

# BIKANER TECHNICAL UNIVERSITY, BIKANER



## SYLLABUS OF B. TECH.

**COMPUTER SCIENCE ENGINEERING  
(Artificial Intelligence & Machine Learning)**

**Effective From Session: 2020-21**

### 3AIML2-01: Advanced Engineering Mathematics

SN	CONTENTS	Hours
1	<b>Random Variables:</b> 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	<b>Historical development</b> , Engineering Applications of Optimization, Formulation of Design Problems as a Mathematical Programming Problems, Classification of Optimization Problems	8
4	<b>Classical Optimization using Differential Calculus:</b> Single Variable and Multivariable Optimization with & without Constraints, Lagrangian theory, Kuhn Tucker conditions	6
5	<b>Linear Programming:</b> Simplex method, Two Phase Method and Duality in Linear Programming. Application of Linear Programming: Transportation and Assignment Problems.	14
<b>TOTAL</b>		<b>40</b>

### 3AIML1-02: Technical Communication

SN	CONTENTS	Hours
1	<b>Introduction to Technical Communication- Definition</b> 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	<b>Comprehension of Technical Materials/Texts and Information Design &amp; development- Reading</b> 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 document design, Strategies for organization, Information design and writing for print and online media.	6
3	<b>Technical Writing, Grammar and Editing-</b> 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	<b>Advanced Technical Writing</b> -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
<b>TOTAL</b>		<b>26</b>

### 3AIML1-03: Managerial Economics and Financial Accounting

SN	CONTENTS	Hours
1	<b>Basic economic concepts</b> - 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	<b>Demand and Supply analysis</b> - 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	<b>Production and Cost analysis</b> - 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	<b>Market structure and pricing theory</b> - Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	<b>Financial statement analysis</b> - 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
<b>TOTAL</b>		<b>26</b>

### 3AIML3-04: Digital Electronics

	CONTENTS	Hours
1	<b>Fundamental concepts:</b> 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	<b>Minimization Techniques and Logic Gates:</b> 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	<b>Digital Logic Gate Characteristics:</b> TTL logic gate characteristics. Theory & operation of TTLN AND 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	<b>Combinational Circuits:</b> Combinational logic circuit design, adder, subtractor, BCD adder encoder, decoder, BCD to 7-segment decoder, multiplexer demultiplexer.	8
5	<b>Sequential Circuits:</b> Latches, Flip-flops- SR, JK, D, T, and Master-Slave Characteristic table and equation, countersandtheirdesign,Synchronouscounters–SynchronousUp/Downcounters– Programmablecounters–State table and state transition diagram, sequential circuits design methodology. Registers–shift registers.	8
<b>TOTAL</b>		<b>40</b>

**Text/References:**

1. Digital integrated electronics, By HerbertTaub,DonaldL.Shilling,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, Vikaspublications

**3AIML4-05: 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-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
<b>TOTAL</b>		<b>40</b>

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

### **3AIML4-06: 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, inference, monotonic and non 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, minimax	8

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

### 3AIML4-07: Object Oriented Programming

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 and ling.	6
	<b>TOTAL</b>	<b>40</b>

### **3AIML4-21: 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 Search Tree.
10	Implementation of different sorting algorithm like insertion, quick, heap, bubble and many more sorting algorithms.

### **3CS4-22: Object Oriented Programming Lab**

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.

### 3AIML4-23: 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

### 3AIML4-24: 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)

### 4AIML2-01: 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 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

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

### 3AIML1-03: Managerial Economics and Financial Accounting

SN	CONTENTS	Hours
1	<b>Basic economic concepts-</b> 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	<b>Demand and Supply analysis-</b> 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	<b>Production and Cost analysis-</b> 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	<b>Market structure and pricing theory-</b> Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	<b>Financial statement analysis-</b> 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
<b>TOTAL</b>		<b>26</b>

## 4AIML1-02: Technical Communication

SN	CONTENTS	Hours
	<b>Introduction to Technical Communication-</b> 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.	
	<b>Comprehension of Technical Materials/Texts and Information Design &amp; development-</b> 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 document design, Strategies for organization, Information design and writing for print and online media.	
	<b>Technical Writing, Grammar and Editing-</b> 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.	
	<b>Advanced Technical Writing-</b> 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 format soft technical articles.	
<b>TOTAL</b>		<b>26</b>

## 4AIML2-04: Introduction to Machine Learning

S.N	Contents	Hours
<b>1</b>	Introduction: Objective, scope and outcome of the course	<b>1</b>
<b>2</b>	Preliminaries, what is machine learning; varieties of machine learning, learning input/output functions, bias, sample application. Boolean functions and their classes, CNF, DNF, decision lists. Version spaces for learning, version graphs, learning search of a version space, candidate elimination methods	<b>10</b>
<b>3</b>	Neural Networks, threshold logic units, linear machines, networks of threshold learning units, Training of feed forward networks by back propagations, neural networks vs. knowledge-based systems	<b>6</b>
<b>4</b>	Statistical Learning, background and general method, learning belief networks, nearest neighbor. Decision-trees, supervised learning of uni-variance decision trees, network equivalent of decision trees, over fitting and evaluation.	<b>6</b>

5	Inductive Logic Programming, notation and definitions, introducing recursive programs, inductive logic programming vs decision tree induction.	5
6	Computational learning theory, fundamental theorem, Vapnik-Chernonenkis dimension, linear dichotomies and capacity. Unsupervised learning, clustering methods based on Euclidian distance and probabilities, hierarchical clustering methods. Introduction to reinforcement and explanation-based learning.	12

Text/References:

1. Introduction to Machine learning, Nils J.Nilsson
2. Machine learning for dummies, IBM Limited ed, by Judith Hurwitz and Daniel Kirsch
3. Introduction to Machine Learning with Python A guide for data scientists, Andreas, C. Muller & Sarah Guido, O'Reilly

## 4AIML4-05: Database Management System

	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, Joins, 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, Time stamp-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

#### 4AIML4-06: Theory of Computation

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 NFA, 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, left most 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 Untraceable Problems :P, NP, NP complete and NP hard problems, Undecidability, examples of the problems like vertex cover problem, Hamiltonian path problem, traveling sales man problem.	8
Total		40

#### 4AIML4-07: Data Human Information Processing and Artificial Intelligence

SN	Contents	Hours
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 object sand 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.	9
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.Integrativemodelsforrepresentingdeclarativeandnon-declarative knowledge.	8
6	Language & its comprehension, reading, understanding conversation and essays. Language context, language and thought, language in a social context. Do animal shave language? Neuro psychology of language. Introduction to problem solving and creativity; decision making and reasoning	7
Total		40

## 4AIML4-21: 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.

## 4AIML4-22: 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, NOTNULL 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 (groupof3-4students) should design database 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.



## 4AIML4-23: Linux & Shell Programming Lab

List of Experiments:

1. Use of Basic Unix Shell Commands: ls, mkdir, rmdir, cd, cat, banner, touch, file, wc, sort, cut, grep, dd, df, space, 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:
  - 3.1 Greatest among three numbers.
  - 3.2 To find a year is leap year or not.
  - 3.3 To input angles of a triangle and find out whether it is valid triangle or not.
  - 3.4 To check whether a character is alphabet, digit or special character.
  - 3.5 To calculate profit or loss.
4. Shell Programming - Looping- while, until, for loops
  - 4.1 Write a shell script to print all even and odd number from 1 to 10.
  - 4.2 Write a shell script to print table of a given number
  - 4.3 Write a shell script to calculate factorial of a given number.
  - 4.4 Write a shell script to print sum of all even numbers from 1 to 10.
  - 4.5 Write a shell script to print sum of digit of any number.
5. Shell Programming - case structure, use of break
  - 5.1 Write a shell script to make a basic calculator which performs addition, subtraction, Multiplication, division
  - 5.2 Write a shell script to print days of a week.
  - 5.3 Write a shell script to print starting 4 months having 31 days.
6. Shell Programming - Functions
  - 6.1 Write a shell script to find a number is Armstrong or not.
  - 6.2 Write a shell script to find a number is palindrome or not.
  - 6.3 Write a shell script to print Fibonacci series.
  - 6.4 Write a shell script to find prime number.
  - 6.5 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
  - 8.1 Write a C program to read and print elements of array.
  - 8.2 Write a C program to find sum of all array elements.
  - 8.3 Write a C program to find reverse of an array.
  - 8.4 Write a C program to search an element in an array.
  - 8.5 Write a C program to sort array elements in ascending or descending order.

## 4AIML3-24: Machine Learning Lab

Sr. No.	Contents
1	Implement and demonstrate the FIND-S algorithm 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 algorithm. 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 to classify a new sample
4	Build an Artificial Neural Network by implementing the Back propagation 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 a Bayesian 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 Neighbor 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