BIKANER TECHNICAL UNIVERSITY, BIKANER

SYLLABUS

B. TECH.

ARTIFICIAL INTELLIGENCE
Effective From Session: 2020-21

3AI2-01: Probability for Computer Scientists

S.N	Content	Hours
1	Introduction: Objective, scope and outcome of the course	1
2	Introduction to Discrete random variables: Sample space, events, algebra of events, Bernoulli's trials. Probability & Baye's theorem. Random variable and their event space, probability generating function, expectations, moments, computations of mean time to failure, Bernoulli & Poisson processes.	8
3	Discrete and continuous distributions: Probability distribution and probability densities: Binomial, Poisson, normal rectangular and exponential distribution and their PDF's, moments and MGF's for above distributions.	8
4	Correlation and regression: Linear regression, Rank correlation, Method of least squares Fitting of straight lines and second degree parabola. Linear regression and correlation analysis.	8
5	Queuing Theory: Pure birth, pure death and birth-death processes. Mathematical models for M/M/1, M/M/N, M/M/S and M/M/S/N queues.	8
6	Discrete Parameter Markov chains: M/G/1 Queuing model, discrete parameter birth-death process. Markov Processes, Hidden Markov Models.	7
	Total	40

Text/References:

1. Probability, Statistics & Random Process By T. Veerajan, TMH.
2. Fundamental of Mathematical Statistics By S.C.Gupta and V.K. Kapoor, Sultan Chand & Sons.
3. Statistics and Probability Theory By Jain & Rawat ,CBC.
4. Statistics and Probability Theory By Schaum's, T.M.H.
5. Probability and Statistics with Reliability, Queuing, and Computer Science Applications by K. Trivedi, John Wiley and Sons, New York, 2nd edition (2002).
6. Probability and Statistics for Computer Scientists by M. Baron, Chapman & Hall/CRC Press (2007).
7. Concepts in Probability and Stochastic Modeling, by J. J. Higgins and S. Keller-McNulty, Wadsworth Publishing House (1995)

3AI1-02: Technical Communication

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, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting informationanddocumentdesign,Strategies fororganization, 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, and 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	**2**

3AI1-03: Managerial Economics and Financial Accounting

SN	CONTENTS	Hours
1	**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.	4
2	**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

3	**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**
4	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	**4**
5	**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**

3AI3-04: Digital Electronics

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 circuitsdesign methodology. Registers –shift registers.	**8**
	TOTAL	**40**

Text/References:

1. Digital integrated electronics, By Herbert Taub, Donald L. S hilling, TMH.
2. Digital Logic and Computer Design By M. Morris Mano, Pearson.
3. Modern Digital Electronics By R.P. Jain, TMH.
4. Fundamentals of Digital circuits By A. Anand kumar, PHI.
5. Digital circuit design By S. Salivahanan, Sarivazhagan, Vikas publications.

3AI4-05: Data structures and Algorithms

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-RoundRobin 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	SearchingTechniques: Sequentialand 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	4

Text/References:

1. An Introduction to data structures with applications By Jean-Paul Tremblay,
   P. G. Sorenson, TMH.
2. Data Structures in C/C++, Horowitz, Sawhney, Galgotia.
3. Data Structures in C/C++, Tanenbaum, Pearson.
4. Data Structures and Algorithms, Aho and Ullman.

3AI4-06: Concepts in Artificial Intelligence

S.N	Content	Hours
1	Introduction: Objective, scope and outcome of the course	1
2	Meaning and definition of artificial intelligence, Physical Symbol System Hypothesis, production systems, Characteristics of production systems; Breadth first search and depth first search techniques. Heuristic search Techniques: Hill Climbing, Iterative deepening DFS, bidirectional search. Analysis of search methods. A* algorithm, and their analysis. Introduction to Genetic Algorithms.	7
3	Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic , logical consequences, syntax and semantics of an expression, semantic Tableau. Forward and backward reasoning. Proof methods, substitution and unification, conversion to clausal form, normal forms, resolution, refutation, deduction, theorem proving, in fencing, monotonic and no monotonic reasoning. Introduction to prolog.	8
4	Network-based representation and reasoning, Semantic networks, Conceptual Graphs, frames. Description logic (DL), concept language, reasoning using DL. Conceptual dependencies (CD), scripts, reasoning using CD. Introduction to natural language processing.	8
5	Adversarial search and Game theory, classification of games, game playing strategies, prisoner's Dilemma. Game playing techniques, mini max procedure, alpha-beta cut-offs. Complexity of alpha-beta search. Automated planning, classical planning problem, forward planning, partial order planning, planning with proposal logic, hierarchical task planning, multi-agent planning	8
6	Reasoning in uncertain environments, Fuzzy logic, fuzzy composition relation, operations on fuzzy sets. Probabilistic reasoning, Bayes theorem, construction of Bayesian networks, belief propagation. Markov processes and Hidden Markov models	8
	Total	40

Text/References:

1. Artificial Intelligent e: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.
3. Artificial Intelligent by Luger (Pearson Education)
4. Russel & Norvig, Artificial Intelligent e: A Modern Approach, Pearson Education

3AI4-07: Principles of Imperative Computation

S.N	Content	Hours
1	Introduction: Objective, scope and outcome of the course	1
2	C language: emphasis on correctness of programs. Given the building blocks: variables, expressions, loops and loop invariants, arrays, and functions, learn the process and techniques to go from high-level descriptions of algorithms to correct implementations, using basic data structures and algorithms	5
3	Efficient coding: To write code correctly by design, and its application	6

	context. Programming to write high quality ode, assessing the performance of a program, and comparing solutions to satisfy deployment constraints. Translate between high-level algorithms and correct imperative code. Fundamental concepts in Computer Science as abstraction, correctness, complexity, and modularity.	
4	Reasoning about code: contracts, invariants, interfaces. Basic Data Structures and Algorithms: Hash Tables, Binary Search Tree, Linked Lists, Graphs. Bit Manipulation. Complexity analysis. Memory: Garbage collection, low-level details of explicit memory management.	**6**
5	Program as data: Concept of programs as data, and write programs that use this concept. Abstractions and interfaces in the presentation of algorithms and data structures. Difference between specification and implementation. Comparing different implementations of a given specification and different specifications that can be applied to a single implementation. Data structure manipulations using data structure invariants. Problem- solving tools: order (sorted or indexed data), asymptotic worst case, average case, and amortized analysis, randomness and (pseudo-) random number generation, and divide-and- conquer strategies.	**11**
6	Programming Skills: Training operational behavior of small programs. Identify, describe basic features of C: integers as signed modular arithmetic , integers as fixed-length bit vectors, characters and strings, Boolean operations, arrays, loops (while and for). Pointers: struct, recursive and mutually recursive functions, void pointers and casts between pointer types, fasts between different numeric types. Writing code using external libraries. Develop: write, test, rewrite, and refine code that meets a given specification or interface. Identify undefined and implementation-defined behaviors in C. Write, compile, and test C programs in a Unix-based environment using make, gcc, and valgrind.	**11**
	Total	**40**

Text/References:

1. The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall of India,
2. Programming in ANSI C, E Balaguruswamy, 1992, M Graw-Hill, India.

3AI4-21: Data Structures and Algorithms Lab

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 de-queue 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 Sear h Tree.
10	Implementation of different sorting algorithm like insertion, quick, heap, bubble and many more sorting algorithms.

3AI4-22: Principles of Imperative Computation Lab

S.N	Contents
1	Write simple programs in C, that includes all variable declarations, comprise arithmetic and logical expressions, control structures, and loops.
2	Write programs that make use of single and two dimensional arrays of integers; and of strings. Perform the operations of sorting and searching using different algorithms.
3	Use array of structures and sort on two fields: primary key, and secondary key. Divide the code in different modules (functions). Compile each module separately, then link together.
4	Write the high level algorithms making use of recursion, for factorial, Fibonacci series, and Towers of Hanoi, and write the corresponding C code.
5	Create an array of structures for field's employee name and surname, and add a third column as a hash key of first two columns. Input name and surname, generate the hash key, and search the array on hash key. Make use the binary search.
6	Write some elementary programs for memory management and Garbage collection using C.
7	Write and test the programs maing use of divide and conquer strategy.
8	Write programs to read program les as data, and compute the statistics of the program read, like, list of tokens, lines of code, elimination of comments, balancing of parentheses, etc.
9	Write a program to read another C program as file, and find out the data memory used by this new program.

10	Write some small programs in C, making use of make, and valgrind. Print the process parameters of this program.

3AI4-23: Artificial Intelligence Lab

SN	Content
1	Installation of gnu-prolog, Study of Prolog (gnu-prolog), its facts, and rules.
2	Write simple facts for the statements and querying it.
3	Write a program for Family-tree.
4	Write Program for Monkey-banana Problem.
5	Write a program which behaves a small expert for medical Diagnosis.
6	Write programs for computation of recursive functions, like, factorial, Fibonacci numbers, etc.
7	Write program to solve 5-queens problem.
8	Write a Program for water jug problem.
9	Write a program for travelling salesman program.
10	Case study of standard AI programs, like, Mycin, and AI Shell

3AI4-24: Digital Electronics Lab

S.N	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 gates with 2, 3, & 4 inputs).
2	To verify the truth table of OR, AND, NOR, Ex-OR, Ex-NOR realized using NAND& NOR gates.
3	To realize an SOP and POS expression.
4	To realize Half adder/ Subtractor & Full Adder/ Subtractor using NAND & NOR gates and 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 ode and drive a TIL -312 seven-segment displays.
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 lo k. 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

II year (4th Semester)

4AI2-01: Discrete Mathematical Structures

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 Pigeon hole and Generalized Pigeon hole 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, Multi graphs 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	4

Text/References:

1. Discrete Mathematics with Applications, Koshy, Elsevier
2. Discrete Mathematical Structures By Lipshutz & Lipson, TMH
3. Discrete Mathematical Structures, Kolman et.al, Pearson
4. Fundamentals of Discrete Mathematical Structures, K R Chowdhary, 3ed, PHI

4AI1-02: Technical Communication

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, Reading and 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 documentdesign, 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, Characteristicsand 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	**2**

4AI1-03: Managerial Economics and Financial Accounting.

SN	CONTENTS	Hours
1	**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.	**4**
2	**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**
3	**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**
4	**Market structure and pricing theory-** Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	**4**
5	**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	**2**

4AI3-04: Modern Regression

S.N	Content	Hours
1	Introduction: Objective, scope and outcome of the course	1
2	Introduction to applied data analysis. Data sets, various models for data, assessing validity assumptions, determine conclusions that can made from data. Review and discussion of exploratory methods, informal techniques for summarizing and viewing data	7
3	Simple linear regression model with only one predictor. Multiple linear regression models with multiple variables to predict the response of interest. Underlying assumptions for all the models. Do the Data support the assumptions? Do they contradict them? Consequences for inference. Introduction to Nonlinear regression/ regression with time- dependent data	8
4	Introduction to Statistical Learning: exploratory Data Analysis, multiple Regression, residual analysis. Model Checking, Bayesian Regression Outliers and Robust Regression. Model Selection, Bayesian Model Averaging Shrinkage. Hierarchical Models for Count Data (Poisson Regression).	8
5	Logistic Regression and Classification. Regression Trees and Forests. Generalized Additive Models. Bayesian Nonparametric Regression Ensemble Methods, Decision and Inference in Modern Regression.	8
6	Correlation: Regression Correlation, and regression. Linear regression, Rank correlation. Method of least squares Fitting of straight lines & second degree parabola. Linear regression and correlation analysis	8

Text/References:

1. Applied Linear Regression by Kutner, Nachtsheim, and Neter. M Graw- Hill, Fourth Edition.
2. Data Analysis using Regression and Multilevel/Hierarchical Models, by Andrew Gelman and Jennifer Hill.
3. An Introduction to Statistical Learning: with Applications in R by Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani.

4AI4-05: Database Management System

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

4AI4-06: Human Information Processing & Artificial Intelligence

S	Contents	H
1	Introduction: Objective, scope and outcome of the course	1
2	Introduction: Definition, psychological antecedences, cognition and intelligence. Fundamental ideas. Cognitive neuroscience: cognition in brain, structures and functions of brain, brain disorders. Intelligence and neuroscience, thinking about thinking.	7
3	Visual perception: from sensation to representation, approaches to perception, perception of objects and forms, role of environment in seeing, deficits in perception, and perception in practice. Attention, consciousness and its nature, when attentions fails, habituation and adaption. Automatic and controlled processes in attention.	8
4	Memory and models: tools for measuring memory, exceptional memory and neuropsychology. Memory processes, encoding and transfer of information, retrieval, process of forgetting and distortion. Constructive nature of memory. Lands scape of memory, mental images, maps, and propositions. Mental representation of knowledge, mental manipulation of images, synthesizing images and propositions, spatial cognition and cognitive Maps	8
5	Organization of knowledge in mind: declarative vs procedural knowledge, organization of declarative knowledge, representation of thinking process. Integrative models for representing declarative and non-declarative knowledge.	8
6	Language & its comprehension, reading, understanding conversation and essays. Language context, language and thought, language in a social context. Do animals have language? Neuropsychology of language. Introduction to problem solving and creativity; decision making and reasoning	8

Text/References:

1. Cognitive Psychology, 6th edition, Robert J. Sternberg and Karin Stern- berg, WADSWORTH Cengage Learning, India.
2. Cognitive Psychology - A students handbook, Michael W. Eysenck & Mark T. Keane, 7th ed., 2015, Taylor & Francis.
3. An introduction to cognitive psychology, David Groome, 3rd ed., Psychology press, 2014. New York.

4AI4-07: Introduction to Computer System

S.N	Contents	Hours
1	Introduction: Objective, scope and outcome of the course	1
2	A tour of Computer Systems Program translators, instruction interpretation, hardware organization of system, running Hello program. Cache, storage devices hierarchies. Operating system as hardware manager: processes, threads, virtual memory, files. System communication using networks. Introduction to Amdahl's law, concurrency and parallel, system abstraction.	7
3	Data representation and operations: Information storage-bits, bytes, hexadecimal, strings, bit and byte level operations in C, logical and shift operations in C, representation of integers, unsigned, signed, and exponential. Integer arithmetic's, two's complements and floating point arithmetic's.	8
4	Machine level representation of programs: program encoding, accessing information - operands specifications, data movement instructions, stack operations. Arithmetic and logical operations, effective address, unary, binary operations, shift operations. Control- condition codes, jump, conditional and unconditional branch, loops, and switch. Procedures run-time stack, control transfer, local and stack storage, recursive procedures	8
5	Array allocation pointer arithmetic's nested arrays, fixed-size arrays, and variable-size arrays. Heterogeneous data structures: Structures, Union, data alignment, pointers, out of bound memory reference and buffer over flow, thwarting buffer over flow attacks, variable size stack frames.	8
6	Processor architecture: Instruction set architecture, programmer visible state, instruction encoding, logic design and hardware control language. General principles of pipelining, pipelining hazards, exceptional handling, performance analysis. Distributed Systems and concurrency.	8

Text/References:

1. Randal E. Bryant and David R. O'Hallaron, Computer Systems: A Programmer's Perspective, Prentice Hall, 2003.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1988

4AI4-21: Python Programming Lab

Sr. No.	Contents
1	Installation of Python, and learning interactively at command prompt and writing simple programs.
2	Learning the conditions and iterations in Python by writing and running simple programs.
3	Random number generations, and problems based on random numbers.
4	Handling tuples and exercises based on tuples.
5	Functions and files
6	Linear and binary search
7	Handeling tokens
8	Finding unique, and duplicate items of a list.
9	Matrix addition, multiplications, and unity matrix.
10	Text processing using python
11.	Programs related to python libraries like Numpy, Pandas, Scipy etc.

4AI4-22: Database Management Lab

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.

4AI4-23: OpenCV Lab

Sr. No.	Content
1	Introduction to OpenCV function for image processing and vision algorithms (cv)
2	Introduction to Auxiliary OpenCV functions (cvaux)
3	Study of OpenCV data structure, XML support drawing functions (cxcore)
4	Study of GUI functions, Image and Video I/O (highgui)
5	Processing of Binary Image.
6	Processing of Grays scale Image.
7	Processing of RGB image
8	Operations on Images like, display, copy image, save image, morphological operations.
9	Video Input, Camera Input, playing with mouse, displaying image in full screen.
10	Haar cascade, image cropping, blob and edge detection.

4AI2-24: Modern Regression Lab

Sr. No.	Contents
1	Getting started with R, and a text editor
2	Fitting classical and multilevel regressions in R
3	Experiments on handling data, using simple models, presentation of data in graphical form, and drawing conclusions.
4	Using exploratory and informal techniques for summarising and viewing data.
5	Selection based techniques: multiple linear regression and stepwise regression. Enhancing the linear regression. Predicting the response of interest.
6	Simple experiments on nonlinear regression, and regression with time dependent data.
7	Experiments on model- checking and Bayesian regression.
8	Hierarchical models for counting data.
9	Experiments based on Regression Trees and Forcasts
10	Experiments on least square fitting of straight lines and second degree parabola.