [Taking file from user]
5	Count total occurrence of each character in a given file. [Taking file from user]
6	Write a C program to insert, delete and display the entries in Symbol Table.
7	Write a LEX program to identify following: 1. Valid mobile number 2. Valid url 3. Valid identifier 4. Valid date (dd/mm/yyyy) 5. Valid time (hh:mm:ss)
8	Write a lex program to count blank spaces,words,lines in a given file.
9	Write a lex program to count the no. of vowels and consonants in a C file.
10	Write a YACC program to recognize strings aaab,abbb using a^nb^n, where b>=0.
11	Write a YACC program to evaluate an arithmetic expression involving operators +,-,* and /.
12	Write a YACC program to check validity of a strings abcd,aabbcd using grammar a^nb^nc^md^m, where n , m>0
13	Write a C program to find first of any grammar.

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5BTCSE-AI09**: Analysis of Algorithms Lab**

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
0L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
2	Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3	a. Obtain the Topological ordering of vertices in a given digraph. b. Compute the transitive closure of a given directed graph using Warshall's algorithm.
4	Implement 0/1 Knapsack problem using Dynamic Programming.
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
6	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
7	a. Print all the nodes reachable from a given starting node in a digraph using BFS method. b. Check whether a given graph is connected or not using DFS method.
8.	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
9.	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
10	Implement N Queen's problem using Back Tracking.

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5BTCSE-AI10**: Advance Java Lab**

Credit: 1 **Max. Marks: 100 (IA:60, ETE:40)**
L+0T+2P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Introduction To Swing, MVC Architecture, Applets, Applications and Pluggable Look and Feel, Basic swing components : Text Fields, Buttons, Toggle Buttons, Checkboxes, and Radio Buttons
2	Java database Programming, java.sql Package, JDBC driver, Network Programming With java.net Package, Client and Server Programs, Content And Protocol Handlers
3	RMI architecture, RMI registry, Writing distributed application with RMI, Naming services, Naming And Directory Services, Overview of JNDI, Object serialization and Internationalization
4	J2EE architecture, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers
5	Server side programming with Java Servlet, HTTP and Servlet, Servlet API, life cycle, configuration and context, Request and Response objects, Session handling and event handling, Introduction to filters with writing simple filter application
6	JSP architecture, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension API, Tag handlers, JSP Fragments, Tag Files, JSTL, Core Tag library, overview of XML Tag library, SQL Tag library and Functions Tag library

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UNDERGRADUATE DEGREE COURSE

B.Tech. VI Semester

Computer Science and Engineering (Artificial Intelligence)

SunRise University, Alwar

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6BTCSE-AI01**: Digital Image Processing**

Credit: 2 **Max. Marks: 100**(IA:40, ETE:60)
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to Image Processing:** Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.	04
3	**Image Transformation & Filtering:** Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, colour models, Pseudo colouring, colour transforms, Basics of Wavelet Transforms.	06
4	**Image Restoration:** Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphism Filtering.	07
5	**Image Compression:** Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	05
6	**Image Segmentation & Representation:** Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors.	05
	Total	28

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6BTCSE-AI02**: Machine Learning**

Credit: 3 **Max. Marks: 100**(IA:40, ETE:60)

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**01**
2	**Supervised learning algorithm:** Introduction, types of learning, application, Supervised learning: Linear Regression Model, Naive Bayes classifier Decision Tree, K nearest neighbor, Logistic Regression, Support Vector Machine, Random Forest algorithm	**09**
3	**Unsupervised learning algorithm:** Grouping unlabelled items using k-means clustering, Hierarchical Clustering, Probabilistic clustering, Association rule mining, Apriori Algorithm, f-p growth algorithm, Gaussian mixture model.	**08**
4	**Introduction to Statistical Learning Theory**, Feature extraction - Principal component analysis, Singular value decomposition. Feature selection – feature ranking and subset selection, filter, wrapper and embedded methods, Evaluating Machine Learning algorithms and Model Selection.	**08**
5	**Semi supervised learning, Reinforcement learning:** Markov decision process (MDP), Bellman equations, policy evaluation using Monte Carlo, Policy iteration and Value iteration, Q-Learning, State-Action-Reward-State-Action (SARSA), Model-based Reinforcement Learning.	**08**
6	**Recommended system,** Collaborative filtering, Content-based filtering Artificial neural network, Perceptron, Multilayer network, Backpropagation, Introduction to Deep learning.	**08**
	Total	**42**

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6BTCSE-AI03**: Information Security System**

Credit:2 **Max. Marks: 100**(IA:40, ETE:60)
2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	**01**
2	**Introduction to security attacks:** services and mechanism, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stream and block ciphers.	**06**
3	**Modern 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. Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode.	**06**
4	**Public Key Cryptosystems with Applications:** Requirements and Cryptanalysis, RSA cryptosystem, Rabin cryptosystem, Elgamal cryptosystem, Elliptic curve cryptosystem.	**06**
5	**Cryptographic Hash Functions, their applications:** Simple hash functions, its requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA). Message Authentication Codes, its requirements and security, MACs based on Hash Functions, Macs based on Block Ciphers. Digital Signature, its properties, requirements and security, various digital signature schemes (Elgamal and Schnorr), NIST digital Signature algorithm.	**05**
6	**Key management and distribution:** symmetric key distribution using symmetric and asymmetric encryptions, distribution of public keys, X.509 certificates, Public key infrastructure. Remote user authentication with symmetric and asymmetric encryption, Kerberos Web Security threats and approaches, SSL architecture and protocol, Transport layer security, HTTPS and SSH.	**04**
	Total	**28**

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6BTCSE-AI04**: Computer Architecture and Organization**

Credit: 3 **Max. Marks: 100**(IA:40, ETE:60)
3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Computer Data Representation:** Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit. Basic Computer Organization and DesignInstruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, design of Accumulator Unit.	10
3	**Programming The Basic Computer:** Introduction, Machine Language, Assembly Language, assembler, Program loops, Programming Arithmetic and logic operations, subroutines, I-O Programming. Micro programmed Control: Control Memory, Address sequencing, Micro program Example, design of control Unit	7
4	**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, data transfer and manipulation, Program Control, Reduced Instruction Set Computer (RISC)Pipeline And Vector Processing, Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	8
5	**Computer Arithmetic:** Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit. Input-Output Organization, Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPUIOP Communication, Serial communication.	8
6	**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Multipreocessors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	8
	Total	42

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6BTCSE-AI05**: Principles of Artificial Intelligence**

Credit: 2 **Max. Marks: 100**(IA:40, ETE:60)

2L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction to AI and Intelligent agent:** Different Approach of AI, Problem Solving : Solving Problems by Searching, Uninformed search, BFS, DFS, Iterative deepening, Bi directional search, Hill climbing, Informed search techniques: heuristic, Greedy search, A* search, AO* search, constraint satisfaction problems.	03
3	**Game Playing:** Minimax, alpha-beta pruning, jug problem, chess problem, tiles problem	06
4	**Knowledge and Reasoning:** Building a Knowledge Base: Propositional logic, first order logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.	06
5	**Learning:** Overview of different forms of learning, Supervised base learning: Learning Decision Trees, SVM, Unsupervised based learning, Market Basket Analysis, Neural Networks.	07
6	**Introduction to Natural Language Processing:** Different issue involved in NLP, Expert System, Robotics.	05
	Total	28

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6BTCSE-AI06**: Cloud Computing**

Credit: 3 **Max. Marks: 100**(IA:40, ETE:60)

3L+0T+0P **End Term Exam: 3 Hours**

SN	Contents	Hours
1	**Introduction:** Objective, scope and outcome of the course.	01
2	**Introduction:** Objective, scope and outcome of the course. Introduction Cloud Computing: Nutshell of cloud computing, Enabling Technology, Historical development, Vision, feature Characteristics and components of Cloud Computing. Challenges, Risks and Approaches of Migration into Cloud. Ethical Issue in Cloud Computing, Evaluating the Cloud's Business Impact and economics, Future of the cloud. Networking Support for Cloud Computing. Ubiquitous Cloud and the Internet of Things	06
3	**Cloud Computing Architecture:** Cloud Reference Model, Layer and Types of Clouds, Services models, Data centre Design and interconnection Network, Architectural design of Compute and Storage Clouds. Cloud Programming and Software: Fractures of cloud programming, Parallel and distributed programming paradigms-Map Reduce, Hadoop, High level Language for Cloud. Programming of Google App engine.	10
4	**Virtualization Technology:** Definition, Understanding and Benefits of Virtualization. Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor VMware, KVM, Xen. Virtualization: of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-centre.	10
5	**Securing the Cloud:** Cloud Information security fundamentals, Cloud security services, Design principles, Policy Implementation, Cloud Computing Security Challenges, Cloud Computing Security Architecture . Legal issues in cloud Computing. Data Security in Cloud: Business Continuity and Disaster Recovery , Risk Mitigation , Understanding and Identification of Threats in Cloud, SLA-Service Level Agreements, Trust Management	08
6	**Cloud Platforms in Industry:** Amazon web services , Google AppEngine, Microsoft Azure Design, Aneka: Cloud Application Platform -Integration of Private and Public Clouds Cloud applications: Protein structure prediction, Data Analysis, Satellite Image Processing, CRM	07
	Total	42

TEXT BOOKS

1. Anthony T. Velte Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", 2010, The McGraw-Hill.
2. Dr. Kris Jamsa, " Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more" , Wiley Publications, ISBN: 978-0-470-97389-9
3. Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications, Cambridge University Press, ISBN: 9780511778476

REFERENCE BOOKS

1. Cloud computing for Dummies (November 2009) Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper
2. IBM Cloud Computing http://www.ibm.com/cloud-computing/us/en/

6BTCSE-AI07**: Digital Image Processing Lab**

Credit: 1.5 **Max. Marks: 100(IA:60, ETE:40)**

0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments

1	Point-to-point transformation. This laboratory experiment provides for thresholding an image and the evaluation of its histogram. Histogram equalization. This experiment illustrates the relationship among the intensities (gray levels) of an image and its histogram.
2	Geometric transformations. This experiment shows image rotation, scaling, and translation. Two-dimensional Fourier transform
3	Linear filtering using convolution. Highly selective filters.
4	Ideal filters in the frequency domain. Non Linear filtering using convolutional masks. Edge detection. This experiment enables students to understand the concept of edge detectors and their operation in noisy images.
5	Morphological operations: This experiment is intended so students can appreciate the effect of morphological operations using a small structuring element on simple binary images. The operations that can be performed are erosion, dilation, opening, closing, open-close, close-open.

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6BTCSE-AI08**: Machine Learning Lab**

Credit: 1.5 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Implement and demonstrate the FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample
4	Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
5	Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7	Write a program to construct aBayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9	Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

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6BTCSE-AI09: Python Lab

Credit: 1.5 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	Write a program to demonstrate basic data type in python.
2	Write a program to compute distance between two points taking input from the user Write a program add.py that takes 2 numbers as command line arguments and prints its sum.
3	Write a Program for checking whether the given number is an even number or not. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
4	Write a Program to demonstrate list and tuple in python. Write a program using a for loop that loops over a sequence. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
5	Find the sum of all the primes below two million. By considering the terms in the Fibonacci sequence whose values do not exceed four million, WAP to find the sum of the even-valued terms.
6	Write a program to count the numbers of characters in the string and store them in a dictionary data structure Write a program to use split and join methods in the string and trace a birthday of a person with a dictionary data structure
7	Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file? Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?
8	Write a program to print each line of a file in reverse order. Write a program to compute the number of characters, words and lines in a file.
9	Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on. Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.
10	Write a program to implement Merge sort. Write a program to implement Selection sort, Insertion sort.

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6BTCSE-AI10: Mobile Application Development Lab

Credit: 1.5 **Max. Marks: 100(IA:60, ETE:40)**
0L+0T+3P **End Term Exam: 2 Hours**

SN	List of Experiments
1	To study Android Studio and android studio installation. Create "Hello World" application.
2	To understand Activity, Intent, Create sample application with login module.(Check username and password).
3	Design simple GUI application with activity and intents e.g. calculator.
4	Develop an application that makes use of RSS Feed.
5	Write an application that draws basic graphical primitives on the screen
6	Create an android app for database creation using SQLite Database.
7	Develop a native application that uses GPS location information
8	Implement an application that writes data to the SD card.
9	Design a gaming application
10	Create an application to handle images and videos according to size.