KKR & KSR INSTITUTE OF TECHNOLOGY AND SCIENCES

(Autonomous)

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

COURSE STRUCTURE & SYLLABUS

(Regulations – R20)

For B. Tech DEPARTMENT OF CSE - DATA SCIENCE

(Applicable for Batches admitted from 2020-2021*)*

KKR & KSR INSTITUTE OF TECHNOLOGY AND SCIENCES

(Autonomous)

(Accredited by NBA & NAAC with Grade "A" and Affiliated to JNTUK-Kakinada)

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DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

I Year - I Semester Course Structure – R20 (With effect from AY 2020-2021)

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	Engineering Science Course	20CS1T01	Problem Solving and Programming Using C	3	0	0	3	30	70	100
2	Basic Science Course	20SH1T04	Applied Chemistry	3	0	0	3	30	70	100
3	Basic Science Course	20SH1T06	Differential Equations	3	0	0	3	30	70	100
4	Engineering Science Course	20ME1T01	Engineering Graphics	1	0	4	3	30	70	100
5	Engineering Science Course	20EE1T02	Basics of Electrical and Electronics Engineering	3	0	0	3	30	70	100
6	Engineering Science Course (Lab)	20CS1L01	Problem Solving and Programming Using C Lab	0	0	3	1.5	15	35	50
7	Engineering Science Course (Lab)	20CS1L02	IT Workshop	0	0	3	1.5	15	35	50
8	Basic Science Course (Lab)	20SH1L04	Applied Chemistry Lab	0	0	3	1.5	15	35	50
			Total	**13**	**0**	**13**	**19.5**	**195**	**455**	**650**

Theory: BSC-2, ESC-3 **Practical:** BSC-1, ESC-2

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

I Year - II Semester

S.NO	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	Humanities and Social Science Course	20SH2T01	Communicative English	3	0	0	3	30	70	100
2	Basic Science Course	20SH2T02	Applied Physics	3	0	0	3	30	70	100
3	Basic Science Course	20SH2T07	Linear Algebra & Vector Calculus	3	0	0	3	30	70	100
4	Engineering Science Course	20EC2T01	Digital Logic Design	3	0	0	3	30	70	100
5	Engineering Science Course	20CS2T01	Python Programming	3	0	0	3	30	70	100
6	Humanities and Social Science Course (LAB)	20SH2L01	Communicative English Skills Lab	0	0	3	1.5	15	35	50
7	Basic Science Course (LAB)	20SH2L02	Applied Physics Lab	0	0	3	1.5	15	35	50
8	Engineering Science Course (LAB)	20CS2L01	Python Programming Lab	0	0	3	1.5	15	35	50
9	Mandatory Course (AICTE suggested)	20GE2M01	Environmental Science	2	0	0	0	15	35	50
10	MOOCS	20MO2A01	Fundamentals of Artificial Intelligence	0	0	0	0	0	0	0
			Total	**17**	**0**	**9**	**19.5**	**210**	**490**	**700**

Theory: BSC-2, HSMC-1, ESC-2 **Practical:** BSC-1, HSMC-1, ESC-1 MC: 1

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

II Year – I SEMESTER

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	Basic Science Course	20SH4T03	Probability and Statistics	3	0	0	3	30	70	100
2	Professional Core Course	20CS3T01	Mathematical Foundations of Computer Science	3	0	0	3	30	70	100
3	Professional Core Course	20CS3T02	Data Structures & Algorithms	3	0	0	3	30	70	100
4	Professional Core Course	20CS3T03	Object Oriented Programming through Java	3	0	0	3	30	70	100
5	Engineering Science Course	20CS3T04	Introduction to Artificial Intelligence	3	0	0	3	30	70	100
6	Engineering Science Course LAB	20CS3L01	Data Structures & Algorithms Lab	0	0	3	1.5	15	35	50
7	Professional Core Course LAB	20CS3L02	OOPS through Java lab	0	0	3	1.5	15	35	50
8	Professional Core Course (LAB)	20CS3L03	Introduction to Artificial Intelligence Lab	0	0	3	1.5	15	35	50
9	Skill Oriented Course	20SC3L01	Mobile App Development	0	0	4	2	15	35	50
10	Mandatory Course AICTE Suggested	20GE3L01	Essence of Indian Traditional Knowledge	2	0	0	0	15	35	50
			Total Cred	**17**	**0**	**13**	**21.5**	**225**	**525**	**750**

Theory: BSC-01,PCC-3,ESC-01: **Practical:** PCC-3,SC-01,MC-01

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

II Year – II SEMESTER

S.No	Category	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	Basic Science Course	20SH3T01	Numerical Methods & Transformations	3	0	0	3	30	70	100
2	Professional Core Course	20CS4T01	Computer Organization	3	0	0	3	30	70	100
3	Professional Core Course	20CS4T02	Database Management Systems	3	0	0	3	30	70	100
4	Engineering Science Course	20CS4T03	Formal Languages and Automata Theory	3	0	0	3	30	70	100
5	Humanities and Social Sciences	20SH4T01	Managerial Economics and Financial Accountancy	3	0	0	3	30	70	100
6	Professional Core Course LAB	20CS4L01	Database Management Systems Lab	0	0	3	1.5	15	35	50
7	Professional Core Course LAB	20CS4L02	Web Application Development Lab	0	0	3	1.5	15	35	50
8	Professional Core Course LAB	20CS4L03	R Programming Lab	0	0	3	1.5	15	35	50
9	Skilled Oriented Course	20SC4L01	Fundamentals of Robotics	0	0	4	2	15	35	100
Total Credits				**15**	**0**	**13**	**21.5**	**210**	**490**	**700**

Theory: BSC-01, PCC-2,ESC-01,HSMC-01: **Practical:** PCC-03,SC-01

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
20SH4T03	**PROBABILITY AND STATISTICS**	3	0	0	3
Subject Category :	**BSC**				

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

At the end of the Course, the student will be able to

CO 1: Determine the mean and variance of discrete and continuous random variables.

CO 2: Calculate probabilities using normal distribution and construct sampling distribution of means.

CO 3: Estimate the confidence interval for the mean of a population and test a hypothesis concerning means

CO 4: Estimate the confidence intervals, test a hypothesis concerning variances and proportions.

CO 5: Calculate correlation coefficient and determine line a regression for bivariate data

Unit I: Random Variables: Random variables, types of random variables, probability distribution function, probability density function, mean and variance of a random variable

Unit II: Probability Distributions and Sampling Distributions:

Normal distribution: calculating normal probabilities, normal approximation to the Binomial distribution. Sampling distributions: population and sample, sampling distribution of the mean (known), sampling distribution of the mean (unknown).

Unit III: Estimation and Test of Hypothesis of Means:

Point estimation, interval estimation, introduction to test of hypothesis, hypotheses is concerning one mean, hypothesis concerning two means, matched pair comparisons.

Unit IV: Estimation, Test of Hypothesis of Variances and Proportions Estimation of variance, hypothesis concerning one variance, hypothesis concerning two variances, estimation of proportion,

hypothecs is concerning one proportion, hypotheses is concerning several proportions.

Unit V: Regression analysis:

The method of least squares, curvilinear regression, multiple regression, correlation (excluding causation).

Text book:

1. Richard A. Johnson,"*Miller & Freund's Probability and Statistics for Engineers*", 8th edition, PHIL earning India Private Limited, 2011.

Reference Books:

1. S.Ross,"*A First Coursein Probability*", Pearson Education India, 2002.
2. W. Feller, "*An Introduction to Probability Theory and its Applications*", 1st edition,Wiley,1968. Gilbert Strang, "*Introduction to Linear Algebra*", 5thedition, Wellesely- CambridgePress,2016.

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
20CS3T01	**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**	3	0	0	3
Subject Category :	PCC				

Course Objectives:

This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:

At the end of the course student will be able to

CO1: Demonstrate skills in solving mathematical problems.

CO2: Comprehend mathematical principles and logic.

CO3: Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software.

CO4: Manipulate and analyze data numerically and/or graphically using appropriate Software.

CO5: Communicate effectively mathematical ideas/results verbally or in writing.

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and

Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hassie Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems.

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.

UNIT V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, BFS and DFS Spanning Trees .

Text Books:

1) *Discrete Mathematical Structures with Applications to Computer Science*, J. P. Tremblay and P.Manohar, Tata McGraw Hill.
2) *Elements of Discrete Mathematics-A Computer Oriented Approach*, C. L. Liu and D. P. Mohapatra,3rdEdition, Tata McGraw Hill.

Reference Books:

1) *Discrete Mathematics for Computer Scientists and Mathematicians*, J. L. Mott, A. Kandel and T. P.Baker, 2nd Edition, Prentice Hall of India.

2) *Discrete Mathematical Structure*s, BernandKolman, Robert C. Busby and Sharon Cutler Ross,PHI.

3) *Discrete Mathematics and its Applications with Combinatorics and Graph Theory*, K. H. Rosen, 7th Edition, Tata McGraw Hill.

E-Resources:

1) https://nptel.ac.in/courses/106/106/106106094/

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
20CS3T02	**DATA STRUCTURES & ALGORITHMS**	3	0	0	3
Subject Category	: **ESC**				

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementingefficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

COURSE OUTCOMES:

At the end of the Course the student shall be able to

CO 1: Analyze algorithms and describe searching, sorting and hashing techniques.

CO 2: Describe the concepts of stacks and queues.

CO 3: Apply the concepts of linked lists.

CO 4: Describe the concepts of trees.

CO 5: Explain the concepts of graphs

UNIT-I :Analysis of Algorithms: Efficiency of algorithms, Apriori Analysis, Asymptotic notations, Time complexity of algorithms sing Onotation, Polynomial Vs Exponential algorithms, Average, Best, Worst case complexities, Analyzing recursive programs.

Searching: Introduction, Linear Search, Binary Search, Fibonacci Search.

Internal Sorting: Introduction, Bubble Sort, Insertion Sort, Selection Sort.

UNIT-II :

Stacks: Introduction, Stack operations (push, pop, peek or top and isEmpty, isFull), Applications (Expression Evaluation, Expression Conversion, Backtracking and)

Queues : Introduction, Operations on queues (Insert, remove, isEmpty, isFull) , circular queues, PriorityQueue and Double-Ended Queue (Deque)

UNIT-III

Linked Lists: Introduction, Singly linked lists, Circular linked lists, Doubly linked lists, Multiple linked lists, Applications.

Linked Stacks and Linked Queues: Introduction, Operations on linked stacks and linked queues, Dynamic memory management, Implementation of linked representations, Applications

UNIT-IV: Trees and Binary Trees: Introduction, Trees: Definition and Basic Terminologies, Representation of trees. Binary trees: Basic terminologies and types, representation of binary trees, binary tree traversals, applications.

Binary Search Trees and AVL Trees : Introduction, Binary search trees: Definition and operations, AVL Trees: Definition and operations, Applications

UNIT-V

Hashing : Introduction, Hash Table Structure, Hash Functions

Graphs: Introduction, Definitions and basic terminologies, Representations of graphs, Graph traversals andapplications.

TEXT BOOKS:

1. *Data Structures & Algorithm Analysis in C* | Second Edition | Mark Allen Weiss |by Pearson
2. *Data Structures using C* |Second Edition| by Reema Thareja| Oxford
3. *Data Structures & Algorithm Analysis in C++* | Third Edition | Mark Allen Weiss |by Pearson

REFERENCES:

1. G.A.V. PAI, Data Structures and Algorithms, Concepts, Techniques and Applications, Volume1, 1st Edition , TataMcGraw-Hill,2008.
2. Richard F. Gilberg & Behrouz A. Forouzan, *Data Structures, Pseudo code Approach with C*, 2nd Edition, Cengage Learning India Edition,2007.
3. angsam,M.J.Augenstein,A.M.Tanenbaum, *Data structure susing C and C++*, 2ndEdition, PHI Education, 2008.
4. Sartaj Sahni, Ellis Horowitz, *Fundamentals of Data Structures in C*, 2nd Edition, Orient blacks wan, 2010.

E- REFERENCES:

1. https://www.javatpoint.com/data-structure-tutorial

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
20CS4T01	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA**	3	0	0	3
Subject Category :	**PCC**				

Course Objectives:

The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:

By the end of the course, the student will be

CO1: Able to realize the concept of Object Oriented Programming & Java Programming Constructs

CO2: Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords.

CO3: Apply the concept of exception handling and Input/ Output operations

CO4: Able to design the applications of Java & Java applet

CO5: Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators : Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to

Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic MethodDispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time. Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder. Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

1) *JAVA one step ahead*, Anitha Seth, B.L.Juneja, Oxford.
2) *The complete Reference Java*, 8th edition, Herbert Schildt, TMH

References Books:

1) *Introduction to java programming*, 7th edition by Y Daniel Liang, Pearson
2) Murach's *Java Programming*, Joel Murach

E-Resources:

1) https://nptel.ac.in/courses/106/105/106105191/
2) https://www.w3schools.com/java/java_data_types.asp

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
	Introduction to Artificial Intelligence	3	0	0	3
Subject Category :	ESC				

Course Objectives:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To provide a basic exposition to the goals and methods of Artificial Intelligence.
- To apply the techniques in applications which involve perception, reasoning and learning.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 : Enumerate the history and foundations of Artificial Intelligence

CO2 : Apply the basic principles of AI in problem solving

CO3 : Choose the appropriate representation of Knowledge

CO4 : Solve the problems with uncertainty using probability

CO5 : Examine the Scope of AI and its societal implications

UNIT I

Introduction: What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT II

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

UNIT III

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNIT IV

Uncertain Knowledge and Reasoning: Acting under Uncertainty**,** Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, Representing Knowledge in an Uncertain Domain,The Semantics of Bayesian Networks.

UNIT V

AI present and Future: Weak AI: Can Machines Act Intelligently?, Strong AI: Can Machines Really Think?, The Ethics and Risks of Developing Artificial Intelligence, Agent Components, Agent Architectures, Are We Going in the Right Direction?, What If AI Does Succeed?.

Text Books:

1) Stuart Russell and Peter Norvig, "*Artificial Intelligence: A Modern Approach*" , 3rdEdition,Pearson.
2) Elaine Rich and Kevin Knight, "*Artificial Intelligence*", Tata McGraw Hill

Reference Books:

1) Saroj Kaushik, "*Artificial Intelligence*", Cengage Learning India, 2011
2) David Poole and Alan Mack worth, "*Artificial Intelligence: Foundations for Computational Agents*", Cambridge University Press 2010.
3) Trivedi, M.C., "*A Classical Approach to Artifical Intelligence*", Khanna Publishing House,Delhi.

Web Resources:

1) https://nptel.ac.in/courses/106105077
2) https://nptel.ac.in/courses/106106126
3) https://aima.cs.berkeley.edu
4) https://ai.berkeley,edu/project_overview.html

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
20CS3L02	**DATA STRUCTURES & ALGORITHMS LAB**	0	0	3	1.5
Subject Category :	**PCC LAB**				

Course Objectives:

The objective of this lab is to

- Demonstrate the different data structures implementation.

Course Outcomes:

At the end of the Course the student shall be able to

CO1: Apply recursive and iterative methodologies to solve complex engineering problems.

CO2: Solve searching and sorting techniques and evaluate time & space complexities.

CO3: Develop solutions to create and implement operations of linear and nonlinear data structures.

CO 4: Identify and apply suitable data structure for a given real time problem

List of Experiments:

Exercise 1:

a) Write a recursive C program to calculate Factorial of an integer.

b) Write a recursive C program which computes the n^{th} Fibonacci number, for appropriate values of n.

Exercise 2:

c) Write a recursive C program to calculate GCD (n, m).

d) Write a recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

Exercise 3:

a) Write a C program that implements Selection sort, to sort a given list of integers in ascending order.

b) Write a C program that implements Insertion sort, to sort a given list of integers in ascending order.

Exercise 4:

a) Write a C program that implements Quick sort, to sort a given list of integers in ascending order.

b) Write a C program that implements Radix sort, to sort a given list of integers in ascending order.

c) Write a C program that implements Merge sort, to sort a given list of integers in ascending order.

Exercise 5:

a) Write a C program that implements Stack (its operations) using arrays.

b) Write a C program that uses Stack operations to convert infix expression into postfix expression

Exercise 6:

a) Write a C program that implements Queue (its operations) using arrays.

b) Write a C program that implements Circular Queue (its operations) using arrays.

Exercise 7:

a) Write a C program that uses functions to create a singly linked list and its operations (insert, delete, search).

b) Write a C program to reverse elements of a singly linked list.

Exercise 8:

a) Write a C program that implements Stack (its operations) using Linked list.

b) Write a C program that implements Queue (its operations) using Linked list.

Exercise 9:

a) Write a C program to create a Circular Linked list and its operations (insert,delete, search).

b) Write a C program to create a Doubly Linked list and its operations (insert,delete, search).

Exercise 10:

a) Write a C program to create a Binary Search Tree and its operations.

b) Write a recursive C program for traversing a Binary Search Tree in preorder, inorder and postorder.

Exercise 11:

a) Write a C program to perform BFS traversal on given graph.

b) Write a C program to perform DFS traversal on given graph.

TEXT BOOKS:

1. Richard F, Gilberg, Forouzan, *Data Structures*, 2nd edition, Cengage
2. Aaron M. Tenenbaum, YedidyahLangsam, Moshe J Augenstein, *Data Structures using C*, Pearson.
3. Mark Allen Weiss, *Data structures and Algorithm Analysis in C*, 2nd edition, Pearson Education. Ltd.

REFERENCE BOOKS:

1. Jean-Paul Tremblay Paul G. Sorenson, *An Introduction to Data Structures with Applications*, 2nd

edition, Mc Graw Hill Higher Education

2. Seymour Lipschutz, *Data Structure with C*, TMH
3. ReemaThareja, *Data Structures using C*, 2nd edition, Oxford

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
20CS4L01	**OBJECT ORIENTED PROGRAMMING THOUGH JAVA LAB**	0	0	3	1.5
Subject Category :	**PCC LAB**				

Course Objectives:

The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:

By the end of the course student will be able to write java program for

CO1: Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings

CO2: Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism.

CO3: Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism

CO4: Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.

c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using StringBuffer to delete, remove character

Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.

b) Write a JAVA program to implement constructor

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

a) Write a JAVA program for creation of Illustrating throw

b) Write a JAVA program for creation of Illustrating finally

c) Write a JAVA program for creation of Java Built-in Exceptions

d) Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a) Write a JAVA program that creates threads by extending Thread class .First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

b) Write a program illustrating **isAlive** and **join ()**

c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

a) Write a JAVA program Producer Consumer Problem

b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

a) Write a JAVA program illustrate class path

b) Write a case study on including in class path in your os environment of your package.

c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to display analog clock using Applet.

c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.

b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
	INTRODUCTION TO ARTIFICIAL INTELLIGENCELAB	0	0	3	1.5
Subject Category :	**ESC**				

Course Objectives:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence.
- To provide a basic exposition to the goals and methods of Artificial Intelligence.
- To apply the techniques in applications which involve perception, reasoning and learning.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 : Apply the basic principles of AI in problem solving using LISP/PROLOG

CO2 : Implement different algorithms using LISP/PROLOG

CO3 : Develop an Expert System using JESS/PROLOG

List of Experiments

1. Implementation of DFS for water jug problem using LISP/PROLOG
2. Implementation of BFS for tic-tac-toe problem using LISP/PROLOG/Java
3. Implementation of TSP using heuristic approach usingJava/LISP/Prolog
4. Implementation of Simulated Annealing Algorithm using LISP/PROLOG
5. Implementation of Hill-climbing to solve 8- PuzzleProblem
6. Implementation of Monkey Banana Problem using LISP/PROLOG
7. Implementation of A* Algorithm using LISP/PROLOG
8. Implementation of Hill Climbing Algorithm using LISP/PROLOG
9. Implementation Expert System with forward chaining using JESS/CLIPS
10. Implementation Expert System with backward chaining using RVD/PROLOG

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
20SC3L01	**MOBILE APP DEVELOPMENT**	0	0	4	2
Subject Category :	**SC**				

Course Objectives:

- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

Course Outcomes:

At the end of this course, students will be able to:

CO1: Identify various concepts of mobile programming that make it unique from programming for other Platforms.

CO2: Critique mobile applications on their design pros and cons

CO3: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,

CO4: Program mobile applications for the Android operating system that use basic and advanced phone features and Deploy applications to the Android marketplace for distribution .

LIST OF EXPERIMENTS:

1. Introduction to mobile technologies and devices , Android platform and applications overview
2. Setting Android development environments
3. Writing Android applications, Understanding anatomy of an Android application
4. Develop an application that uses GUI components, Font and Colours
5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop an application that makes use of Notification Manager
9. Implement an application that uses Multi-threading
10. Develop a native application that uses GPS location information

11. Implement an application that writes data to the SD card.
12. Implement an application that creates an alert upon receiving a message
13. Write a mobile application that makes use of RSS feed
14. Develop a mobile application to send an email.
15. Develop a Mobile application for simple needs (Mini Project)

References:

1. *Android Programming unleashed* , B.M. Harwani, Pearson, 2013.
2. *Android Programming (Big Nerd Ranch Guide),* by Bill Phillips, Chris Stewart, Brian Hardy, Kristin Marsicano, Pearson, 2016
3. *Android Programming – Pushing the limits* by Hellman by Erik Hellman, WILEY, 2013

Web References:

1. The Complete Android N Developer Course –Udemy https://www.udemy.com/course/complete-android-n-developer- course/?altsc=428526
2. Android Development Courses on Google developers training https://developers.google.com/training/android/
3. Mobile Computing - Video course- NPTEL https://nptel.ac.in/courses/106/106/106106147/#
4. Android Tutorial – Tutorial Point https://www.tutorialspoint.com/android/index.htm

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: III
Course Code	Course Name	L	T	P	C
20GE3L01	**ESSENCE OF INDIAN TRADITIONALKNOWLEDGE**	2	0	0	0
Subject Category :	**MC**				

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and internecine. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Understand the significance of Indian Traditional Knowledge

CO2: Classify the Indian Traditional Knowledge

CO3: Compare Modern Science with Indian Traditional Knowledge system.

CO4: Analyze the role of Government in protecting the Traditional Knowledge

CO5: Understand the impact of Philosophical tradition on Indian Knowledge System.

Unit I

Introduction to Traditional Knowledge: Define Traditional Knowledge- Nature and Characteristics-Scope and Importance- kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in global economy.

Unit II

Basic structure of Indian Knowledge System: AstadashVidya – 4 Ved -4 Upaved (Ayurved, Dhanurved, Gandharva Ved & Sthapthya Adi),6vedanga(Shisha, Kalppa, Nirukha,Vykaran,Jyothisha &Chand),4upanga(Dharmashastra, Meemamsa,purana&Tharka Shastra).

Unit III

Modern Science and Indian Knowledge System-Indigenous Knowledge, Characteristics- Yoga and Holistic Health care-cases studies.

Unit IV

Protection of Traditional Knowledge: The need for protecting traditional knowledge -Significance of Traditional knowledge Protection-Role of government to harness Traditional Knowledge.

Unit V

Impact of Traditions: Philosophical Tradition (Sarvadarshan) Nyaya, Vyshepec, Sankhya, Yog, Meemamsa, Vedantha, Chavanka, Jain &Boudh - Indian Artistic Tradition - Chitrakala, Moorthikala, Vasthukala , Sthapthya, Sangeetha, NruthyaYevamSahithya.

Reference Books:

1. *Traditional Knowledge System in India*, by AmitJha, 2009.
2. *Traditional Knowledge System and Technology in India* by Basanta Kumar Mohanta andVipin Kumar Singh, PratibhaPrakashan 2012.
3. Sivaramakrishnan (Ed.), *Cultural Heritage of India*-course material, BharatiyaVidya
4. Swami Jitatmanand, *Holistic Science and Vedant*, BharatiyaVidyaBhavan
5. *Yoga Sutra of Patanjali*, Ramakrishna Mission, Kolkata.
6. Pramod Chandra, *India Arts*, Howard Univ. Press, 1983.
7. Krishna Chaitanya, *Arts of India*, Abhinav Publications, 1987.

Web Resources:

2. https://www.wipo.int/wipo_magazine/en/2017/01/article_0004.html
3. http://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil- Kapoor.pdf
4. https://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_21/wipo_grtkf_ic_21_ref_facilitators_text.pdf

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
20SH3T01	**NUMERICAL METHODS & TRANSFORMATIONS**	3	0	0	3
Subject Category :	BSC				

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

At the end of the course, the student will be able to

CO1: Evaluate approximating the roots of polynomial and transcendental equations

CO2: Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals.

CO3: Apply different algorithms for approximating the solutions of ordinary Differential equations to its analytical computations.

CO4: Apply the Laplace transform for solving differential equations.

CO5: Find or compute the Fourier series of periodic signals and apply integral Expressions for the forwards and inverse Fourier transform to a range of non- periodic waveforms.

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UNIT I : Iterative methods:

Introduction – Bisection method – Iteration method – Newton-Raphson method (One variable) – Jacobiand Gauss-Seidel methods for solving system of equations.

UNIT II: Interpolation:

Introduction – Finite differences – Forward differences – Backward differences – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula.

UNIT III: Numerical integration and solution of ordinary differential equations

Trapezoidal rule – Simpson's 1/3rd and 3/8th rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

UNIT-IV: Laplace Transform :

Laplace transforms of standard functions-Shifting Theorems, Transforms of derivatives and integrals , Inverse Laplace transforms– Convolution theorem (with out proof).Application : Solutions of ordinary differential equations using Laplace transforms

UNIT V:Fourier Series:

Introduction- Periodic functions – Fourier series of -periodic function - Dirichlet's conditions– Even and odd functions –Change of interval– Half-range sine and cosine series. **Fourier Transforms**: Fourier integral theorem (without proof) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

Text Books:

1. **B. S. Grewal,** *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana,** *Higher Engineering Mathematics*, 2007 Edition, Tata Mc. Graw HillEducation.

Reference Books:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, Wiley-India.
2. Dass H.K., Rajnish Verma. Er., *Higher Engineering Mathematics*, S. Chand Co. Pvt. Ltd,Delhi

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
	COMPUTER ORGANIZATION	3	0	0	3
Subject Category :	**ESC**				

Course Objectives:

The course objectives of Computer Organization are to discuss and make student familiar with

- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to theCPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

Course Outcomes:

By the end of the course, the student will

CO1: Develop a detailed understanding of computer systems

CO2: Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations

CO3 : Develop a detailed understanding of architecture and functionality of central processing unit

CO4 : Exemplify in a better way the I/O and memory organization

CO5 : Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating,Point Representation. Other Binary Codes, Error Detection Codes.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II

Register Transfer Language and Micro operations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

UNIT III

Central Processing Unit: General Register Organization, STACK Organization. InstructionFormats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Micro programmed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

UNIT IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous datatransfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

UNIT V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures,Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1) *Computer System Architecture*, M. Morris Mano, Third Edition, Pearson, 2008.
2) *Computer Organization*, Carl Hamacher, ZvonkoVranesic, SafwatZaky, 5/e, McGrawHill, 2002.

Reference Books:

1) *Computer Organization and Architecture*, William Stallings, 6/e, Pearson, 2006.
2) *Structured Computer Organization*, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3) *Fundamentals of Computer Organization and Design*, Sivarama P. Dandamudi, Springer,2006.

Web Resources:

1) https://nptel.ac.in/courses/106/105/106105163/
2) http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
20CS3T04	**DATABASE MANAGEMENT SYSTEMS**	3	0	0	3
Subject Category :	**ESC**				

Course Objectives:

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:

By the end of the course, the student will be able to

CO1: Describe a relational database and object-oriented database

CO2: Create, maintain and manipulate a relational database using SQL

CO3: Describe ER model and normalization for database design

CO4: Examine issues in data storage and query processing and can formulate appropriate solutions

CO5: Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic &logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL:Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing,Comparison of File Organizations, Indexes and Performance Tuning.

Text Books:

1) *Database Management Systems*, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
2) *Database System Concepts*,5/e, Silberschatz, Korth, TMH

Reference Books:

1) *Introduction to Database Systems*, 8/e C J Date, PEA.

2) *Database Management System*, 6/e RamezElmasri, Shamkant B. Navathe, PEA

3) *Database Principles Fundamentals of Design Implementation and Management*, Corlos Coronel,Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

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

2) https://www.geeksforgeeks.org/introduction-to-nosql/

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
20CS4T03	**FORMAL LANGUAGES AND AUTOMATATHEORY**	3	0	0	3
Subject Category :	**ESC**				

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

By the end of the course students can

CO1: Classify machines by their power to recognize languages.

CO2: Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy

CO3: Employ finite state machines to solve problems in computing

CO4: Illustrate deterministic and non-deterministic machines

CO5: Quote the hierarchy of problems arising in the computer science

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma

of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, Є-Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

1) *Introduction to Automata Theory, Languages and Computation*, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
2. *Theory of Computer Science-Automata, Languages and Computation*, K. L. P. Mishra and N.Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:

1) *Elements of Theory of Computation*, Lewis H.P. &Papadimition C.H., Pearson /PHI
2) *Theory of Computation*, V. Kulkarni, Oxford University Press, 2013

3) *Theory of Automata, Languages and Computation*, Rajendra Kumar, McGraw Hill, 2014

e-Resources:

1) https://nptel.ac.in/courses/106/104/106104028/

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
20SH4T01	**MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY**	3	0	0	3
Subject Category :	**HSMC**				

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

CO1: The Learner is equipped with the knowledge of estimating the Demand and demand elasticity's for a product.

CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.

CO3: The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of differentBusiness Units.

CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.

CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics – Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions- Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprisesand their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements- Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flowand cash flow analysis (Problems).

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional

Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1) A R Aryasri, *Managerial Economics and Financial Analysis*, The McGraw – Hill companies.

Reference Books:

1) Varshney R.L, K.L Maheswari, *Managerial Economics,* S. Chand & Company Ltd.
2) JL Pappas and EF Brigham, *Managerial Economics*, Holt, R & W; New edition edition
3) N.P Srinivasn and M. SakthivelMurugan, *Accounting for Management*, S. Chand & CompanyLtd.
4) Maheswari *S.N, An Introduction to Accountancy*, Vikas Publishing House Pvt Ltd
5) I.M Pandey, *Financial Management* , Vikas Publishing House Pvt Ltd
6) V. Maheswari, *Managerial Economics,* S. Chand & Company Ltd.

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
20CS3L04	**DATABASE MANAGEMENT SYSTEMS LAB**	0	0	3	1.5
Subject Category :	**ESC LAB**				

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

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

CO1: Utilize SQL to execute queries for creating database and performing data manipulation Operations.

CO2: Examine integrity constraints to build efficient databases

CO3: Apply Queries using Advanced Concepts of SQL

CO4: Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round,

to_char, to_date)

5.

i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)

ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN And OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERECURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

1) *Oracle: The Complete Reference* by Oracle Press
2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3) Rick F Vander Lans, "*Introduction to SQL*", Fourth Edition, Pearson Education, 2007

DEPARTMENT OF CSE - ARTIFICIAL INTELLIGENCE

Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
	WEB APPLICATION DEVELOPMENT LAB	0	0	3	1.5
Subject Category :	**ESC**				

Course Objectives:

- To develop the skill in Creating dynamic web pages with servlets
- To provide knowledge in connecting java programs with database using JDBC.
- To develop the skill in server side programming using JSP, node.js, React.js
- To provide knowledge about MERN stack
- Testing the application on an Application Server.
- Debugging Web applications locally and remotely

Course Outcomes:

By the end of the course, the student will be able to

CO1 : Develop Single Page Applications

CO2 : Develop NodeJS & ReactJS Reusable Service

CO3 : Store the data in MySQL

CO4 : Get acquainted with the latest web application development trends in the IT industry

List of Experiments:

1. Authentication using Java Servlet
2. Authentication using JSP
3. Connect MySQL database using JSP
4. Design and development of Online Book Shop using JSP/Node.js & React.js
5. Design and development of Online Examination using JSP/Node.js & React.js
6. Design and development of online ticket reservation system using JSP/Node.js & React.js
7. Design and development of online library using JSP/Node.js & React.js
8. Design and development of online banking using JSP/Node.js & React.js
9. Design and development of online job portal using JSP/Node.js & React.js

10. Design and development of Online Auction using JSP/Node.js & React.js

Note: Students are encouraged to propose innovative ideas in the field of E-commerce as projects.

References

1. Jason Hunter, William Crawford , *Java Servlet Programming*, Second Edition, ,O'ReillyMedia
2. Hans Bergsten, *Java Server Pages*, O'Reilly
3. http://www.oracle.com/technetwork/java/index-jsp-135475.html
4. http://www.oracle.com/technetwork/java/javaee/jsp/index.html

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Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
20CS4L03	**R PROGRAMMING LAB**	0	0	3	1.5
Subject Category	:				

Course Objective:

In this course student will learn about the fundamentals of R programming, standard R libraries, solid understanding of R functions, write programs using the R and gain skills in R programming Language, get acquaintances with Arrays, Files, Strings, Packages, and distributions using R.

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

CO1: Implement basic concepts of R programming, and its different module that includes conditional, looping, lists, Strings, Functions, Frames, Arrays, and File programming.

CO2: Implement the concepts of R Script to extract the data from data frames and file operations.

CO3: Implement the various statistical techniques using R.

CO4: Extend the functionality of R by using add-on packages

CO5: Use R Graphics and Tables to visualize results of various statistical operations on data

List of Lab Experiments:

Week 1:

Installing R and R Studio

Basic functionality of R, variable, data types in R

Week 2:

a) Implement R script to show the usage of various operators available in R language.

b) Implement R script to read person's age from keyboard and display whether he iseligible for voting or not.

c) Implement R script to find biggest number between two numbers.

d) Implement R script to check the given year is leap year or not

Week 3:

a) Implement R Script to create a list.

b) Implement R Script to access elements in the list.

c) Implement R Script to merge two or more lists. Implement R Script to perform matrix operation

Week 4:

Implement R script to perform following operations:

a) various operations on vectors

b) Finding the sum and average of given numbers using arrays.

c) To display elements of list in reverse order.

d) Finding the minimum and maximum elements in the array.

***Week 9*:**

a) Implement R Script to perform Normal, Binomial distributions.

b) Implement R Script to perform correlation, Linear and multiple regression.

Week 10:

Introduction to Non-Tabular Data Types: Time series, spatial data, Network data. Data Transformations: Converting Numeric Variables into Factors, Date Operations,String Parsing, Geocoding

Week 5:

a) Implement R Script to perform various operations on matrices

b) Implement R Script to extract the data from data frames.

c) Write R script to display file contents.

d) Write R script to copy file contents from one file to another

Week 6 :

a) Write an R script to find basic descriptive statistics using summary, str, quartile function onmtcars & cars datasets.

b) Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset

Week 7:

a) Reading different types of data sets (.txt, .csv) from Web or disk and writing in file in specific disk location.

b) Reading Excel data sheet in R.

c) Reading XML dataset in R

Week 8:

a) Implement R Script to create a Pie chart, Bar Chart, scatter plot and Histogram (Introduction to ggplot2 graphics)

b) Implement R Script to perform mean, median, mode, range, summary, variance, standard deviation operations.

Week 11:

Introduction Dirty data problems: Missing values, data manipulation, duplicates, forms of data dates,

outliers, spelling

Week 12:

Data sources: SQLite examples for relational databases, Loading SPSS and SAS files, Reading from Google Spreadsheets, API and web scraping examples

References:

1. *R Cookbook Paperback* – 2011 by Teetor Paul O Reilly Publications
2. Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Wiley Publications
3. *R Programming For Dummies* by JorisMeysAndrie de Vries, Wiley Publications
4. *Hands-On Programming with R* by Grolemund, O Reilly Publications
5. *Statistical Programming in R* by KG Srinivas G.M. Siddesh, ChetanShetty&Sowmya B.J. - 2017edition
6. *R Fundamentals and Programming Techniques*, ThomasLumely.
7. *R for Everyone Advanced Analytics and Graphics*, Jared P. Lander- Addison WesleySeries
8. *The Art of R Programming*, Norman Matloff, CengageLearning
9. Maria DoloresUgarte,AnaF.Militino,AlanT.Arnholt—*Probability and Statistics with R* ‖2nd Edition on, CRC Press,2016.
10. *R-programming for Data science*, RogerD.Peng.
11. *An Introduction to statistical learning-with applications in R*, Trevor Hastie and Rob Tibshirani

E-Resources:

1. URL: https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources)
2. http://nptel.ac.in/courses/106104135/48
3. http://nptel.ac.in/courses/110106064/

SOFTWARE requirements:

1. *The R statistical software program*. Available from: https://www.r-project.org/
2. *R Studio an Integrated Development Environment (IDE) for R*. Available from: https://www.rstudio.com/

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Programme: CSE-AI					Semester: IV
Course Code	Course Name	L	T	P	C
	Fundamental of ROBOTICS	0	0	4	2
Subject Category :	SC				

Course Objective:

- The objective of this course is to enlighten the students about the fundamentals of roboticsystems.
- To understand the basics of robot, Robot Transformations and Sensors,
- To program them for functioning.

Course Outcomes:

The Student will be able to

CO 1: Specify the characteristics of robots used in different domains.

CO 2: Describe about the different types of gripper mechanisms

CO 3: Describe the use of sensor networks and quality control

CO 4: Discuss about the advanced methods for control of robot moments.

CO 5: Summarize the applications of automation and robotics.

List of Experiments:

1. Study of different types of robots based on configuration and application.
2. Study of different type of links and joints used in robots
3. Study of components of robots with drive system and end effectors
4. Determination of maximum and minimum position of links
5. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
6. Estimation of accuracy, repeatability and resolution
7. Implement the following functionality in robot

A. Programming a simple Robot on Wheels.

B. Programming a Walking Robot.

C. Experiments based on Bipedal Robot.

D. Experiments based on Humanoid Robot-ROOBONOVA.

E. Pick and Place Application Prog ramming with 4 DOF Robot Arm by Interfacing to PC.

F. Swap Application Programming with 4 DOF Robot Arm by Interfacing to PC.